FINAL
(VERSION 4)

COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS JOINT MILITARY TRAINING TRANSPORTATION STUDY

Department of the Navy
Naval Facilities Engineering Command, Pacific
258 Makalapa Drive, Suite 100
JBPHH HI 96860-3134

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EXECUTIVE SUMMARY

The purpose of this report is to provide specific information related to transportation including existing ground, air, and marine infrastructure, and construction of new facilities associated with the proposed action to establish a series of live-fire and maneuver ranges, training areas, and supporting facilities on the islands of Tinian and Pagan within the Commonwealth of the Northern Mariana Islands (CNMI). Figure ES-1 provides an overview of the CNMI, and Figure ES-2 and Figure ES-3 provide an overview of Tinian and Pagan, respectively.

The United States (U.S.) Pacific Command has identified unfilled unit level and combined level training requirements in the Western Pacific. U.S. Pacific Command designated the U.S. Marine Corps Forces Pacific (a part of the Marine Corps) as Executive Agent to address the unfilled training requirements. To address these shortfalls, the U.S. Marine Corps is overseeing the development of the CNMI Joint Military Training (CJMT) Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) for the proposed action. Proposed actions on Tinian would focus on unit level training requirements, while actions on Pagan would focus on combined level training requirements.

There are two different training tempos proposed for both Tinian and Pagan. The first training tempo is the proposed action presented in the CJMT EIS/OEIS, consisting of 20 weeks per year on Tinian and 16 weeks per year on Pagan. In the future, the training tempo might be increased to 45 weeks per year on Tinian and 40 weeks per year on Pagan and is addressed by the CJMT EIS/OEIS as a potential future action. This study addresses both training tempos.

GROUND TRANSPORTATION STUDY ON TINIAN

The existing conditions and capacity of Tinian's roadway facilities (within and outside of the Military Lease Area) and future travel demand with the proposed action have been analyzed. This ground transportation study uses available traffic volume data from the *CNMI Comprehensive Highway Master Plan* (CDPW 2008). The analysis of roadway segment level of service (LOS) is based on the roadway functional classification, maximum capacity, geometry, and average daily traffic volumes. Any roadway with LOS F is considered as over capacity with average daily traffic volume higher than the capacity threshold. The operational analysis indicates that all roadway segments are currently operating at acceptable level of service (LOS A) and would continue to operate at acceptable levels of service with low average daily traffic volumes and capacity available to accommodate projected traffic growth.

Existing roadways have sufficient available capacity to accommodate the traffic volumes generated by the proposed action. However, the current overgrown and poor condition of many of the roadways is such that based on the operational requirements with the proposed action, some level of improvements and upgrades to existing roads, such as, vegetation clearance, resurfacing, and regrading would be required to support recurring use by heavier and larger military vehicles. Several new roadways would be required to provide access to areas where ranges and training areas or support facilities are proposed and no roads currently exist.

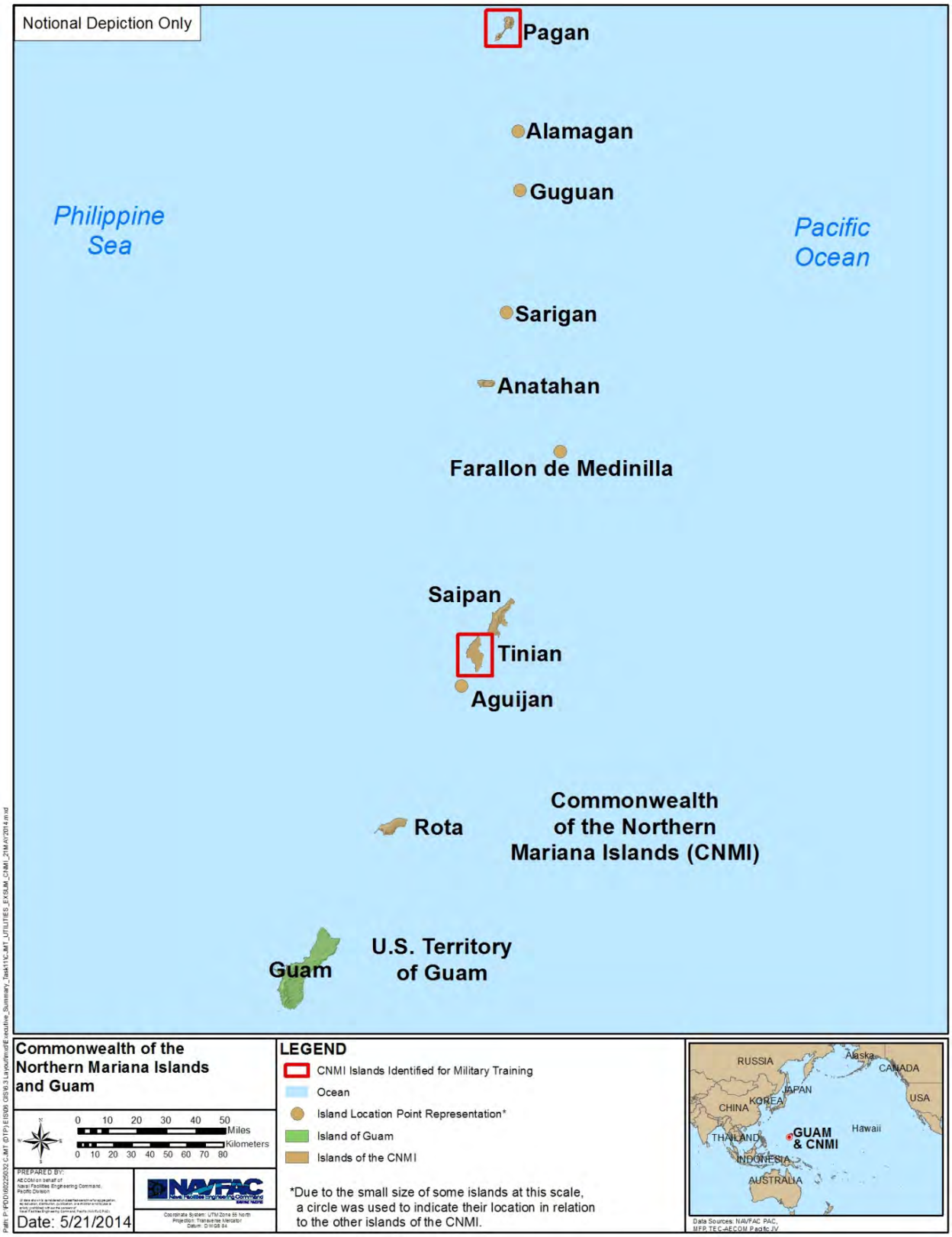

Figure ES-1. Commonwealth of the Northern Mariana Islands and Guam
Source: DoN 2014.

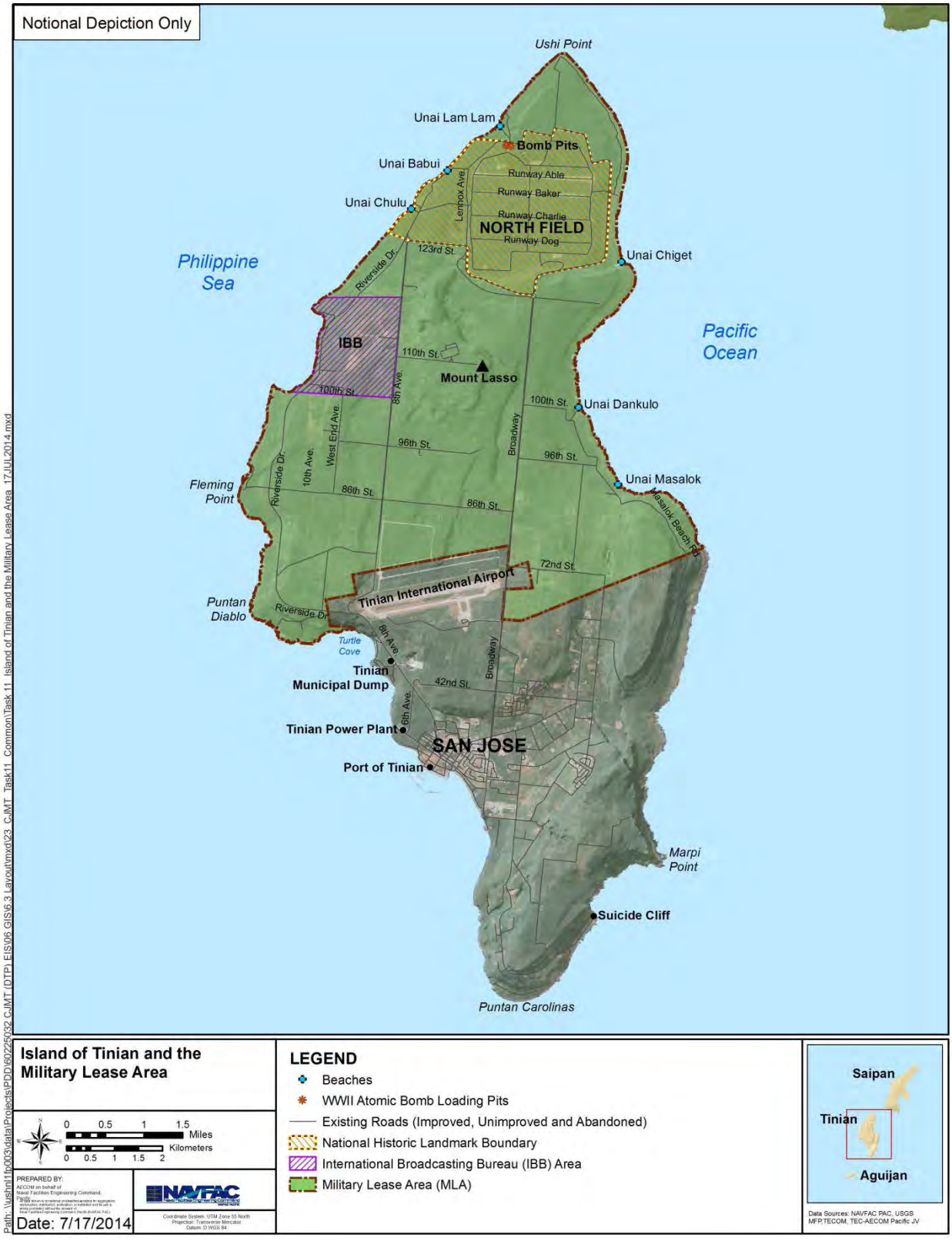

Figure ES-2. Island of Tinian and the Military Lease Area
Source: DoN 2014.

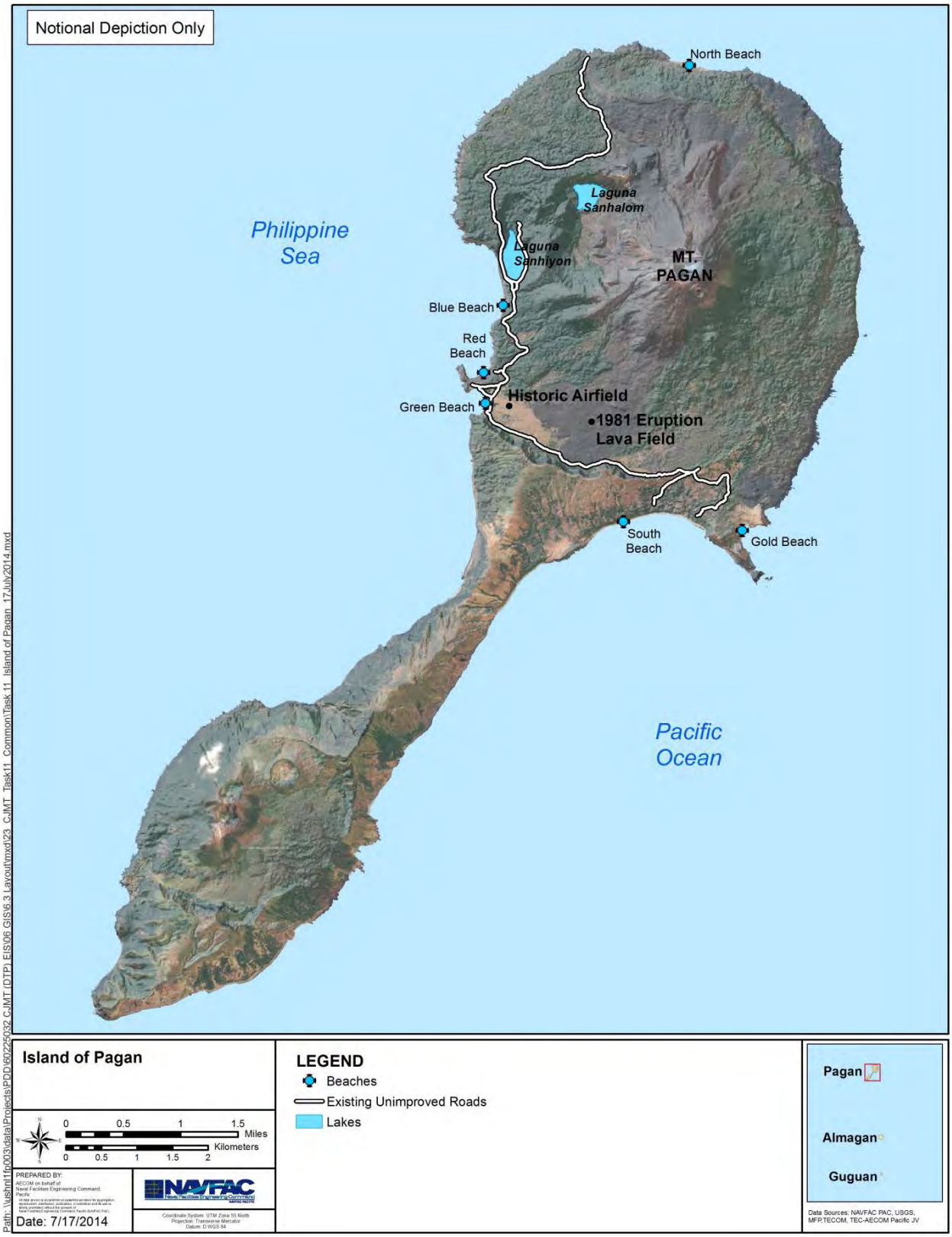

Figure ES-3. Island of Pagan
Source: DoN 2014.

The proposed roadway improvement recommendations for Tinian are identified in Figure ES-4. The recommended roadway improvement actions/construction requirements are listed below.

- *Improve Road Right-of-Way for Utilities*
- *Repair Existing Road for Public Use*
- *Repair Existing Road for Public Use – Boulevard*
- *Construct New Paved Road*
- *Repair Existing Road for General Use*
- *Construct New Gravel Road*
- *Establish Military Training Road*
- *Perimeter Patrol Road*
- *Road Closures*

The following cargo transit and tracked-vehicle transit routes would be established on Tinian:

- *Port to the Base Camp and MSA*
- *Tracked-Vehicle Training Trail*

Existing roads around the North Field runway (e.g., 123rd Street, Ushi Point Road, and Lennox Avenue) would be maintained by the U.S. military to allow tour bus access (see meeting notes provided in Appendix A).

Roadway improvements are subject to change pending the results of ongoing study and evaluation.

As part of the 1999 amendment to the 1984 lease agreement, the U.S. military transferred ownership of the roads within the military lease-back portion of Tinian to the CNMI for the purposes of maintaining the roads used by the civilian population, and to alleviate public-safety concerns for those requiring access to the Lease Back Area (CNMI and United States of America 1999). Roadways within the Exclusive Military Use Area were retained by the military through a maintenance agreement between the CNMI and the U.S. military to facilitate access to the historic areas inside the Exclusive Military Use Area. Development within the Military Lease Area (MLA) would require a review of the 1999 agreement on road ownership and maintenance. Based on a discussion held on April 24, 2014, the U.S. military may request to take control or otherwise develop an agreement with the CNMI and Municipality of Tinian concerning control, use, and maintenance of all roads within the MLA (meeting notes are provided in Appendix A).

Varying degrees of public access may be allowed to the MLA during training periods, depending on the training activities. When allowable, the perimeter security system would provide access to civilians to areas within the MLA. Military training would increase on Tinian approximately 20 weeks per year based on the proposed action and approximately 45 weeks per year under a potential future increased training tempo. As such, it is estimated that civilian use and access would be affected up to 20 weeks per year based on the proposed action and up to 45 weeks per year under a potential future increased training tempo. The 8th Avenue gate would be manned per standard security and operating procedures to allow MLA access by authorized personnel (including International Broadcasting Bureau employees). Gates would be manned as required to assure safety and security of the area (DoN 2014c).

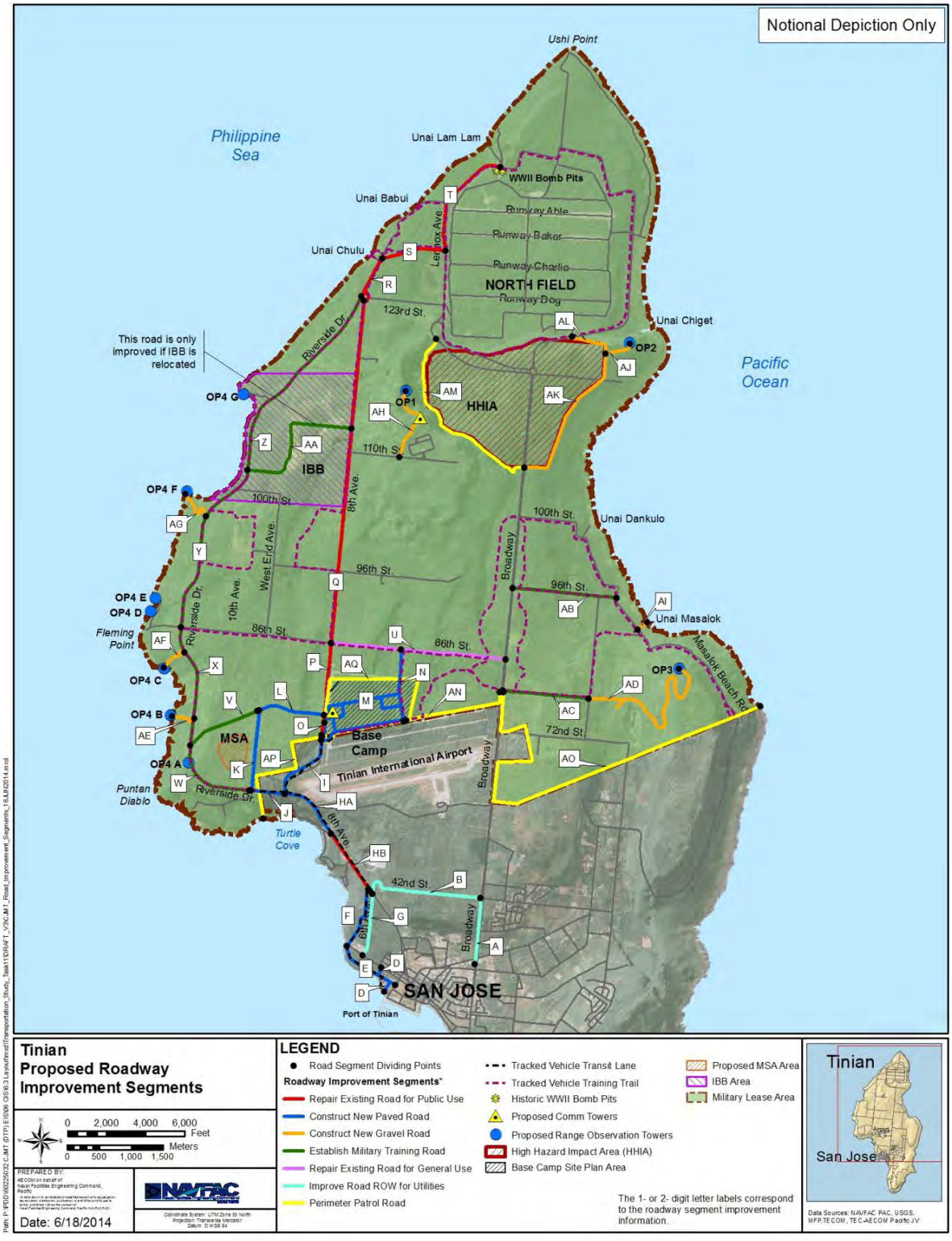

Figure ES-4. Tinian Proposed Roadway Improvement Segments
Source: DoN 2014.

The following roads would be permanently or temporarily closed:

- Permanent Closure –
  - *Within the MLA:* Gated security fences to the proposed MSA, HHIA, observation posts, and the base camp would be established to keep unauthorized people from entering these areas. Roads within the established fence line of these areas would be off limits to the public under all alternatives (DoN 2014c). Permanent closure of existing roads within the MLA, including portions of Broadway and 116th Street, would limit route choice and restrict vehicular access to areas of northern Tinian, including the National Historic Landmark. Civilian motorists who currently access areas within the MLA via Broadway would be diverted to the 8th Avenue gate during periods when civilian access to the MLA is allowed. Altered circulation patterns resulting from the permanent closure of roads within the MLA would not adversely affect traffic circulation or LOS on Tinian roadways. Roadways within and outside the MLA would continue to operate under capacity and at an acceptable LOS (i.e., LOS A).
- Temporary Closure –
  - *Outside the MLA:* Transportation of munitions may result in the temporary disruption of traffic of normal traffic patterns on roads and intersections that are near the munitions supply route (Figure 3.1-5 in Chapter 3). A security concept of operations has been developed for convoys transporting munitions between the Port of Tinian and the MSA (DoN 2014c).
  - *Within the MLA:* Only certain areas of the MLA would be open to the public during training periods. As training cycles are better defined, an access plan would be developed and published for public information. Training periods would be published electronically and by other media sources as agreed to between the Department of Defense and the Municipality of Tinian. Signs would also be posted to announce training periods. Long-range public notice of this training intent would give commercial travel and tourism companies sufficient lead-time to engage potential markets for visitors to Tinian. This notice would also inform visitors of the days and times when they may gain access to the MLA. An MLA public-access plan would be developed as part of the Range Management Plan.

Additional details regarding public access and security are provided in the *CJMT Security Study* (DoN 2014c).

To minimize the potential negative adverse effect of the roadway closures, including altered circulation patterns and increased traffic volumes on detour routes, the military would implement the Department of Defense's standard operating procedures, which include providing advance notification and ensuring that an area is clear of all nonparticipating personnel before training activities take place. In addition, the U.S. military will continue coordinating with local agencies (e.g., the Commonwealth Department of Public Works, Tinian Mayor's office), authorities, and communities to enhance the existing public notification process and provide as much advance notice as possible about the dates and times when public access to areas within the MLA would be available. Proper signage and warnings would be placed at strategic locations on Tinian (major roadways within the village of San Jose and the MLA gates at Broadway and 8th Avenue) to alert the public to roadway closures and appropriate alternate travel routes.

AIR TRANSPORTATION STUDY ON TINIAN

The existing capacity of Tinian International Airport (TNI) facilities and the air transportation demand for the proposed action have been analyzed. Based on the airfield demand/capacity analysis, TNI is not expected to experience airfield-capacity (operational) constraints with the additional air transportation demand under the proposed action.

No additional runway pavement or strengthening of existing pavement is anticipated. The existing runway length at TNI would be sufficient to accommodate the fleet mix with reduced maximum takeoff weights (i.e., limited allowable gross weights) for B747-400, C-17, and C-130.

The following improvements and new facilities for air transportation are recommended for consideration:

- Install runway centerline lights
- Replace the medium-intensity runway lights with high-intensity runway lights
- Construct a new aircraft parking apron and associated taxiway
- Modify the security fence to 7 feet (2.1 meters) high with three strands of barbed wire on a single extension arm [1]

In addition, the following specific improvements required for envisioned military training on Tinian are identified in the *Commonwealth of the Northern Mariana Islands Joint Military Training, Unconstrained Training Concept for Tinian and Pagan* (DoN 2014a) and the airport laydown plans for expeditionary operations and end state operations. They are listed below for easy reference. The proposed facilities for expeditionary operations are temporary in nature.

For the expeditionary operations:

- Combat aircraft loading area for loading aviation ordnance
- Hot cargo pads for munitions staging and equipment
- Aviation ordnance arm and dearm pad
- Helicopter landing pad (Landing helicopter dock pad)
- Field carrier landing practice area (Concrete pad for arresting gear)
- Landing signal officer's shack (a movable unit)
- Refueling area (aircraft parking locations for refueling while the aircraft is operating, including expeditionary fuel bladders)
- A biosecurity quarantine protocol would be developed for aircraft transporting military equipment and personnel arriving and departing Tinian

[1] Denotes improvement works that are also identified by the Commonwealth Ports Authority (CPA) and the Commonwealth Economic Development Strategic (CEDS) Planning Commission (CEDS 2009, CPA 2009b).

Additional for the end state operations:

- Airport Traffic Control tower
- Medium intensity approach lighting system [2]
- Hazardous cargo pad (expanded from the hot cargo pad in the expeditionary state)
- Aviation ordnance arm and dearm pads (relocated and expanded from the aviation ordnance arm and dearm pad in the expeditionary state)
- Aviation bulk fuel storage [1] (a separate facility from the bulk fuel storage near the port)
- Hot fuel pits (at the same location as the expeditionary fuel bladders in the expeditionary state)
- Hangars and maintenance building
- Vertical/Short takeoff Landing / Optical Landing System
- Localizer [1, 2]
- Glideslope [1, 2]
- Tactical Air Navigation System
- Full parallel military taxiway

A communication tower at the base camp, for both expeditionary and end state operations, is identified in the preliminary analysis as a potential obstruction to air navigation with height greater than the CFR Title 14 (Aeronautics and Space) Part 77 imaginary surfaces. Under the CFR Title 14 Part 77, Subpart B (Federal Aviation Administration [FAA] 2013a), FAA Form 7460-1, *Notice of Proposed Construction or Alternation*, must be filed before construction for FAA to evaluate the communication tower and determine if the tower represents a hazard to air navigation. The notice to the FAA must be submitted on or before an application for a license from the Federal Communications Commission is submitted, if applicable. The FAA will conduct an aeronautical study to determine whether the aeronautical effects of the proposed construction would constitute a hazard to air navigation.

MARINE TRANSPORTATION STUDY ON TINIAN

The port facilities on Tinian and vessel traffic patterns present in adjacent waters have been analyzed. The study assessed the suitability of current facilities for use during construction and operation of the proposed action. The study also assessed potential impacts on current and future marine vessel traffic. The Port of Tinian, the only port on the island, has a functional wharf and boat ramp as well as off-loading, biosecurity, and bulk fuel storage facilities. The Port of Tinian has available capacity and could meet the port requirements associated with the proposed action; existing facilities could be repaired and additional facilities could be constructed to increase capacity as needed.

[2] Denotes improvement works that are also recommended in the *West Tinian Master Plan Update* (CPA 2001).

For safety during live-fire use of the training ranges, some regular shipping lanes may be disrupted by the closure of open water they transect. The severity of the disruption would depend on the frequency and duration of closures.

The following specific improvements required for envisioned military training on Tinian are identified in the *CJMT Unconstrained Training Concept for Tinian and Pagan* (DoN 2014a):

- Construction of staging areas
- Improvement of boat launch ramps
- New biosecurity facilities
- Additional storage area and logistical support for equipment and materials (including heavy machinery and munitions)
- Construction of a military bulk fuel storage area

GROUND TRANSPORTATION STUDY ON PAGAN

The existing conditions of roadway facilities on Pagan and the future travel demand with the proposed action have been analyzed. A 22-mile (35-kilometer) gravel military training trail system is planned around the perimeter of the northern half of Pagan that would connect the expeditionary bivouac area and airfield to the North Range Complex. Approximately 6 miles (10 kilometers) of this system would utilize existing all-terrain vehicle trails. The other half of the perimeter military training trail system would be established over terrain where no trails exist. On Pagan, the term "road" is not applicable, as the vehicular travel paths would not be constructed like a traditional road, but rather corridors would be cleared by military personnel for vehicular maneuvering and mobility. During training activities, personnel would clear vegetation, cut/fill terrain and remove/compact lava and soil. Vehicles would move along the established military training trails and would utilize existing pathways and other terrain that they could safely navigate (excluding no maneuver areas). Access to all-terrain vehicle pathways or trails and areas within the HHIA would be restricted. As there are no permanent residents on Pagan no impacts related to transportation, including access restrictions, are expected.

AIR TRANSPORTATION STUDY ON PAGAN

The existing capacity of the Pagan Airstrip (TT01) and the air transportation demand for the proposed action have been analyzed. Based on the airfield demand/capacity analysis, TT01 would not experience airfield-capacity (operational) constraint(s) with the additional air transportation demand under the proposed action. Although the airfield has sufficient capacity for the increased operations, the existing physical constraints at TT01, such as the lava flow from the 1981 volcano eruption, would limit its usage for the proposed action with the proposed aircraft fleet mix.

The following new facilities or improvements for air transportation have been recommended for consideration:

- Extend, regrade, and strengthen the existing runway.
- Add turnarounds at the two runway ends.
- Install a permanent marker at thresholds and along the landing strip boundary, such as low-intensity runway lights for possible operations at night.

- Install windsocks.
- Add a supplementary aviation weather reporting station and include Pagan in the Terminal Aerodrome weather forecast and METAR weather report. METAR is the international standard code format for hourly surface weather observations.
- Construct a new aircraft parking apron and associated taxiway for U.S. military use.
- Stabilize the drop-off area at the western end of the Runway 11/29 with riprap.

A cost-benefit analysis should be completed to determine the financially optimum runway length, surface or pavement materials, and design parameters. A detailed site investigation and topographic survey would be required for this cost-benefit analysis in the design phase.

In addition, the following specific improvements required for envisioned military training on Pagan are identified in the *Commonwealth of the Northern Mariana Islands Joint Military Training, Unconstrained Training Concept for Tinian and Pagan* (DoN 2014a). They are listed below for easy reference.

- A forward arming and refueling point for Pagan's landing strip, to provide fuel, ordnance loading, and arming/dearming in support of helicopter flight operations and other training.
- A fuel bladder containment berm to facilitate the use of the forward arming and refueling point, which would be equipped with expedient refueling systems. A biosecurity quarantine protocol would be developed for aircraft transporting military equipment and personnel arriving and departing Pagan.

Existing obstructions within the runway object free area would be removed. Trees would be trimmed to outside the transition slope and obstacle clearance surfaces. The historical remains from the Japanese military period, which are within the runway safety area and runway object free area, would be relocated or removed depending upon requirements for preservation of historic sites.

In addition, an FAA aeronautical study should be completed to determine whether there is a hazard to air navigation and to specify the traffic pattern for the runway to suit the terrain and aircraft category.

MARINE TRANSPORTATION STUDY ON PAGAN

The port facilities on Pagan and vessel traffic patterns in adjacent waters have been analyzed. No usable port facilities currently exist at Pagan. No port facilities are planned for this action; however, as force flow or U.S. posture changes in the region, additional facilities may have to be constructed, including the potential for a new pier and breakwater. There is no appreciable marine vessel traffic in waters offshore of Pagan; therefore, no appreciable conflict with marine traffic would occur.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	aircraft approach category
AASHTO	American Association of State Highway and Transportation Officials
AAV	Amphibious Assault Vehicle
AC	Advisory Circular
ARC	Airport Reference Code
ARFF	aircraft rescue and firefighting
ARTCC	Air Route Traffic Control Center
ASV	annual service volume
CDPW	Commonwealth Department of Public Works
CEDS	Commonwealth Economic Development Strategic
CFR	Code of Federal Regulations
CJMT	Commonwealth of the Northern Mariana Islands Joint Military Training
CNMI	Commonwealth of the Northern Mariana Islands
CPA	Commonwealth Ports Authority
DoN	Department of the Navy
DZ	Danger Zone
ECF	Entry Control Facility
ETL	Engineering Technical Letter
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FPCON	Force Protection Condition
GSN	Saipan International Airport
HHIA	High Hazard Impact Area
HIRL	high-intensity runway light
ID	identification
IFR	Instrument Flight Rules
ILS	Instrument Landing System
JGPO	Joint Guam Program Office
JHSV	Joint High Speed Vessel
LOS	Level of Service
LZ	Landing Zone
MARFORPAC	Marine Corps Forces Pacific
MIRL	medium-intensity runway light
MLA	Military Lease Area
msl	mean sea level
MTOW	maximum takeoff weight
NAVFAC	Naval Facilities Engineering Command
NDB	nondirectional beacon
NGS	National Geodetic Survey
NMIAC	Northern Mariana Islands Administrative Code
NOAA	National Oceanic and Atmospheric Administration
PAPI	precision approach path indicator
RDC	Runway Design Code
RTA	Range and Training Area
SDDCTEA	Surface Deployment and Distribution Command Transportation Engineering Agency
SUA	Special Use Airspace
TACAN	Tactical Air Navigation System
TAF	Terminal Area Forecast
TDG	Taxiway Design Group
TNI	Tinian International Airport
U.S.	United States
UFC	Unified Facilities Criteria
VFR	Visual Flight Rules

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CHAPTER 1. INTRODUCTION

1.1 OVERVIEW

The purpose of this report is to provide information regarding the ground, air, and marine transportation infrastructure capacity/demand analysis and facility requirements associated with a proposed action to establish a series of live-fire and maneuver ranges, and training areas and supporting facilities within the Commonwealth of the Northern Mariana Islands (CNMI) to address the United States (U.S.) Pacific Command Service Components' unfilled training requirements in the Western Pacific. These live-fire ranges, training courses, and maneuver areas collectively constitute a Range and Training Area (RTA). Under the proposed action, a unit level RTA is proposed for Tinian and a combined level RTA is proposed on Pagan. The proposed action includes construction, range management, expanded training and operations (to include combined-arms, live-fire, and maneuver training at the unit and combined levels), establishment of danger zones, designation of Special Use Airspace (SUA), and acquisition and/or lease of land to support simultaneous and integrated training. The CNMI Joint Military Training (CJMT) Environmental Impact Statement/Overseas Environmental Impact Statement is being prepared to assess potential impacts associated with the proposed action. This report focuses on existing ground, air, and marine transportation infrastructure capacity and facility requirements, proposed projects, and methodology, and recommends improvements to existing transportation infrastructure and construction of new transportation infrastructure to meet the proposed action. Figure 1.1-1 provides an overview of the CNMI, and Figure 1.1-2 and Figure 1.1-3 provide overviews of Tinian and Pagan, respectively.

There are two different training tempos proposed for both Tinian and Pagan. The first training tempo is the proposed action presented in the CNMI Joint Military Training Environmental Impact Statement/Overseas Environmental Impact Statement, consisting of 20 weeks per year on Tinian and 16 weeks per year on Pagan. In the future, the training tempo might be increased to 45 weeks per year on Tinian and 40 weeks per year on Pagan and is addressed by the CNMI Joint Military Training Environmental Impact Statement/Overseas Environmental Impact Statement as a potential future action. This study addresses both training tempos.

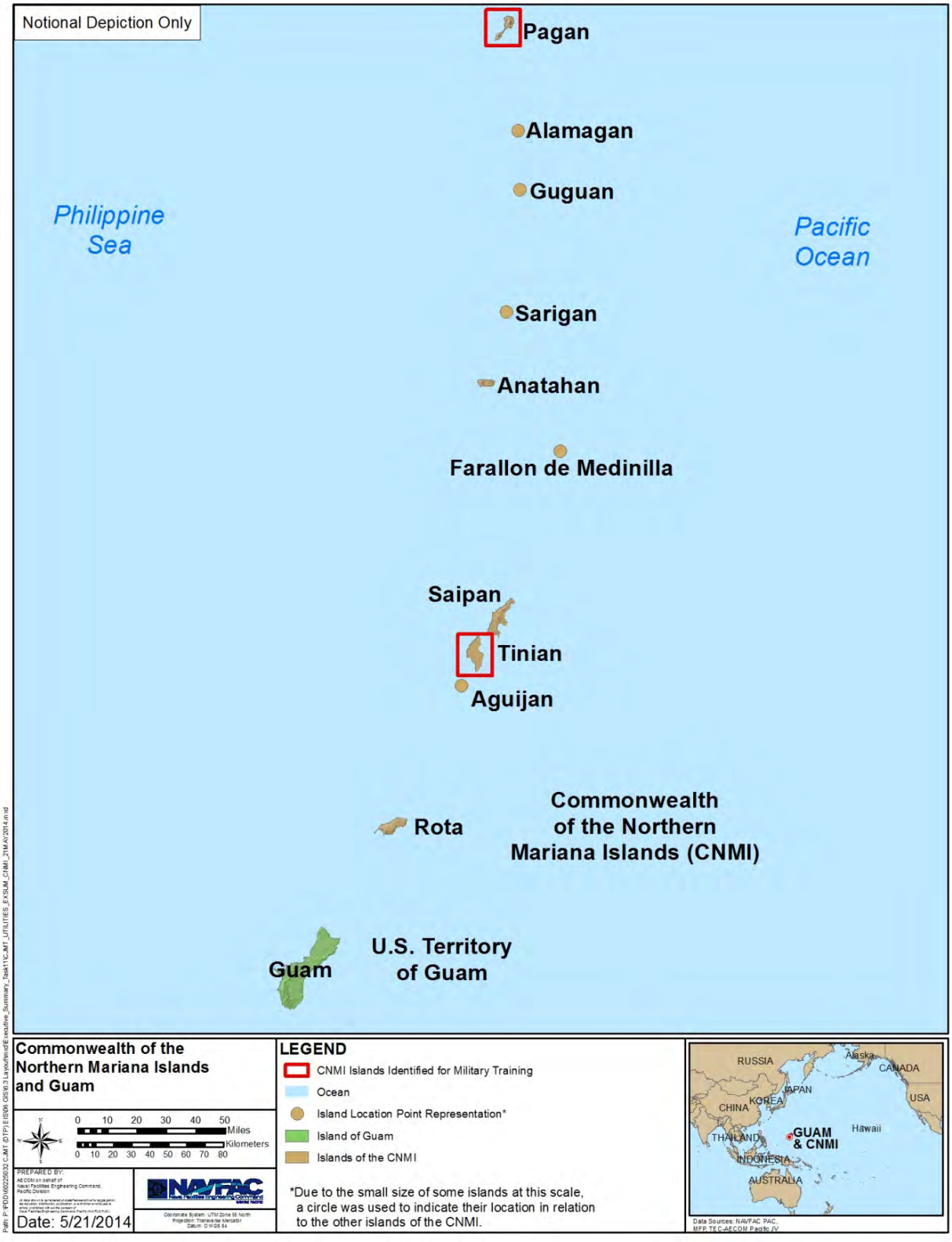

Figure 1.1-1. Commonwealth of the Northern Mariana Islands and Guam
Source: DoN 2014.

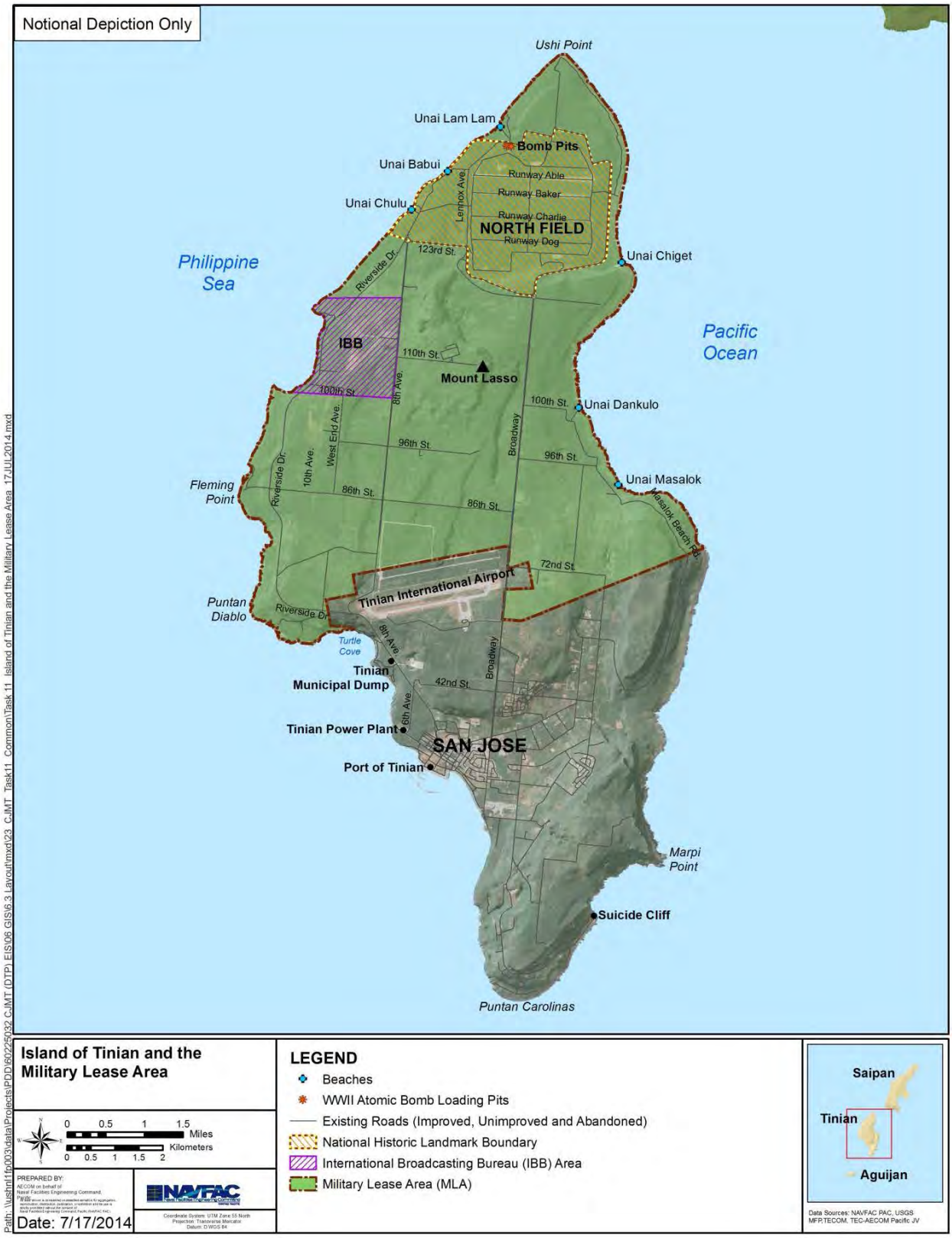

Figure 1.1-2. Island of Tinian and the Military Lease Area
Source: DoN 2014.

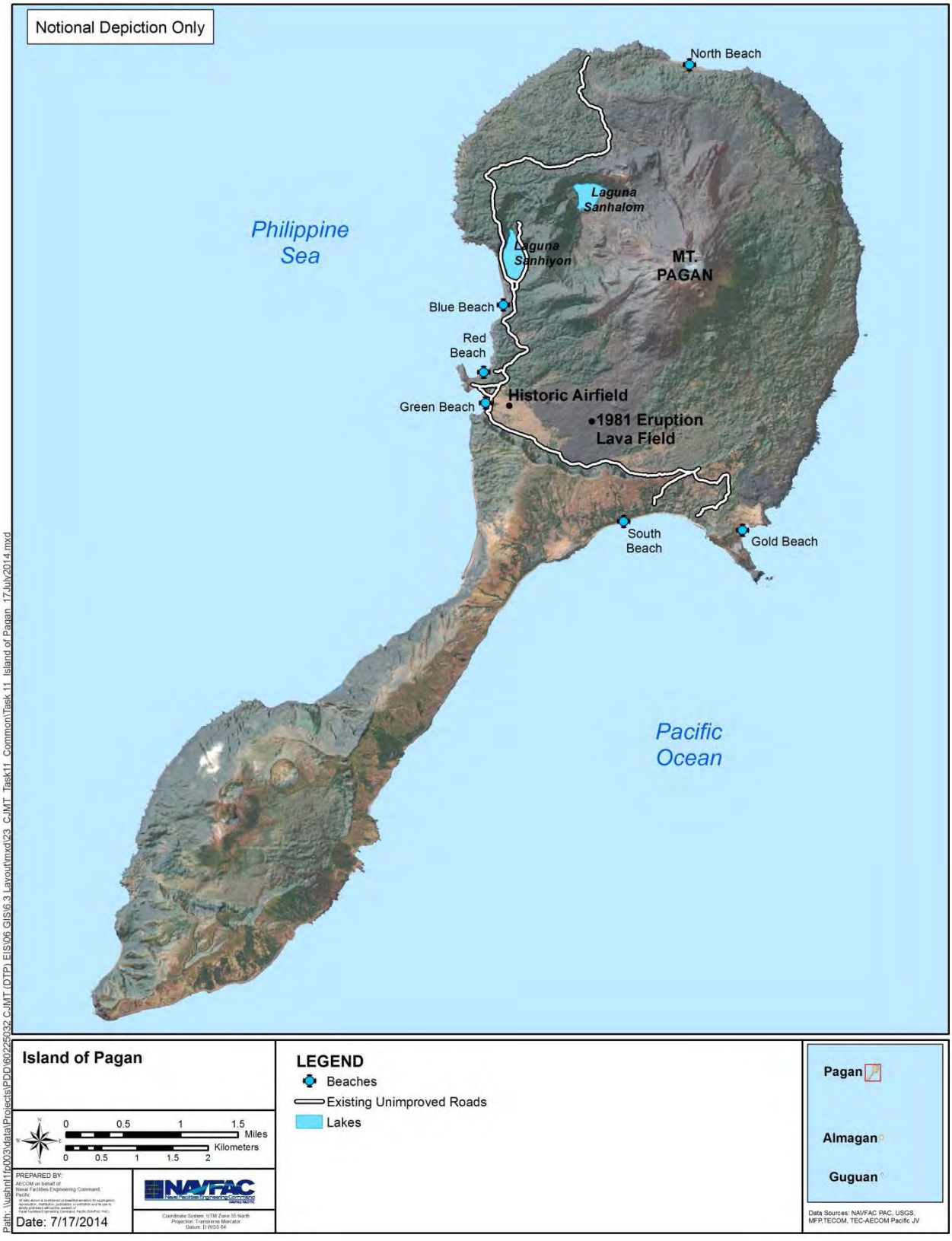

Figure 1.1-3. Island of Pagan
Source: DoN 2014.

CHAPTER 2. BASELINE CONDITIONS

2.1 TINIAN

Tinian is the third largest island of the Mariana Islands. It is located approximately 3 miles (5 kilometers) southeast, across the Saipan Channel, from the island of Saipan. The island of Guam is 122 miles (196 kilometers) to the south. Approximately two-thirds of the land area on Tinian has been leased to the U.S. federal government for military purposes. The Military Lease Area (MLA) divides the island into two distinct northern and southern areas (Figure 1.1-2).

2.1.1 Ground Transportation

2.1.1.1 Regulatory Framework

The federal and CNMI regulations applicable to ground transportation are identified in this section.

- CFR Title 23, *Highways* (CFR 2012)
- CNMI Administrative Code Title 155-20: *Roads and Facilities Division* (NMIAC 2004)
- *A Policy on Geometric Design of Highways and Streets* (AASHTO 2011)
- Unified Facilities Criteria (UFC) 3-250-01FA, *Pavement Design for Roads, Streets, Walks, and Open Storage Areas* (Department of Defense 2004b)

Road Ownership and Maintenance

As part of the 1999 amendment to the 1984 lease agreement, the U.S. military transferred ownership of the roads within the military lease-back portion of the island to the CNMI for the purposes of maintaining roads used by the civilian population, and to alleviate public-safety concerns for those requiring access to the Lease Back Area (CNMI and United States of America 1999). Roadways within the Exclusive Military Use Area were retained by the military through a maintenance agreement between the CNMI and the U.S. military, to facilitate access to the historic areas inside the Exclusive Military Use Area. Development within the MLA would require a review of the 1999 agreement on road ownership and maintenance. Based on the April 24, 2014 transportation meeting, the U.S. military may request to take control or otherwise develop an agreement with the CNMI and Municipality of Tinian concerning control, use, and maintenance of all roads within the MLA (see meeting notes provided in Appendix A).

2.1.1.2 Roadway Network

Approximately 3,500 people, including visitors and tourists, are estimated to be on the island. Tinian's population nucleus and commercial center is located in the village of San Jose, at the south end of the island. Tinian has approximately 68 total miles (110 kilometers) of existing roadways. Most roadways were designed, developed, and constructed in 1944 to accommodate constant volumes of heavy vehicle traffic, when the island's U.S. military population was approximately 50,000. Many of the existing roadways throughout Tinian are now in poor condition as a result of long periods of neglect and lack of maintenance.

Roadway segments chosen for evaluation consist of those roadway segments within and outside of the MLA that would be affected by the proposed action. Specifically, the study roadway segments comprise

potential military travel routes or public detour routes with the proposed action. Roadway segments south of the village of San Jose would not be affected by the proposed action but are included in the evaluation for informational purposes. The existing conditions and average daily traffic volumes (measured in vehicles per day) on the selected study roadway segments are depicted in Figure 2.1-1. The current state and general conditions of the roadways are summarized in Table 2.1-1 and depicted in Photo 2.1-1 through Photo 2.1-12.

Table 2.1-1. Tinian Roadway Conditions and Average Daily Traffic

Road	***Segment***	***Existing Conditions Description***	***Average Daily Traffic (vehicles per day)***
Within Military Lease Area			
Riverside Drive	North of 8th Avenue	Paved, poor condition	25
Riverside Drive	South of 8th Avenue	Dirt/grass, poor condition	25
110th Street	Between 8th Avenue and Broadway	Paved, poor condition	50
8th Avenue	North of 86th Avenue	Paved, west lane overgrown/unused and east lane poor condition	50
8th Avenue	South of 86th Avenue	Paved/gravel, poor condition	90
86th Avenue	Between 8th Avenue and Broadway	Paved, poor condition	100
Broadway	North of 71st Street	Paved, west lane overgrown/unused and east lane poor condition	180
Outside Military Lease Area			
Broadway	Between 42nd Street and 72nd Street	Paved, fair condition	390
Broadway	Between Route 201 and 42nd Street	Paved, good condition	1,470
Broadway	South of Route 201	Paved, good condition	300
8th Avenue	North of 42nd Street	Paved/gravel, poor condition	180
8th Avenue	South of 42nd Street	Paved, good condition	300
Route 201	West of Broadway	Paved, good condition	2,240
Canal Street (Route 202)	West of Broadway	Paved, good condition	1,520
Unnamed Road	Between Route 201 and Broadway	Paved, good condition	300
42nd Street	Between Broadway and 8th Avenue	Paved, good condition	150
Unnamed Road	Between 8th Avenue and Canal Street	Paved, good condition	310
West Road	East of 8th Avenue	Paved, fair condition	290

Sources: CDPW 2008, DoN 2014.

Two north-south roadways (Broadway and 8th Avenue) and two east-west roadways (Canal Street [Route 202] and Route 201) connect the village of San Jose to the MLA. These roadways carry the highest traffic volumes, between 1,470 and 2,240 vehicles per day. Outside of the village of San Jose, the roadways on Tinian experience very little vehicular traffic (Photo 2.1-7 to Photo 2.1-12). Roadways on Tinian are typically two lanes, undivided with no striped median, and have a capacity of approximately 5,000 vehicles per day. Most roadways on Tinian carry between 25 and 400 vehicles per day.

- *Broadway* is a two-lane divided highway with approximately 20-foot-wide (6-meter) lanes and a 32-foot-wide (10-meter) median. Lack of maintenance within the MLA has caused the southbound lane (west side) of the road to become moderately to severely overgrown and suitable only for convoy and tracked vehicles. Broadway carries up to 1,470 vehicles per day, between Route 201 and 42nd Street, outside the MLA. (Photo 2.1-1, Photo 2.1-2, and Photo 2.1-3).

- *8th Avenue* has three distinct roadway sections (Photo 2.1-4, Photo 2.1-5, and Photo 2.1-6):
  - From 42nd Street to Tinian International Airport (TNI), 8th Avenue is a 24-foot-wide (7-meter) unpaved road in poor condition. 8th Avenue carries about 180 vehicles per day on this segment outside the MLA.
  - Adjacent to TNI, 8th Avenue is an 18- to 22-foot-wide (5- to 7-meter) two-lane undivided paved/gravel road in poor condition. 8th Avenue carries about 180 vehicles per day on this segment outside the MLA.
  - Within the MLA, 8th Avenue is an 18-foot-wide (5-meter) two-lane undivided paved road in poor condition. This segment was previously a divided roadway with two 18-foot-wide (5-meter) lanes and a 36-foot-wide (11-meter) median. Lack of maintenance on 8th Avenue within the MLA has caused the southbound lane (west side) of the road to become moderately to severely overgrown and unsuitable for use by wheeled vehicles. 8th Avenue carries about 50 vehicles per day on this segment within the MLA.

Figure 2.1-1. Existing Roadways and Average Daily Traffic
Source: DoN 2014.

Photo 2.1-1. Aerial Photo of Broadway Roundabout, Looking South
Source: Map – Google Maps 2014.

Photo 2.1-2. Broadway, Looking North
Source: Map – Google Maps 2014.

Photo 2.1-3. 100th Street at Broadway, Facing East
Source: Map – Google Maps 2014.

Photo 2.1-4. 8th Avenue, Facing South
Source: Map – Google Maps 2014.

Photo 2.1-5. 8th Avenue, Facing South
Source: Map – Google Maps 2014.

Photo 2.1-6. 110th Street at 8th Avenue, Facing East
Source: Map – Google Maps 2014.

Photo 2.1-7. Riverside Drive at 8th Avenue, Facing Northwest
Source: Map – Google Maps 2014.

Photo 2.1-8. 71st Street at 8th Avenue, Facing West
Source: Map – Google Maps 2014.

Photo 2.1-9. 100th Street at 8th Avenue, Facing East
Source: Map – Google Maps 2014.

Photo 2.1-10. Lennox Avenue at Riverside Drive, Facing South
Source: Map – Google Maps 2014.

Photo 2.1-11. Ushi Point Road, Facing North
Source: Map – Google Maps 2014.

Photo 2.1-12. Boston Post Road, Facing East Toward the Blowhole Scenic Viewpoint
Source: Map – Google Maps 2014.

Construction work on Route 21 (Broadway), Route 24 (42nd Street), and Route 27 (southern Tinian) for the Tinian Hazard Elimination Project (a project 100% funded by the Federal Highway Administration under the U.S. Department of Transportation [Saipan Tribune 2013c]) is scheduled to begin in 2014. The scope of the project includes installing pavement and shoulder delineation improvements, traffic signage improvements, as well as safety barriers at locations that have steep slopes or may pose hazards to motorists. Planned improvements on Route 21 (Broadway) and Route 24 (42nd Street) are shown in Figure 2.1-2 and Figure 2.1-3. Additional details, including a project overview map and improvement descriptions, are included in Appendix B to this Transportation Study. In addition to the Route 21/Route 24/Route 27 improvements, approximately 12,000 linear feet (3,658 meters) of roadways are currently under construction as part of the West San Jose Village Homesteads residential subdivision project. There are no other funded, approved, pending, or reasonably foreseeable roadway improvement projects on Tinian.

Level of Service

Roadway segments were evaluated using the *Highway Capacity Manual* (Transportation Research Board 2000) methodology. This analysis utilizes a roadway level of service (LOS) methodology based on the volume-to-capacity ratio of the roadway. LOS is a qualitative description of the performance of a facility and ranges from LOS A, which indicates free-flow or excellent conditions, to LOS F, which indicates congested or overloaded conditions. LOS definitions for roadway segments are summarized in Table 2.1-2. Average daily traffic volumes are shown in Figure 2.1-1.

Based on the traffic volume data and the analysis in the *CNMI Comprehensive Highway Master Plan* (CDPW 2008) and verified through field observations, all selected study roadway segments operate under capacity at acceptable LOS A in their existing condition, as evidenced by free-flowing traffic and no traffic delays.

2.1.1.3 Transit Network

Tinian does not have an existing transit service. With the island's relatively low population density, demand for public transportation is considered low, and the predominant mode of travel is the automobile. However, the Commonwealth Office of Transit Authority is in the process of procuring professional consultant services to develop a 20-year transportation master plan for the islands. The master plan will involve creating a feasibility study of viable public transportation alternatives that may be considered for implementation in the CNMI, including a "fixed" (regularly scheduled, fixed-route services) and "flex" (on-demand or on-call services) bus transit system (Saipan Tribune 2013a). Currently, limited paratransit services (i.e., transportation services that do not follow a fixed route or schedule) are available for senior citizens and disabled persons on demand. Tour buses and some hotel shuttle services are provided by private companies, mainly for visitors and tourists.

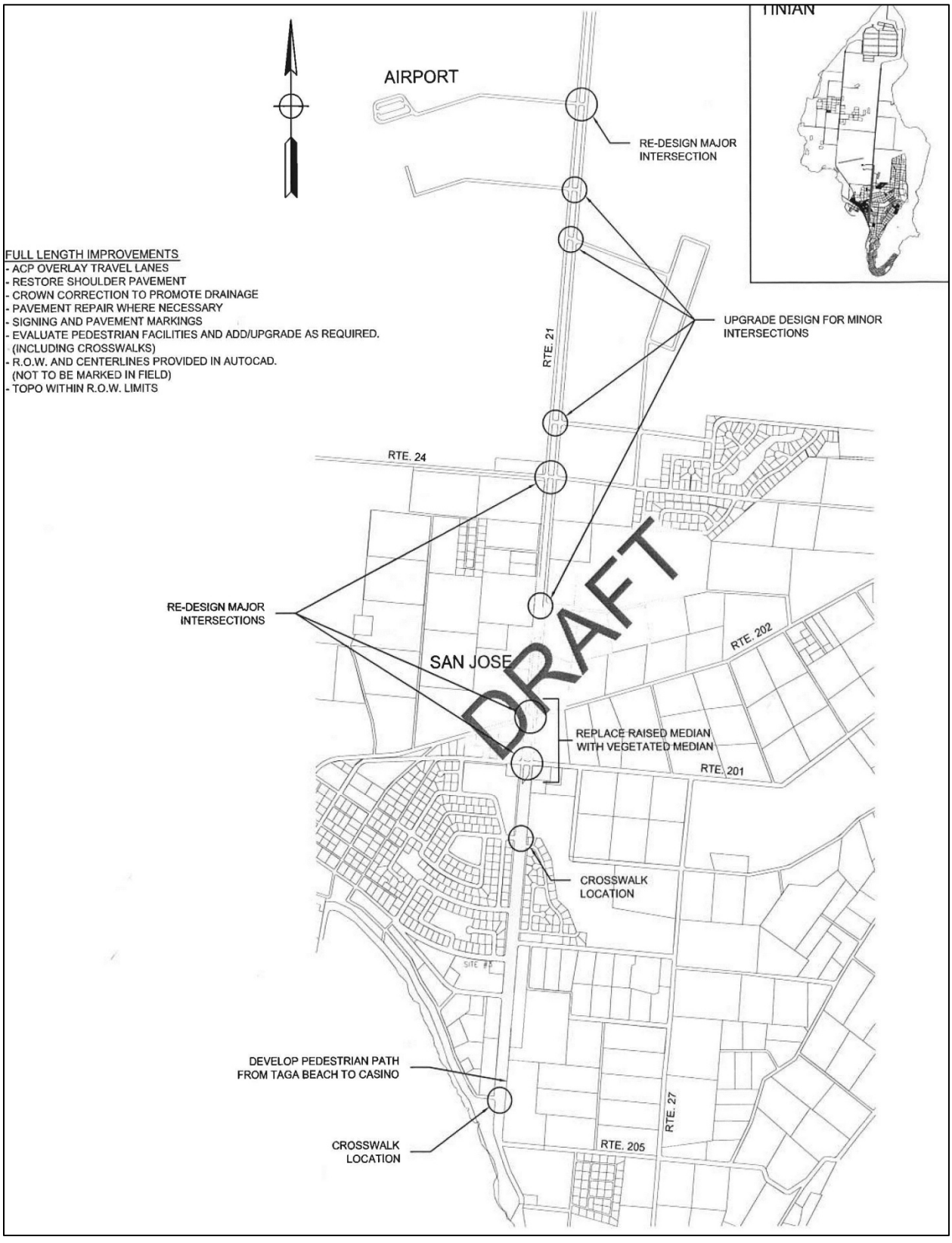

Figure 2.1-2. Tinian Hazard Elimination Project – Route 21 (Broadway) Improvements
Source: GHD 2013.

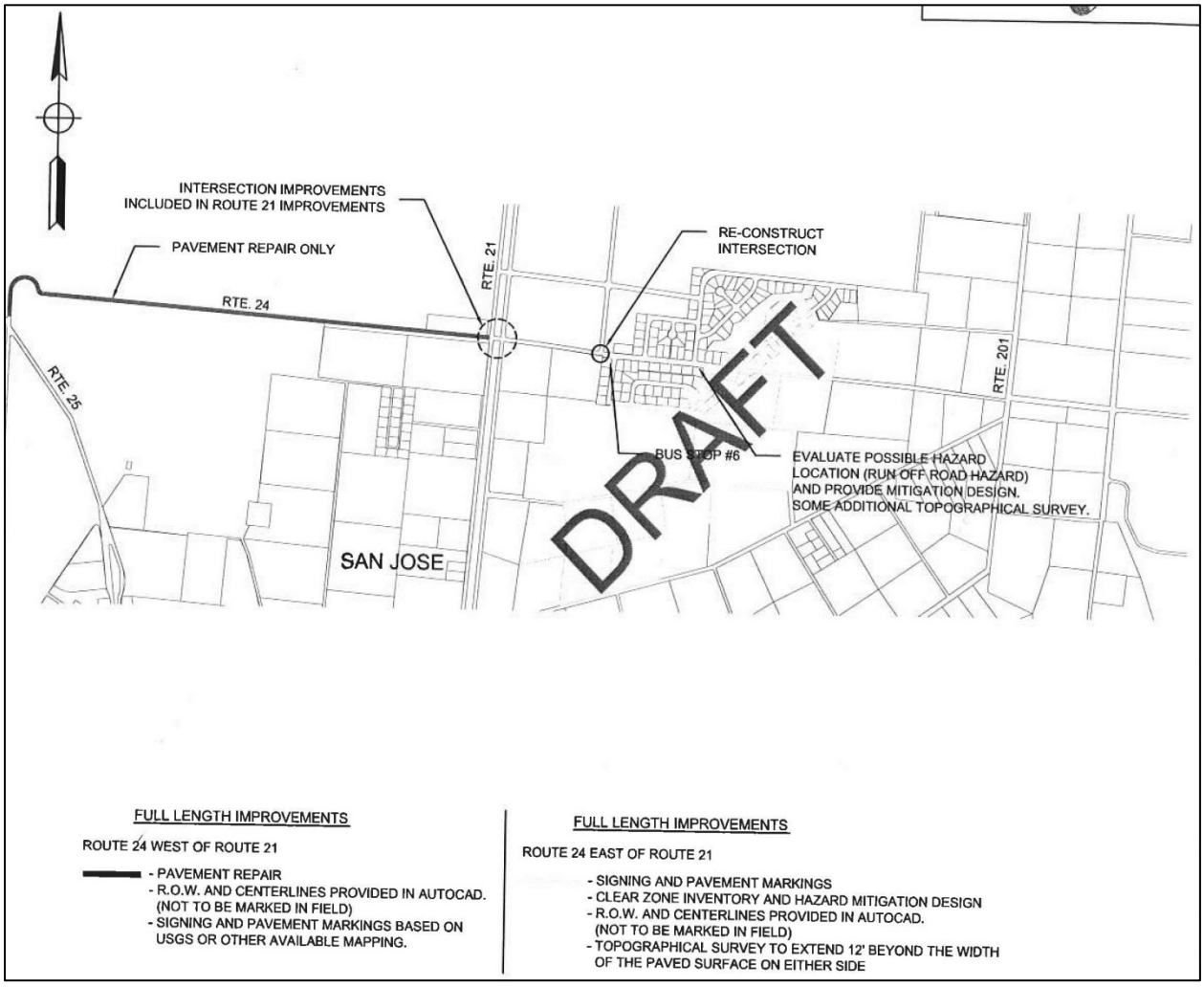

Figure 2.1-3. Tinian Hazard Elimination Project – Route 24 (42nd Street) Improvements
Source: GHD 2013.

Table 2.1-2. Level of Service Criteria for Roadway Segments

LOS	*Description*	*Volume-to-Capacity Ratio*
A	Vehicles travel at free-flow speeds and can maneuver almost freely within the traffic stream.	≤ 0.30
B	Vehicles travel at free-flow speeds and movement within the traffic stream is only slightly restricted.	> 0.30 and ≤ 0.50
C	Vehicles travel at or near free-flow speed and movement is somewhat restricted. Incidents can cause local queuing.	> 0.50 and ≤ 0.71
D	Vehicle speed declines as density increases, and maneuverability within the traffic stream is noticeably limited.	> 0.71 and ≤ 0.89
E	Roadway is operating at or near capacity, with vehicles closely spaced. Any incident can cause backups that propagate upstream.	> 0.89 and ≤ 1.00
F	Roadway operates beyond capacity, with significant queuing at bottlenecks such as key intersections or lane drops. Vehicles are closely spaced and maneuverability is extremely restricted.	> 1.00

Legend: LOS = level of service.
Source: Transportation Research Board 2000.

2.1.1.4 Pedestrian and Bicycle Network

Tinian has limited designated bicycle paths along major roadways and at main tourist attractions. Isolated sidewalks can be found along short segments of some roadways in San Jose (Photo 2.1-13). In general, however, continuous sidewalks do not exist on most roadways. Typically, the outside lane or shoulder of a roadway, which is generally unpaved, functions as the pedestrian/bicycle space. Bicyclists are required to share the road with vehicles in existing travel lanes and pedestrians are required to walk on the roadway shoulder or in landscaped areas off to the side of the roads.

Photo 2.1-13. Example of Tinian Existing Sidewalk in San Jose Near Port
Source: Map – Google Maps 2014.

2.1.2 Air Transportation

2.1.2.1 Aviation Facilities

General

TNI is a public international airport located on Tinian within the CNMI (Figure 2.1-4). It is classified by the Federal Aviation Administration (FAA) as a primary commercial service airport. TNI is owned, managed, and operated by the Commonwealth Ports Authority (CPA). The published geodetic location of TNI is 14°59.95' North latitude and 145°37.16' East longitude, at an elevation of 271 feet (82.6 meters) above mean sea level (msl). The airport encompasses approximately 1,416 acres (573 hectares) (FAA 2013a).

TNI is part of the National Airspace System so FAA is responsible for its safety. The FAA also aims at improving the capacity, efficiency, and sustainability of the U.S. airports for the benefits of the National Airspace System.

The airport is attended from 6:00 a.m. to 8:00 p.m. (local time) and prior permission from the CPA is required for access when the airport is unattended. The airport is equipped for night operations and accommodates chartered night flights between Saipan and Tinian on an "on call" reservation basis (CPA 2005).

No direct scheduled international flights currently operate at TNI.

As indicated during a meeting with Star Marianas Air personnel, there are limitations in existing hospital capacity for handling emergency incidents involving large jet aircraft (see meeting notes in Appendix C).

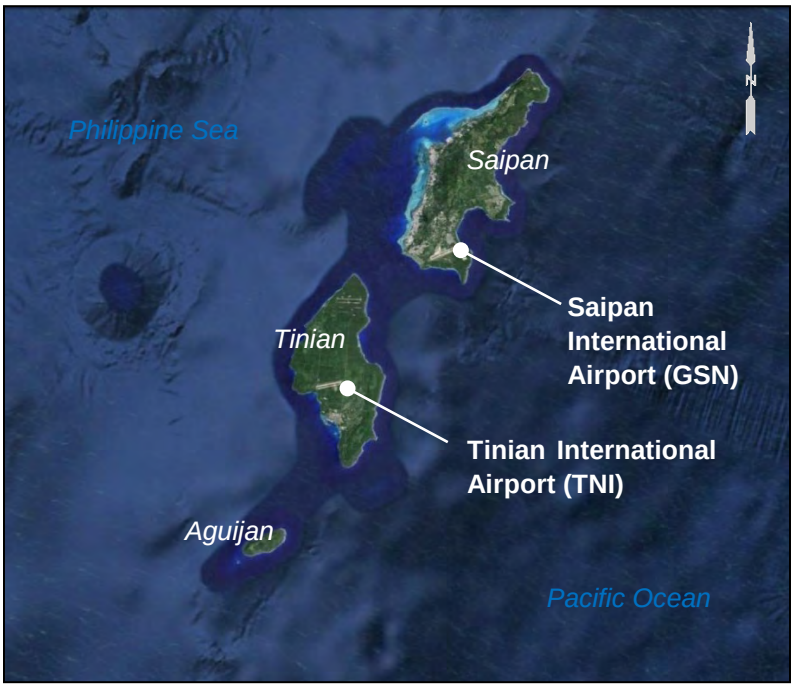

Figure 2.1-4. Location Map – Tinian International Airport
Source: Google Earth 2014.

The following paragraphs describe the existing facilities at TNI. Figure 2.1-5 provides an overview of the existing airport facilities.

Airfield

Runway

TNI has a single east-west Runway 08/26, measuring 8,600 feet (2,621 meters) long and 150 feet (46 meters) wide with 35-foot-wide (10.5-meter) shoulders on each side.

Runway 08/26 is paved and marked for precision approaches with centerline, runway designation, threshold, aiming point, touchdown zone markings, and edge stripes.

The runway was extended from 6,000 feet to 8,600 feet (1,829 to 2,621 meters) in 2002 with the capability of accommodating B767 aircraft (see Volume 3, Chapter 14, *Roadways and Marine Transportation, of the* Guam and CNMI Military Relocation Environmental Impact Statement [JGPO 2010]). The CPA mentioned in a meeting held on December 6, 2013, that TNI was designed for B747 aircraft traffic. As part of the Exercise Forager Fury in December 2012, a B747 landed at TNI.

Based on the site visit in December 2013, there is an arresting gear adjacent to Runway 08/26, which was installed during Exercise Forager Fury 2012.

Figure 2.1-5. Overview of the Tinian International Airport Facilities
Source: Google Earth 2014.

Taxiway

The taxiway system at TNI is designated by letters. Taxiway A, measuring 75 feet (23 meters) wide, serves as a parallel taxiway for Runway 08/26 with two entrances/exits connecting to the two ends of the runway. The separation distance between the parallel Taxiway A centerline and the runway centerline is approximately 750 feet (229 meters) (Figure 2.1-6). Taxiway A has shoulders measuring approximately 35 feet (10.5 meters) wide on each side.

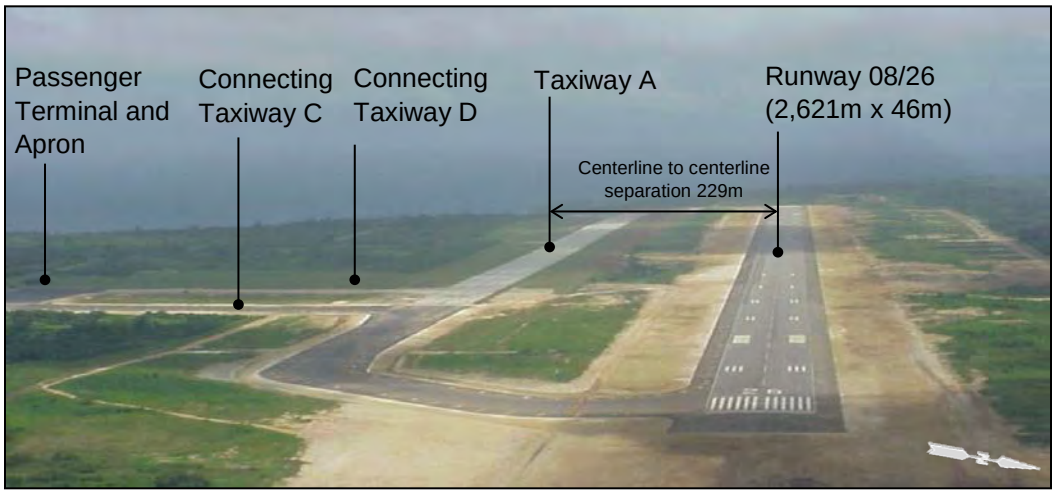

Figure 2.1-6. Overview of Tinian International Airport's Airfield on Approach to Runway 26
Source: CPA 2009a.

TNI also has two apron taxiways, Taxiways C and D, connecting the aircraft parking apron to the parallel Taxiway A. Both Taxiways C and D are 75 feet (23 meters) wide with approximately 35-foot-wide (10.5-meter) shoulders on each side.

Runway and Taxiway Pavement

The runway pavement is asphalt and the condition is good[3]. Load-bearing capacity is 75,000 pounds (34,000 kilograms) for single-wheel, 200,000 pounds (90,700 kilograms) for double-wheel, 400,000 pounds (181,000 kilograms) for double tandem, and 832,000 pounds (377,000 kilograms) for dual-double-tandem aircraft (FAA 2013a).

The taxiway pavement is asphalt. During a meeting held on December 6, 2013, the CPA confirmed that the taxiway pavement is in good condition (Appendix A).

Apron

The apron is the ramp area north of the passenger terminal building. The apron area is approximately 35,000 square yards (29,000 square meters), including an apron edge taxi lane (Figure 2.1-6 and Figure 2.1-7). The apron area connecting to Hangar One west of the passenger terminal building is mainly for general aviation. The existing apron pavement is asphalt.

According to Volume 3, Chapter 14, *Roadways and Marine Transportation*, of the Guam and CNMI Military Relocation Environmental Impact Statement, the apron is capable of handling two B767 aircraft in addition to one B767 aircraft at the gate. As part of Exercise Forager Fury II in 2013, a B737 carrying

[3] Pavement conditions are classified as good, fair or poor. Good Condition: Some cracking of the pavement. Cracks are generally spaced more than 50 feet apart. Less than 10% of the cracks and joints need sealing. There is minimal or slight raveling. There is no distortion and the patches are in good condition. Fair Condition: Some cracking and raveling. Cracks are generally spaced less than 50 feet apart. Joint and crack sealing is needed on 10% to 25% of the cracks and joints. There is isolated alligator cracking, patches are in poor condition, and or there are crack settlements up to 1 inch. Poor Condition: Widespread, open, unsealed cracks and joints. There are cracks over ½ inch wide with raveling in 25% of the cracks. Cracks are generally spaced 5 to 50 feet apart with surface and slab spalling. Alligator cracking or patches are in poor condition and cover up to 20% of the surface or there is vegetation through the cracks and joints.

participants landed at TNI and the passengers deplaned on the apron. The airport has additional capacity for one C-130 in the hard packed area at the west end of the taxiway (JGPO 2010).

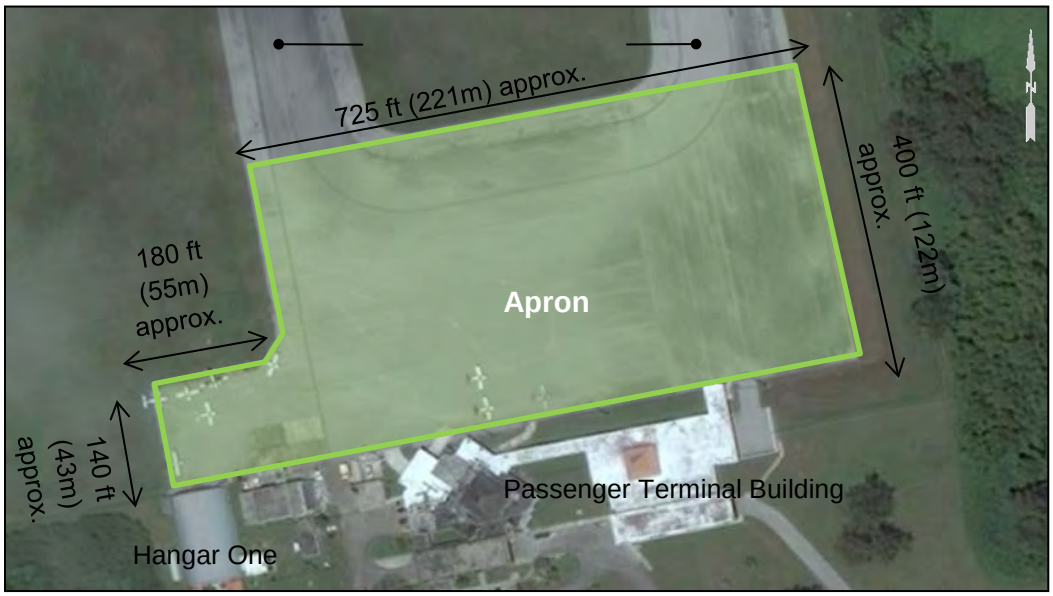

Figure 2.1-7. Aircraft Parking Apron and Hangar
Source: Google Earth 2014.

Airspace and Air Traffic Control

The airspace surrounding TNI is designated Class G Airspace, which extends from the surface to 700 feet (213 meters) above ground level. The sectional aeronautical chart for the area around TNI is shown in Figure 2.1-8 (FAA 2013b).

TNI operates without an airport traffic control tower or ground control. Aircraft flying to and from TNI normally provide courtesy notification to CPA operations and air traffic control on Saipan for approach and departure clearance. TNI is an uncontrolled airfield; pilots must maintain separation, takeoffs, and landings using the common traffic advisory frequency listed on the aeronautical chart (FAA 2013a, b).

TNI is within the FAA's Guam Air Route Traffic Control Center (ARTCC) Flight Information Region. Guam ARTCC provides radar services to high-altitude aircraft operating on Instrument Flight Rules (IFR) flight plans and is responsible for controlling aircraft en route to, transiting within, and arriving at or departing from the airports within its service area. Guam ARTCC radar coverage and service begins at 3,500 feet (1,100 meters) msl above TNI. Air taxi service to and from Saipan and Tinian generally remains under 3,000 feet (900 meters).

The traffic pattern at TNI is standard (left-hand turns) for Runway 08 and nonstandard (right-hand turns) for Runway 26. Traffic pattern altitude is established at 1,800 feet (500 meters) msl for large and turbine-powered aircraft, and 1,300 feet (400 meters) msl for small aircraft (FAA 2013c).

Under Part 77 of the Federal Aviation Regulations (FAR) in Code of Federal Regulations (CFR) Title 14, the approach category is C for non-precision-instrument runways (FAA 2013a).

Navigation and Lighting Aids

Only one nondirectional beacon (NDB) exists within a 25-nautical mile (46-kilometer) radius of TNI. That NDB is located at Saipan International Airport (GSN) (Figure 2.1-8).

The nearest high-frequency omnidirectional range station with tactical air navigation system beacon is at A. B. Won Pat International Airport, Guam, approximately 100 nautical miles (185 kilometers) south of TNI.

Navigation guidance for aircraft approaching TNI is based on GSN's NDB. TNI has three published instrument approach procedures: Area Navigation Global Positioning System approach to Runway 08, Area Navigation Global Positioning System approach to Runway 26, and NDB approaches to either runway end (FAA 2013d).

Runway 08/26 has medium-intensity runway lights (MIRLs) along the runway edges, runway end identification (ID) lights, and precision approach path indicators (PAPIs) at both ends as visual aids to guide the pilots' approach. The taxiways include medium-intensity edge lighting.

TNI is also equipped with a rotating beacon, four wind cones, and a segment circle (FAA 2013a).

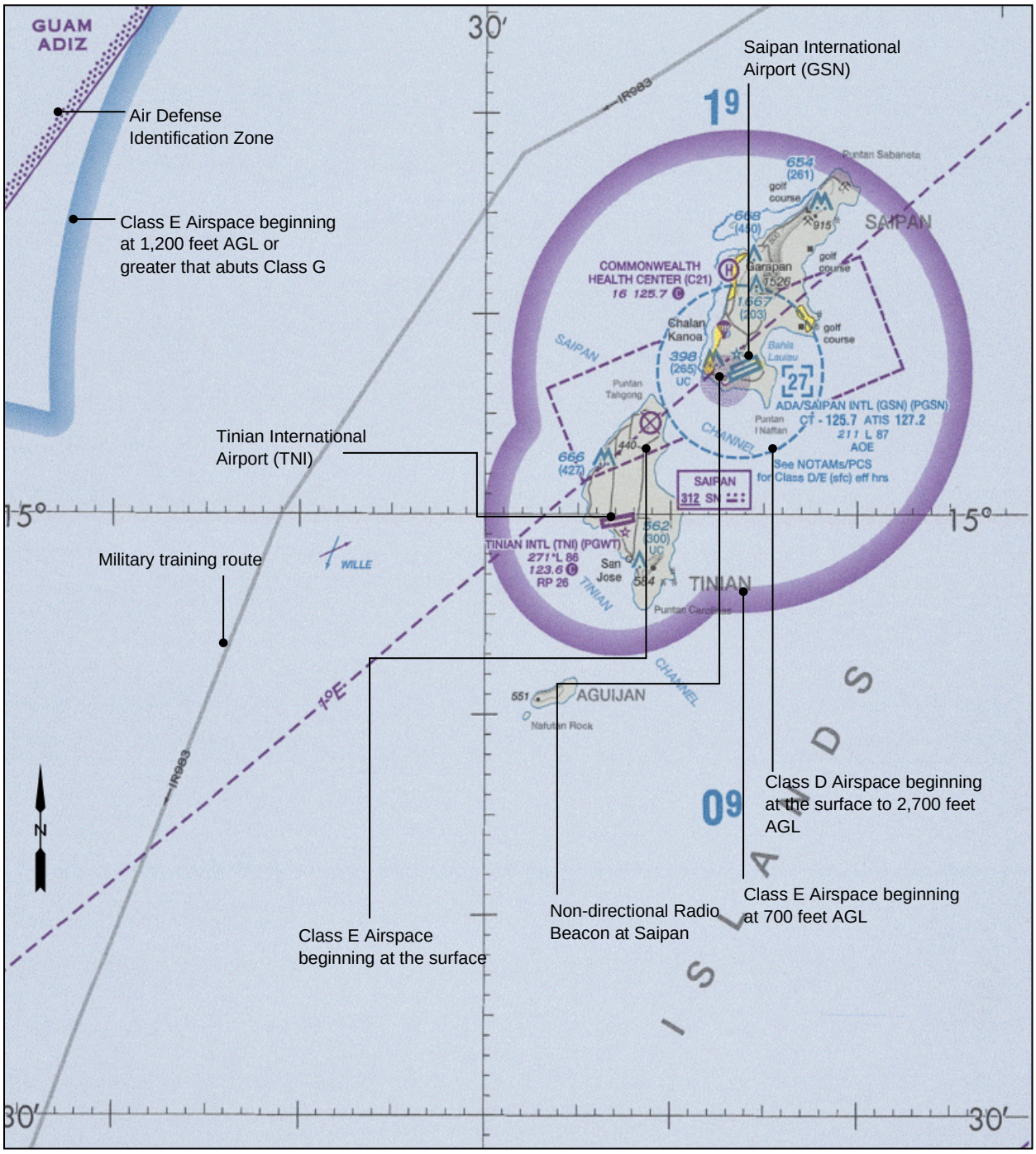

Figure 2.1-8. Sectional Aeronautical Charts, Edition October 17, 2013

Source: FAA 2013b.

Airport Weather Reporting Equipment

A supplementary aviation weather reporting station is located at TNI and the ID code is PGWT. A supplementary aviation weather reporting station is a facility where weather observations are taken, prepared, and transmitted by a local operator certified by the National Weather Service under federal government supervision.

An automated surface observing system is provided at GSN.

The Weather Forecast Office Guam is responsible for the weather report and forecast program, including the METAR weather report and Terminal Aerodrome weather forecast for the Northern Mariana Islands. METAR is the international standard code format for hourly surface weather observations. Hourly weather information – wind speed, wind direction, visibility, sky condition, temperature, dew point, relative humidity, pressure, and precipitation – are recorded at PGWT from approximately 6:00 a.m. to 8:00 p.m. local time every day (NWS 2013).

Commercial Passenger Terminal Area

Passenger Terminal

The passenger terminal was expanded between 2005 and 2008 (Saipan Tribune 2005, 2009). The project included construction of a 24,000-square-foot (2,200-square-meter) departure terminal building and improvements to the existing building, such as a security-related system and a baggage conveyor system (CPA 2009b). The new departure terminal building (Photo 2.1-14) is currently under renovation to correct deficiencies in the original construction and to accommodate anticipated direct flights from China (CPA 2005). Since the terminal's expansion, the original terminal building (Photo 2.1-14) has been used for arrivals and departures.

Passenger loading bridges are not used at TNI (Photo 2.1-14). Airlines ground load and unload passengers (CPA 2012).

TNI has defined sterile areas capable of accommodating limited numbers of international passengers (CPA 2012). However, prior arrangement must be made with Chief Immigration Saipan for immigration and customs clearance for nonscheduled operations.

General Aviation Facilities

Hangar

Hangar One, located west of the passenger terminal (Photo 2.1-15), is the headquarters of Star Marianas Air. The current fleet for Star Marianas Air consists of seven Cherokee Six aircraft and three twin-engine Navajo aircraft, all based at TNI Hangar One (Appendix C).

Airport Support Facilities

Aircraft Rescue and Firefighting

Aircraft rescue and firefighting (ARFF) services are provided by the West Tinian Airport ARFF Department. The ARFF building is located west of the passenger terminal building (Photo 2.1-16). TNI is a certified Class I airport and meets ARFF Index A requirements (FAA 2013h). ARFF Index A requirements are as follows: one vehicle carrying at least 500 pounds (225 kilograms) of sodium-based dry chemical, halo 1211, or clean agent; or 450 pounds (200 kilograms) of potassium-based dry chemical and water with a commensurate quantity of aqueous film forming foam to total 100 gallons for simultaneous dry chemical and aqueous film-forming foam application. The CPA is planning to relocate the ARFF building to improve

its line of sight, the visibility of the flight service office, and direct access to the airside (CPA 2009b). Future improvement also includes procurement of an ARFF vehicle (CPA 2005).

Fuel Storage Facilities

Public fuel service is not available for Jet A or aviation gasoline (100LL or 100) at TNI. Star Marianas Air fuels its aircraft on Saipan.

Photo 2.1-14. Passenger Terminal Building
Sources: CPA 2009a, Bing 2014.

Photo 2.1-15. Airside Access to the Passenger Terminal Building (Looking South)
Source: CPA 2009a.

Photo 2.1-16. Aircraft Rescue and Firefighting Building
Sources: CPA 2009a, Bing 2014.

Hard Packed Area

A hard packed area (approximately 11,000 square yards [9,197 square meters]) is located on the west side of the airfield adjacent to Taxiway A. With reference to the West Tinian Airport Military Land Use Plan provided by the CPA, the hard packed area is designated as the hot cargo area for U.S. military use. An area farther to the southeast of the hot cargo area is designated as the hot refueling area for U.S. military use (Figure 2.1-9) (CPA 2013).

Landside access to the hard packed area is available via security Gate "C" or Gate "D" through the perimeter fence to the local roads (Figure 2.1-9) (CPA 2013). The hard packed area is used by U.S. military aircraft (e.g., KC-130J Hercules) for delivery of equipment and supplies (Photo 2.1-17) (DVIDS 2012a).

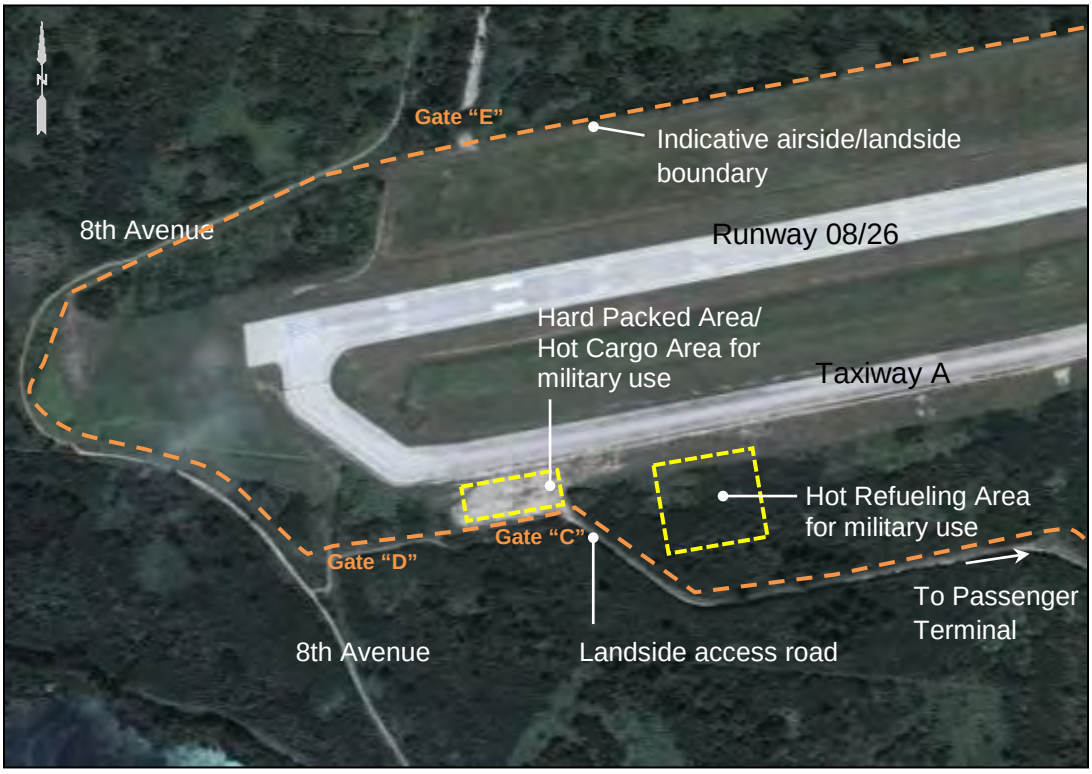

Figure 2.1-9. Hard Packed Area
Sources: Bing 2014, CPA 2013.

Photo 2.1-17. KC-130J at Tinian International Airport
Source: DVIDS 2012a.

Airport Security

The airside of TNI is generally surrounded by a security fence with security gates for personnel or vehicular access. The existing layout of the security fence and location of Gates A–F is depicted in Figure 2.1-10 (CPA 2013). Gate A is located between the passenger terminal building and the ARFF building. Gate B is located next to Hangar One. Gates C–F are located along the perimeter of the airport boundary. The existing security fence is 6 feet (1.8 meters) high and topped with additional 1 foot (0.3 meters) barbed wire. Photo 2.1-18 illustrates the existing security fence.

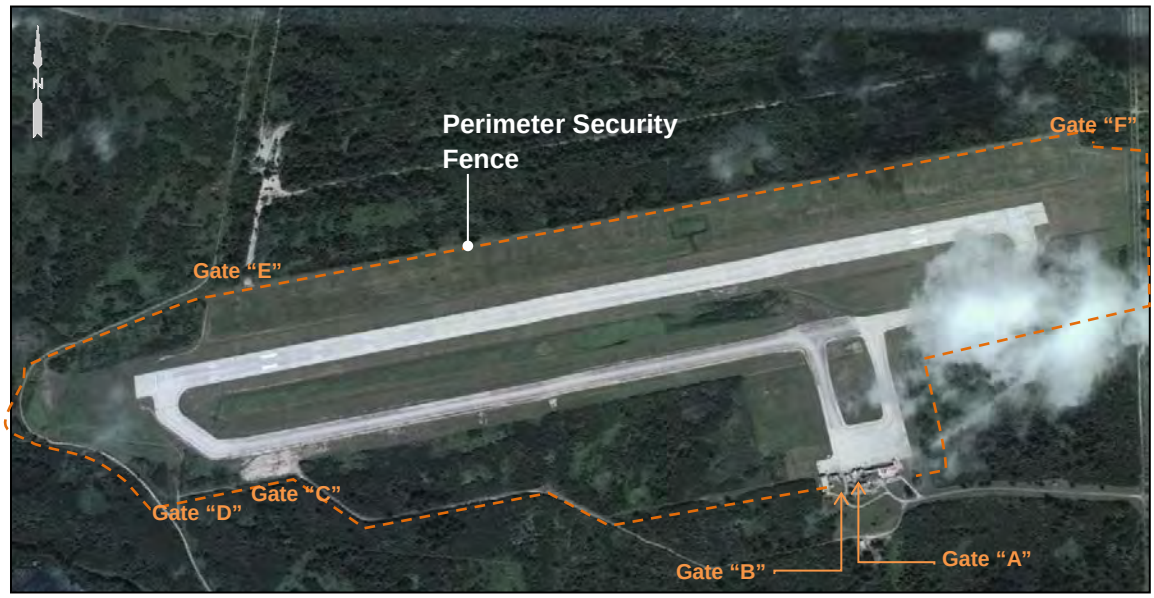

Figure 2.1-10. Security Fence Layout
Sources: Bing 2014, CPA 2013.

Planned Airport Development

Airport development projects at TNI have been identified and recommended by local agencies for implementation in the near future. The Commonwealth Economic Development Strategic (CEDS) Planning Commission identified the two projects at TNI (CEDS 2009) listed below with the status of each project.

- Instrument Landing System (ILS) – On hold until funding for future maintenance is available.
- Tinian Airport Fuel Farm – Lack of jet fuel supply because of shipment issues (not yet resolved).

Photo 2.1-18. Existing Security Fence

The CPA has identified several improvement projects for TNI (CPA 2009b) with the status of each.

- High Speed Taxiway B – On hold until funding is available.
- ARFF Building Relocation – Design completed, but project on hold until matching local funds are available.
- Taxiway E – Included in the ARFF Building Relocation Project. Same status as above.
- ARFF Access Road – Included in the ARFF Building Relocation Project. Same status as above.
- Security Access System – On hold because the Transportation Security Administration is not present on Tinian.
- Perimeter Security Fence Replacement – On hold until funding is available. Priority is low.

The layout showing the planned High Speed Taxiway B, Taxiway E, relocated ARFF building, and ARFF access road is presented in Figure 2.1-11 (CPA 2013).

Figure 2.1-11. Some Planned Airport Development Projects at Tinian International Airport
Sources: Bing 2014, CPA 2013.

Current U.S. Military Training Activity at TNI

TNI has supported several U.S. military training activities. They include the establishment of a tactical airfield fuel dispensing system, an aircraft arresting gear system (Photo 2.1-19), and an expeditionary air–ground support operations center for the command and control of ground-based support to aviation units for the recent Marine aviation relocation training exercises on Tinian (the Forager Fury II exercise in 2013). Ground support personnel on Tinian were billeted in expeditionary accommodations on Tinian North Field and established expeditionary fuel distribution systems using fuel bladders and pumps at TNI. Marine FA-18 Hornet jet aircraft deployed to Guam landed on Tinian using the arresting gear at TNI, refueled, and departed for other training events. Marine KC-130 Hercules tanker aircraft landed at TNI, off-loaded fuel, and departed for other training events. Ground support personnel and equipment were transported to and from Tinian via various modes including contract air carriers, U.S. military airlift, barges, and high-speed vessels. These exercises lasted between 14 and 20 days, and involved 13-20 aircraft, and approximately 260 personnel on Tinian. It is anticipated that this training activity would continue to be supported through the use of TNI (DoN 2014a).

Photo 2.1-19. Arresting Gear at Tinian International Airport

The U.S. military has previously communicated and coordinated with CPA for military training activities at TNI. Temporary time slots for the exclusive use of the airfield by the military have been arranged in previous training exercises (see meeting record dated January 30, 2014, in Appendix C).

Based on activity associated with Exercise Forager Fury 2012 (Photo 2.1-20) and Forager Fury II (Photo 2.1-21), the following U.S. military aircraft have operated at TNI and are anticipated to continue to use the TNI:

- B747-400: Delivery of gear and equipment
- B737: Transportation of personnel
- C-17 Globemaster III or KC-130J Hercules: Delivery of equipment, vehicle, and fuel (the C-17 Globemaster III is the same as shown in Photo 2.1-22 for Andersen Air Force Base, Guam)
- MV-22B Ospreys
- MH-60S Knighthawk helicopters
- FA-18D Hornets: Included arrested landing

Photo 2.1-20. Prior U.S. Military Activities at Tinian International Airport
Sources: DVIDS 2012a, b, c, d.

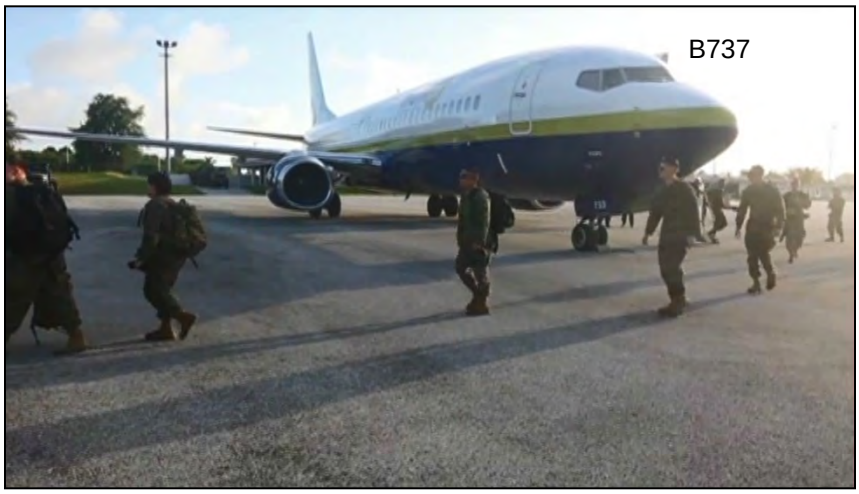

Photo 2.1-21. Prior U.S. Military Activities at Tinian International Airport (Continued from Photo 2.1-20)
Source: DVIDS 2013.

Photo 2.1-22. Transport Aircraft from Andersen Air Force Base, Guam (also used at Tinian International Airport)

2.1.2.2 Aviation Services

TNI is used primarily for interisland travel between the islands of Saipan, Rota, and Guam. Star Marianas and Arctic Circle Air currently operate out of TNI. Freedom Air used to provide scheduled flight services in TNI but ceased its services after filing for bankruptcy.

Star Marianas Air provides passenger charters mainly between Saipan and Tinian, and cargo charters between Guam, Rota, Tinian, and Saipan. Approximately 30% of its passenger service customers are locals while 70% are tourists. Its air cargo services between Tinian and Saipan are used primarily to deliver bread and perishables for stores and schools. Star Marianas Air is also working on an agreement to transport specimens for the Tinian Health Center to Saipan Hospital. The airline is also planning to provide scheduled services subject to FAA approval.

Arctic Circle Air provides mainly air cargo services and has expanded to include passenger flights (Saipan Tribune 2012a, b; Saipan Tribune 2013b; Appendix C). It has one twin-engine Britten Norman Turbo Islander BN-2T and is based on Saipan. Approximately 80% of Arctic Circle Air's flights are for cargo

services between Saipan and Rota and between Guam, Rota, and Saipan. Most of the airline's passengers are locals who used to fly with Freedom Air. Approximately 20% are tourists going to Rota Resort.

Freedom Air ceased service on Saipan, Tinian, and Rota in March 2014 after filing for bankruptcy on Guam in September 2013 (Saipan Tribune 2014). Table 2.1-3 shows a historical flight schedule provided by Freedom Air, as a reference that represents the activity levels of a regular service provider if the provider's scheduled flights are resumed. Freedom Air used to have 13 scheduled flights per day with approximately 135 passengers, operated by single-engine Cherokee aircraft (6 seats). Freedom Air also used to have a twin-engine Short 360 aircraft (30-seat capacity) scheduled for three trips per week, but the aircraft required maintenance and repairs. Freedom Air's cargo services included delivery of lab specimens, hazardous materials, and other goods, typically between Guam and Saipan; between Saipan, Rota, and Guam; and on other routes if chartered (Appendix C).

Table 2.1-3. Historical Flight Schedule at Tinian International Airport

Time	Flight Numbers		Time	Flight Numbers	
	Arrival	Departure		Arrival	Departure
6:55 AM	Flight 101		1:00 PM		
7:00 AM			1:05 PM		
7:05 AM		Flight 102	1:10 PM	Flight 115	
7:10 AM			1:15 PM		
7:15 AM			1:20 PM		
7:20 AM			1:25 PM		
7:25 AM			1:30 PM		Flight 116
7:30 AM			1:35 PM		
7:35 AM			1:40 PM		
7:40 AM	Flight 103		1:45 PM		
7:45 AM			1:50 PM		
7:50 AM		Flight 104	1:55 PM		
7:55 AM			2:00 PM		
8:00 AM			2:05 PM		
8:05 AM			2:10 PM		
8:10 AM	Flight 105		2:15 PM		
8:15 AM			2:20 PM		
8:20 AM		Flight 106	2:25 PM		
8:25 AM			2:30 PM		
8:30 AM			2:35 PM		
8:35 AM			2:40 PM	Flight 117	
8:40 AM			2:45 PM		
8:45 AM			2:50 PM		Flight 118
8:50 AM	Flight 107		2:55 PM		
8:55 AM			3:00 PM		
9:00 AM		Flight 108	3:05 PM		
9:05 AM			3:10 PM		
9:10 AM			3:15 PM		
9:15 AM			3:20 PM		
9:20 AM	Flight 109		3:25 PM		
9:25 AM			3:30 PM		
9:30 AM			3:35 PM		
9:35 AM			3:40 PM		
9:40 AM			3:45 PM		
9:45 AM			3:50 PM		
9:50 AM			3:55 PM		
9:55 AM			4:00 PM		
10:00 AM		Flight 110	4:05 PM		
10:05 AM			4:10 PM	Flight 119	
10:10 AM			4:15 PM		
10:15 AM			4:20 PM		Flight 120
10:20 AM			4:25 PM		
10:25 AM			4:30 PM		
10:30 AM			4:35 PM		
10:35 AM			4:40 PM		
10:40 AM			4:45 PM		
10:45 AM			4:50 PM	Flight 121	
10:50 AM			4:55 PM		
10:55 AM	Flight 111		5:00 PM		Flight 122
11:00 AM			5:05 PM		
11:05 AM		Flight 112	5:10 PM		
11:10 AM			5:15 PM		
11:15 AM			5:20 PM		
11:20 AM			5:25 PM		
11:25 AM			5:30 PM		
11:30 AM			5:35 PM		
11:35 AM			5:40 PM		
11:40 AM			5:45 PM		
11:45 AM			5:50 PM	Flight 123	
11:50 AM	Flight 113		5:55 PM		
11:55 AM			6:00 PM		
12:00 PM		Flight 114	6:05 PM		Flight 124
12:05 PM			6:10 PM		
12:10 PM			6:15 PM		
12:15 PM			6:20 PM		
12:20 PM			6:25 PM		
12:25 PM			6:30 PM		
12:30 PM			6:35 PM		
12:35 PM			6:40 PM	Flight 125	
12:40 PM					
12:45 PM			Total Operations	13	12
12:50 PM					
12:55 PM					

Source: Freedom Air 2013.

2.1.3 Marine Transportation

2.1.3.1 Marine Facilities

The Port of Tinian (Photo 2.1-13, Photo 2.1-18, Photo 2.1-23 through Photo 2.1-27), is located near the village of San Jose and is the only port on the island. It is used for public, commercial, and U.S. military uses. Sheltered by a degraded breakwater, the port is accessible via a channel with a navigable width of 500 feet (152 meters) and a minimum depth of 27 feet (8 meters) (measured May 2007). The port and harbor were constructed in 1944 to accommodate Liberty Ship cargo vessels with a length of 465 feet (142 meters), a beam of 57 feet (17 meters), and a draft up to 28 feet (8 meters) (U.S. Pacific Command 1999). No records are available to indicate that maintenance dredging of the channel has been conducted. Therefore, the existing width and depth of the channel may have decreased from the width and depth reported above.

Photo 2.1-23. Overview of the Port of Tinian

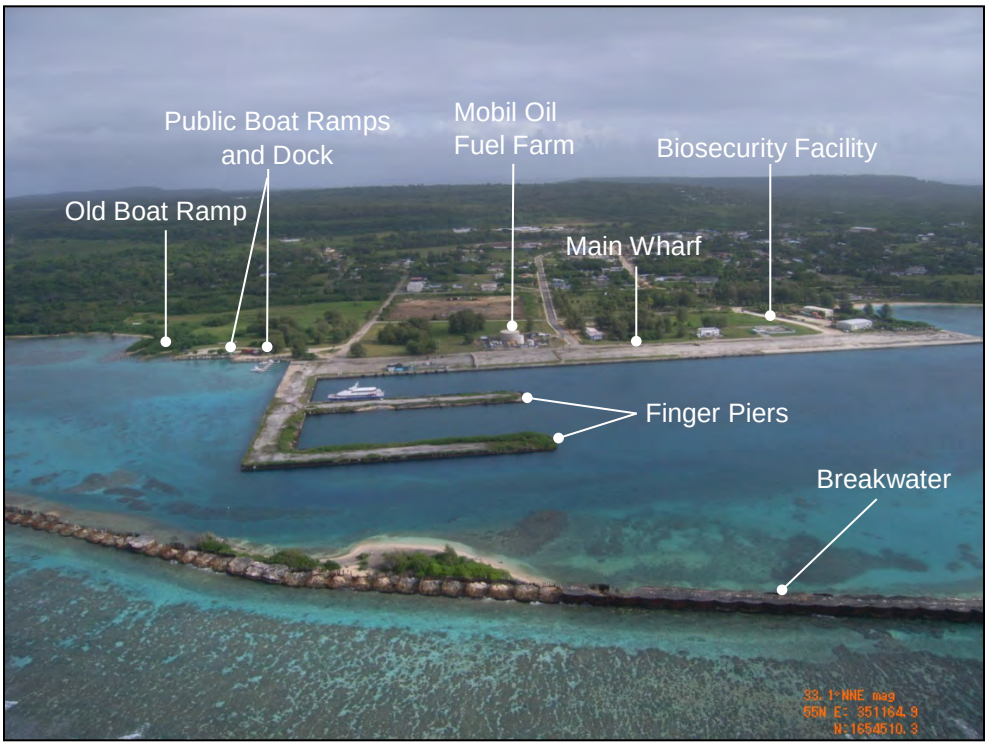

Photo 2.1-24. Port of Tinian Features and Facilities

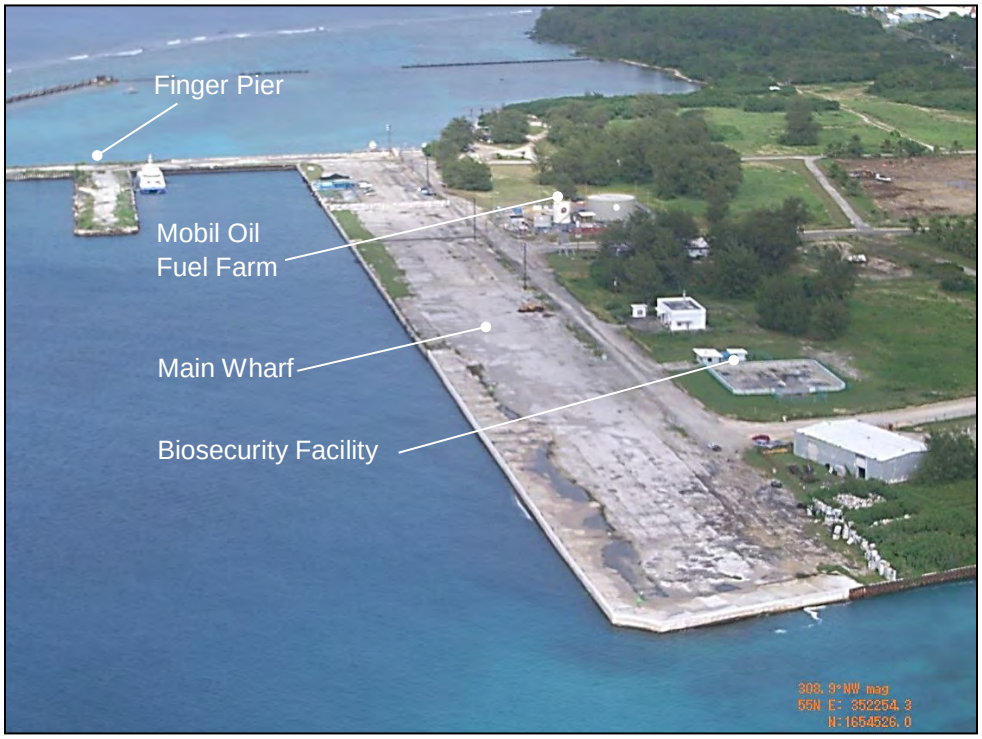

Photo 2.1-25. Port of Tinian Main Wharf and Port Facilities

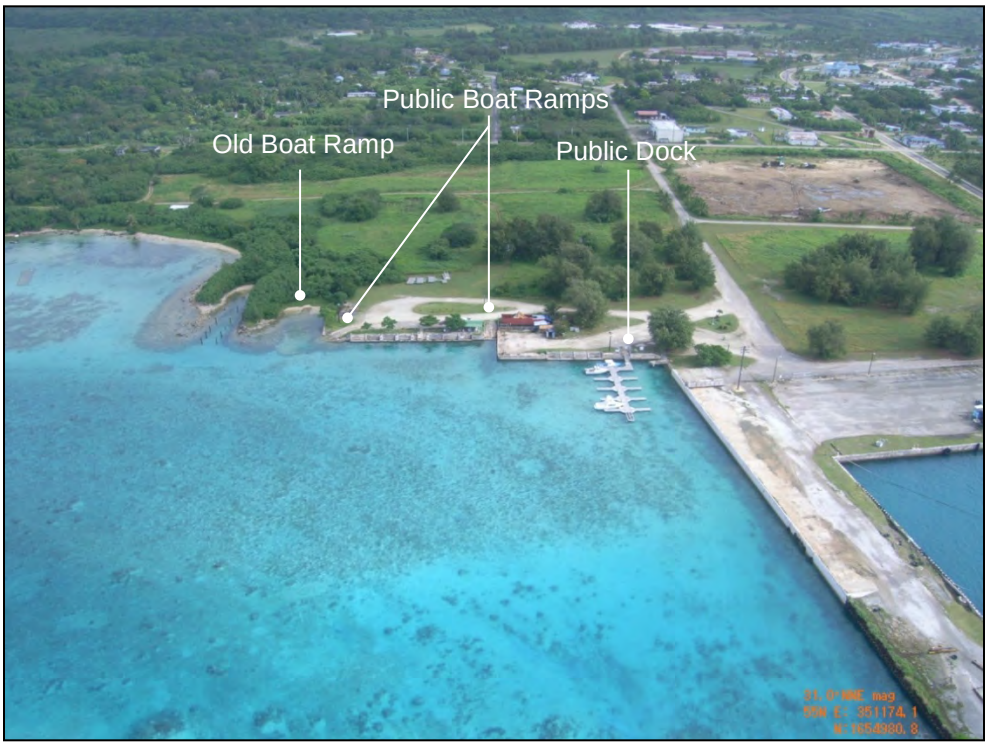

Photo 2.1-26. Port of Tinian Boat Dock and Ramps

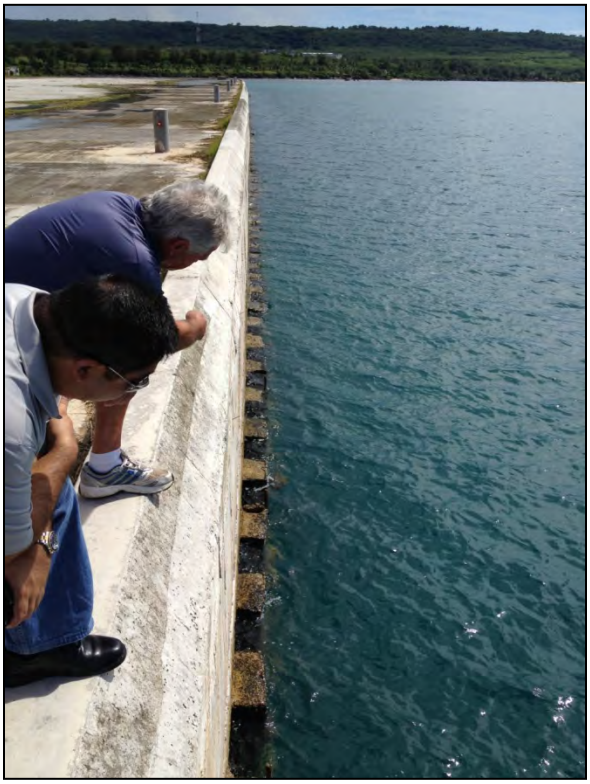

Photo 2.1-27. Main Wharf of Port of Tinian (note sheet pile along waterline)

The current port docking facilities consist of a main wharf that is approximately 2,000 feet (610 meters) long with a usable length of 1,600 feet (488 meters). Approximately 400 feet (122 meters) of the main wharf are currently in disrepair and unusable. Water depths along the wharf range from 24 to 29 feet (7 to 9 meters).

A 700-foot (213-meter) section of the main wharf was repaired in 1984. This repair consisted of a concrete-face panel section founded on a pile cap that is connected to the existing sheet pile system. A more recent repair was implemented in 1998 that relies less on the connection to the top of existing sheet piling. Information gathered during a recent site visit resulted in the following information (Photo 2.1-27):

1. The sheet piling above elevation 0 mean lower low water is in varying states of condition. Some sheet piling is corroded badly above the water level but mostly intact below. Other areas of dock sheet piling have corroded away completely above the water level.
2. The current use of the main wharf indicates that the piling below the water level is intact and possibly able to be reused. The more recent repair (circa 1998) is an alternative approach to the 1984 repair that does not rely on the full strength of the existing top of the piling; this is more of a "gravity" block or soil block structure.
3. Both the 1984 and 1998 marginal wharf repairs rely on the integrity of the sheet piling below elevation 0 mean lower low water.

The port has no fixed shore-side cranes or lighting. West of the main wharf are two finger piers (Pier 1 and Pier 2), both are in complete disrepair and unusable.

North of the main wharf and adjacent to the current public dock and ramps is an old concrete boat ramp that is suitable in size for, and has been used by, amphibious assault vehicles (AAVs) in the past. This ramp has an adjacent grassy staging area suitable for storing vehicles brought ashore, or for staging, cleaning, and reloading AAVs (U.S. Pacific Command 1999).

A mooring buoy in Turtle Cove, 2 miles (3 kilometers) north of the Port of Tinian has been removed, but the anchoring system is still in place. The anchoring system could be used by vessels, or a new mooring buoy system could be installed and be used by large draft ships for transfer of cargo and passengers to smaller draft ships.

Currently the port is used for the transshipment of the island's power plant and commercial vehicle fuel supply and their regular day-to-day commodities. Fuel is provided by a fuel tanker (the *AKRI*, shown in Photo 2.1-28) that makes deliveries on a monthly basis. The only commercial fuel supplier for the island is Mobil Oil. The fuel tanker is berthed at the main wharf; fuel is piped from the tanker to storage tanks located about 300 feet (approximately 100 meters) inland. Usual stay time for the fuel tanker is 1 day.

2.1.3.2 Vessel Traffic

Tinian's commodities are brought from Saipan via a privately owned SM5 boat (LCM-6 type, Photo 2.1-29) that transits periodically between the islands. The SM5 boat is off-loaded from the shore ramp facility located near the floating small-boat pier. For larger shipments, a tug and barge are used to bring intermodal containers (standard reusable metal shipping containers) to the island from Saipan. The barge only transits about once every 60 days because an accumulation of 7–8 containers worth of goods is required to make the transit cost effective. The Saipan barge is used and is moored off of the main wharf. Usual stay time for the barge is approximately 1 day. A ferry system, proposed by the Tinian Dynasty Hotel and Casino, between Tinian and Saipan, could increase vessel traffic.

Photo 2.1-28. Fuel Tanker *AKRI*

Photo 2.1-29. Privately Owned SM5 Boat (LCM-6 type)

The open waters off Tinian have no known restrictions. Shipment of cargo (to and from Saipan) typically occurs on waters west of the island because of the calmer waters on the island's lee side. Large vessels maintain a distance of approximately 1 mile (2 kilometers) off shore, while smaller vessels come within 100 feet (30 meters) of shore (Crisostomo, G., PTI Com January 2014).

2.1.3.3 Existing Port Capacity

Table 2.1-4 shows recent annual data for revenue tonnage in and out of the Port of Tinian. The Department of the Navy estimates that the main wharf has the capacity to process approximately 4,500 tons (4,100 metric tons) of cargo daily. The CPA estimates that the port has a capacity to accommodate passenger vessels holding up to 1,500 passengers. Gasoline and diesel fuel can be obtained at the Mobil

Oil tank compound adjacent to the port. Ships exceeding the dimensions of the harbor, channel, or port facilities can transfer personnel and cargo at sea to an available tugboat and barge of smaller draft (lightering) to access the Port of Tinian (meeting with Ambyth Shipping with the Department of the Navy and AECOM Technical Services, Inc., on December 4, 2012). The Port of Tinian has a facility for biosecurity/control of brown treesnake (Boiga irregularis), with a capacity of four shipping containers.

Table 2.1-4. Port of Tinian Cargo Tonnage Handled during Fiscal Years 2005 through 2010

Fiscal Year	*In*	*Out*	*Total*
2005	29,818	2,141	31,959
2006	28,584	3,101	31,685
2007	23,174	2,373	25,547
2008	33,790	3,448	37,238
2009	15,979	736	16,715
2010	11,978	2,926	14,904

Sources: CPA 2007, 2011.

Planned residential development of the West San Jose Village Homesteads could increase traffic demand of the Port of Tinian due to construction activities and a permanently increased resident population. The proposed ferry system between Tinian and Saipan could also increase use of the port.

2.2 PAGAN

2.2.1 Ground Transportation

2.2.1.1 Roadway Network

No significant vehicular traffic patterns occur on Pagan. Only a few all-terrain-vehicle pathways exist on Pagan and their use is limited (Photo 2.2-1, Photo 2.2-2, Photo 2.2-3, and Photo 2.2-4). All residents of Pagan were evacuated to Saipan in May 1981 after the eruption of Mount Pagan; as a result, there currently are no permanent residents on the island (U.S. Census Bureau 2010).

Photo 2.2-1**. Existing All-Terrain-Vehicle Pathway on Pagan**.

Photo 2.2-2. Existing All-Terrain-Vehicle Pathway on Pagan

Photo 2.2-3. Existing All-Terrain-Vehicle Pathway on Pagan

Photo 2.2-4. Existing All-Terrain-Vehicle Pathway on Pagan

2.2.1.2 Transit Network

There is no existing transit service on Pagan.

2.2.1.3 Pedestrian and Bicycle Network

There are no dedicated pedestrian or bicycle facilities on Pagan.

2.2.2 Air Transportation

2.2.2.1 General

The Pagan Airstrip (TT01) is a public airport located on Pagan within the CNMI (Figure 2.2-1). It is classified by the FAA as a basic general aviation airport. TT01 is owned and managed by the CPA and administered by the Department of Public Lands (FAA 2014, CPA 2008). The published geodetic location of TT01 is 18°07.47' North latitude and 145°46.12' East longitude, at an elevation of 34 feet (10 meters) above msl (FAA 2014).

TT01 is part of the National Airspace System so FAA is responsible for its safety. FAA also aims at improving the capacity, efficiency, and sustainability of the U.S. airports for the benefits of the National Airspace System.

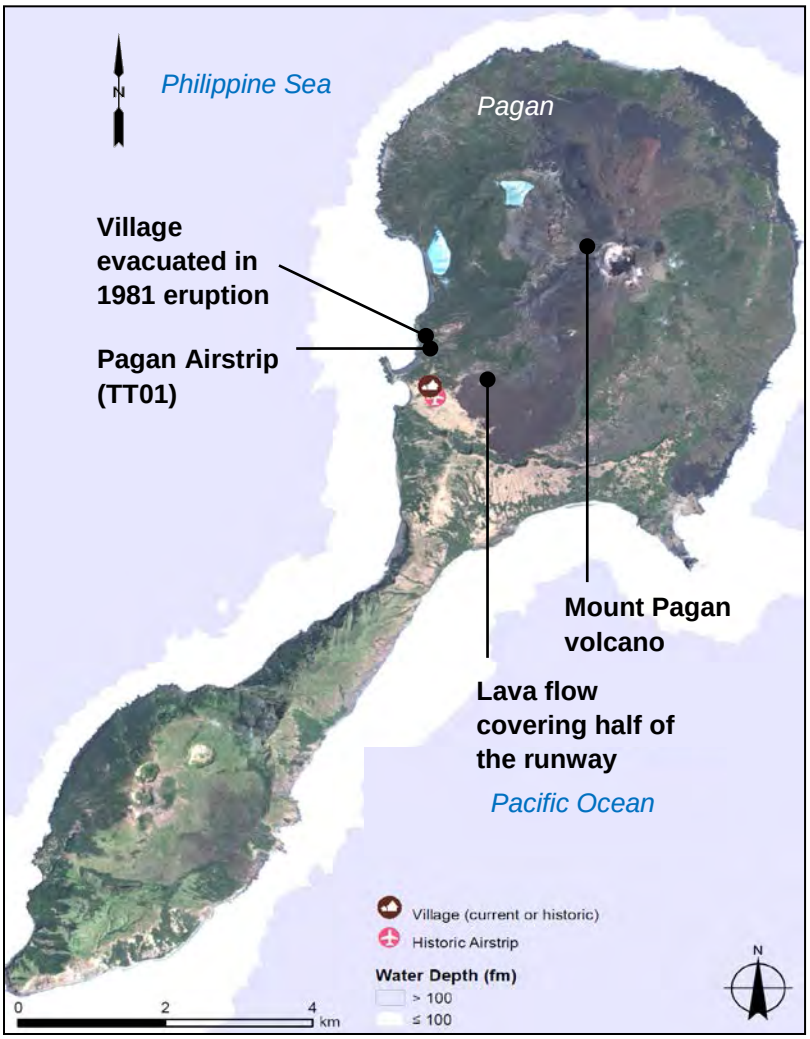

Figure 2.2-1. Location Map of the Pagan Airstrip
Source: NOAA 2012.

The island has been uninhabited since the volcanic eruption in 1981. TT01 is unattended and has no scheduled flights. Limited charter flights/air taxi and general aviation operations occur at TT01 for visitors, but no aircraft are based there. Charter flights to Pagan began in the late 1980s and continue today. Passengers traveling to Pagan have been primarily federal and local government officials, including personnel from the U.S. Fish and Wildlife Service, U.S. Geological Survey, and U.S. military; the Northern Islands Mayor's Office; and other local government agencies. Most of the flights, whether by helicopter or Cessna, have carried the maximum load of four passengers and the pilot (CPA 2008). There is no fuel service at TT01.

The eruption in 1981 included lava flows on the northeastern and northwestern flanks of the Mount Pagan volcano. Flows on the southwestern flank measuring 20–25 feet (6 to 7.5 meters) high covered nearly half of the runway at TT01.

The existing facilities at TT01 are described below. Figure 2.2-2 provides an aerial view of existing airport facilities. Figure 2.2-3 depicts the approximate extent of the artificial fill historically placed for the airport platform. Photo 2.2-5 and Photo 2.2-6 show existing conditions.

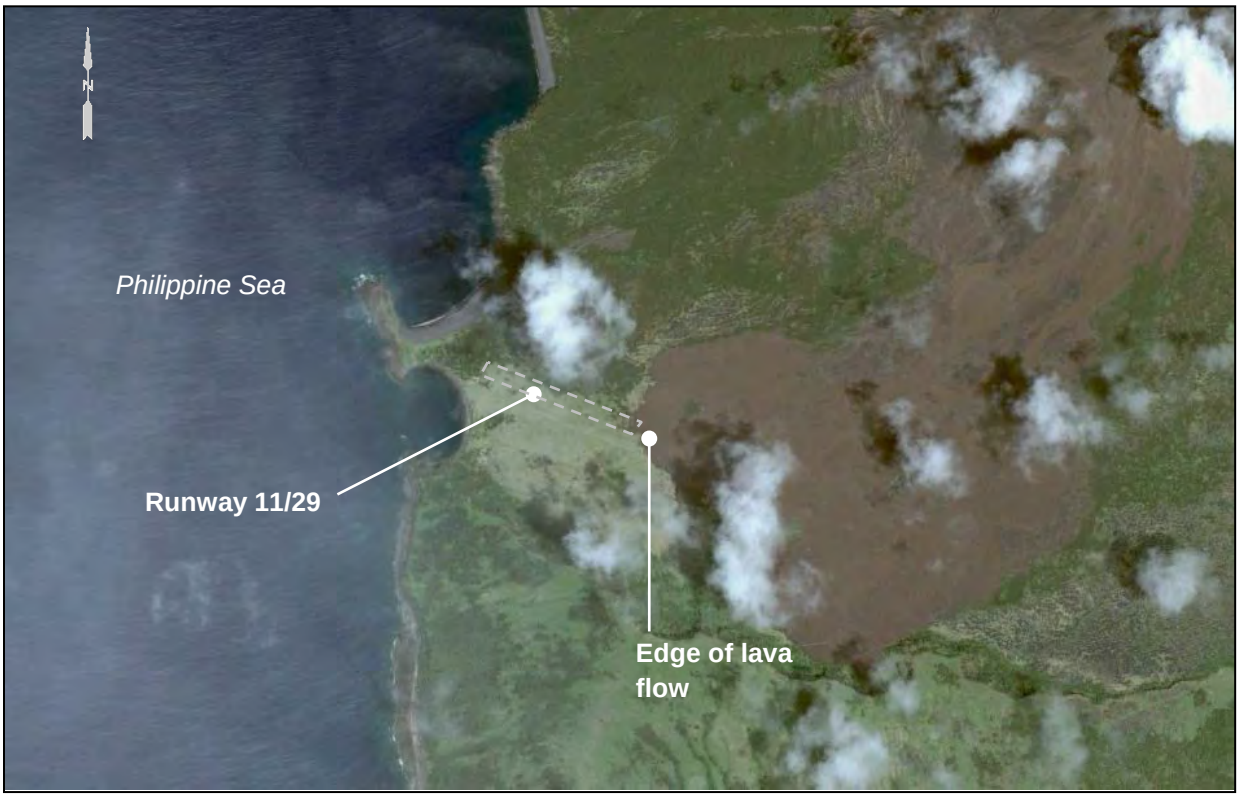

Figure 2.2-2. Overview of Existing Pagan Airstrip Facilities
Source: Google Earth 2014.

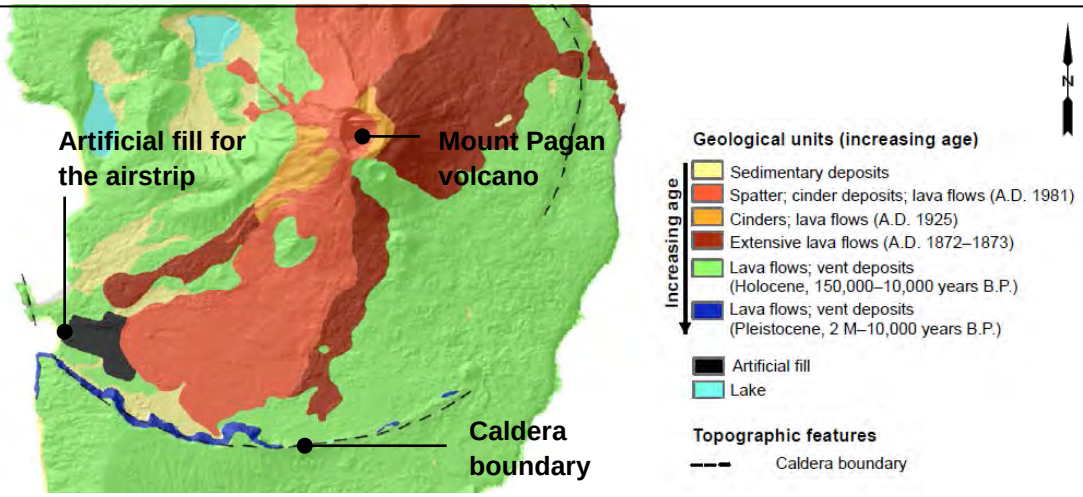

Figure 2.2-3. Extent of Artificial Fill for the Pagan Airstrip
Source: NOAA 2012.

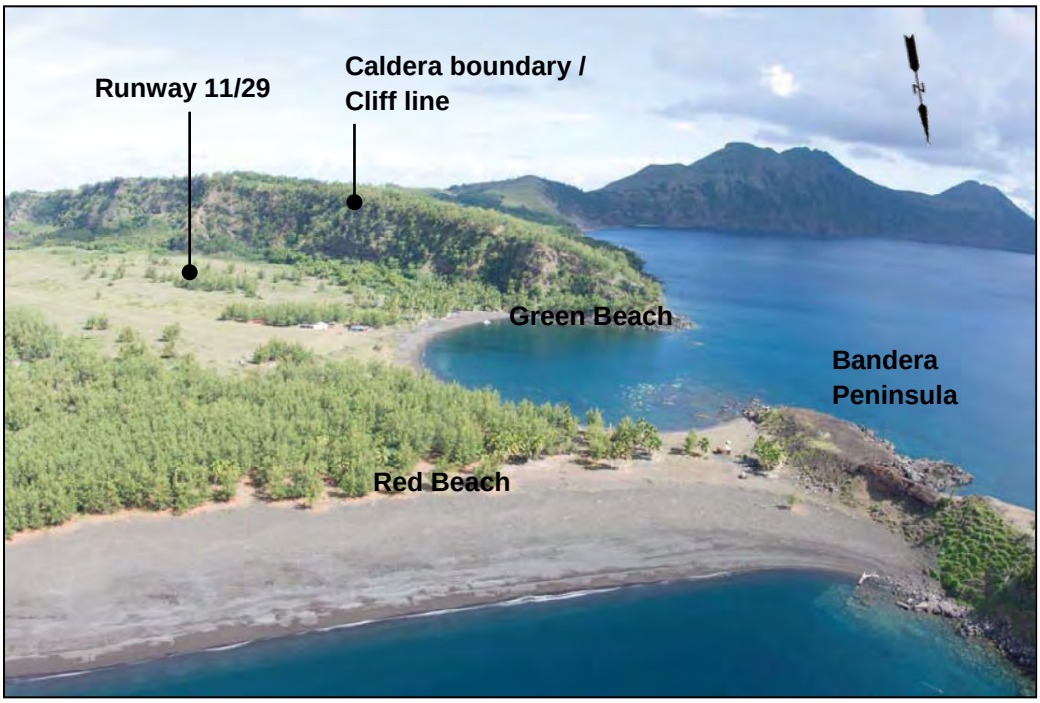

Photo 2.2-5. View Toward Existing Pagan Airstrip
Source: U.S. Fish and Wildlife Service 2010a.

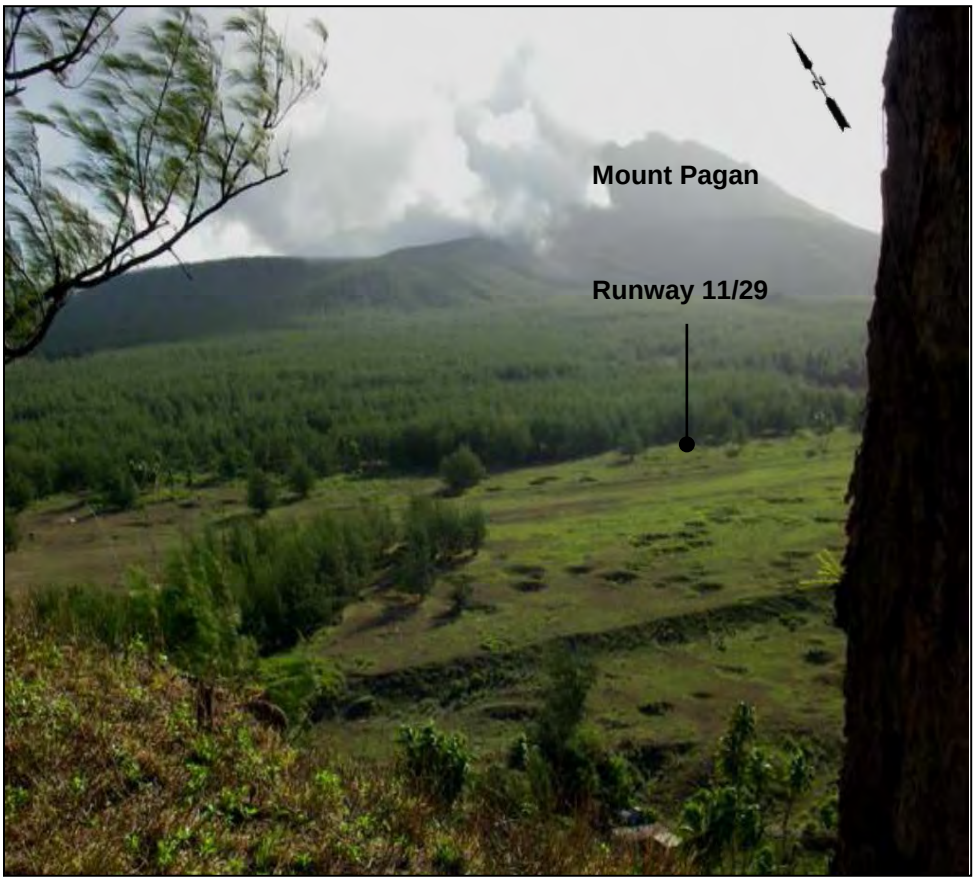

Photo 2.2-6. View of Existing Pagan Airstrip
Sources: U.S. Fish and Wildlife Service 2010a, b.

2.2.2.2 Airfield

Runway and Runway Pavement

The airfield was built by the Japanese before or during World War II. The runway was approximately 2,500 feet (760 meters) long and 190 feet (60 meters) wide. The west end of the runway was on fill that was as much as 15 feet (4.5 meters) deep, and the east end was cut into clinker lava flows with excavations up to 20 feet (6 meters) deep. Concrete drainage ditches were built on either side of the runway and were used for water catchment. These facilities have since been destroyed. In the early 1970s, a Seabees' Civic Action Team regraded the airfield. Subsequent work on the runway was minimal and limited, with occasional clearing of trees in the approach zones and mowing of the runway (Office of Transition Studies and Planning 1978).

The eruption in 1981 significantly reduced the runway's length. TT01 currently has a single runway, east-west Runway 11/29, measuring 1,500 feet (457 meters) long and 120 feet (37 meters) wide. The runway surface is turf and gravel, with a load-bearing capacity of 4,000 pounds (1,800 kilograms) for single-wheel aircraft (FAA 2014). A field survey was done in 2003; some of the existing features near the runway are depicted in Figure 2.2-4.

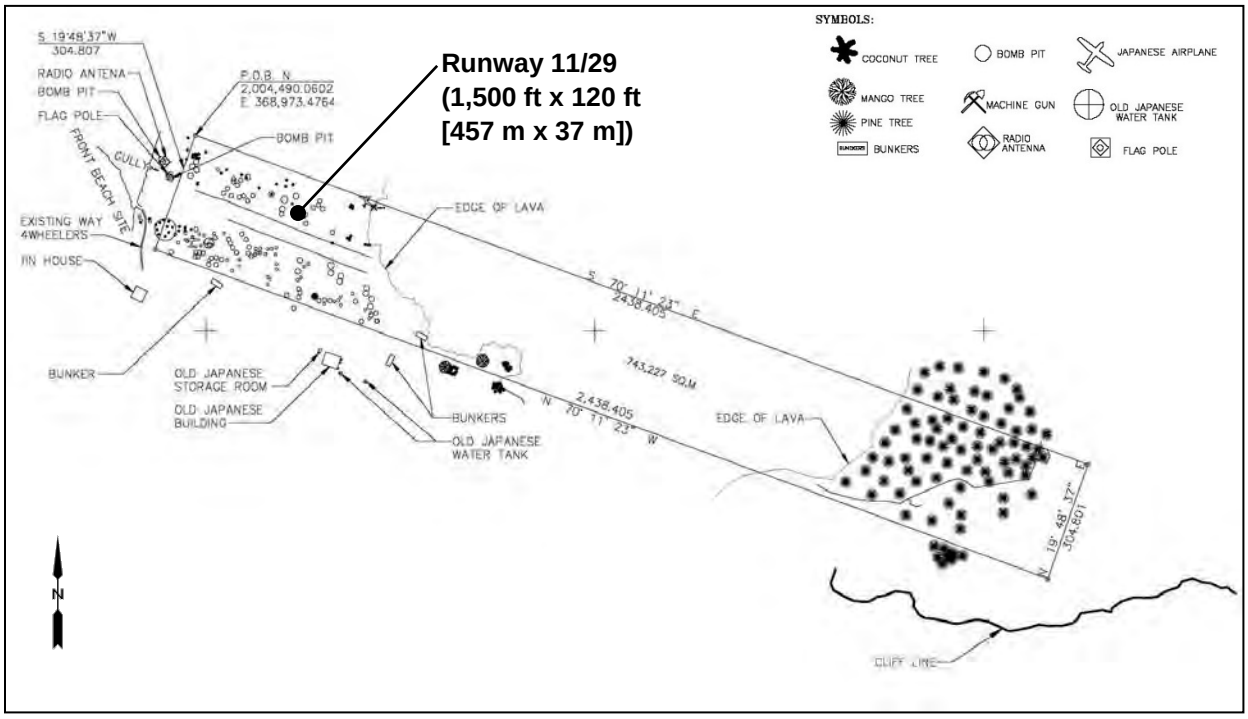

Figure 2.2-4. Survey of the Airfield at the Pagan Airstrip, as of 2003
Source: CPA 2008.

Airspace and Air Traffic Control

The airspace surrounding TT01 is designated as Class G airspace. TT01 operates without an airport traffic control tower or ground control. Aircraft flying to and from TT01 normally provide courtesy notification to CPA operations and air traffic control on Saipan for approach and departure clearance. TT01 is considered an uncontrolled airfield and pilots are responsible for maintaining separation, takeoffs, and landings using the common traffic advisory frequency listed on the aeronautical chart or the Airport/Facility Directory (FAA 2014).

A flight service station is provided at Honolulu Flight Service Station (FAA 2014).

2.2.2.3 Airport Support Facilities

No existing airport support facilities have been identified at TT01.

Planned Airport Development

The CPA has identified the following improvement projects for TT01 in the latest version of the *Pagan Airstrip Master Plan* (CPA 2008). However, there is no implementation schedule for these improvements.

- Airport Property Boundary – Adjust to measure 8,000 feet (2,400 meters) long and 1,000 feet (approximately 300 meters) wide and align to the existing runway. The area within the boundary would be under the control of the CPA.
- Site Improvement – Remove and/or trim trees; fill the depressions, possibly with crushed volcanic rock; and compact the runway. Lava flows approximately 2,100 feet (640 meters) long beyond the east edge of the existing runway would be cleared and removed to allow extension of the runway's length to 3,000 feet (900 meters) and grading of the runway protection zone. The drop-off area on the western end of the runway would be stabilized with riprap. Drainage would be improved.
- Runway – Extend to 3,000 feet (900 meters) long and 60 feet (18 meters) wide.
- Apron – Add an aircraft parking area for small aircraft (six-seater).
- Airfield Marking, Lighting, Navigational Aids – Add runway end and edge markings. Replace nonfunctioning windsock.
- Terminal Building Facilities – Provide a simple, concrete-structure, open-air pavilion to provide shelter and serve as a waiting area for passengers with temporary vehicle parking close to the pavilion.
- Fuel Storage – Provide a simple concrete storage building with a self-serve facility.
- Boundary Fence – Optionally, add fencing to keep out animals, particularly cows and goats.
- Preservation of Historical Remains – Preserve the historical remains from the Japanese military period. These remains will likely be a focus of visitor interest.

Figure 2.2-5 presents the planned airport layout, including the proposed improvement works for Pagan (CPA 2008).

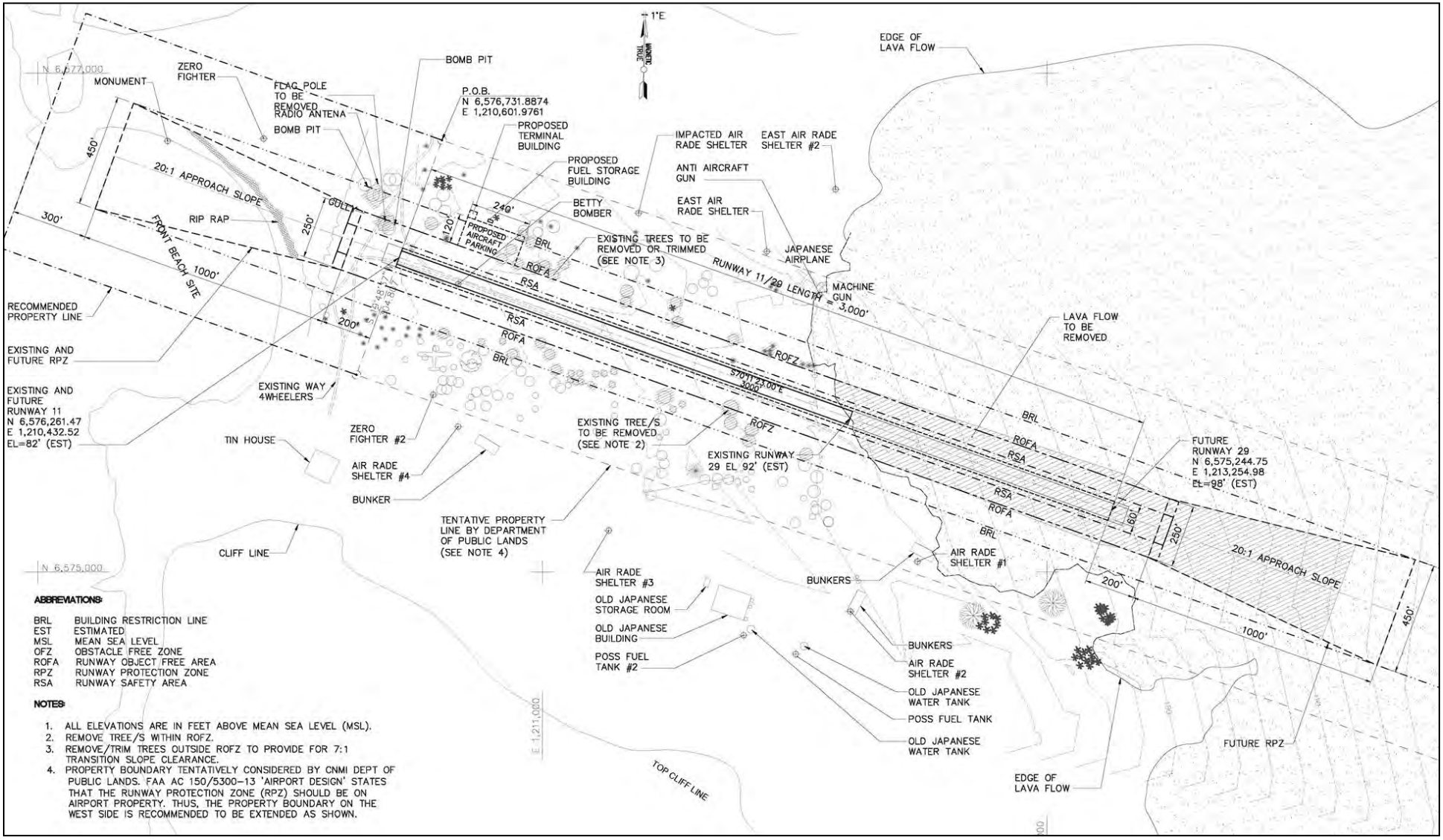

Figure 2.2-5. Commonwealth Ports Authority Proposed Airport Improvements at the Pagan Airstrip
Source: CPA 2008.

2.2.3 Marine Transportation

No significant marine traffic patterns exist near Pagan. Pagan has no working marine port facilities. The only pier on the island (Photo 2.2-7) was built in the 1940s, has been in disrepair since the 1970s (Government of the Northern Mariana Islands 1978), and is currently so degraded that it is unable to provide any docking facilities. Previous delivery of cargo required transferring to vessels of smaller draft (hull depth) to reach the island (Government of the Northern Mariana Islands 1978). Anchorage of vessels is possible in bays offshore.

Photo 2.2-7. View of Pagan Pier in Current Condition

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CHAPTER 3.
PROPOSED ACTION CONDITIONS

3.1 TINIAN

The proposed action is based on a 20 weeks per year training tempo for Tinian. There is the potential for the training tempo to be ramped up to 45 weeks per year in the future. This increased training tempo is being evaluated in the CJMT Environmental Impact Statement/Overseas Environmental Impact Statement under cumulative impacts. Because the transportation requirements are essentially based on peak usage (e.g., for ground transportation, peak usage is defined as the day [or hour] with the highest traffic volumes). Peak usage would be directly related to the number of personnel and the amount and type of equipment used during the training period. The number of weeks that training would occur (i.e., the training tempo) would have little effect on the transportation requirements or associated impacts. Therefore, other than wear and tear that would result in an increased need for maintenance, there would be little difference in the transportation analysis between the two training tempos, and the longer tempos are used as the basis of this analysis.

Three unit level alternatives have been developed for Tinian to meet unfilled training requirements (DoN 2014b). Tinian Alternative 2 was chosen as the representative unit level alternative for this analysis. Tinian Alternative 2 is shown in Figure 3.1-1. Transportation of training units, support personnel, and equipment to and from Tinian could include commercial and military shipping such as barges, a ferry, a high-speed vessel, military amphibious ships, or Military Sealift Command platforms. The high-speed vessel, with potential use of other vessels, is considered the primary mode of transporting personnel and equipment in support of the training cycle, while air movement is a secondary mode (DoN 2014b). The specific number and type of vessels required to move unit equipment would depend on the numbers and types of vehicles staged on Tinian for rotational training use and the using unit's specific requirements. The types of vehicles and equipment that would be transported to Tinian to support the proposed unit level training under the proposed action are summarized in Section 3.1.1.2. At a minimum, repairs and improvements to Tinian's transportation infrastructure would be required to support the anticipated logistical demands. Improvements to support the proposed action unit level training requirements include construction of a base camp and Munitions Storage Area (MSA) (Figure 3.1-2), fencing and gates, airport facilities, port facilities at the Port of Tinian, and roadways (Figure 3.1-3, Figure 3.1-4, Figure 3.1-5, Figure 3.1-6, and Figure 3.1-7, respectively).

3.1.1 Ground Transportation – Tinian

3.1.1.1 Future Baseline Conditions

Traffic forecasts were prepared using population and employment projections summarized in the *CJMT Socioeconomic Impact Assessment Study*. Based on these population projections, average daily traffic volumes on Tinian would not be expected to increase. Therefore, the existing conditions as described in Chapter 2 would persist and represent the future baseline. As such, all of the selected study roadway segments would continue to operate under capacity at an acceptable LOS (LOS A), under future baseline conditions. Traffic volumes would be similar to those shown in Figure 3.1-1.

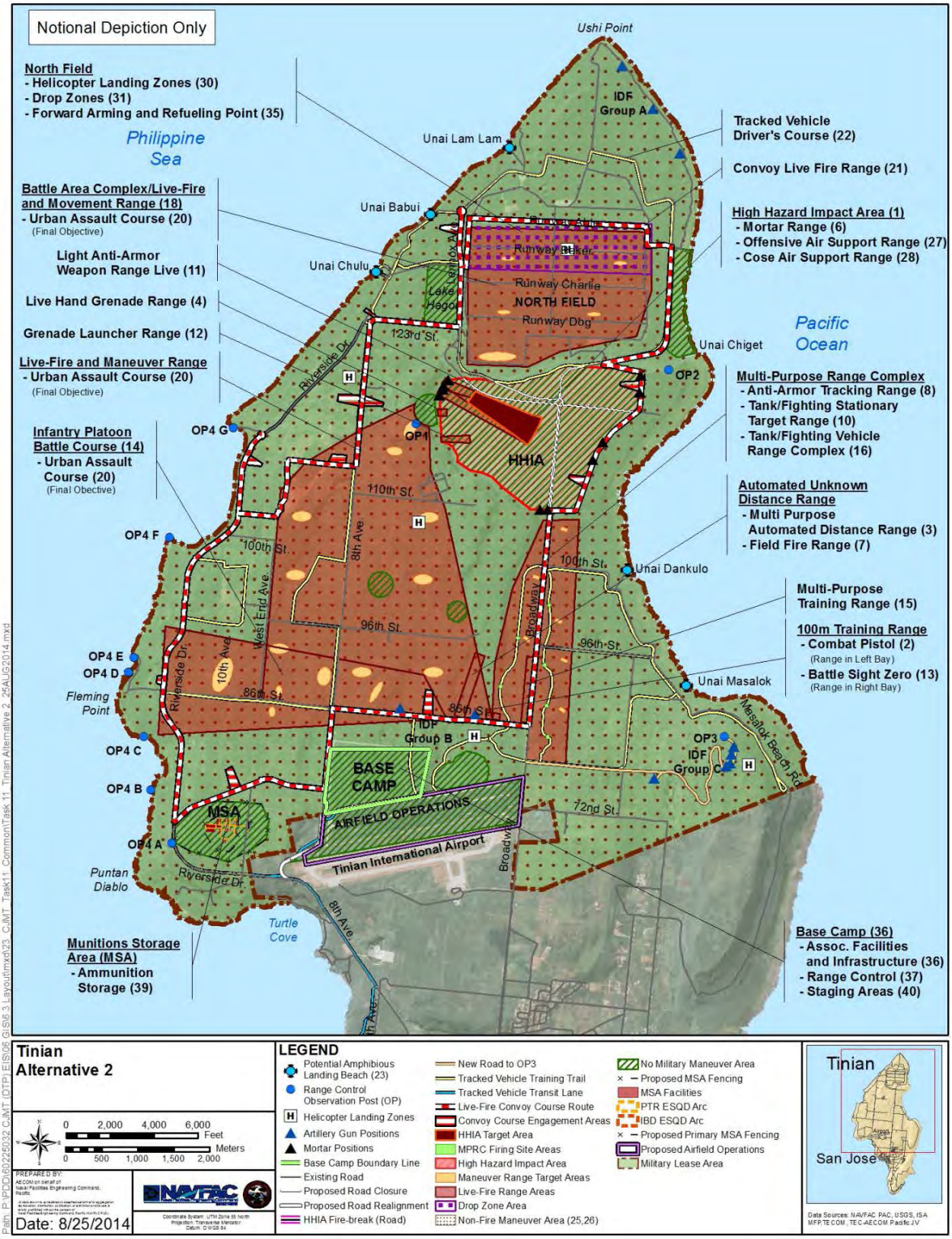


Figure 3.1-1. Tinian Alternative 2
Source: DoN 2014b.

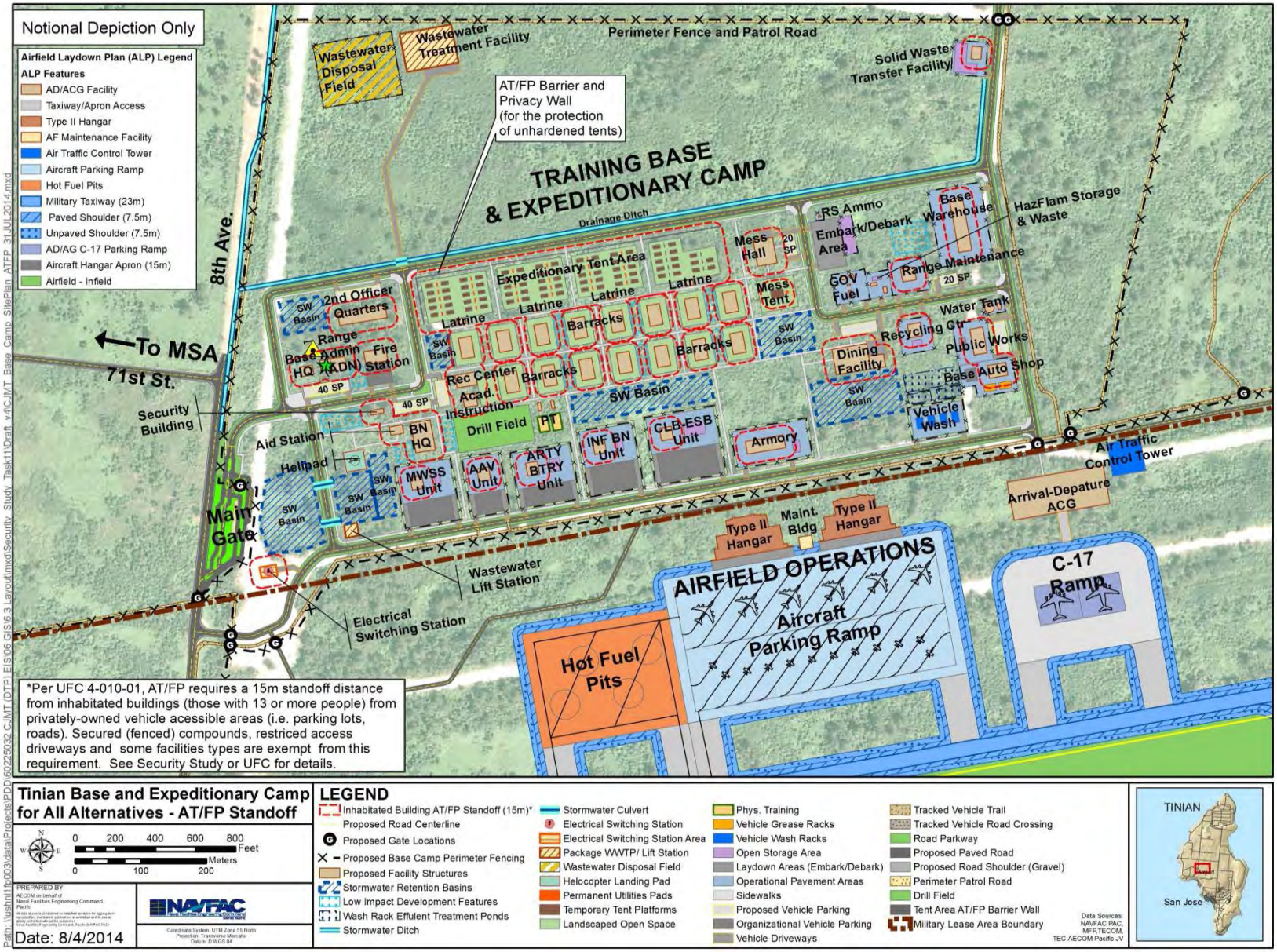


Figure 3.1-2. Tinian Base and Expeditionary Camp for All Alternatives (End State)
Source: DoN 2014b.

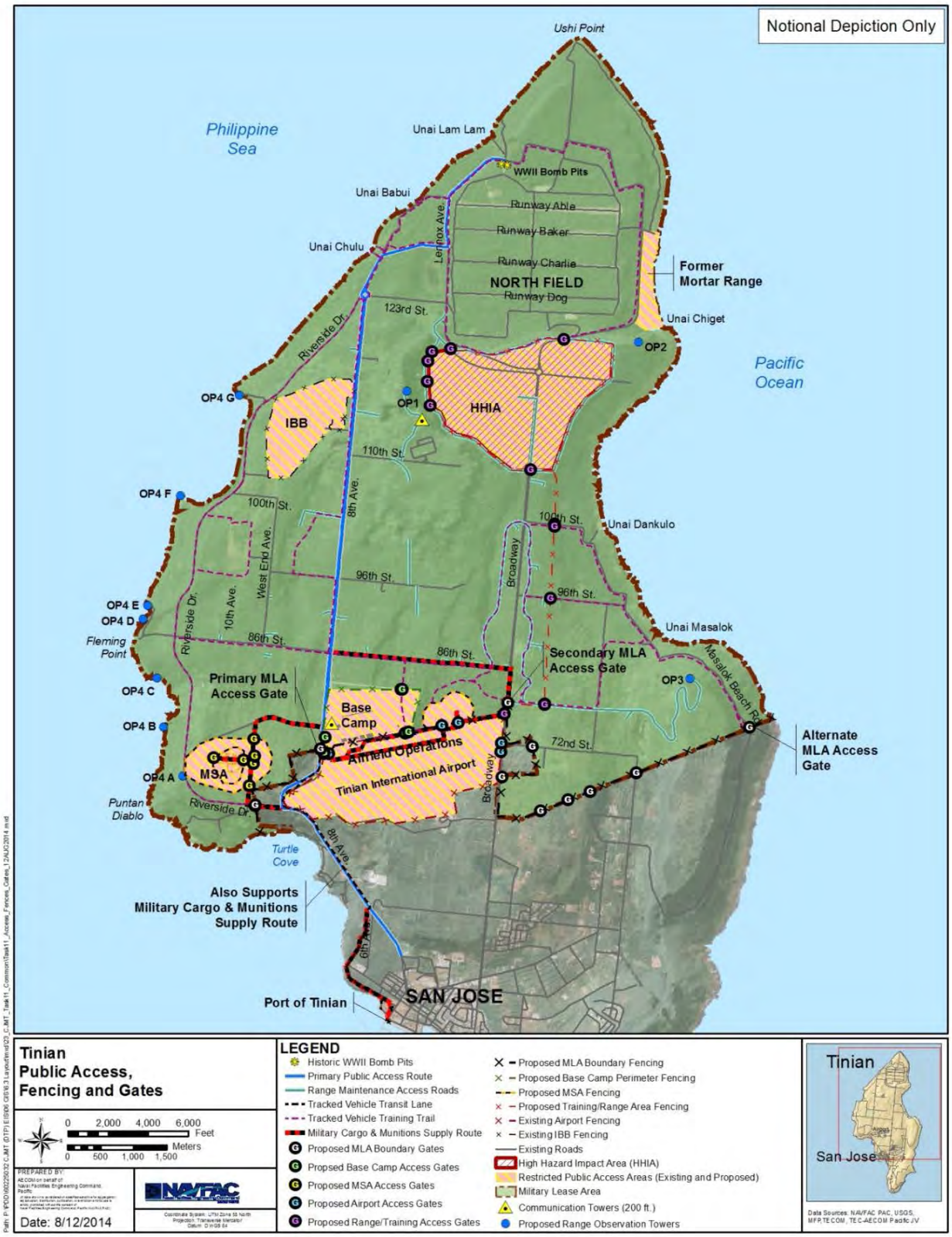


Figure 3.1-3. Tinian Public Access, Fencing, and Gates
Source: DoN 2014b.

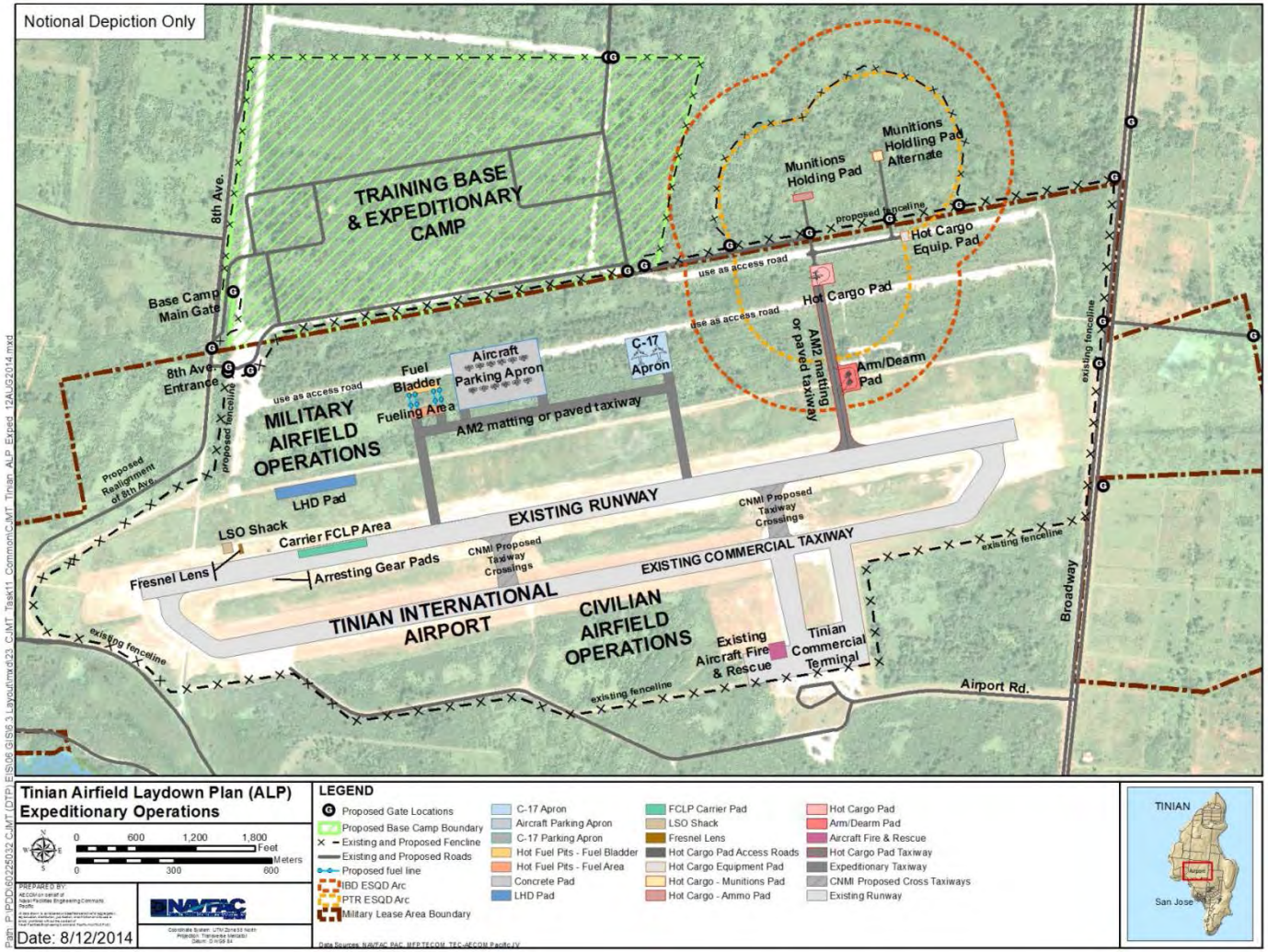


Figure 3.1-4. Tinian Airfield Laydown Plan [4]- Expeditionary Operations

[4] The airfield layout was based on a CNMI CPA drawing titled "*West Tinian Airport Airside Improvements – Airport Layout Plan*" dated September 1998 (CPA 1998) for the purpose of this Environmental Impact Statement. Since 1998, CPA has made changes to their proposed airfield layout and FAA has revised their relevant Advisory Circulars. The airfield layout will be designed in accordance to the latest FAA Advisory Circulars in the detailed design phase.

Source: DoN 2014.

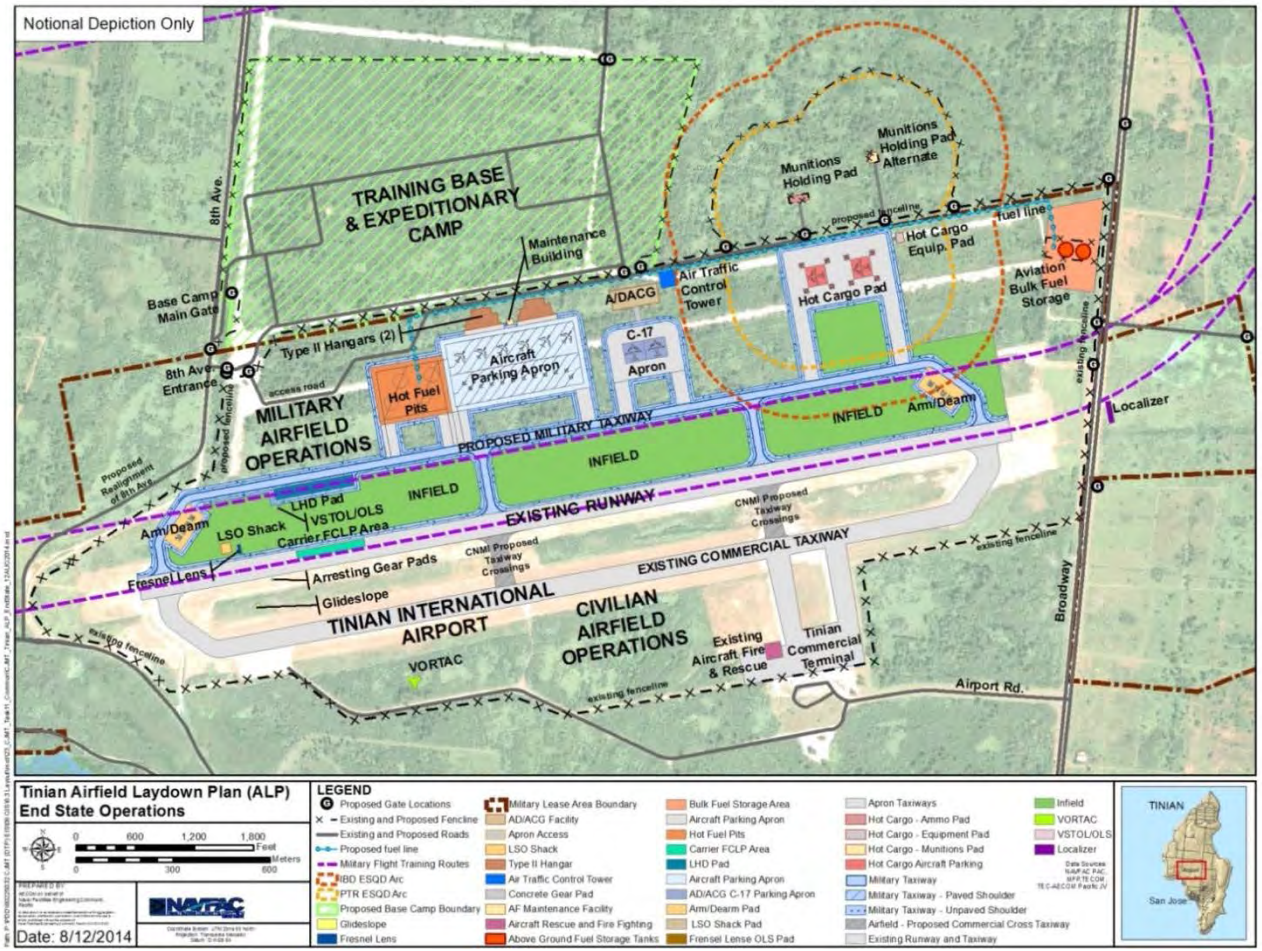


Figure 3.1-5. Tinian Airfield Laydown Plan[5] - End State Operations

Source: DoN 2014.

[5] The airfield layout was based on a CNMI CPA drawing titled "*West Tinian Airport Airside Improvements – Airport Layout Plan*" dated September 1998 (CPA 1998) for the purpose of this Environmental Impact Statement. Since 1998, CPA has made changes to their proposed airfield layout and FAA has revised their relevant Advisory Circulars. The airfield layout will be designed in accordance to the latest FAA Advisory Circulars in the detailed design phase.

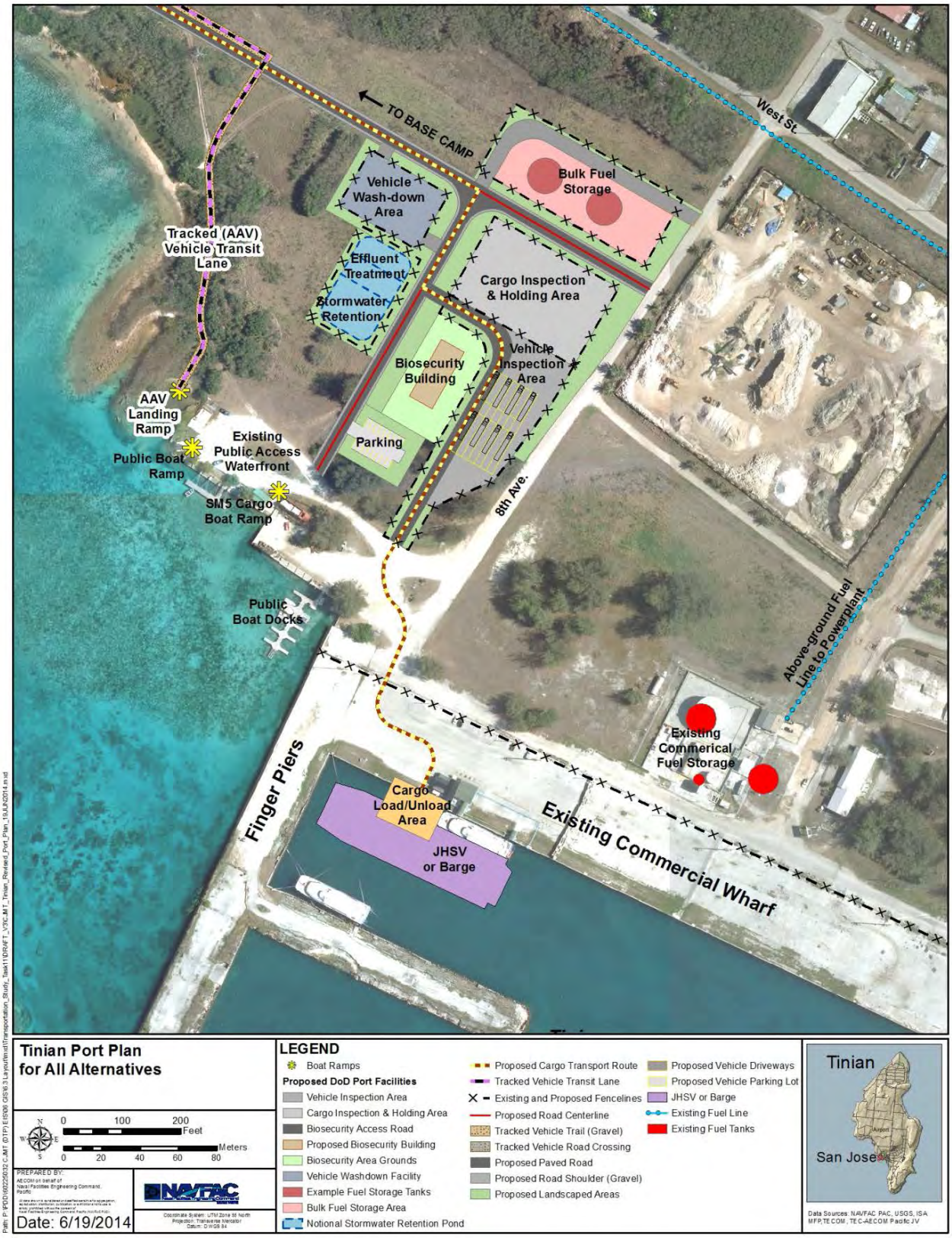


Figure 3.1-6. Tinian Port Plan for All Alternatives
Source: DoN 2014b.

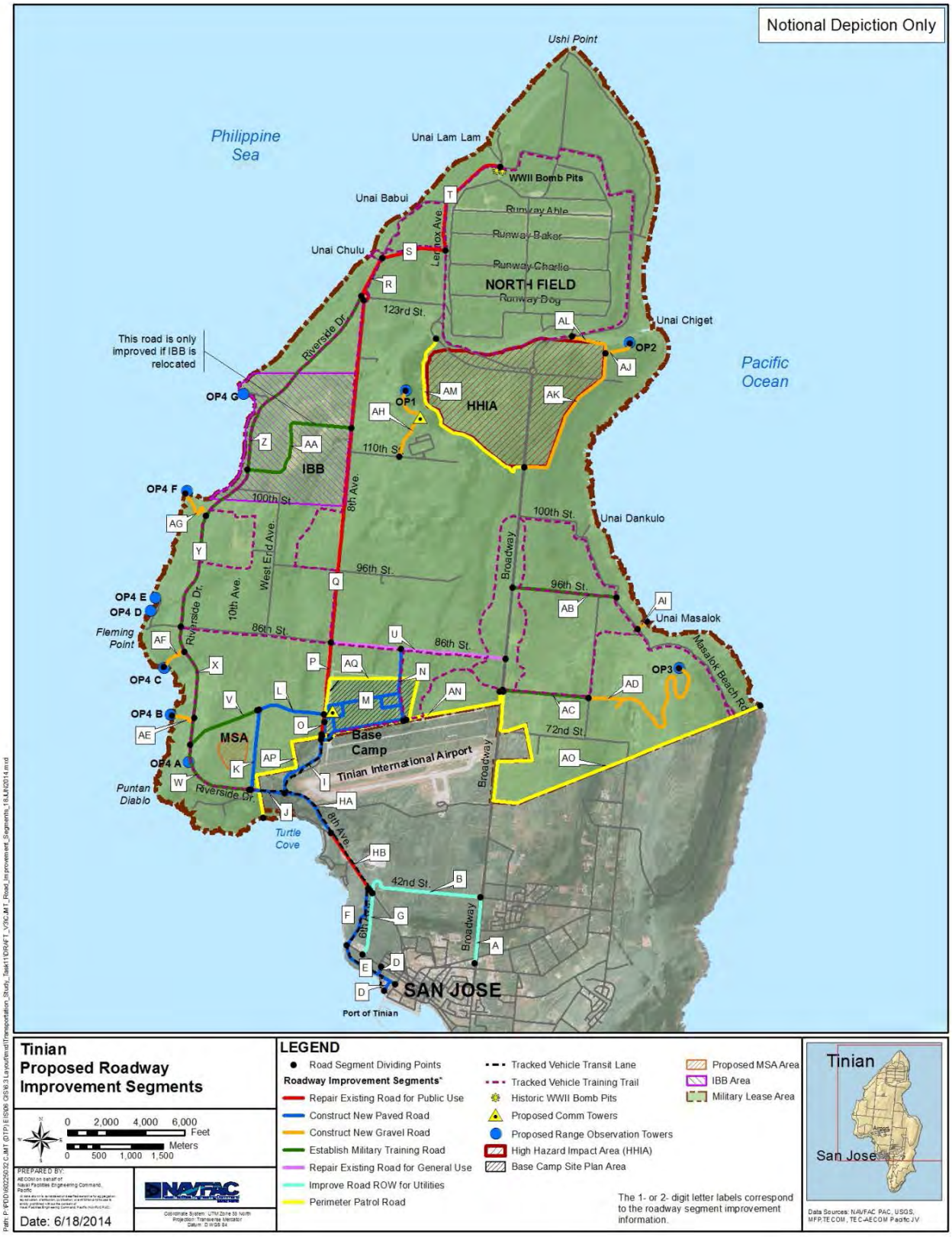


Figure 3.1-7. Tinian Proposed Roadway Improvement Segments
Source: DoN 2014b.

3.1.1.2 Proposed Action Conditions

This section includes a summary of the amount and type of vehicles that would be used during the training period and for ongoing range maintenance. Vehicle traffic generated by the proposed action is estimated for the pre-arrival, mobilization (arrival/departure), and training periods and the potential effect of this additional traffic on the study roadway segments is evaluated. The proposed temporary and permanent roadway closures and public access restrictions are described and the potential transportation-related effects of these closures are assessed.

Training Vehicles

Ground transportation would be provided by each unit, transporting its own equipment required for training. The type and number of vehicles and equipment required would vary depending on the training activities being conducted. The following are some examples of the types of vehicles that would be used on Tinian:

- High-mobility multipurpose wheeled vehicle
- Light armored vehicle
- AAV
- Medium tactical vehicle replacement 7-ton truck
- Commercial flatbed truck
- Four-wheel-drive truck
- Commercial bus

Daily Maintenance Vehicles

The proposed permanent base camp motor pool is summarized in Table 3.1-1.

Table 3.1-1. Tinian Permanent Base Camp Motor Pool

Vehicle (use)	***Number of Vehicles***
Buses (for troop transport)	8
Sedans (for use by permanent staff)	2
4-Wheel-Drive Trucks (light) – Service pick-ups for use by permanent staff (facilities and range maintenance)	15
Medium Tactical Vehicle Replacement 7-ton Trucks (range maintenance)	5
Commercial Flatbed Trucks	5
D7 Bulldozer	2
Front-End Loader	2
Medium Tactical Vehicle Replacement 7-Ton Dump Truck	2
Rough Terrain Forklift	1
(Rough terrain) Material Handling Equipment (for port and airfield use)	1
Fire Trucks (brush trucks)	3
Fire Fighting Water Supply Truck	1
Extended Boom Forklift	1
4 Wheel Drive 4-Passenger Gators with Dump Bed	8
Gang Mowers with Tractor	2
Bush Hog with Tractor	2
Mower (John Deere 850)	4
Total	64

Source: MARFORPAC 2013.

To minimize the need for shipping equipment to Tinian, a parking area for permanently staged vehicles could be provided within the MLA. Units training on Tinian would bring any additional vehicles and other equipment required for training. Training participants using the Tinian RTA would be transient personnel; therefore, privately owned vehicles would not be available for use during non-training hours (DoN 2014b, Section 2.4.1.4, *Transportation*).

Vehicle Characteristics

Table 3.1-2 provides a sample list of the vehicle characteristics that units would bring and use on Tinian.

Table 3.1-2. Vehicle Characteristics

Representative Vehicle	*Classification*	*Weight*	*Length*	*Width*	*Height*	*Max. Speed*
Jeep J8	Light Utility Vehicle	5,740 lb (2,600 kg)	15.2 ft (4.6 m)	6.2 ft (1.9 m)	5.8 ft (1.8 m)	87 mph (140 kmh)
HMMWV	Light Utility Vehicle	4,630 lb (2,100 kg)	15.4 ft (4.7 m)	7.0 ft (2.1 m)	5.7 ft (1.8 m)	65–70 mph (105–112 kmh)
Oshkosh L-ATV	Light Utility Vehicle (protected)	4,610 lb (2,090 kg)	—	—	6.2 ft (1.9 m)	75 mph (120 kmh)
John Deere M-Gator	All-Terrain Vehicle	1,660 lb (750 kg)	9.0 ft (2.7 m)	5.0 ft (1.5 m)	3.6 ft (1.1 m)	19 mph (30 kmh)
Oshkosh MTVR	MTVR	25,140 lb (11,400 kg)	26.2 ft (8.0 m)	8.2 ft (2.5 m)	11.7 ft (3.6 m)	65 mph (105 kmh)
Stryker	Armored Personnel Carrier	32,850 lb (11,400 kg)	22.8 ft (7.0 m)	8.9 ft (2.7 m)	8.7 ft (2.6 m)	62 mph (100 kmh)
AAVC7A1	Tracked Command Vehicle (amphibious)	46,080 lb (20,900 kg)	26.0 ft (7.9 m)	10.7 ft (3.3 m)	10.7 ft (3.3 m)	45 mph (72 kmh)

Legend: — = unknown; ft = feet; HMMWV = High Mobility Multipurpose Wheeled Vehicle; kg = kilogram; kmh = kilometers per hour; L-ATV = Light All-Terrain Vehicle; lb = pound; m = meters; Max. = maximum; mph = miles per hour; MTVR = Medium Tactical Vehicle Replacement.
Source: Military-Today.com 2014.

To account for the adverse impact of the heavier and larger vehicles (i.e., buses, trucks, and tracked vehicles) present in the traffic stream, traffic volumes containing a mix of vehicle types are typically converted into an equivalent flow of passenger cars using a passenger car equivalency factor. A passenger car equivalency factor is intended to approximate the effect of heavy vehicles, essentially the impact that mode of transport has on traffic variables such as headway, speed, and density, compared to a passenger car and is expressed as a multiple of the effect of an average passenger car. A passenger car equivalency of three was assigned to the larger vehicles to account for their size and acceleration relative to passenger cars (i.e., one larger vehicle is equivalent to three passenger vehicles).

Pre-training Preparation

Pre-training preparation would include an advance team of approximately 2 to 100 personnel performing administrative functions within the Tinian RTA such as checking out the base camp facilities, clearing the MLA of nonparticipating personnel, and establishing checkpoints/roadblocks within the MLA. Vehicles involved in pre-training preparation would primarily travel on roadways within the MLA. Occasional trips to destinations outside the MLA (e.g., the Port of Tinian and San Jose) may occur. The minimal, infrequent, and temporary increase in traffic volumes associated with pre-training preparation would not be expected to adversely affect traffic circulation or roadway LOS. Pre-training preparation would reduce the risk of safety hazards, accidents, and collisions.

Pre-training preparation would be the same under all alternatives.

Arrival/Departure

A period of peak demand on roadways outside the MLA would be expected to occur during the mobilization/demobilization periods – that is, the period immediately following the arrival or preceding the departure of personnel and equipment. During the mobilization period, the Port of Tinian and TNI would serve as the primary embarkation and disembarkation points for marine and air transport of personnel and equipment, respectively. Personnel arriving at Tinian would disembark and proceed to the base camp via bus. Eight buses (40 passengers per bus) would be available for troop transport.

The expected primary route for personnel traveling between TNI and the base camp is less than 0.5 mile (0.8 kilometer) in length and does not require travel on roadways outside the MLA. The expected primary route for military transit (tracked and wheeled vehicles) between the Port of Tinian and the base camp (Figure 3.1-3) is approximately 3.4 miles (5.5 kilometers) in length and includes the following roadways outside the MLA: new parallel roadway south of West Street, new parallel roadway west of 6th Avenue and Tinian Power Plant, and 8th Avenue.

Approximately 150 round-trip bus trips (450 passenger-car-equivalent round-trips) would be required to transport the maximum 3,000 personnel during the mobilization/arrival period at surge capacity. Assuming that 100% of personnel would arrive and disembark at the Port of Tinian and be bused to the base camp in a single day, the largest increase in traffic volume would occur on 8th Avenue, south of 86th Avenue. Daily traffic volumes on this roadway segment would increase from 115 to 565 vehicles (measured in passenger car equivalents). Although substantial, this estimated increase in traffic volumes would not exceed available capacity and all study roadway segments along this route would continue to operate at an acceptable LOS (LOS A).

During the mobilization period, brief traffic delays, and increased traffic congestion would occur on roadways that comprise the route between the embarkation and disembarkation point and the base camp. Specifically, vehicular traffic would increase on roadways outside the MLA, including: Riverside Drive, between the MLA perimeter to 8th Avenue; 8th Avenue, between the MLA perimeter and the new cargo transit/tracked vehicle transit trail; and, along the new cargo transit/tracked vehicle transit trail, west of 6th Avenue and southwest of West Street through the Biosecurity Building and Cargo Inspection and Holding Area to the cargo load/unload area at the existing commercial wharf. These roadways have sufficient capacity to accommodate expected increases in vehicular traffic volumes. Traffic levels on most roadways would not be affected and traffic volumes on military transit corridors outside the MLA would return to baseline conditions following the mobilization period. All Tinian roadways would continue to operate at acceptable LOS (LOS A) during arrival/departure.

The frequency of the U.S. military personnel's arrival to the base camp would vary from one mobilization to the next; however, it is assumed that the traffic would be dispersed throughout any given travel day and throughout the training period. The additional traffic proposed by transporting personnel, equipment, and ammunition from the Port of Tinian and/or TNI to the base camp would not exceed the available capacity of the roadways. Increases in daily traffic volumes associated with these mobilizations would be temporary. Conditions during departure would be similar to those for arrival.

Training

The proposed ranges and training areas are generally located in four geographic areas of the MLA–north, central, south, and west–and are accessible from the base camp without leaving the MLA (Figure 3.1-1). Hence, training activities at the ranges and training areas would not result in increases in traffic on roadways outside the MLA. Several training assets would be distributed throughout the MLA, including a

Convoy Live-Fire Vehicle Course, Tracked Vehicle Driver's Course, and Maneuver Areas (Light and Amphibious Forces) (Figure 3.1-1). Vehicle maneuvering would occur only on developed roads or trails within the MLA and tracked vehicles would travel only along designated tracked-vehicle trails (i.e., the Tracked Vehicle Driver's Course) (DoN 2014b, Section 2.4.1.2, *Training Operations*). Hence, tactical vehicles involved in training exercises at MLA-wide training assets would not result in a direct increase in traffic on roadways outside the MLA.

Training activities would occur throughout the MLA for the following live-fire and maneuver ranges and training areas:

- *Convoy Live-Fire Vehicle Course* – The Convoy Live-Fire Vehicle Course consists of a designated route within the MLA along which engagement areas are located. Personnel travel in vehicle convoys of approximately 10 Humvees and/or trucks and stop at engagement areas along the course.
- *Tracked Vehicle Driver's Course* – The Tracked Vehicle Driver's Course is a non-live-fire training course that is intended to teach the basic driving skills of steering and gear shifting of a tracked vehicle (e.g., AAV-7A1). The course would consist of an unpaved (dirt/gravel) path approximately 14.0 feet (4.3 meters) in width. Certain areas of roads where tracked vehicles cross over would be reinforced with concrete for stability and to minimize potential adverse effects of the tracked vehicles on the road. During amphibious landing exercises, amphibious vehicles would maneuver from the sea to the shore and then transit via the designated tracked-vehicle course to a live-fire training venue.
- *Maneuver Area, Light Forces/Amphibious Forces* – Maneuver Area (Light Forces) refers to areas where maneuvering (mounted or dismounted) is restricted to small units, or units using only wheeled vehicles (e.g., Humvees) on designated (paved or unpaved) roadways. Maneuver Area (Amphibious Forces) refers to areas such as landing beaches where ship-to-shore maneuvering is conducted.
- *Landing Zones (LZs)* – This non-live-fire training area would be located within North Field, on the southeast corner of the MLA, east of the base camp, west of the MSA, and within the southern Battle Area Complex. Access roads for LZ maintenance and movement of personnel and cargo would be required.

During the training period, supporting activities, such as transportation of munitions and hazardous waste, could require the use of roadways outside the MLA (Figure 3.1-3). Vehicles transporting hazardous materials (including munitions) will travel from Tinian Port into the MLA and to the proposed MSA, Base Camp, and/or military airfield. The primary munitions supply route will be used for transportation of hazardous materials and munitions outside of the MLA. During training activities, all roads within the Military Lease Area may be used for the transport of munitions as necessary to live-fire range and training areas. The U.S. Department of Transportation regulations establish the requirements for transporting hazardous substances. Transportation of all materials would be conducted in compliance with the U.S. Department of Transportation regulations and CFR Title 49 (Section 4.13.3). Transportation of munitions would result in the temporary closure of intersections along the munitions convoy route. A temporary direct and indirect increase in vehicular traffic would occur on roadways outside the MLA. Traffic levels on most roadways would not be affected and traffic volumes would return to baseline conditions following transportation of munitions. All Tinian roadways currently operate at acceptable LOS (LOS A) and have sufficient capacity to accommodate expected increases in vehicular traffic

volumes. Therefore, transportation of munitions would not be expected to adversely affect traffic circulation or LOS. Additional details regarding the munitions convoy route and security requirements are provided in the *CJMT Security Study* (DoN 2014c).

Liberty

Military personnel training on Tinian are expected to have approximately one day of liberty per training cycle. While off-duty, military personnel would have liberty to go into town. Military personnel would not have access to privately owned vehicles and would be bused to town and/or other destinations on Tinian. The number of bus trips required to transport off-duty personnel would vary depending on the training cycle. The minimal incremental increase in traffic associated with transportation of military personnel to and from town, or other destinations on Tinian, would not be expected to adversely affect traffic circulation or roadway LOS.

Public Access

Mandatory vehicle access control to military installations is a Department of Defense requirement (Department of Defense Directives 5200.8-R and 5200.8 [1991, 2005a]). Common to all alternatives would be the prohibition of public access at any time to the HHIA, the MSA, the base camp, all fenced and gated ranges, and the range observation posts.

Varying degrees of public access may be allowed during training periods, depending on the areas of use and nonuse for training. When allowable, the perimeter security system would provide access to civilians to areas within the MLA. Military training would increase on Tinian approximately 20 weeks per year based on the proposed action and approximately 45 weeks per year under a potential future increased training tempo.

During training events, including sufficient lead time before training to ensure range clearance, some areas within the MLA would only be accessible to authorized personnel. To facilitate range safety, ground access would be controlled by traffic control points on existing roads. Traffic control points would be established and manned as needed to ensure orderly movement of traffic in accordance with traffic control plans. Gates at 8th Avenue and Broadway would be manned per standard security and operating procedures to allow MLA access to authorized personnel, including International Broadcasting Bureau employees. Gates for the HHIA, the MSA, Broadway, and secondary base camp access points would be manned as needed to assure safety and security of the area (DoN 2014c).

Certain roads would be closed permanently or temporarily:

- Permanent Closure –
    - *Within the MLA:* Gated security fence to the proposed MSA, HHIA, observation posts, and the base camp would be established to keep unauthorized people from entering these areas. Roads within the established fence lines would be off limits to the public under all alternatives (DoN 2014c).
- Temporary Closure –
    - *Outside the MLA:* Transportation of munitions would result in the temporary disruption of normal traffic patterns of roads and intersections that are near the munitions supply route (Figure 3.1-5). A security concept of operations has been developed for convoys transporting munitions between the Port of Tinian and the MSA (DoN 2014c).

- *Within the MLA:* Only certain areas of the MLA would be open during the training period. As training cycles are better defined, an access plan would be developed and published for public information.

Permanent closure of existing roads within the MLA, including portions of Broadway and 116th Street, would limit route choice and restrict vehicular access to areas of northern Tinian, including the National Historic Landmark. Civilian motorists who currently travel on Broadway (280 daily vehicle trips) would be diverted to 8th Avenue during periods when access to areas within the MLA is allowed. The estimated peak-hour vehicle demand at the 8th Avenue gate would be fewer than 50 vehicles. The estimated peak-hour demand would not exceed the gate capacity of 300 vehicles per hour. Adequate vehicle storage would be provided and queues would not be expected to spill back onto adjacent roadways. The proposed gate at 8th Avenue would provide the security level required with little or no disruption to the ingress and egress of the installation. The altered circulation pattern (i.e., redistribution of traffic on roadways between Broadway and 8th Avenue) would not adversely affect traffic circulation or roadway LOS on Tinian roadways. Roadways within and outside the MLA would continue to operate under capacity and at an acceptable LOS (LOS A). Additionally, proposed improvements along 8th Avenue (Table 3.1-3 and Figure 3.1-7) would ensure sufficient capacity to accommodate the projected traffic levels (approximately 345 daily vehicles) with the diversion.

Table 3.1-3. Unified Facilities Criteria Design Controls and Elements

Design Controls and Elements	***Roadway Classification***		
	Class D	***Class E***	***Class F***
Traffic Composition			
0%	1,000–3,000 vpd	70–1,000 vpd	< 70 vpd
10%	770–2,300 vpd	53–770 vpd	< 53 vpd
20%	630–1,900 vpd	40–630 vpd	< 40 vpd
30%	< 1,600 vpd	< 570 vpd	< 34 vpd
Minimum Travel Lane Width	10.0 ft (3.0 m)	10.0 ft (3.0 m)	9.0 ft (2.7 m)
Minimum Shoulder Width	6.0 ft (1.8 m)	6.0 ft (1.8 m)	4.0 ft (1.2 m)
Surface/Stabilization Method	Stabilized with select material	Compacted soil	Compacted soil
Desirable (Absolute) Maximum Grade	5% (8%)	6% (9%)	6% (9%)

Note: Traffic composition represents the proportion of total traffic composed of buses, trucks, and tracked vehicles; the remainder is light delivery trucks and passenger cars. Minimum travel lane width indicated is for use on roads where the traffic will consist primarily of vehicles with maximum overall width of 8.0 ft (2.4 m) or less. Desirable (absolute) maximum grade is used to indicate the maximum severity of a designated upgrade upon which a loaded truck can operate.
Legend: ft = feet; kmh = kilometers per hour; m = meters; mph = miles per hour; vpd = vehicles per day.
Source: Department of Defense 2004b.

To minimize the potential negative adverse effect of the roadway closures, including altered circulation patterns and increased traffic volumes on detour routes, the military will implement the Department of Defense's standard operating procedures, which include providing advance notification and ensuring that an area is clear of all nonparticipating personnel before training activities take place. Additionally, the U.S. military will continue to coordinate with local agencies (e.g., the Commonwealth Department of Public Works, Municipality of Tinian), authorities, and communities to enhance the existing public notification process and provide as much advance notice as possible about the dates and times when public access to areas within the MLA would be available. Training periods would be published electronically and via other media as agreed upon with the Municipality of Tinian. Long-range public notice of this training intent would give commercial travel and tourism companies sufficient lead-time to engage

potential markets for visitors to Tinian. This notice would also inform visitors of the days and times when they may gain access to the MLA. A public access plan would be developed as part of the Range Management Plan. Additional details regarding public access and security are provided in the *CJMT Security Study* (DoN 2014c).

Construction Conditions

Construction is anticipated to span 8–10 years (DoN 2014b, Section 2.4.1.1, *Construction and Improvements*). Depending on the progress and level of intensity of construction activity, the average number of construction workers would range from 456 to 571 on Tinian for each year of the 8- to 10-year construction period. Most construction workers on Tinian would be expected to live in construction workforce housing and would be bused to the construction site. According to the *CJMT Socioeconomic Study*, approximately 4% of this construction workforce, between 18 and 23 workers, were assumed to be construction managers and would be expected to live in town and drive to work alone (NAVFAC Pacific 2014). An estimated 11to 14 daily round-trip bus trips (utilizing a 40-passenger bus) would be required to transport construction workers between workforce housing and the construction site. An estimated 18 to 23 round-trip automobile trips would be required to transport construction managers to and from the construction site. This increase in traffic volumes on Tinian roadways would not adversely affect traffic circulation or roadway LOS.

Throughout the construction period, temporary and intermittent impacts on traffic circulation may result from movement of trucks containing construction and removal materials, as well as from commuting of construction workers. Among the potential short-term impacts are temporary traffic congestion; slower travel speeds in construction zones; and short, intermittent detours that may result from movement of equipment, delivery of construction materials, or removal of construction debris.

To minimize impacts of construction on vehicular travel, bicycle and pedestrian circulation, and/or access to destinations near the construction area, a construction management plan and appropriate traffic management strategies would be developed and implemented. The traffic management plan may include the following elements:

- A set of comprehensive traffic control measures would be implemented during each construction phase and specific to each construction site, including scheduling of major truck trips and deliveries to avoid peak traffic hours; provision of detour signs if required; development of lane closure procedures, signs, and cones for drivers, bicycles, and pedestrians; and ID of designated construction access routes.
- Notification procedures for adjacent property owners (for each construction site) and public safety personnel regarding the timing of major deliveries, detours, and lane closures.
- A map depicting approved locations of construction staging areas for materials, equipment, and construction personnel vehicles.
- A process for tracking and responding to complaints regarding construction activity.
- Provision for accommodation of pedestrian and bicycle flow.
- Provision of parking management and spaces for all construction workers to ensure that construction workers do not park in on-street spaces.

In addition, the following best management practices for the maintenance of roadways and public rights-of-way may be imposed on the general contractor during the construction periods:

- Any damage to the roadways caused by heavy equipment or resulting from project construction shall be repaired. All damage that is a threat to public health or safety shall be repaired immediately. The public rights-of-way shall be restored to their preconstruction condition as established by a designated inspector and/or photo documentation.
- Any heavy equipment brought to the construction site shall be transported by truck, where feasible.
- No materials or equipment shall be stored on the traveled roadway at any time.
- Portable toilet facilities and debris boxes shall be installed on the site before construction and shall be maintained properly through project completion.
- All equipment shall be equipped with mufflers.
- Before the end of each work day during construction, the general contractor or other subcontractors shall pick up and properly dispose of all litter resulting from, or related to the project, whether located on the property, within the public rights-of-way, or properties of adjacent or nearby neighbors.

With implementation of these best management practices and work zone traffic management strategies, traffic circulation impacts during the construction period could be minimized and/or avoided.

3.1.1.3 Roadway Improvements

Design Requirements

Roadways are classified for design and planning purposes in accordance with topography, land use, speed, volume, and composition of traffic. Public roadways would be designed in accordance with the AASHTO publication *A Policy on Geometric Design of Highways and Streets* (AASHTO 2011). Military use roadways would be designed in accordance with criteria included in UFC 3-250-01FA, *Pavement Design for Roads, Streets, Walks, and Open Storage Areas* (Department of Defense 2004b). All roadways would be maintained using locally sourced aggregate materials at adequate structural levels to ensure their serviceability for the intended classes of vehicles. The UFC design controls and cross section elements for Class D, Class E, and Class F roads are summarized in Table 3.1-4.

Table 3.1-4. Roadway Improvement Classification

Proposed Improvement	***UFC Roadway Classification***	***Roadway Surface***	***Number of Travel Lanes***	***Travel Lane Width***	***Shoulder Width***	***Total Cross-Section Width***
Public access roadway	Class D	Paved	2	10.0 ft (3.0 m)	4.0 ft (1.2 m)	28.0 ft (8.5 m)
Public access boulevard	Class D	Paved	2 + median	10.0 ft (3.0 m)	4.0 ft (1.2 m)	28.0 ft + median (8.5 m + median)
General use roadway	Class E	Dirt/grass, gravel	2	10.0 ft (3.0 m)	4.0 ft (1.2 m)	28.0 ft (8.5 m)
Gravel road	Class F	Gravel	1	14.0 ft (4.3 m)	0.0 ft (0.0 m)	14.0 ft (4.3 m)

Proposed Improvement	*UFC Roadway Classification*	*Roadway Surface*	*Number of Travel Lanes*	*Travel Lane Width*	*Shoulder Width*	*Total Cross-Section Width*
Military training road	Class F	Dirt/grass, gravel	1	14.0 ft (4.3 m)	0.0 ft (0.0 m)	14.0 ft (4.3 m)
Perimeter patrol road	Class F	Dirt/grass, gravel	1	10.0 ft (3.0 m)	3.0 ft (0.9 m)	13.0 ft (3.9 m)

*Note:*Shoulders would not be paved. Shoulders would be provided on both sides of the road for all roadway types with the exception of the perimeter patrol road, which would provide a 3.0-foot (0.9-meter) shoulder on one side and 3.0 feet (0.9 meter) of vegetation clearance on the other. UFC Class F roadways are comparable to the American Association of State Highway and Transportation Officials' Local Roadway classification.
Legend: ft = feet; m = meters; UFC = United Facilities Criteria.
Source: Department of Defense 2004b.

Operational Requirements

The operational requirements for Tinian roadways are summarized in Table 3.1-5. Operational requirements of the proposed action include the following:

- Port and base camp utility connections
- Military supply route
- Tracked vehicle transit route
- Perimeter patrol road
- Munitions Storage Area access
- Amphibious landing access
- Range and training area access
- Observation post access
- Live-fire convoy course
- Public access
- Realignment to accommodate potential runway expansion

Considerations and Constraints

Existing and new proposed roadway alignments were evaluated for feasibility and constructability. The results of the evaluation are summarized in Table 3.1-5. Elevation profiles of selected roadway segments are included as Appendix D.

Table 3.1-5. Roadway Segment Operational Requirements and Improvement Recommendations

ID	*Road*	*Segment*	*Operational Requirement*	*Condition/Consideration/ Constraint*	*Recommendation*
A	Broadway	S of 42nd St.	Port and base camp utility connections	Paved, good condition Utility service interruptions and roadway damage during construction/installation A2: 17% grade	Utilities Provide advance notice, construct utility improvements in advance of roadway construction, and repair damage to roadways.
B	42nd St.	b/w 8th Ave. and Broadway	Port and base camp utility connections	Paved, good condition Utility service interruptions and roadway damage during construction/installation B1: 4.6% grade B3: 4.5% grade B5: 15.7% grade	Utilities Provide advance notice, construct utility improvements in advance of roadway construction, and repair damage to roadways.
C	Boat ramp access	b/w boat ramp and unnamed E/W road	Military supply route, tracked-vehicle transit route	Dirt/grass, overgrown, nonexistent New road	Construct new paved road Implement BMPs for roadway construction.
D	Unnamed N/S road	Unnamed E/W road to West St.	Port and base camp utility connections	Nonexistent New road 6.5% grade	Construct new paved road Implement BMPs for roadway construction. Reconfigure alignment to reduce grade.
E	Unnamed E/W road	Port of Tinian to West Street	Military supply route, tracked-vehicle transit route	Dirt/grass, overgrown, Nonexistent New road	Construct new paved road (cargo transit route)/tracked vehicle transit lane Implement BMPs for roadway construction.
F	New road	West St. to 8th Ave. (6th Ave. Bypass)	Military supply route, tracked-vehicle transit route, 6th Ave. Bypass	Dirt/grass, overgrown, Nonexistent Fuel line F2: 9.2% grade	Construct new paved road (cargo transit route)/tracked vehicle transit lane Construct new roadway south of and parallel to fuel line, cross over fuel line where it is underground (west of Tinian Power Plant). Reconfigure alignment to reduce grade.
G	6th Ave.	b/w West St. and 8th Ave.	Port and base camp utility connections	Coral gravel, some paving limited available ROW, power poles, and platted parcels along 6th Avenue G1: 5.3% grade G3: 7.1% grade	Utilities Construct new roadway for wheeled vehicle transit between 6th Avenue and 8th Avenue. Reconfigure alignment to reduce grade.

ID	Road	Segment	Operational Requirement	Condition/Consideration/ Constraint	Recommendation
HA	8th Ave.	b/w Dump and Riverside Drive	Public access, military supply route, port and base camp utility connections	Paved, fair condition Tracked-vehicle transit route crossover 8.8% grade	Construct new paved road Reinforce surfaces at locations where tracked vehicles cross over. Reconfigure alignment to reduce grade.
HB	8th Ave.	b/w 6th Ave./42nd St. and Dump	Public access, military supply route, port and base camp utility connections	Ungraded, poor condition Tracked-vehicle transit route crossover	Improve for public access Reinforce surfaces at locations where tracked vehicles cross over.
I	8th Ave.	W of TNI	Public access, military supply route, port and base camp utility connections, realignment to accommodate potential runway expansion	Gravel, ungraded, poor condition Airfield expansion I2: 13% grade I4: 9.6% grade	Construct new paved road (realign segment) Realign roadway west to accommodate expansion, use for tracked-vehicle transit. Reconfigure alignment to reduce grade.
J	Riverside Drive	b/w 8th Ave. and 71st St.	Munitions supply route, MSA access, utility connections, live-fire convoy course	Dirt/grass, fair condition Steep embankment to south MLA perimeter gate, intersection with unpaved roadway (Riverside Drive west of 71st St) J2: 6.2% grade J4: 10.2% grade	Construct new paved road Gradually eliminate crown of the unpaved road to match the edge of the pavement. Reconfigure alignment to reduce grade. Construct retaining walls to minimize erosion.
K	MSA Access	b/w Riverside Drive and 71st St.	MSA access	Dirt/grass, fair condition MSA gate, intersection with unpaved roadways	Construct new paved road Gradually eliminate crown of the unpaved road to match the edge of the pavement.
L	71st St.	b/w MSA gate and 8th Ave.	MSA access, live-fire convoy course	Dirt/grass, fair condition Intersection with unpaved roadway L2: 14.3% grade L4: 6.3% grade	Construct new paved road Gradually eliminate crown of the unpaved road to match the edge of the pavement. Reconfigure alignment to reduce grade.
M	Base camp internal road	Base camp	Base camp circulation	Nonexistent New road MA2: 8.3% grade MA4: 6.1% grade MC1: 3.7% grade MC2: 6.5% grade MC4: 8.5% grade	Construct new paved road Implement BMPs for roadway construction. Reconfigure alignment to reduce grade.

ID	***Road***	***Segment***	***Operational Requirement***	***Condition/Consideration/ Constraint***	***Recommendation***
N	Base camp training access road	Base camp to 86th St.	Base camp circulation	Nonexistent Training access gate, tracked-vehicle transit route crossover (at 86th Street) N1: 27.6% grade	Construct new paved road Reconfigure vertical alignment and add cut/fill slope to reduce grade or retaining walls to stabilize slopes. Reinforce surfaces at locations where tracked vehicles cross over.
O	8th Ave.	Realigned 8th Ave. to base camp gate	Public access, military supply route, port and base camp utility connections	Paved, poor condition MLA perimeter gate, Tinian Base Camp access	Improve for public access (boulevard) Provide adequate storage capacity to accommodate projected traffic demand.
P	8th Ave.	Base camp gate to 86th St.	Public access, military supply route, port and base camp utility connections	Paved, poor condition Intersection with unpaved roadway (86th Street)	Improve for public access (boulevard) Gradually eliminate crown of the unpaved road to match the edge of the pavement.
Q	8th Ave.	b/w 86th St. and 123rd St.	Public access, live-fire convoy course, observation post and range utility connections	Paved, overgrown, poor condition Steep embankment, intersection with unpaved roadway (Riverside Drive), tracked-vehicle transit route crossover Q2: 8.3% grade Q4: 10.2% grade Q6: 10.7% grade	Improve for public access (boulevard) Provide vegetation clearance, provide adequate sight distance on all roundabout approaches, gradually eliminate crown of the unpaved road to match the edge of the pavement, reinforce surfaces at locations where tracked vehicles cross over. Reconfigure alignment to reduce grade.
R	Riverside Drive	b/w 123rd St. and Unai Chulu and Babui Road	Public access, amphibious landing access	Paved, poor condition Intersection with unpaved roadway (Riverside Drive), tracked-vehicle transit route crossover	Improve for public access Provide vegetation clearance, provide adequate sight distance on all roundabout approaches, gradually eliminate crown of the unpaved road to match the edge of the pavement, reinforce surfaces at locations where tracked vehicles cross over.

ID	Road	Segment	Operational Requirement	Condition/Consideration/ Constraint	Recommendation
S	Lennox Ave. Access Rd.	b/w 8th Ave. and Lennox Ave.	Public access, live-fire convoy course, access to ranges	Paved, poor condition Intersection with unpaved roadway (Riverside Drive), tracked-vehicle transit route crossover S2: 5.7% grade	Improve for public access Provide vegetation clearance, provide adequate sight distance on all roundabout approaches, gradually eliminate crown of the unpaved road to match the edge of the pavement, reinforce surfaces at locations where tracked vehicles cross over. Reconfigure alignment to reduce grade.
T	Lennox Avenue/Boston Post Road	b/w Lennox Ave. Access Rd. and Unai Lam Lam Access Rd.	Public access, live-fire convoy course, access to ranges	Paved, poor condition Tracked-vehicle transit route crossover T2: 7.1% grade	Improve for public access Reinforce surfaces at locations where tracked vehicles cross over. Reconfigure alignment to reduce grade.
U	86th St.	b/w 8th Ave. and Broadway	Live-fire convoy course, access to ranges	Paved, poor condition Tracked-vehicle transit route crossover U2: 6.6% grade U4: 15% grade	Improve for general use Reinforce surfaces at locations where tracked vehicles cross over. Reconfigure alignment to reduce grade.
V	71st St.	b/w MSA gate and Riverside Drive	Live-fire convoy course	Dirt/grass, fair condition V2: 13.9% grade	Establish military training road Erosion control and bank stabilization, maintenance and monitoring. Reconfigure alignment to reduce grade.
W	Riverside Drive	West of 71st St.	Access to observation posts and ranges	Dirt/grass, fair condition Steep embankment to south W2: 5.9% grade	Establish military training road Implement erosion control and bank stabilization, maintenance, and monitoring. Reconfigure alignment to reduce grade.
X	Riverside Drive	b/w 71st St. and 86th St.	Live-fire convoy course, observation post utility connections	Dirt/grass, fair condition Steep embankment to west X2: 8.3% grade X4: 8.8% grade	Establish military training road Implement erosion control and bank stabilization, maintenance, and monitoring. Reconfigure alignment to reduce grade.
Y	Riverside Drive	b/w 86th St. and OP 4F	Live-fire convoy course, observation post utility connections	Dirt/grass, fair condition Steep embankment to west 11.9% grade	Establish military training road Implement erosion control and bank stabilization, maintenance, and monitoring. Reconfigure alignment to reduce grade.

ID	***Road***	***Segment***	***Operational Requirement***	***Condition/Consideration/ Constraint***	***Recommendation***
Z	Riverside Drive	b/w OP 4F and 123rd St.	Live-fire convoy course, observation post utility connections	Dirt/grass, fair condition Steep embankment to west Intersection with paved roadway Z1: 10.4% grade Z3: 6.3% grade Z5: 6.2% grade Z7: 23.5% grade Z8: 8.9% grade	Establish military training road Where necessary, reconfigure vertical alignment and add cut/fill slope or retaining walls to reduce grade. Provide vegetation clearance, provide adequate sight distance on all roundabout approaches, gradually eliminate crown of the unpaved road to match the edge of the pavement.
AA	113th St. (IBB Internal Road)	b/w Riverside Drive and 8th Ave.	Live-fire convoy course (Tinian Alternative 1 only)	Dirt/grass, fair condition and nonexistent Relocation of IBB AA1: 5.6% grade AA3: 9.3% grade AA5: 7.5% grade	Establish military training road Improve road if IBB is relocated. Reconfigure alignment to reduce grade.
AB	96th Street	b/w Broadway and Masalok Beach Road	Access to ranges	Dirt/grass, fair condition AB2: 11.6% grade AB4: 7.6% grade	Establish military training road Reconfigure alignment to reduce grade. Implement erosion control and bank stabilization, maintenance, and monitoring.
AC	Access OP 3	b/w Broadway and OP 3	Access to Observation Post 3, access to ranges	Gravel, fair condition Steep embankment AC2: 5.5% grade AC4: 12.9% grade AC6: 13% grade	Establish military training road Reconfigure alignment to reduce grade. Implement erosion control and bank stabilization, maintenance, and monitoring.
AD	Access OP 3	b/w Broadway and OP 3	Access to Observation Post 3, access to ranges	Gravel, fair condition Steep embankment AD1: 10.0% grade AD2: 10.8% grade AD4: 5.1% grade AD6: 8.7% grade AD7: 3.4% grade	Construct new gravel road Reconfigure alignment to reduce grade. Implement erosion control and bank stabilization, maintenance, and monitoring.
AE	Access OP 4B	W of Riverside Drive	Access to Observation Post 4B	Nonexistent 15.5% grade	Construct new gravel road Reconfigure alignment to reduce grade. Implement erosion control and bank stabilization, maintenance, and monitoring.

ID	***Road***	***Segment***	***Operational Requirement***	***Condition/Consideration/ Constraint***	***Recommendation***
AF	Access OP 4C	W of Riverside Drive	Access to Observation Post 4C	Nonexistent 16.1% grade	Construct new gravel road Reconfigure alignment to reduce grade. Implement erosion control and bank stabilization, maintenance, and monitoring.
AG	Access OP 4F	W of Riverside Drive	Access to Observation Post 4F, observation post utility connections	Nonexistent 26.9% grade	Construct new gravel road Reconfigure vertical alignment and add cut/fill slope or retaining walls to reduce grade. Implement erosion control and bank stabilization, maintenance, and monitoring.
AH	Access OP 1	E of 8th Ave., N of 110th St.	Access to Observation Post 1, observation post utility connections	Nonexistent AH1: 5.3% grade AH3: 14.6% grade	Construct new gravel road Reconfigure alignment to reduce grade. Implement erosion control and bank stabilization, maintenance, and monitoring.
AI	Access to Unai Masalok	Unai Masalok	Amphibious landing access (LCAC)	Foot trail, fair condition 15% grade	Construct new gravel road Reconfigure alignment to reduce grade. Implement erosion control and bank stabilization, maintenance, and monitoring.
AJ	Access OP 2	E of HHIA	Access to Observation Post 2, observation post utility connections	Nonexistent steep embankment to east 4.7% grade	Construct new gravel road Reconfigure alignment to reduce grade. Reconfigure alignment to reduce grade. Implement erosion control and bank stabilization, maintenance, and monitoring.
AK	HHIA perimeter road	E of HHIA	Live-fire convoy course, access to ranges, fire break	Nonexistent Steep embankment to east AK2: 4.2% grade	Construct new gravel road Reconfigure vertical alignment and add cut/fill slope or retaining walls to reduce grade. Implement erosion control and bank stabilization, maintenance, and monitoring.
AL	HHIA perimeter road	E of HHIA	Live-fire convoy course, access to ranges, fire break	Nonexistent Steep embankment to north AL2: 5% grade	Construct new gravel road Reconfigure vertical alignment and add cut/fill slope or retaining walls to reduce grade. Implement erosion control and bank stabilization, maintenance, and monitoring.

ID	Road	Segment	Operational Requirement	Condition/Consideration/ Constraint	Recommendation
AM	HHIA perimeter road	W of HHIA	Access to ranges, fire break	Nonexistent New road AM2: 53.3% grade AM4: 17.4% grade AM6: 11.4% grade AM7: 32% grade	Construct new perimeter patrol road Reconfigure vertical alignment and add cut/fill slope or retaining walls to reduce grade. Implement erosion control and bank stabilization, maintenance, and monitoring.
AN	MLA/base camp perimeter patrol road and tracked-vehicle trail	MLA/base camp perimeter	Perimeter patrol road, tracked-vehicle transit route	Nonexistent New road AN2: 7.5% grade AN4: 34.4% grade AN6: 6.2% grade	Construct new perimeter patrol road/tracked-vehicle trail Reconfigure vertical alignment and add cut/fill slope or retaining walls to reduce grade. Implement BMPs for roadway construction.
AO	MLA perimeter patrol road	MLA perimeter	Perimeter patrol road	Nonexistent New road AO2: 4.6% grade AO4: 12.7% grade AO6: 30.2% grade AO8: 28.9% grade AO10: 25.3% grade	Construct new perimeter patrol road Reconfigure vertical alignment and add cut/fill slope or retaining walls to reduce grade. Implement erosion control and bank stabilization, maintenance, and monitoring.
AP	MLA perimeter patrol road	MLA perimeter	Perimeter patrol road	Nonexistent New road AP2: 31.3% grade AP4: 16.8% grade AP6: 71.6% grade	Construct new perimeter patrol road Reconfigure vertical alignment and add cut/fill slope or retaining walls to reduce grade. Implement BMPs for roadway construction.
AQ	Base Camp Perimeter Patrol Road	Base camp perimeter	Perimeter patrol road	Nonexistent New road AQ2: 15.2% grade AQ4: 32.6% grade	Construct new perimeter patrol road Reconfigure vertical alignment and add cut/fill slope or retaining walls to reduce grade. Implement BMPs for roadway construction.
AR	Broadway	S of roundabout	High Hazard Impact Area	Paved, overgrown, fair condition Public access restriction, 8th Ave. detour	Roadway closure Provide advance notification, traffic plans, and detour signage.
AS	Broadway	N of roundabout	High Hazard Impact Area	Paved, fair condition Public access restriction, 8th Ave. detour	Roadway closure Provide advance notification, traffic plans, and detour signage.
AT	116th St.	W of roundabout	High Hazard Impact Area	Paved, poor condition Public access restriction, 8th Ave. detour	Roadway closure Provide advance notification, traffic plans, and detour signage.

ID	***Road***	***Segment***	***Operational Requirement***	***Condition/Consideration/ Constraint***	***Recommendation***
AU	116th St.	W of roundabout	High Hazard Impact Area	Paved, poor condition Public access restriction, 8th Ave. detour	Roadway closure Provide advance notification, traffic plans, and detour signage.
AV	116th St.	E of roundabout	High Hazard Impact Area	Gravel, dirt/grass, fair condition Public access restriction, 8th Ave. detour	Roadway closure Provide advance notification, traffic plans, and detour signage.

Legend: Ave. = Avenue; b/w = between; E = East; HHIA = High Hazard Impact Area; ID = Segment identification letter corresponding to segment ID on proposed roadway improvement figures (Figure 3.1-7); MLA = Military Lease Area; MSA = Munitions Storage Area; N = North; OP = Observation Post; Pt. = Point; Rd. = Road; S = South; St. = Street; TNI = Tinian International Airport; W = West.
Source: DoN 2014b.

Implementation of an erosion control plan during construction and operations would reduce maintenance requirements and minimize nonpoint source pollution in surface waters due to sediment delivery. The following is a list of some specific Best Management Practices:

Construction:

- Minimize the ground disturbance area. Contractors will be held responsible for ground disturbance/vegetation removal that occurs outside of project areas identified in contractor specifications.
- Erosion control through site approval process (whereby the DoN reviews each proposed project for its erosion potential, and involves the designated installation Natural Resource Specialist in the process).
- Topsoil removed from the site would be placed in the immediate area and reused for re-compaction purposes (if appropriate, in accordance with geotechnical recommendations).
- Soil exposed near water as part of the project would be protected from erosion with erosion control blankets (organic or synthetic fibers held together with net to cover disturbed areas) after exposure, and stabilized as soon as practicable (e.g., with vegetation matting, and hydroseeding).
- Flatten landfill slopes for increased soil stability.
- Silt-containment (silt fences and other physical barriers that intercept runoff from drainage areas).
- Re-vegetate as soon as possible after any ground disturbance or grading.
- Minimize construction and grading during times of inclement weather.
- Soil piles and exposed slopes covered during times of inclement weather.
- Stockpiling of excavated materials behind impermeable berms and away from the influence of river waters and runoff.
- Implement a re-vegetation program to ensure graded benches are fully vegetated as landfills mature.
- Vegetation/mulch stabilization (applying coarse plant residue to cover soil surface. The vegetation/mulch should be free of invasive species viable reproductive parts, such as rhizomes, seeds, and plants).
- Level spreader (non-erosive outlet for runoff to disperse flow uniformly across slope).
- Rock outlet protection (rock protection placed at end of culverts).
- Sediment basin (barrier that retains sediment from runoff).

Operation:

Restrict vehicles in training areas (ensure that all training areas, including transit routes necessary to reach training areas, are clearly identified or marked. Restrict vehicular activities to designated areas).

Recommendations

Existing roadways have sufficient available capacity to accommodate the traffic volumes generated by the proposed action. However, the current overgrown and poor condition of many of the roadways is such that based on the operational requirements with the proposed action, some level of improvements and upgrades to existing roads, such as, vegetation clearance, resurfacing, and regrading would be required to support recurring use by heavier and larger military vehicles. Several new roadways would be required to provide access to areas where ranges and training areas or support facilities are proposed and no roads currently exist.

UFC classifications and cross section elements considered for implementation as part of the proposed action are summarized in Table 3.1-4 and described below. Representative typical cross sections are illustrated in Figure 3.1-8, Figure 3.1-9, and Figure 3.1-10.

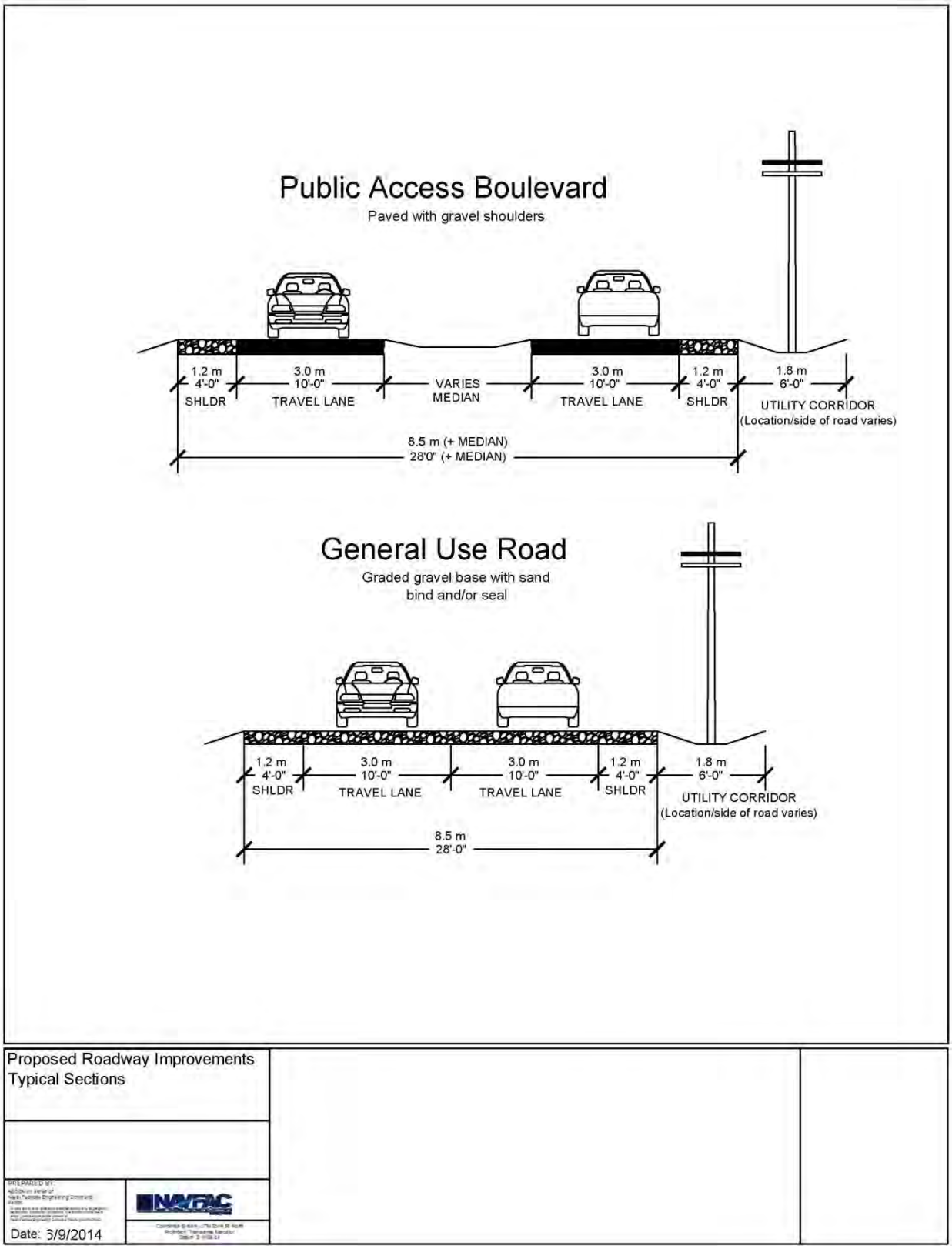


Figure 3.1-8. Proposed Roadway Improvements – Typical Sections
Source: DoN 2014b.

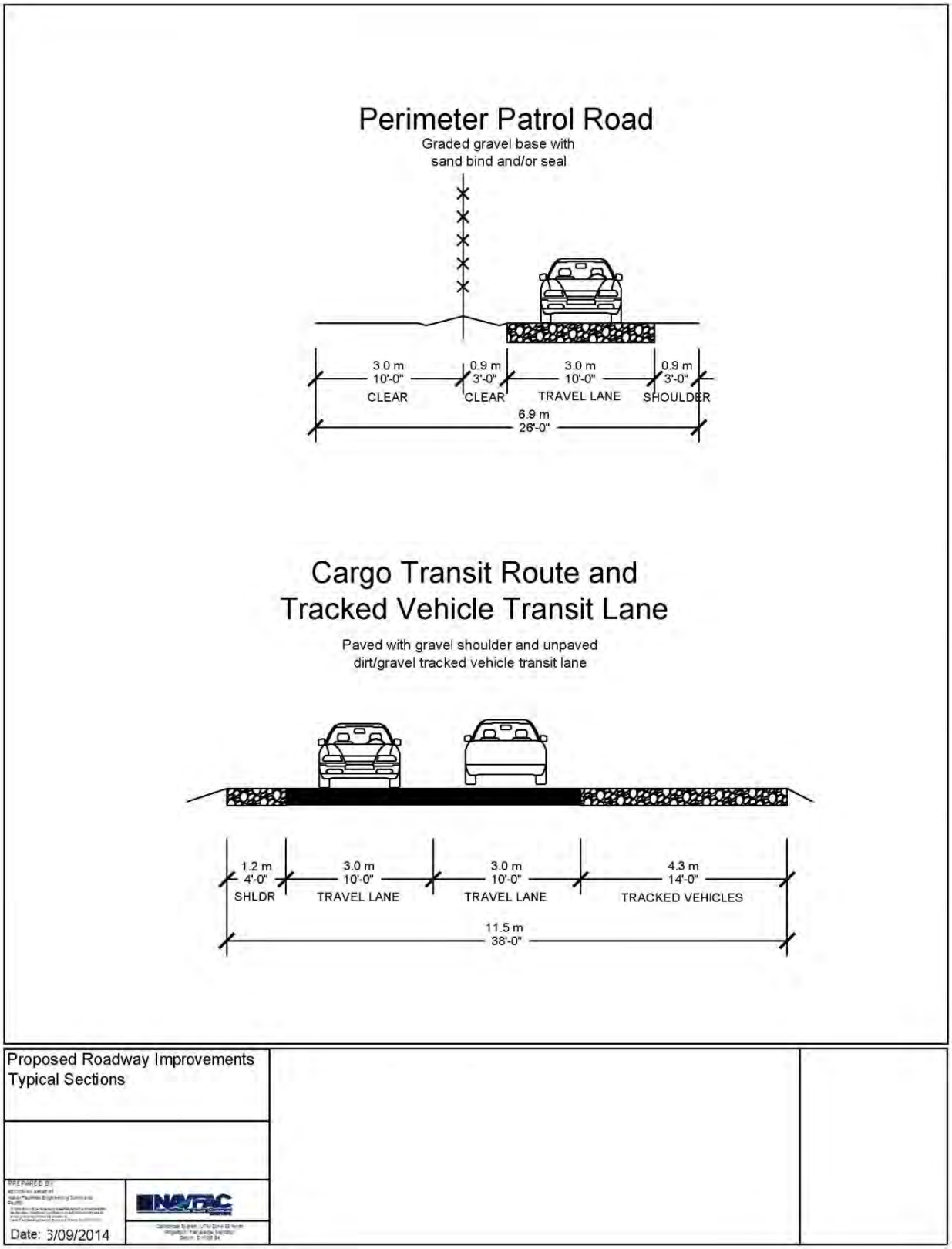


Figure 3.1-9. Proposed Roadway Improvements – Typical Sections
Source: DoN 2014b.

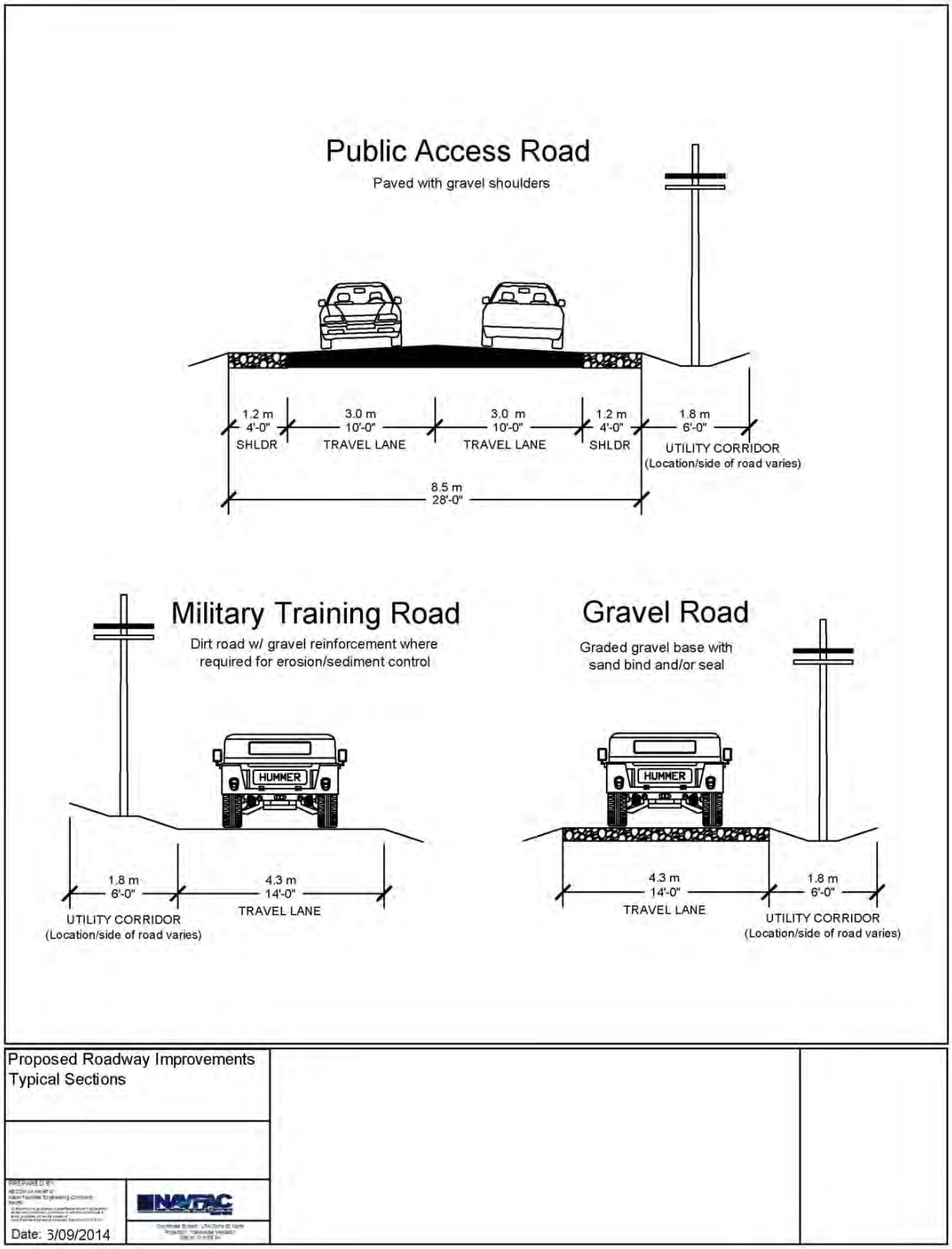


Figure 3.1-10. Proposed Roadway Improvements – Typical Sections
Source: DoN 2014b.

The improvements to existing roadways and construction of new roadways that would be required to provide and/or improve access to ranges and training areas, to support training activities, and to improve public access on Tinian are summarized by segment in Table 3.1-5. The proposed roadway network for Tinian is shown in Figure 3.1-7.

- *Improve Road Right-of-Way for Utilities* – Utility connections would be provided in a 6.0-foot-wide (1.8-meter) utility corridor adjacent to existing roadways. Utility connections are proposed along the west side of Broadway, from IT&E (cable landing facility) to 42nd Street, and along the north side of 42nd Street, from Broadway to 6th Avenue/8th Avenue. Utility improvements would occur within the road right-of-way and would not include improvements to the traveled way.
    - Planning and continued coordination with utility providers during the preliminary engineering and final design and the construction stages of roadway projects would be necessary to minimize or eliminate interruption in utility service to customers. The U.S. military would coordinate with the affected service provider to ensure that work is conducted in accordance with the appropriate requirements and criteria. In addition, coordination efforts would lay out utility reroutes, identify potential conflicts, ensure that construction of the proposed project minimizes disruption to utility operations, and formulate strategies for overcoming problems that may arise. If interruptions of utility service are required, they would be restricted in duration and geographic extent. Careful scheduling of these disruptions and advance notification to occupants of the adjacent properties that would be affected by temporary service interruptions would help to avoid any critical service periods. Where feasible, utility relocations would be undertaken in advance of roadway construction activities.
- *Repair Existing Road for Public Use* – The public access roadway (Class D) is a paved asphalt concrete roadway that contains two 10.0-foot-wide (3.0-meter) travel lanes (one lane in each direction) with 4.0-foot-wide (1.2-meter) graded gravel shoulders on both sides. The typical cross section width would be 28.0 feet (8.5 meters). Public access roadways provide circulation for both military and public use and include portions of 8th Avenue, Riverside Drive, Unai Chulu Road, and Lennox Avenue. Improvement actions include clearing overgrown vegetation and resurfacing existing roads to safely accommodate bidirectional traffic.
- *Repair Existing Road for Public Use – Boulevard* – The public access boulevard (Class D) is a variant of the public access roadway. Its key distinction is the division of the roadway by a center landscape (dirt/grass) median that varies in width along the roadway. It contains two 10.0-foot-wide (3.0-meter) travel lanes (one lane in each direction) with 4.0-foot-wide (1.2-meter) graded gravel shoulders on both sides. The segment of 8th Avenue from 71st Street to 123rd Street would be repaired to a public access boulevard. Improvement actions include clearing overgrown vegetation and resurfacing the existing road (specifically the entire length of the west [southbound] travel lane, and segments of the east [northbound] lane as needed) to safely accommodate bidirectional traffic. The existing dirt/grass median would not be improved, with the exception of vegetation clearance where required for sight distance and visibility.

- *Construct New Paved Road* – Paved roads (Class D) are paved asphalt concrete roadways that are used for on-site circulation and access to the MSA at the Tinian base camp, as well as inside and outside the MLA. These roadways contain two 10.0-foot-wide (3.0-meter) paved travel lanes (one lane in each direction) with 4.0-foot-wide (1.2-meter) graded gravel shoulders on both sides. Some roadways in this classification may accommodate curbs and sidewalks. The typical cross section width would be 28.0 feet (8.5 meters). The cross section for this type of roadway is identical to that of the public access roadway, but this roadway type has a different pavement loading requirement and is not intended for public use. Improvement actions include clearing overgrown vegetation, resurfacing existing paved roads, and reconstructing/upgrading existing dirt/gravel roads to paved roads.

- *Repair Existing Road for General Use* – General use roadways (Class E) are graded gravel base roads with sand binder and/or seal on the surface and top layers. This roadway type provides general access and circulation and consists of two 10.0-foot-wide (3.0-meter) travel lanes (one lane in each direction) with 4.0-foot-wide (1.2-meter) shoulders on both sides. The typical cross section width would be 28.0 feet (7.3 to 8.5 meters). The segment of 86th Street from 8th Avenue to Broadway would be repaired to serve as a general use roadway. Improvement actions include vegetation clearance and reconstruction to sealed dirt/graded gravel road.

- *Construct New Gravel Road* – Gravel roads (Class F) are graded gravel base roads with sand binder and/or seal on the surface and top layers, and are generally intended for relatively flat terrain. This roadway is most suited for handling unidirectional traffic patterns; as such, they are most suitable for points with directional split travel characteristics. Gravel roads provide one travel lane measuring 14.0 feet (4.3 meters) wide, and are used for military access to observation posts and circulation around the HHIA perimeter. Convoy live-fire course engagement zones (492 feet [150 meters] in length) may be used as pull-outs where possible (e.g., along the HHIA perimeter) to allow for vehicle passing or emergency parking. No additional pullouts would be constructed. This type of roadway is not intended for use by the public.

    - Gravel roads must be designed and maintained with a properly shaped cross section. The road surface must have enough crown to drain water to the shoulder, but not excessive crown, which makes the road hard to travel safely. At least 1/2 inch of crown per foot (approximately 4%) straight cross slope is ideal. A ditch must be established and maintained to drain water away from the roadside. High shoulders – shoulder areas higher than the edge of the traveled portion of the road – should be eliminated because high shoulders prevent water from draining to the ditch. Maintaining shoulders (including mowing vegetation along the roadway edge) is a critical part of gravel road maintenance. At locations where gravel roads intersect with paved roads, the crown of the gravel road would be gradually eliminated to match the edge of the pavement.

- *Establish Military Training Road* – Military training roads (Class F) are unpaved (dirt/gravel) roadways and are for military use within the MLA. These roads would be designed with one travel lane measuring 14.0 feet (4.3 meters) wide. Convoy live-fire course engagement zones (492 feet [150 meters] in length) may be used as pull-outs where possible (i.e., along Riverside Drive) to allow for vehicle passing or emergency parking. No additional pullouts would be constructed. This type of roadway is not intended for use by the public.

- *Perimeter Patrol Road* – The perimeter patrol road (Class F) is an unpaved (sand sealed/dirt surface layers and graded gravel base) road that is designed to run along the southern perimeter of the MLA and the northern and eastern perimeters of the base camp. It provides one travel lane measuring 10.0 feet (3.0 meters) wide with a 3.0-foot (0.9-meter) shoulder on one side and 3.0 feet (0.9 meters) of vegetation clearance between the road and the perimeter fence on the other side. An additional 10.0 feet (3.0 meters) of vegetation clearance would be provided outside the MLA adjacent to the perimeter fence. Perimeter patrol roads would be constructed as new roadways in locations where there is no existing road. This type of roadway is not intended for use by the public.
- *Road Closures – No Improvements* – Closures are proposed for those roadways (i.e., roads within the HHIA) that would be closed to unauthorized personnel with the proposed action. The roads would remain in place but would be used only as range clearance service roads. This type of roadway is not intended for use by the public.

The following cargo transit and tracked-vehicle transit routes would be established on Tinian:

- *Port to the Base Camp and MSA* – Tracked vehicles would transit via a new tracked vehicle lane from the AAV landing ramp to the new cargo transit route/tracked vehicle transit lane. The tracked vehicle transit lane provides one travel lane measuring 14.0 feet (4.3 meters) wide constructed of sealed dirt/graded surface layers and gravel base. Wheeled vehicles would transit between the cargo load/unload area at the existing commercial wharf and cross over the public waterfront/boat ramp access road to access a new paved road. The paved road contains two 10.0-foot-wide (3.0-meter) paved travel lanes (one lane in each direction) with 4.0-foot-wide (1.2-meter) graded gravel shoulders on both sides. The cargo transit route would pass through the vehicle inspection area, cargo inspection and holding area, biosecurity building, and vehicle wash-down area to a new paved east/west roadway. The tracked vehicle transit lane would cross over the cargo transit route and use the shoulder on the north side of the road. The cargo transit route/tracked vehicle transit lane would provide two 10.0-foot-wide (3.0-meter) paved travel lanes (one lane in each direction) with one 4.0-foot-wide (1.2-meter) gravel shoulder and one 14.0-foot-wide (4.3-meter) gravel road to support tracked vehicles within a minimal footprint. The typical cross section width would be 44.0 feet (13.4 meters). The cargo transit route/tracked vehicle transit lane would run parallel to West Avenue to the Tinian Power Plant and continue north to its intersection with 8th Avenue. The tracked vehicle transit lane would cross over 8th Avenue and continue along a separate alignment. The cargo transit route would continue along 8th Avenue and Riverside Drive to the MLA perimeter. A representative cross section is included in Figure 3.1-8.
- *Tracked-Vehicle Training Trail* – The tracked-vehicle training trail (Class F) is an unpaved trail composed of sealed dirt/graded surface layers and gravel base. It provides one travel lane measuring 14.0 feet (4.3 meters) wide and is best suited for handling unidirectional traffic patterns. Convoy live-fire course engagement zones (492 feet [150 meters] in length) may be used as pull-outs where possible to allow for vehicle passing or emergency parking. No additional pull-outs would be constructed. Roadway surfaces would be reinforced (e.g., with a concrete pad) at locations where cross-over travel for tracked vehicles must be accommodated. The tracked-vehicle training trail would also be used by other military vehicles within the MLA and would merge with the perimeter patrol road near the base camp. This type of roadway is not intended for use by the public.

Based on an April 24, 2014 discussion between NAVFAC, Pacific and MARFORPAC the existing roads around the North Field runway (e.g., 123rd Street, Ushi Point Road, and Lennox Avenue) would be maintained by the U.S. military to allow tour bus access (DoN 2014d).

Entry Control Facilities

Entry Control Facilities (ECFs) ensure the proper level of access control for all U.S. military personnel, visitors, and truck traffic to an installation. An ECF encompasses the overall layout, organization, infrastructure, and facilities of an access point. Generally, the purpose of an ECF is to provide security by monitoring the traffic entering a military installation. The objective of an ECF is to secure the area from unauthorized access and intercept contraband while maximizing vehicular traffic flow. The level of ID and inspection requirements at an ECF would vary depending on the Force Protection Condition (FPCON). The FPCON levels vary from NORMAL at the lowest to DELTA as the highest level. In accordance with Department of Defense 0-2000.12-H, *DoD Antiterrorism Handbook* (Department of Defense 2004a), "the security measures of FPCON BRAVO+ must be capable of being maintained indefinitely without causing undue hardship, affecting operational capability, or aggravating relations with local authorities." The traffic engineering requirements for the proposed Tinian Base Camp ECF are summarized below and additional information, including design concepts are included in the *CJMT Security Study* (DoN 2014c).

Traffic Engineering

The minimum lane width for an ECF is 10 feet (3 meters). The preferred lane width is 12.0 feet (3.6 meters). Lanes approaching the gate should be 12.0 feet (3.6 meters) wide, plus another 2.0 feet (0.6 meter) on each side for the curb and gutter. Consider narrowing the lanes at the gate house/guard facilities to 10 feet (3 meters) wide to slow motorists down and place them close to the ID checker. If this is done, at least one inbound lane, usually the outer lane, at multi-lane gates should be 12.0 feet (3.6 meters) wide to accommodate larger, wider vehicles. Also consider other potential impacts of narrow lanes, such as: narrow lanes are highly restrictive to large vehicles, including some emergency vehicles; narrow lanes can impact traffic flow; and when the lane width is less than 12.0 feet (3.6 meters), motorists drive very cautiously and also tend to increase the spacing between vehicles. At approach zone locations that are used as serpentine lanes, the lane width would be set at a 12-foot (4-meter) width.

Shoulders are discouraged near an ECF because motorists tend to go faster where there are shoulders. Shoulders also make it harder to constrain and control the movement of vehicles. If used, shoulders should be 6–8 feet (2–3 meters) wide, and all fixed objects, such as signs, trees, and posts, should be at least 6 feet (2 meters) from the edge of the shoulder or 12.0 feet (3.6 meters) from the edge of the travel lane. Where a road edge changes from a shoulder to a curb, the transition area should be gradual, with a minimum taper ratio of 10 to 1, to give the driver time to react.

The radius of a corner or turning lane depends on the largest vehicle expected to use the lane and the average turning speeds, which would be quite low around an ECF. Other factors to consider include the available right-of-way, the angle of the intersection, and pedestrian activity. The following minimum inside radii should be used: for locations serving only passenger vehicles, 15 feet (5 meters) to 30 feet (9 meters), with a preferred radius of 20 feet (6 meters); for intersections where large trucks, including semi-trailers, turn, 50 feet (154 meters); and turnarounds for large trucks, 65 feet (20 meters).

Processing Rates

The results of assessments at more than 200 ECFs of security, safety, and capacity traffic engineering is documented in *Traffic and Safety Engineering for Better Entry Control Facilities* (SDDCTEA 2014). The

data from these assessments are used to establish criteria regarding capacity and processing rates at ECFs. The manual processing rate per lane with one ID checker ranges from 300 to 450 vehicles per hour at FPCON Level BRAVO+. With the implementation of tandem lane-check arrangements, the manual processing rate per lane increases to a range of 400–600 vehicles per hour. Processing rates are shown in Table 3.1-6.

Table 3.1-6. Entry Control Facility Manual Processing Rates

FPCON Level	*Processing Technique*	*Single Lane Check*	*Tandem Lane Check*
ALPHA	Vehicle identification only	800–1,400	NA
BRAVO, BRAVO+, and CHARLIE	Vehicle and occupant identification	300–450	400–600
DELTA	Inspection of mission essential vehicles only	20–120	NA

Note: Manual processing rate shown in vehicles per hour per lane. Manual processing rates based on a compilation of Surface Deployment and Distribution Command Transportation Engineering Agency rates for more than 200 entry control facility studies and revalidated as of March 2008.
Legend: FPCON = Force Protection Condition; NA = not applicable.
Source: SDDCTEA 2014.

As shown in Table 3.1-6, each lane can accommodate 300–450 vehicles per hour with manual ID checks. Using a Physical Access Control System, each lane can accommodate 275–375 vehicles per hour. Vehicle demand at the proposed ECFs on Tinian would not be expected to exceed 300 vehicles per hour. Adequate storage would be provided and vehicle queues would not be expected to spillback onto adjacent roadways with a single lane. The proposed Tinian Base Camp ECF would provide the security level desired (FPCON BRAVO+) with little or no disruption to the ingress and egress of the installation. However, should periods of congestion occur, tandem processing could be used to increase the capacity of the ECF during periods of high demand. UFC 4-022-01, *Security Engineering: Entry Control Facilities/Access Control Points* (Department of Defense 2005b), mandates that all ECFs be designed with tandem-processing capabilities (multiple ID checkers per lane).

3.1.2 Air Transportation Demand – Tinian International Airport

3.1.2.1 Methodology for the Aviation Demand Forecast for Tinian International Airport

This air transportation study adopts the existing record of based aircraft and annual operations from the FAA Form 5010 Airport Master Record (FAA 2013a), and the forecast growth rate from the 2013 FAA Terminal Area Forecast (TAF) at TNI as the baseline. The FAA TAF does not forecast any growth for all categories of aircraft at TNI. The increase in aviation demand will be for military use under the proposed action. Forecast aviation demand for the proposed action is estimated from the annual number of events for different aircraft types within the Tinian Military Operations Area as presented in *CJMT Unconstrained Training Concept for Tinian and Pagan* (DoN 2014a). Three scenarios – low, medium, and high – are projected in the forecast aviation demand analysis. The combined forecast demand for the proposed action is the sum of the baseline aviation demand and the aviation demand associated with the proposed action. The estimated aviation demands are the same for Tinian Alternatives 1, 2, and 3.

3.1.2.2 Existing Aviation Demand at Tinian International Airport

The existing numbers of based aircraft and annual operations at TNI are recorded in the FAA Form 5010 Airport Master Record (FAA 2013a) and presented in Table 3.1-7.

Table 3.1-7. Existing Operations at Tinian International Airport

Period	*Based Aircraft*	*Annual Operations*								
	Total	*Itinerant Operations*					*Local Operations*			*Total Operations*
		Air Carrier	*Air Taxi & Commuter*	*General Aviation*	*U.S. Military*	*Total Itinerant*	*Civil*	*U.S. Military*	*Total Local*	
2013	13	58	46,206	454	476	47,190	1,922	0	1,922	49,116

Legend: U.S. = United States.
Source: FAA 2013a.

3.1.2.3 Forecast Aviation Demand for Tinian International Airport

Baseline Forecast (Without the Proposed Tinian Action)

The year-over-year growth rate estimated by the FAA TAF for the number of based aircraft and annual operations for TNI is 0% (FAA 2013e). The baseline forecast for based aircraft and annual operations at TNI from 2014 to 2040 is presented in Table 3.1-8.

Table 3.1-8. Baseline Forecast at Tinian International Airport

Period	*Based Aircraft*	*Annual Operations*								
	Total	*Itinerant Operations*					*Local Operations*			*Total Operations*
		Air Carrier	*Air Taxi & Commuter*	*General Aviation*	*U.S. Military*	*Total Itinerant*	*Civil*	*U.S. Military*	*Total Local*	
2014–2040	13	58	46,206	454	476	47,190	1,922	0	1,922	49,116

Legend: U.S. = United States.
Sources: FAA 2013a, e.

Air Transportation Demand for the Proposed Tinian Action

TNI would act as a hub for aerial debarkation and embarkation for training and support personnel. Personnel, along with attachments and equipment, would arrive at Tinian via marine or air transportation (C-130 or C-17) and would be bused to the base camp (DoN 2014a).

Potential air transportation support to and from TNI would include the use of U.S. military aircraft and contracted commercial air carriers. Marine Corps rotary wing (CH-53) and tilt-rotor aircraft (MV-22) would arrive from Andersen Air Force Base, Guam, based aboard ships, or other military bases in the region. Marine fixed-wing aircraft (KC-130) and Air Force Air Mobility Command C-17 and C-130 aircraft may also transport personnel and equipment to Tinian. These aircraft may use either TNI or Tinian's North Field (DoN 2014a).

Other than air transportation support, military training activities will use some of the airport facilities at TNI. SUA is proposed around TNI under the proposed action to support the military training. The SUA surrounding TNI includes military operations areas, and restricted areas. Military operation area includes airspace designed to separate or segregate certain nonhazardous military activities from other air traffic and to identify where these activities are conducted. Examples of nonhazardous military flight activities include air combat maneuvers, air intercepts and low altitude tactics, etc. Restricted areas contain airspace within which the flight or aircraft is subject to restrictions. Restricted areas denote the existence of hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles (DoN 2014a). Details of the airspace usage are included in the separate airspace study. The focus of this analysis is to estimate the usage of the TNI airport facilities based on the forecast airspace usage given in the *CJMT Unconstrained Training Concept for Tinian and Pagan* (DoN 2014a).

The estimated annual aircraft operations in the SUA at Tinian for the 20 weeks a year expeditionary operations is shown in Table 3.1-9 (DoN 2014a). The estimated annual aircraft sorties for the 45 weeks a year end state operations is shown in Table 3.1-10.

Table 3.1-9. Estimated Annual Aircraft Operations, Special Use Airspace – Tinian (20 weeks a year expeditionary operations)

Aircraft Type (example)	*Annual No. of Operations*	*Average Minutes/Mission (per single-type aircraft) in SUA*
Tinian MOA, Tinian Restricted Area R-7203		
Fighter (F-18/F-22/F-35/F-15/F-16)	7,400	45
Transport Tilt-Rotor (MV-22)	200	90
Transport Rotary Wing (CH-53)	180	60
Attack Helicopter (AH-1/H-60)	80	45
Transport Fixed Wing (C-130)	1,500	35
Unmanned (RQ-7B Shadow)	200	240

Legend: SUA = Special Use Airspace; No. = number.
Source: Personal Communication between Jon Miclot and Greg Dorn, June 17, 2014

Table 3.1-10. Estimated Annual Aircraft Sorties – Tinian (45 weeks a year end state operations)

Aircraft Type (example)	*Annual No. of Operations*	*Average Minutes/Mission (per single-type aircraft) in SUA*
Tinian MOA, Tinian Restricted Area R-7203		
Fighter (F-18/F-22/F-35/F-15/F-16)	15,400	45
Transport Tilt-Rotor (MV-22)	1,000	90
Transport Rotary Wing (CH-53)	360	60
Attack Helicopter (AH-1/H-60)	760	45
Transport Fixed Wing (C-130)	4,700	35
Unmanned (RQ-7B Shadow)	400	45

Source: Personal Communication between Jon Miclot and Greg Dorn, August 27 2014.

In the estimated SUA usage shown in Table 3.1-9, the use of TNI would be expected for events identified in Tinian's military operations area that involve transport aircraft, and some of the fighters, attack helicopters, and unmanned aircraft. With reference to the *Description of Proposed Action and Alternatives V4* (DoN 2014b), the control stations for the unmanned aircraft system would operate from North Field.

Three scenarios were analyzed based on the 20 weeks a year expeditionary operations. The high scenario assumes that all events estimated in Table 3.1-11 would involve landings and takeoffs at TNI. The medium scenario assumes that 50% of the fighter, attack helicopter, and unmanned events would require landings and takeoffs at TNI. The low scenario assumes that 25% of the fighter, attack helicopter, and unmanned events would involve landings and takeoffs at TNI. All three scenarios assume that the events involving transport aircraft would require landings and takeoffs at TNI and each event would include two operations (i.e., arrival and departure). The increases in annual operations at TNI for the three scenarios are estimated and presented in Table 3.1-11 (approximately between 3,800 and 9,560 operations).

Table 3.1-11. Proposed Action Aviation Demand Forecast at Tinian International Airport (20 weeks a year expeditionary operations)

Aircraft Type (example)	*No-Action Alternative*	*Tinian Alternative 1, 2, or 3*		
		Low Scenario	*Medium Scenario*	*High Scenario*
Fighter	0	1,850	3,700	7,400
Transport Tilt-Rotor	0	200	200	200
Transport Rotary Wing	0	180	180	180
Attack Helicopter	0	20	40	80
Transport Fixed-Wing	0	1,500	1,500	1,500
Unmanned	0	50	100	200
Total	0	3,800	5,720	9,560

Note: This table represents additional annual demand over existing uses.
Source: AECOM analysis.

For the 45 weeks a year end state operations, it is assumed that each sortie include two operations (arrival and departure). If all the estimated aircraft sorties will take place at TNI, the increase in annual operations would be approximately 22,220 operations.

No military aircraft are proposed to be based at TNI. All increases in annual operations would be itinerant U.S. military operations.

The personnel associated with the proposed action, including all support personnel, would enplane and deplane separate from civilian passengers and then be bused to base camp in designated vehicles. If TNI is the first port of entry to the U.S. for the foreign allies or participants from overseas military facilities, clearance for immigration, customs, and quarantine control would be carried out at designated staging areas separate from the existing airport terminal facilities. Therefore, no increase in the annual volume of passengers using the airport terminal is anticipated.

Combined Forecast Aviation Demand for Tinian International Airport

The combined forecast aviation demand is the sum of the baseline aviation demand as shown in Table 3.1-11, and the forecast aviation demand associated with the Tinian alternatives as shown in Table 3.1-12.

Table 3.1-12. Estimated Combined Forecast Aviation Demand at Tinian International Airport (20 weeks a year expeditionary operations)

Annual Operations										
Forecast	*Itinerant Operations*					*Local Operations*			*Total*	*Total Percentage Increase*
	Air Carrier	*Air Taxi & Commuter*	*GA*	*U.S. Military*	*Total Itinerant*	*Civil*	*U.S. Military*	*Total Local*		
No Action Alternative	58	46,206	454	476	4,7190	1,922	0	1,922	49,116	0%
Tinian Alternative 1, 2, or 3										
Low Scenario	58	46,206	454	4,276	50,994	1,922	0	1,922	52,916	7.7%
Medium Scenario	58	46,206	454	6,196	52,914	1,922	0	1,922	54,836	11.6%
High Scenario	58	46,206	454	10,036	56,754	1,922	0	1,922	58,676	19.5%

Legend: GA = general aviation; U.S. = United States.
Sources: FAA 2013a, e; DoN 2014a; AECOM analysis.

For the 45 weeks a year end state operations, if all the estimated annual aircraft sorties will take place at TNI, the total annual operations will be approximately 71,336 operations with 45 percent increase from the baseline.

3.1.3 Air Transportation Facility Requirements – Tinian International Airport

3.1.3.1 Airfield Requirements

Based on the forecast aviation demand estimated in Section 3.1.2.3, airfield demand/capacity is analyzed to determine the ability of TNI to accommodate the projected activity levels with the implementation of the proposed action and to identify the additional airport facilities, if required.

3.1.3.2 Airfield Demand/Capacity Analysis

Airfield capacity is an important part of the airport planning process. A comparison of operational demand with airfield capacity results in airfield development requirements.

FAA Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay* (FAA 1983), provides the methodology for estimating airport capacities and average delay per aircraft. Naval Facilities Engineering Command P-80.1 (NAVFAC 1972) provides the procedures for estimating the aircraft handling capacity of an air station's runway system. TNI is a civilian airport and the focus of the analysis is to determine the capacity of TNI to accommodate the additional U.S. military operations. Therefore, FAA AC 150/5060-5 (FAA 1983) is adopted in lieu of Naval Facilities Engineering Command P-80.1 (NAVFAC 1972) for the airfield demand/capacity analysis.

FAA AC 150/5060-5 (FAA 1983) provides formulas to estimate annual service volume (ASV). ASV is a reasonable estimate of an airport's annual capacity. It accounts for differences in runway use, aircraft mix, weather conditions, fleet mix, and other factors that would be encountered over a year's time (FAA 1983). The capacity and delay calculations for long-range planning as provided in Chapter 2 of FAA AC 150/5060-5 (FAA 1983) have been adopted for the airfield demand/capacity analysis for TNI.

The capacity and delay calculations for TNI include the following default settings and assumptions:

- *Runway-Use Configuration:* It is assumed that at least 80% of the time, the airport is operated with the runway-use configuration that produces the greatest hourly capacity. Because TNI has only one runway-use configuration (a single-runway configuration), this assumption is applicable.
- *IFR Weather Conditions:* The model assumes that IFR weather conditions occur roughly 10% of the time. This default setting is a conservative assumption considering the historical visibility at Tinian recorded a monthly average of 7.0 miles (11.0 kilometers) from January to December 2013 (WeatherSpark 2013), which is well above the Visual Flight Rules (VFR) visibility minimums (1.0 mile [1.6 kilometers] at daytime for Class G airspace).
- *Percent Arrivals:* The model assumes arrivals equal departures.
- *Percent Touch-and-Go Operations:* Most activity at TNI is for air commuters and air taxis. It is estimated that the percent of touch-and-go operations would be minimal and insignificant.
- *Taxiways:* The model assumes a full-length parallel taxiway, ample runway entrance/exit taxiways, and no taxiway crossing problems.
- *Runway Instrumentation:* The model assumes that the airport has at least one runway equipped with an ILS and has the necessary air traffic control facilities and services to carry out operations in a radar environment. TNI does not have an ILS at present, but it has three published instrument approaches. For a conservative estimate, the capacity estimated by the model is reduced by 20% to reflect the lack of an ILS.

The aircraft fleet mix is the primary driver of capacity. The types of aircraft operating at an airport affect airport capacity. For example, when smaller aircraft follow larger aircraft on approach, additional separation is required to account for wake turbulence. This additional separation increases the time between aircraft operations, resulting in a lower airfield capacity. The more homogenous the fleet mix, the higher the capacity of a given airfield configuration.

With reference to the forecast above, the assumptions for the fleet mix are given below:

- Small aircraft (below 12,500 pounds [5,700 kilograms]) include:
  - Light military helicopters, such as UH-1
  - Itinerant general-aviation aircraft
  - Local civil aircraft
  - 50% of the air taxis, such as PA-32 operated by Star Marianas Air
- Large aircraft (more than 12,500 pounds [5,700 kilograms] but not more than 300,000 pounds [136,000 kilograms]) include:
  - Military fighters
  - Transport tilt rotors
  - Transport rotary wings
  - 50% of the transport fixed wings, like C-130
  - Air carriers
  - 50% of the air taxis, such as Short 360
- Heavy aircraft (more than 300,000 pounds [136,000 kilograms]) include:
  - The remaining 50% of the military transport fixed wings, such as C-17 and contract carrier B747-400

The distribution percentages for these three different weight categories are similar for the low, medium, and high forecast scenarios.

The input data from the calculations for the airfield demand/capacity analysis and the results are summarized in Table 3.1-13.

The FAA recommends a detailed planning analysis for airfield enhancements when annual operations reach 60% of the ASV (FAA 2000) and implementing the enhancements when annual operations approach 80% of the ASV (FAA 2007a). The existing airfield capacity of TNI is approximately 164,000 ASV, with VFR hourly capacity of 50 operations and IFR hourly capacity of 45 operations. The estimated annual operations for the 20 weeks a year expeditionary operations would reach approximately 32% to 36% of the ASV for the three scenarios. The estimated demand levels are well below TNI's capacity. Even during the 45 weeks a year end state operations, the estimated annual operations would reach approximately 44% of the ASV and are still below TNI's capacity.

As mentioned in Chapter 2, the CEDS Planning Commission has recommended the installation of an ILS for TNI. The funds have been set aside by the Tinian Mayor's office (CEDS 2009); however, as noted in Chapter 2, this project is on hold until funding for future maintenance is available. If an ILS is installed, the discount applied to the estimated capacity would be reduced and the ASV estimated would be increased.

Table 3.1-13. Airport Capacity and Delay – Tinian

Characteristic Description	***Input Data***
C = Percent of airplanes of more than 12,500 pounds (5,700 kilograms) but not more than 300,000 pounds (136,000 kilograms)	50.3 to 55
D = Percent of airplanes of more than 300,000 pounds (136,000 kilograms)	1.3 to 1.4
Mix Index (C+3D)	54.6 to 58.9
	Between 51 and 80
Target Level of Annual Operations	
Low Scenario	52,916
Medium Scenario	54,836
High Scenario	58,676
Output Data	
Runway-Use Configuration	Sketch No. 1 of Figure 2-1, AC 150/5060-5, for a single-runway configuration
Annual Service Volume	164,000
Capacity (Operations/Hour)	
VFR	50
IFR	45
Percentage of Annual Operations to Annual Service Volume	
Low Scenario	32%
Medium Scenario	34%
High Scenario	36%
Average Range Delay per Aircraft (minutes) [(1)]	
Low	0.1
High	0.25

Note: (1) In estimating the average delay per aircraft using Figure 2-2 in Federal Aviation Administration Advisory Circular 150/5060-5, the predominant operations are assumed to be general aviation instead of air carrier for a conservative estimate.
Legend: IFR = Instrument Flight Rules; VFR = Visual Flight Rules.
Source: FAA 1983, AECOM analysis.

Although changes in the assumptions could affect the capacity estimates, no substantial change is anticipated at this time. As shown in Table 3.1-13, the margin between the demand and capacity is sufficient to conclude that TNI would not experience an airfield capacity constraint with the additional air transportation anticipated under the Tinian alternatives.

Representative Fleet Mix

Typically, aviation facilities are designed for a specific aircraft known as the "critical" or "design" aircraft, which is the most operationally and/or physically demanding aircraft to make substantial use of the facility. The critical or design aircraft is used to establish the dimensional requirements for safety parameters and obstacle clearances (Department of Defense 2008).

FAA defines the term "critical aircraft" as the aircraft most demanding on airport design (based on aircraft dimensions, approach speeds, and/or other requirements) that operates at least 500 annual operations at a particular airport. The existing critical design aircraft defined in the *West Tinian Master Plan Update f*or TNI is B777/B747 (CPA 2002, 2009a).

With reference to the forecast annual operations for transport fixed-wing aircraft presented in Table 3.1-11, the annual operations for large and heavy transport aircraft, such as C-130, C-17, or B747-400, would be less than 500 per year at TNI. No change in critical aircraft for TNI would result from implementation of any of the Tinian alternatives. Although the U.S. military fleet mix would not change the critical aircraft for TNI, an analysis of the facilities requirements for the models of aircraft that would generally represent operations at TNI under the proposed action was conducted to identify whether any additional facilities are

required. The representative fleet mix for transportation of personnel, gear, and equipment, and the fighter aircraft that may operate at TNI under the proposed action, is summarized in Table 3.1-14. Although the representative fleet mix does not include the complete list of U.S. Pacific Command assets, it generally includes the critical models for each aircraft type. The facility requirements are assessed based on the critical models, which would be able to meet the need of less critical models. The B747-400 is included in the transport fleet mix for possible delivery of gear and equipment, if necessary. Smaller commercial carriers such as B737 may also be used in transportation of personnel, gear, or equipment based on a recent exercise on Tinian. Other smaller commercial carriers (B737 and B777) are not as critical as the B747-400 in terms of facility requirements; only the B747-400 is included in the representative fleet mix for assessment. The usage of B747-400 in TNI for air transportation is anticipated to be low.

Table 3.1-14. Representative Fleet Mix – Tinian

Aircraft Type	*Wingspan/Rotor Diameter (feet [meters])*	*Length (feet [meters])*	*Tail Height (feet [meters])*	*Runway Classification based on UFC*	*Runway Design Code based on FAA AC*	*Taxiway Design Group based on FAA AC*
Transport Fixed Wing						
B747-400	213.0 [64.9]	231.8 [70.7]	64.0 [19.5]	—	D-V	6
C-130	132.6 [40.4]	97.8 [29.8]	38.1 [11.6]	Class B	C/D-IV	3
C-17	170.0 [51.8]	174.0 [53.0]	55.1 [16.8]	Class B	C/D-IV	5
Fighter						
F-18	40.4 [12.3]	56.0 [17.1]	15.3 [4.7]	Class B	C/D-I	1
Transport Tilt-Rotor						
MV-22	45.7 [13.9]	57.3 [17.5]	22.1 [6.7]	Class A	—	—
Transport Rotary Wing						
CH-53	79.0 [24.1]	99.0 [30.2]	28.3 [8.6]	—	—	—
MH-60S	54.0 [16.5]	65.0 [19.8]	16.7 [5.1]	—	—	—
Attack Helicopter						
AH-1	48.0 [14.6]	58.0 [17.7]	14.1 [4.3]	—	—	—
UH-1	48.0 [14.6]	57.7 [17.6]	14.4 [4.4]	—	—	—

Legend: — = not specified; AC = Advisory Circular; FAA = Federal Aviation Administration; UFC = Unified Facilities Criteria.
Source: AECOM analysis.

Runway Design Code

FAA AC 150/5300-13A, *Airport Design* (FAA 2012a), defines the classifications of airports for design purposes. The Airport Reference Code (ARC) designation encompasses airfield parameters and the highest Runway Design Code (RDC). The RDC consists of three parameters: the aircraft approach category (AAC), the airplane design group, and the approach visibility minimums of a runway. As defined in FAA AC 150/5300-13A (FAA 2012a) and AC 150/5070-6B, *Airport Master Plans* (FAA 2007b), the ARC is used for planning and design purposes only. The ARC does not limit the aircraft categories that can safely operate at the airport.

The ARC consists of two aircraft characteristics that govern the dimensions of airfield facilities and the associated design surfaces. The first component of the ARC is a letter that references the AAC, which indicates the approach speed of the critical aircraft that the runway is designed to accommodate. The second component of the ARC is a Roman numeral that references the airplane design group, which indicates the critical aircraft wingspan and tail height a runway is designed to accommodate.

Currently, TNI is classified as an ARC D-V airport (CPA 2002).

The RDCs for the representative fleet mix are shown in Table 3.1-15. The most demanding facility requirements for the RDC would be those for D-V. Table 3.1-15 summarizes the corresponding runway requirements for RDC D-V with reference to FAA AC 150/5300-13A (FAA 2012a).

Runway Classifications based on Unified Facilities Criteria

The UFC are defined in terms of Class A and B runways and their supporting taxiways, aprons, etc. Aircraft such as C-130, C-17, and F-18 operate on Class B runways. MV-22 aircraft can operate on Class A runways as rotary-wing aircraft and operate as either fixed-wing or rotary-wing aircraft on taxiways associated with Class A runways (Department of Defense 2013).

The Class B runway geometries are shown in Table 3.1-15 (Department of Defense 2013).

Table 3.1-15. Runway Geometries – Tinian

Characteristic Description	***Class B Runway (UFC)***	***D-V Runway (FAA)***	***Existing Conditions at Runway 08/26***
Length	Refer to paragraphs below		8,600 feet (2,621 meters)
Width	200 feet (61 meters)	150 feet (46 meters)	150 feet (46 meters)
Width of Shoulders (each side)	150 feet (46 meters) (75 feet [23 meters] each side)	70 feet (21 meters) (35 feet [10.7 meters] each side)	70 feet (21 meters (35 feet [10.7 meters] each side)
Runway Centerline to Parallel Taxiway Centerline	500 feet (152 meters)	400 feet (122 meters)	750 feet (230 meters) approximately
Runway Centerline to Aircraft Parking Area	Apron and taxi lane – outside the primary surface Parked aircraft – clear from 7:1 transitional surface	500 feet (152 meters)	Edge of taxi lane at 1,650 feet (500 meters) approximately from runway centerline Parked aircraft clear from 7:1 transitional surface (based on the highest tail height from Table 3.1-14)

Legend: FAA = Federal Aviation Administration; UFC = Unified Facilities Criteria.
Sources: Department of Defense 2013, FAA 2012a, AECOM analysis

Runway Length

In estimating the runway length requirements for the representative fleet mix under the proposed action, FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design* (FAA 2005), is applied with the airplane manufacturer manual where available. This approach is adopted for B747-400.

For the remaining military aircraft (i.e., C-130, C-17, F-18, MV-22, and the rotary wings), the runway length requirements refer to UFC 2-000-05N, *100 Series, Operational and Training Facilities* (Department of Defense 2013) and Engineering Technical Letter (ETL) 09-6: *C-130 and C-17 LZ Dimensional, Marking, and Lighting Criteria* (Air Force 2009) for guidance.

The runway length requirements are summarized in Table 3.1-16.

Table 3.1-16. Runway Length Requirements – Tinian

Aircraft Type	*Takeoff Length Requirement [1]/ Max. TGR [2] (feet [meters]) (max. takeoff weight)*	*Landing Length Requirements [1]/Max. Landing Distance [2] (feet [meters]) (max. landing gross weight)*	*Runway Length Requirement (approx. feet [meters])*	*Remarks*
Based on FAA AC 150/5325-4B and Boeing's Manual				
Transport Fixed Wing				
B747-400 [1]	11,200 [3,400]	7,900 [2,400]	11,200 [3,400]	B747-400 with MTOW of 875,000 pounds (396,900 kilograms) would require a runway length of 11,200 feet (3,400 meters). Max. allowable takeoff weight could be reduced to 760,000 pounds (344,700 kilograms) for a runway length of 8,600 feet (2,621 meters).
Based on UFC 2-000-05N				
Transport Fixed Wing				
C-130 [2]	4,700 [1,400]	2,020 [600]	9,300 [2,800]	C-130 with MTOW of 155,000 pounds (70,300 kilograms) would require runway length of 9,300 feet (2,800 meters) with a safety factor of 1.6. The existing 8,600-foot (2,621-meter) runway would provide a safety factor of 1.49. Max. allowable takeoff weight could be reduced to 120,000 pounds (54,400 kilograms) for a runway length of 8,600 feet (2,621 meters) to maintain a safety factor of 1.6.
Fighter				
F-18 [2]	3,680 [1,100]	4,160 [1,300]	8,200 [2,500]	Existing runway length would be sufficient.
Transport Tilt-Rotor				
MV-22	Not Available	0 (vertical landing)	Class A runways are typically less than 8,000 [3,400]	Existing runway length would be sufficient.
Rotary Wing				
CH-53, MH-60S, AH-1, UH-1	Not Available	Not Available	1,900 [600]	Existing runway length would be sufficient.

Aircraft Type	***Takeoff Length Requirement [(1)]/ Max. TGR [(2)] (feet [meters]) (max. takeoff weight)***	***Landing Length Requirements [(1)]/Max. Landing Distance [(2)] (feet [meters]) (max. landing gross weight)***	***Runway Length Requirement (approx. feet [meters])***	***Remarks***
Based on ETL 09-6 (As landing zones for some air crew training and contingency operations)				
Transport Fixed Wing				
C-130	—	—	3,000 [900]	Existing runway length would be sufficient.
C-17 [(3)]	—	—	3,500 [1,100]	

Notes:
1. The correction for airport temperature and elevation on the runway length required for B747-400 is included in the takeoff length requirement and landing length requirement from the charts in the airplane manufacturer's manual. The runway length required is the maximum of the two.
2. The correction for airport temperature, altitude, gradient, and safety factor on the runway length required for C-130 and F-18 is not included in the maximum takeoff ground run and maximum landing distance obtained from tables in Unified Facilities Criteria 2-000-05N. The correction is applied to the maximum of the two and shown as the runway length requirement.
3. The runway length requirement for C-17 is based on runway condition rating of 23 dry for paved runway.
Legend: — = not specified; max. = maximum; MTOW = maximum takeoff weight; TGR = Takeoff Ground Run; UFC = Unified Facilities Criteria.
Sources: FAA 2005, Boeing 2002, Department of Defense 2013, Air Force 2009, AECOM analysis.

With reference to FAA AC 150/5325-4B (FAA 2005) and the 747-400 *Airplane Characteristics for Airport Planning* from Boeing (Boeing 2002), the runway length requirement for the possible transport aircraft B747-400 is estimated and shown in Table 3.1-16.

The runway length required for maximum takeoff weight (MTOW) of B747-400 (875,000 pounds [396,900 kilograms]) is estimated to be 11,200 feet (3,400 meters), which exceeds the existing runway length. Nevertheless, it is estimated from the airport planning manual that the reduced limit of takeoff weight for B747-400 would be 760,000 pounds (344,700 kilograms) for a takeoff runway length of 8,600 feet (2,621 meters) at TNI.

With reference to UFC 2-000-05N (Department of Defense 2013), the proposed runway length requirement is based on the longest takeoff ground run or landing roll of the fixed-wing aircraft and corrected for altitude (271 feet [123 meters] above msl), temperature (88.0 degrees Fahrenheit [31.1 degrees Celsius] mean highest daily, hottest month), and effective gradient (0%); and applied with a safety factor (1.6). The safety factor allows for variation in pilot technique, runway surface conditions, wind, minor mechanical difficulties, and physiological factors. The result is rounded up to the nearest 100 feet (30.5 meters). The corrected runway length requirements for C-130 and F-18 based on UFC 2-000-05N (Department of Defense 2013) are 9,300 feet (2,800 meters) and 8,200 feet (2,500 meters), respectively, as summarized in Table 3.1-16.

The corrected runway length requirement for the transport aircraft C-130 at MTOW of 155,000 pounds (70,300 kilograms) (9,300 feet [2,800 meters]) would exceed the existing Runway 08/26 (8,600 feet [2,621 meters]) based on UFC 2-000-05N. Instead of providing a safety factor of 1.6, the existing Runway 08/26 provides a safety factor of 1.49. However, C-130 aircraft may operate at a limited takeoff weight of approximately 120,000 pounds (54,400 kilograms) on the given 8,600-foot (2,621-meter) runway at TNI to maintain a safety factor of 1.6.

UFC 2-000-05N does not provide the maximum takeoff ground run and landing distance for C-17. With reference to the information from the manufacturer, Boeing, the takeoff field length at maximum gross weight is 7,740 feet (2,400 meters) and the landing field length with 160,000 pounds (72,600 kilograms) of cargo is 3,000 feet (900 meters) for C-17. It is anticipated that C-17 aircraft may operate at limited

takeoff weight on the given 8,600-foot (2,621-meter) runway at TNI to maintain the factor of safety as required in UFC 2-000-05N.

Additionally, ETL 09-6 (Air Force 2009) provides dimensional guidance for planning, design, construction, and evaluation of LZs used for air crew training and contingency operations of C-130 and C-17 aircraft. The ETL advises that the minimum paved runway length for C-130 is 3,000 feet (900 meters) for C-130 and 3,500 feet (1,100 meters) for C-17, with 300-foot (91-meter) overruns on both thresholds. The overruns must be constructed to the same standards as the runway. The existing Runway 08/26 has sufficient length to be an LZ with overruns for C-130 and C-17 aircraft for some air crew training and contingency operations according to the ETL.

The transport tilt-rotor aircraft MV-22 could operate on Class A runways, which are ordinarily less than 8,000 feet (2,400 meters) long. The MV-22 should be able to operate on the existing Runway 08/26.

Runway Length for Rotary-Wing Aircraft

The corrected runway length requirement for rotary-wing aircraft is 1,900 feet (approximately 600 meters) according to UFC 2-000-05N (Department of Defense 2013). Runway 08/26 has sufficient length for normal takeoff and landing operations of the rotary-wing aircraft.

Runway Width

As stated in Table 3.1-15, the width of Class B runways as specified in UFC 2-000-05N (Department of Defense 2013) is 200 feet (60 meters) with 75-foot-wide (23-meter) shoulders on each side. According to FAA AC 150/5300-13A (FAA 2012a), the required runway width for ARC D-V is 150 feet (46 meters) with 75-foot-wide (23-meter) shoulders.

With reference to the ETL (Air Force 2009), the width of runways for LZs is 60 feet (18 meters) for C-130 and 90 feet (27 meters) for C-17 aircraft, with 10-foot-wide (3-meter) shoulders on each side.

Although the width of Runway 08/26 does not meet the Class B characteristics defined by the UFC, it meets the FAA's minimum design requirements for D-V aircraft.

Runway Width for Rotary-Wing Runways

The standard width for rotary-wing runways is 75 feet (23 meters). To support CH-53 or any helicopter with rotor diameter greater than 70 feet (21 meters), the width of the runway must be 100 feet (30 meters) with reference to UFC 2-000-05N (Department of Defense 2013). Runway 08/26 has sufficient width for the rotary-wing operations.

Runway Grades

The requirements for Class B runway longitudinal grades as specified in UFC 2-000-05N (Department of Defense 2013) are slightly higher (maximum 1%) than requirements specified in FAA AC 150/5300-13A (FAA 2012a) for AAC D (0% to ±1.5% at the middle portion of runway). The requirements on transverse grades are the same in both standards (1.0% to 1.5%). The effective gradient of the existing Runway 08/26 is 0.35% (CPA 2009a).

Runway Pavement

The existing runway pavement has a weight capacity of 75,000 pounds (34,000 kilograms) for single-wheel, 200,000 pounds (90,700 kilograms) for double-wheel (D200), 400,000 pounds (181,400 kilograms) for double-tandem (DT400), and 832,000 pounds (377,400 kilograms) for dual-double-tandem aircraft (DDT832) (FAA 2013a).

The two largest transport aircraft being proposed, as identified in Table 3.1-14, would be B747-400 and C-17.

The maximum design takeoff weight for B747-400 is 875,000 pounds (396,900 kilograms) with dual double tandem. The pavement for Runway 08/26 would limit the MTOW/allowable gross weight to less than 832,000 pounds (377,400 kilograms). It is also noted in the runway length analysis above that the runway length of 8,600 feet (2,621 meters) would have already limited the MTOW/allowable gross weight to 760,000 pounds (344,700 kilograms). The control factor for air transportation using B747-400 is the runway length rather than the pavement strength.

The maximum takeoff gross weight for C-17 is 585,000 pounds (265,400 kilograms) with two triple tandems. With reference to the Runway FAA Strength Rating Conversions (Boeing 2012), the conversions of D200, DT400, and DDT832 for C-17 are 636,000 pounds (288,500 kilograms) (200,000 x 3.18), 716,000 pounds (324,800 kilograms) (400,000 x 1.79), and 665,600 pounds (301,600 kilograms) (832,000 x 0.80), respectively. It is recommended to adopt the lowest of the three conversions to be conservative. The load capacity of the existing runway pavement for triple tandem is estimated to be 636,000 pounds (288,500 kilograms), which is sufficient to accommodate C-17 operations.

As long as the delivery by heavy aircraft (B747-400 and C-17) is limited to the allowable takeoff weight discussed above, no additional strengthening of the existing runway pavement would be required. However, if the runway would be lengthened to accommodate B747-400 aircraft at MTOW, the runway should also be strengthened.

Object Clearing Criteria

Safe and efficient operations at an airport require that certain areas on and near the airport are clear of objects or restricted to objects with a certain function, composition, and/or height. The clearing standards and criteria are established to create a safer environment for the aircraft operating at or near the airport. These object clearing requirements for the critical aircraft, i.e., D-V aircraft, for visibility minimum not lower than 3/4 mile in accordance with FAA AC 150/5300-13A (FAA 2012a) are listed below.

- Runway Object Free Area
  - Length beyond runway end: 1,000 feet (305 meters)
  - Length before threshold: 600 feet (183 meters)
  - Width: 800 feet (244 meters)
- Runway Safety Area
  - Length beyond departure end 1,000 feet (305 meters)
  - Length before threshold: 600 feet (183 meters)
  - Width: 500 feet (152 meters)
- Runway Obstacle Free Zone
  - Length beyond runway end: 200 feet (61 meters)
  - Width: 400 feet (122 meters)
- Runway End Establishment Obstacle Clearance Surfaces

  - Approach end of runway:
    - Slope: 20:1
    - Distance from threshold: 200 feet (61 meters)
    - Inner width: 800 feet (244 meters)
    - Outer width: 3,800 feet (1,200 meters)
    - Length: 10,000 feet (3,048 meters)
  - Departure runway end for instrument operations:
    - Slope: 40:1
    - Inner width: 1,000 feet (305 meters)
    - Outer width: 6,466 feet (2,000 meters)
    - Length: 10,200 feet (3,100 meters)
- Navigational Aids – Critical Areas
  - PAPI obstacle clearance surface:
    - From PAPI: 300 feet (91 meters)
    - Angle on either side of runway centerline: 10 degrees
    - Radius: 4 miles (6.4 kilometers)
    - Slope: 2 degrees
- Approach Runway Protection Zone
  - Length: 1,700 feet (518 meters)
  - Inner width: 1,000 feet (305 meters)
  - Outer width: 1,510 feet (460 meters)
- Departure Runway Protection Zone
  - Length: 1,700 feet (518 meters)
  - Inner width: 500 feet (152 meters)
  - Outer width: 1,010 feet (308 meters)

The new construction under the proposed action, including base camp, the bulk fuel storage area, and the MSA and Range Control observation posts, would be outside the above-listed areas and no penetrations to the clearance surfaces are identified.

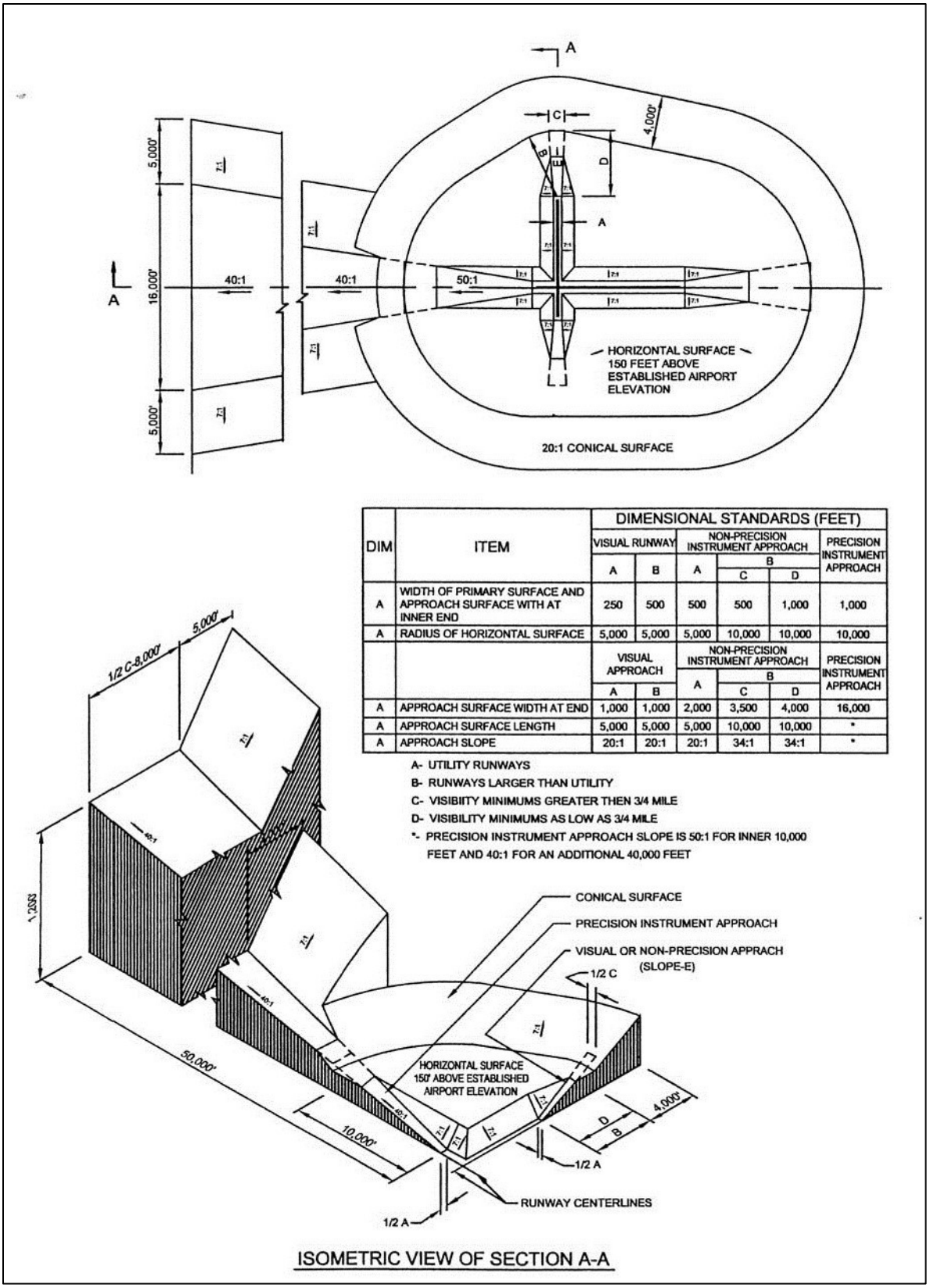
Obstruction Identification Surfaces

In accordance with FAA Order JO 7400.2J Change 3 (FAA 2013g) regarding procedures for handling airspace matters, the obstruction standards in Part 77 regarding military airport imaginary surfaces are applicable to airports operated and controlled by a U.S. military service, regardless of whether use by civil aircraft is permitted. The obstruction standards in Part 77 regarding civil airport imaginary surfaces apply to civil joint-use airports.

Under Part 77 of the FAR in CFR Title 14, the existing approach category for TNI is C for a non-precision instrument runway with visibility minimums not lower than 3/4 mile. Because TNI would continue to operate as a civil airport after the implementation of the proposed action, no change would occur in the conditions for CFR Title 14 FAR Part 77 Category C. The existing FAR Part 77 imaginary surfaces for TNI include:

- Primary Surface
  - Length beyond runway end: 200 feet (61 meters)
  - Width: 500 feet (152 meters)
  - Elevation: Same as runway centerline
- Transitional Surface
  - Slope: 7:1
  - Extend from the sides of primary surface and the sides of the approach surfaces
- Horizontal Surface
  - Elevation: 271 feet (83 meters) msl + 150 feet (46 meters) = 421 feet (129 meters) msl
  - Radius of arch from primary surface: 10,000 feet (3,000 meters)
- Conical Surface
  - Slope: 20:1
  - Width: 4,000 feet (1,200 meters)
  - Extend outward and upward from periphery of the horizontal surface
- Approach Surfaces
  - Slope: 34:1
  - Inner width: 500 feet (152 meters)
  - Outer width: 3,500 feet (1,100 meters)
  - Length: 10,000 feet (3,000 meters)
  - Extend outward and upward from each end of the primary surface

A graphical depiction of typical FAR Part 77 imaginary surfaces is given in Figure 3.1-11.



DIM	ITEM	DIMENSIONAL STANDARDS (FEET)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT APPROACH			PRECISION INSTRUMENT APPROACH
		A	B	A	B		
					C	D	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WITH AT INNER END	250	500	500	500	1,000	1,000
A	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL APPROACH		NON-PRECISION INSTRUMENT APPROACH			PRECISION INSTRUMENT APPROACH
		A	B	A	B		
					C	D	
A	APPROACH SURFACE WIDTH AT END	1,000	1,000	2,000	3,500	4,000	16,000
A	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	*
A	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1	*

A- UTILITY RUNWAYS
B- RUNWAYS LARGER THAN UTILITY
C- VISIBIITY MINIMUMS GREATER THEN 3/4 MILE
D- VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
*- PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET

Figure 3.1-11. Typical FAR Part 77 Imaginary Surfaces
Source: NGS 2014.

If an ILS was installed and a precision instrument approach was developed for TNI, the FAR Part 77 imaginary surfaces would change.

With the exception of a communication tower at the northwest corner of base camp, the maximum height of the new facilities at base camp, the bulk fuel storage area, the MSA, and Range Control observation posts would be below 150 feet (46 meters). The height of the communication tower is approximately 200 feet (61 meters) above ground and would penetrate the horizontal surface. Under CFR Title 14 FAR Part 77 Subpart B, FAA Form 7460-1, Notice of Proposed Construction or Alternation, must be filed before construction; an application for a license from the Federal Communications Commission must also be filed, if applicable. The FAA will conduct an aeronautical study to determine whether the aeronautical effects of the proposed construction would constitute a hazard to air navigation.

In summary, other than the communication tower identified above, there are no new construction elements under the Tinian alternatives that would penetrate the existing Part 77 imaginary surfaces for TNI. However, it is noted that any construction on TNI would require the filing of FAA Form 7460-1, Notice of Proposed Construction or Alteration; this applies to temporary and permanent structures.

Taxiway System

Table 3.1-17 summarizes the geometric requirements for taxiways associated with a Class B runway according to UFC 2-000-05N (Department of Defense 2013) and taxiway design group (TDG) 5 and TDG-6 based on FAA AC 150/5300-13A (FAA 2012a) for C-17 and B747-400 aircraft, respectively. The existing taxiway systems at TNI generally meet the taxiway width, shoulder width, and taxiway/taxi lane separation requirements according to the UFC, FAA TDG-5, and FAA TDG-6.

Table 3.1-17. Taxiway Geometries – Tinian

Characteristic Description	***Class B Runway (UFC)***	***D-V Runway***		***Existing Conditions at TNI***
		TDG-5 (FAA)	***TDG-6 (FAA)***	
Taxiway Width	75 feet (22.9 meters)	75 feet (22.9 meters)	75 feet (22.9 meters)	75 feet (22.9 meters)
Width of Taxiway Shoulders (each side)	N/A	25 feet (7.6 meters) (12.5 feet [3.8 meters] each side)	35 feet (10.7 meters) (17.5 feet [5.3 meters] each side)	35 feet (10.7 meters) (17.5 feet [5.3 meters] each side)
Taxiway/Taxi Lane Centerline to Parallel Taxiway/Taxi Lane Centerline	237.5 feet (72.4 meters)	267 feet (81 meters)	350 feet (107 meters)	Separation between Taxiways C and D: Approximately 550 feet (168 meters) Separation between Taxiway A and apron edge is more than 900 feet (247 meters).

Legend: FAA = Federal Aviation Administration; N/A = not applicable; TDG = Taxiway Design Group; TNI = Tinian International Airport; UFC = Unified Facilities Criteria.
Sources: Department of Defense 2013, FAA 2012a, AECOM analysis.

Navigation and Lighting Aids

The air transportation activities associated with the proposed action would be conducted at TNI using the existing navigation and lighting aids. However, the operations may be limited to VFR. UFC 2-000-05N (Department of Defense 2013) requires high-intensity runway lights (HIRLs), and recommends runway centerline lights for operating in IFR conditions. TNI is equipped with MIRL instead of HIRL. Should IFR operations at TNI be anticipated, installation of HIRL and runway centerline lights would be recommended.

Aircraft Parking Apron

During the recent Exercise Forager Fury II in 2013, a B737 landed at TNI, and participants deplaned and the aircraft was unloaded on the east side of the main apron during the daytime. The runway, the taxiway system, and the west side of the apron were still operational for civilian activities.

If the transport aircraft would use a portion of the main apron for loading/unloading and/or enplanement/deplanement under the Tinian alternatives, the potential impacts on civilian activities would depend on the number and type of transport aircraft, the duration, and time of day. It is anticipated that the impacts would be insignificant at night when use of the apron for civilian activities is very low and the transport aircraft are parked away from the west side of the apron adjacent to Hangar One, where the base aircraft of Star Marianas Air are parked. If transport aircraft must be parked at the main apron during the day, close coordination with the CPA would be required to minimize the impact on civilian usage. It is likely that a maximum of two airplane design group V transport aircraft (such as B747, with some push back challenges) or three airplane design group IV transport aircraft (such as B767, with some restrictions in maneuvering and sequencing) would be able to park at the same time subject to CPA permission.

During previous exercises with U.S. military aircraft operations at TNI, training and support personnel embarked and debarked and air cargo was loaded and unloaded on parallel Taxiway A adjoining the hard packed area at the west of the airfield as described above and occupied parking area. Some of the loading and unloading activities, especially those operations involving heavy aircraft like B747-400, were performed in the late evening and after sunset when the civil operations at TNI are very low. The main apron in front of the passenger terminal building and Hangar One were not affected.

The concern about using the hard packed area with the transport aircraft parked at the adjacent Taxiway A for loading and unloading is that it would restrict the use of (close) Taxiway A to other aircraft to Runway 08 for departures during east flows and landing aircraft from Runway 26 for arrivals during the west flows. Back taxiing on the runway would be required. Implementing the proposed Taxiway E with the taxiway exit located to the east of the hard packed area would reduce back taxiing.

The level of impact depends on the taxiway occupancy time required for loading and unloading activities. With reference to *Commonwealth of the Northern Mariana Islands Joint Military Training, Unconstrained Training Concept for Tinian and Pagan* (DoN 2014a), the average duration per day per each type of aircraft in the mission area is 45 minutes for the transport fixed wings. Although Freedom Air ceased operation at TNI in March 2014, and no existing scheduled flights are operating at TNI, an assessment was carried out based on the previous schedule of flights for a scenario in which a carrier would resume similar operations as Freedom Air. The historical flight schedule is shown in Table 2.1-3 as a reference representing the activity levels of a regular service provider. In this case, time slots would be available for loading and unloading activities at Taxiway A and the hard packed area under the following conditions:

- If the occupancy time on the ground is around 45 minutes, several time slots would be available between scheduled arrivals or departures during the day.
- If the loading/unloading activities require a few hours, time slots would be available throughout the night.

The impact on scheduled flights, if resumed by any carrier in the future, would be minimal because time slots are available between scheduled flights. If Freedom Air does not resume operation at TNI, and there is no future carrier providing scheduled flights, there would be no impacts on scheduled operations.

Depending on the dominant wind directions (i.e., operating at west flows or east flows), either the arrivals or departures of the other unscheduled civil operations may be delayed should Taxiway A be occupied by a parked U.S. military aircraft for loading and unloading at the hard packed area.

To minimize the possible impacts (in terms of delays) on the unscheduled civilian aircraft, the transport aircraft with bulk delivery and long loading/unloading time could be operated after the normal airport opening hours (i.e., outside 6:00 a.m. to 8:00 p.m). Otherwise, the proposed action may consider adding a new aircraft parking apron outside the existing taxiway object free area with connecting taxiways.

In summary, there are three possible locations for parking the transport aircraft:

- East portion of the main apron (with limitations and potential impacts)
- Parallel Taxiway A and adjacent to the hard pack area (with limitations and potential impacts)
- New aircraft parking apron with associated taxiways for military use

Commonwealth of the Northern Mariana Islands Joint Military Training, Unconstrained Training Concept for Tinian and Pagan (DoN 2014a) indicates that airport ramp space is proposed north of the TNI runway. This improvement would support the administrative movement of personnel and cargo to and from TNI via aviation platforms such as C-130 and C-17 aircraft.

3.1.3.3 Commercial Terminal Facility Requirements

Passenger Terminal

As mentioned above, if TNI is the first port of entry to the U.S. for the foreign allies or participants from overseas military facilities, clearance for immigration, customs, and quarantine control would be carried out at designated staging areas separate from the existing airport terminal facilities. Therefore, no additional requirement for customs, immigration, or quarantine facilities would be needed at the existing passenger terminal.

Personnel of the proposed action would enplane and deplane at TNI separate from civilian passengers and would be bused to/from base camp in designated vehicles. It is anticipated that personnel would not be processed in the existing passenger terminal. No additional requirement for passenger processing in the existing passenger terminal is anticipated. A potential exception would be the pre-deployment and post-deployment personnel, depending on the mode of travel they take to and from Tinian. These are relatively small numbers of individuals.

3.1.3.4 General Aviation Requirements

It is anticipated that the transportation of personnel, gear, and equipment would not have a significant impact on the existing facilities for general aviation activities, including Hangar One, the adjacent apron area, and the access road to Hangar One.

3.1.3.5 Airport Support Facility Requirements

Aviation Fuel Facilities

Public fuel service is not available at TNI. The CEDS recommended a fuel farm that can accommodate various types of aircraft flying direct from Asia to TNI. The CEDS considered that the refueling facility at TNI would also potentially help reduce the cost of aviation fuel and facilitate travel (CEDS 2009).

Recent military exercises on Tinian included the establishment of a rapid ground refueling system at TNI. This expeditionary fuel distribution system used fuel bladders and pumps (Photo 3.1-1) at the hot refueling area as shown in Figure 2.1-9.

Photo 3.1-1. Temporary Ground Refueling System at Tinian International Airport
Source: DVIDS 2012a.

Expeditionary ground refueling would be accomplished by aviation ground units manning proposed aviation ground support facilities at TNI, at an expeditionary forward arming and refueling point located on Tinian's North Field and the existing area as depicted in Figure 2.1-8.

The U.S. military bulk fuel storage area would be located in the northwest corner of TNI, adjacent to 8th Avenue, and outside the airport boundary. It is anticipated that should air resupply be required via TNI, tank trucks would be used for the delivery from the airport to the bulk fuel storage area.

For the end state operations, bulk fuel storage would be established at the airport, which would be a separate facility from the one at the port.

Aircraft Rescue and Firefighting

ARFF services are required for airports that require certification under CFR Title 14 Part 139 (FAA 2013h). Part 139 certification is for airports providing scheduled passenger service with greater than nine passenger seats. TNI is a Class I airport certification and meets the ARFF Index A requirements (FAA 2013h). The index group is determined by the longest air carrier with five or more average daily departures at an airport. Index A includes air carriers less than 90 feet (27 meters) long. The largest scheduled air carrier in the historical fleet mix is Short 360, which is approximately 71 feet (22 meters) long.

It is anticipated that the largest fixed-wing transport aircraft for regular delivery of personnel and equipment would be the C-17 (174 feet [53 meters] long). Based on previous exercises on Tinian, B747-400 aircraft (232 feet [71 meters] long) may also be used to deliver gear and equipment. However, the operations for these transport aircraft would be low. With reference to the estimated annual operations listed in Table 3.1-11, the operations for the transport fixed-wing aircraft would be approximately 200 per year, which would be less than 5 average daily departures based on a 20-week annual training occupancy. No increase in ARFF index for TNI would be required.

Any additional ARFF vehicles, such as a P-19 with 1,000-gallon (3,785-liter) capacity, if required for the training exercises and to support the hot refueling area for the training period, would need to be provided by the U.S military and accounted for under the proposed action. Additional training is required for ARFF personnel would also need to be provided by the U.S. military.

3.1.3.6 Airport Security

The existing airport security fence is 6 feet (1.8 meters) high, with 1 foot (0.3 meter) of barbed wire on the top. It is recommended to modify the security fence to a height of 7 feet (2.1 meters) with three strands of barbed wire on a single extension arm, which would have a minimum 6-inch (15-centimeter) separation between strands and extend outward at a 45-degree angle from the horizontal. This recommendation is further described and analyzed in the separate *CJMT Security Study* (DoN 2014c).

If any additional landside access to the airfield is required, additional security gates and modification of existing airport boundary fence may be required.

3.1.3.7 Summary of Airport Facility Requirements

Based on the airfield demand/capacity analysis described above, TNI would not experience airfield capacity (operational) constraints with the additional air transportation demand under the proposed action.

No additional runway pavement or strengthening of existing pavement is anticipated. The existing runway length at TNI would be sufficient to accommodate the fleet mix with reduced MTOW (i.e., limited allowable gross weight) for B747-400, C-17, and C-130 aircraft.

The following improvements and new facilities for air transportation are recommended:

- Install runway centerline lights.
- Replace the MIRLs with HIRLs.
- Construct a new aircraft parking apron and associated taxiway.
- Modify the security fence to 7 feet (2.1 meters) high with three strands of barbed wire on a single extension arm.

In addition, the following specific improvements required for envisioned military training on Tinian are identified in the *Unconstrained Training Concept for Tinian and Pagan* (DoN 2014a) and the airport laydown plans for expeditionary operations and end state operations. They are listed below for easy reference.

For the expeditionary operations:

- Combat aircraft loading area for loading aviation ordnance
- Hot cargo pads for munitions staging and equipment
- Aviation ordnance arm and dearm pad
- Helicopter landing pad (Landing helicopter dock pad)
- Field carrier landing practice area (Concrete pad for arresting gear)
- Landing signal officer’s shack (a movable unit)
- Refueling area (aircraft parking locations for refueling while the aircraft is operating, including expeditionary fuel bladders)
- A biosecurity quarantine protocol would be developed for aircraft transporting military equipment and personnel arriving and departing Tinian

Additional for the end state operations:

- Airport Traffic Control tower
- Medium intensity approach lighting system
- Hazardous cargo pad (expanded from the hot cargo pad in the expeditionary state)
- Aviation ordnance arm and dearm pads (relocated and expanded from the aviation ordnance arm and dearm pad in the expeditionary state)
- Aviation bulk fuel storage (a separate facility from a bulk fuel storage near the port)
- Hot fuel pits (at the same location as the expeditionary fuel bladders in the expeditionary state)
- Hangars and maintenance building
- Vertical/Short takeoff Landing / Optical Landing System
- Localizer
- Glideslope
- Tactical Air Navigation System (TACAN)
- Full parallel military taxiway

A communication tower at the base camp is identified in the preliminary analysis as potential obstruction to air navigation with height greater than the Part 77 imaginary surfaces. Under CFR Title 14 FAR Part 77 Subpart B, FAA Form 7460-1, *Notice of Proposed Construction or Alternation,* must be filed before construction. The notice to the FAA must be submitted on or before an application for a license from the Federal Communications Commission is submitted, if applicable. The FAA will conduct an aeronautical study to determine whether the aeronautical effects of the proposed construction would constitute a hazard to air navigation.

3.1.4 Marine Transportation—Tinian

3.1.4.1 Future Baseline Conditions

No significant change in the baseline (non-action-related) level of port use is predicted. Recent levels of port use (in fiscal years 2009 and 2010) were lower than use levels in previous years (Table 2.1-4), likely because of the downturn in the global economy.

3.1.4.2 Project-Generated Travel Demand

Use of the Port of Tinian to import required cargo and personnel to Tinian would be required to transport the initial equipment and materials to establish the training ranges and required supporting facilities. U.S. military and support personnel would be transported by marine or air transport. For this study, the largest demand at any given time was used for consideration of the layout and development of supporting facilities for port operations. The estimated number of trainees in transit at any one time is 1,500; it is anticipated that the trainees will be transported via air or sealift by Joint High Speed Vessel (JHSV). The JHSVs would be dedicated for both personnel and equipment transportation transiting between the CNMI and Guam. Transportation of training units, support personnel, and equipment to and from Tinian could include commercial and military shipping such as barges, a ferry, a high-speed vessel, military amphibious ships, or Military Sealift Command platforms.

In addition to JHSVs, this study also considers transient ships arriving at the Port of Tinian, including the two variants of the littoral combat ship, high-speed vessel, and U.S. Coast Guard ships. Should deep draft ships need to berth at Tinian, a mooring buoy and marine terminal approximately 3,000 feet (915 meters) off the west coast of the island, just south of Tinian International Airport, in an area referred to as Turtle Cove could be considered. Lighterage and connected vessels (such as AAVs and JHSVs) could be used to transport cargo and personnel between deep draft ships and the Port of Tinian. Dredging of the harbor entrance could also be done to allow larger vessels access to the port.

Given the relatively low baseline use of the Port of Tinian, port capacity would be expected to be able to accommodate vessel trips to transport equipment, materials, and personnel at the beginning and end of each 2-week training cycle. AAVs could use the old concrete boat ramp located in the northern part of Port of Tinian. New ramps specifically for disembarkation and recovery of the AAVs may be constructed as either a part of the reconstructed finger piers or adjacent to the existing ramp.

Because of the current low level of commercial and public use, military use of the port during embarkation and debarkation would be accommodated with minimal disruption to commercial use of the main wharf or the public's use of the public dock and boat ramps. Military activities would result in additional marine traffic within the harbor and open waters outside the harbor. However, a minimal impact is predicted.

New construction at the port for the proposed action would handle the demands of the proposed action. These facilities would include vehicle wash down capabilities, cargo inspection and holding areas, and a bulk fuel storage facility to handle aviation fuel. Fuel would be transported by truck to the bulk fuel storage area planned at the base camp area. Official requirements for port facilities have not been developed at this time.

3.1.4.3 Project-Generated Restriction of Open Waters

Danger Zones (DZs) and restricted areas would be established as part of the ranges in the proposed action. Access to open water within the DZs and below the restricted airspace (R-7203 North, West, East, and South for the public and for other military units [Figure 3.1-12]) would be closed to vessels on a full-time or intermittent basis, depending on training requirements. Potential safety hazards from presence of non-participating vessels in areas of military training requires limiting public access to the DZ. Additional restricted areas may be required to allow U.S. military activities to proceed while assuring public safety. The Range Control facility, situated within the base camp headquarters, would survey the range for any vessels in the restricted area before and during use. This information would be communicated to personnel involved in training to maximize safety for the public and for other military units. Procedures would be implemented to prevent vessels from entering the restricted areas. If a vessel inadvertently enters a restricted area, Range Control would interrupt the training process so that the vessel would be cleared and training could resume.

The DZs could interfere with marine traffic patterns. The proposed DZs extend approximately 3 miles (6 kilometers) off the west coast of Tinian and could affect the usual route of vessels to and from Saipan. Vessels would either have to detour around the DZ or schedule their passage to avoid the closures.

3.1.4.4 Construction Conditions

All vessels associated with the construction and operations of the ranges and supporting facilities would use the main wharf at Tinian's commercial pier or the mooring buoy located off of Turtle Cove, north of the Port of Tinian. AAVs (to transfer cargo and passengers from larger-draft vessels at the mooring buoy) would use the boat ramp.

3.1.4.5 Deficiencies/Requirements

Quantitative data on the required port uses have yet to be determined. A structural study on the Tinian main wharf is part of the planning effort for the proposed action but has not yet begun. This study would determine both the structural capacity of the wharf and requirements for any proposed repair of degraded sections of the wharf or finger piers. The analysis, results, and recommendations may have a bearing on the conclusions to marine transportation. The severity of the impact of the closed DZs is dependent on the frequency and length of closures, which have not been determined.

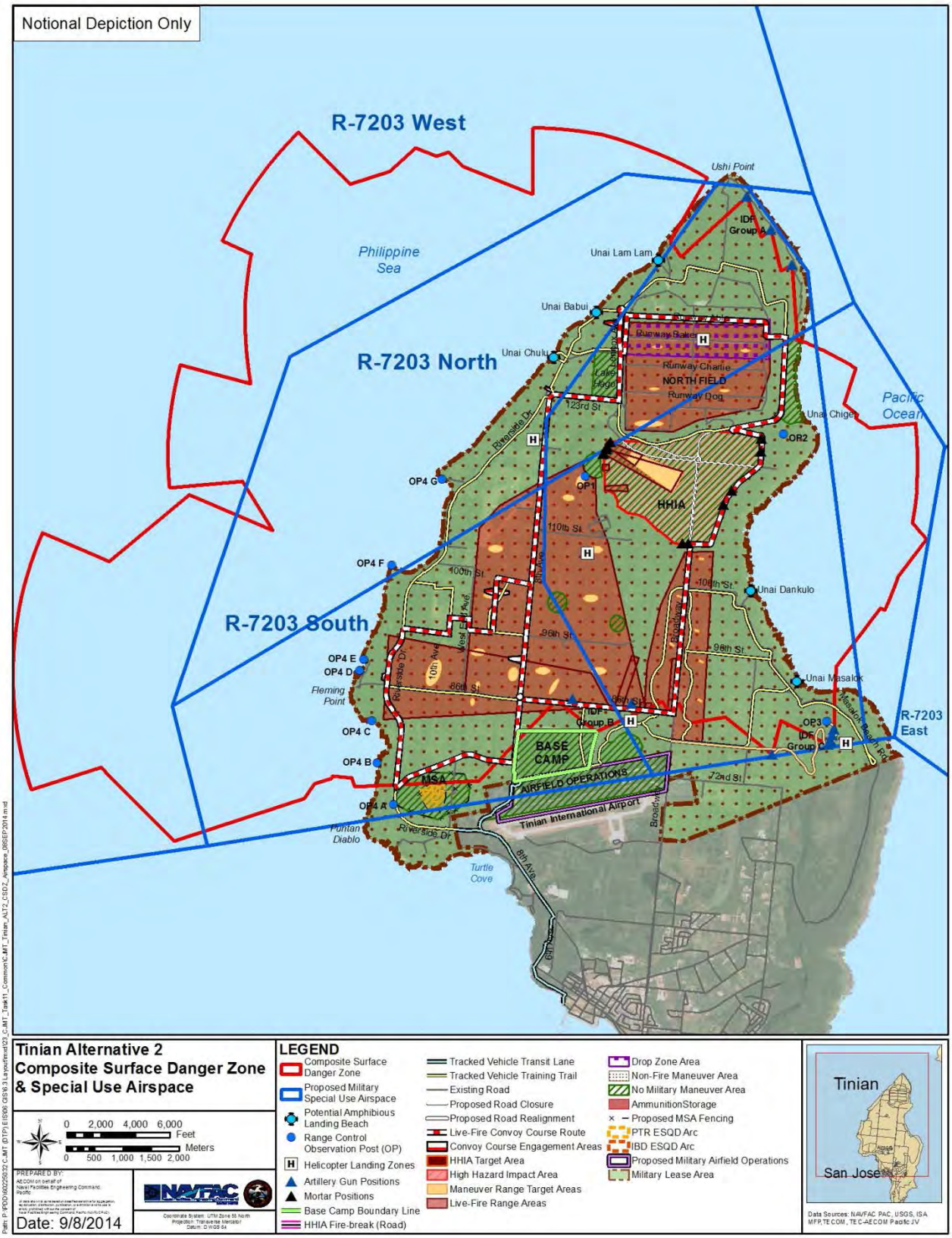


Figure 3.1-12. Tinian Alternative 2 Composite Surface Danger Zone & Special Use Airspace
Source: DoN 2014b.

3.2 PAGAN COMBINED LEVEL TRAINING

The proposed action is based on a 16-weeks-per-year training tempo for Pagan. There is the potential for the training tempo to be ramped up to 40 weeks per year in the future. Should that occur, a breakwater and pier, not included in the currently proposed actions, would be constructed. This training tempo is being evaluated in the CJMT Environmental Impact Statement/Overseas Environmental Impact Statement under cumulative impacts. Because the transportation requirements are essentially based on peak usage, the number of weeks that training would occur would have little effect on air and ground transportation requirements or impacts, besides wear and tear that would result in increased need for maintenance. Thus, there would be little difference in the transportation analysis between the two training tempos, and the longer tempos are used as the basis of this analysis. Selection of the higher training tempo would have a positive effect on marine transportation, due to the construction of a pier and breakwater, which would increase transportation capacity and allow for docking of additional vessel types and transfer of roll-on/roll-off cargo and equipment onshore.

Two RTA alternatives were developed for combined level training on Pagan to meet the unfilled training requirements presented in *Commonwealth of the Northern Mariana Islands Joint Military Training, Description of Proposed Action and Alternatives*, Section 1.2, *Background* (DoN 2014b, Table 1-1). Training on Pagan is envisioned to be expeditionary in nature. Only those infrastructure improvements required to support transportation of training personnel and their immediate logistical requirements would be considered for implementation. At a minimum, repairs and improvements to Pagan's transportation infrastructure are required to support the anticipated logistical demands. Improvements include establishment of an expeditionary bivouac area, rehabilitation to the airfield, and construction of military training trails (Figure 3.2-1 and Figure 3.2-2). Pagan Alternative 1 was chosen as the representative combined level alternative for this analysis and is depicted in Figure 3.2-3.

3.2.1 Ground Transportation – Pagan

3.2.1.1 Future Baseline Conditions

There were no reported permanent residents on Pagan in 2010 (U.S. Census Bureau 2010). No organic population or employment growth is expected to occur on Pagan with or without implementation of the proposed action. Under future-year baseline conditions, the projected average daily traffic volumes would be the same as existing volumes (i.e., negligible).

There are no funded, approved, pending, nor reasonably foreseeable transportation improvement projects on Pagan. Under future-year baseline conditions, the all-terrain-vehicle pathway would be the same as the existing pathway.

3.2.1.2 Proposed Action Conditions

The maximum estimated number of military personnel using the live-fire and maneuver ranges and training areas at any one time could surge to 4,000 personnel during large-force exercises on Pagan. A minimum of 30 people would be present for a Special Operations event. As on Tinian, personnel would arrive and depart via sea transport (e.g., high-speed vessel) and aircraft (CH-53, MV-22, and C-130). All units would arrive (and depart) with the vehicles and equipment required to conduct training exercises.

The types of vehicles and equipment that would be used on Pagan would be similar to those used on Tinian, as described in Section 3.1.1.2, *Proposed Action Conditions,* and in Table 3.1-2. The types and amounts of vehicles and equipment required would vary depending on the training activities being conducted.

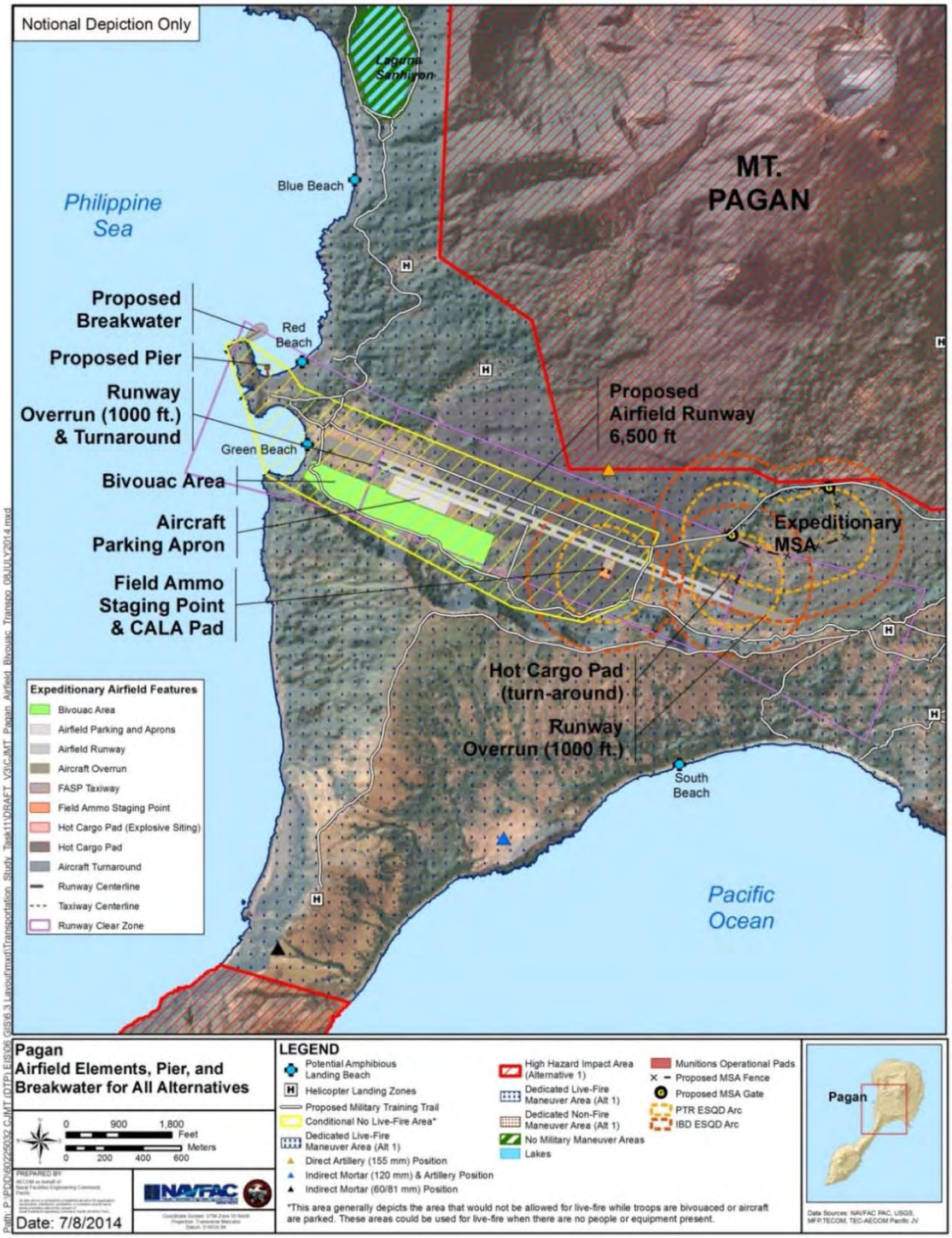


Figure 3.2-1. Pagan Airfield Elements, Pier, and Breakwater for All Alternatives[6]
Source: DoN 2014.

[6] Pier and Breakwater depicted are not part of this proposed action.

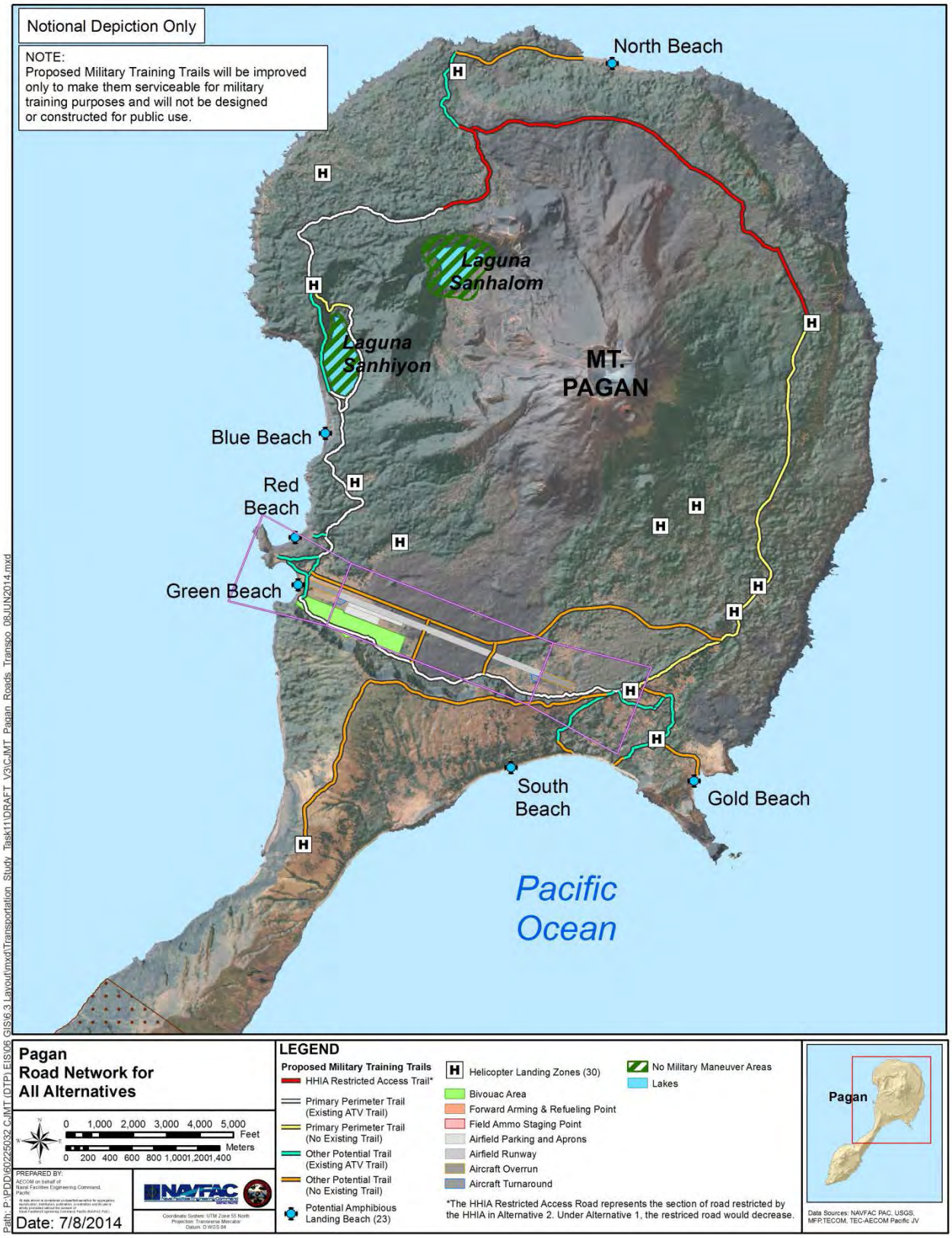


Figure 3.2-2. Pagan Road Network for All Alternatives
Source: DoN 2014.

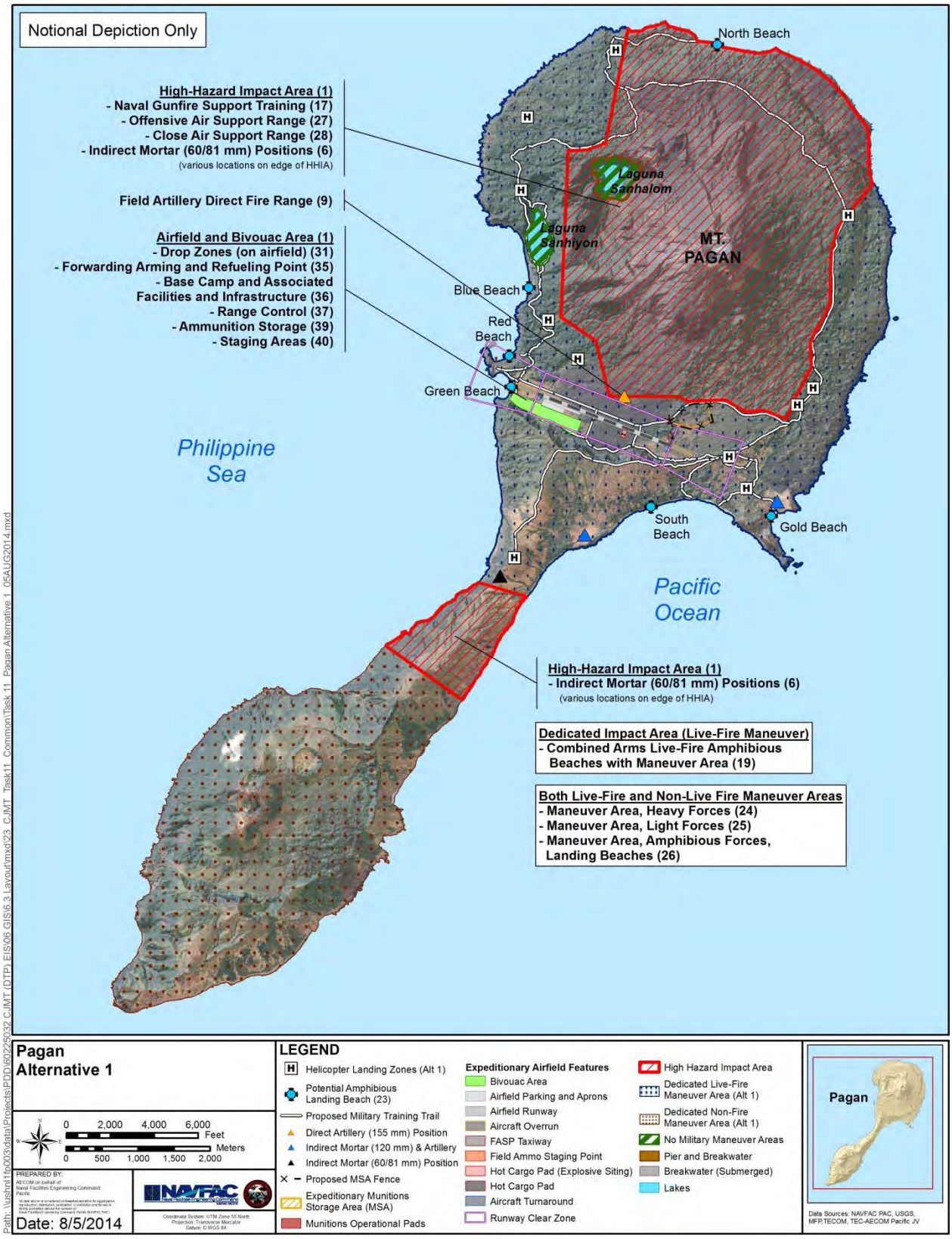


Figure 3.2-3. Pagan Alternative 1
Source: DoN 2014.

Much of the island is not accessible to ground transportation and is challenging to traverse on foot because of its severe slopes. Additionally, the shoreline, except for the beaches, is devoid of access areas that could support basic logistical movements. Given these restrictions, there are three major transit corridors (starting from the landing strip), that could support ground movement:

- Clockwise rotation, heading north to the northwest tip of the island
- Counterclockwise rotation, heading east and then north until reaching the High Hazard Impact Area
- South, heading east, and then due south along the isthmus

Beach egress would lead to perimeter military training trails to facilitate access to inland training areas. Amphibious forces would maneuver from naval platforms via water or air to various locations on Pagan, predicated on the training exercise design. The central area of Pagan provides a maneuver area for heavy forces training requirements.

Vehicles would move along the established military training trails and existing all-terrain vehicle pathway as well as other terrain that they could safely navigate (excluding no maneuver areas). All trafficable portions of Pagan provide maneuver areas for the light forces training requirement. Access to all-terrain vehicle pathways or trails and areas within the High Hazard Impact Area would be restricted. Because there is currently no road system or traffic on Pagan, there would be no impacts on traffic circulation or roadway LOS with the proposed action.

Roadway Improvements

A 22-mile (35-kilometer) gravel military training trail system is planned around the perimeter of the northern half of Pagan that would connect the expeditionary bivouac area and airfield to the North Range Complex. Approximately 6 miles (10 kilometers) of this system would utilize existing all-terrain vehicle trails. The existing trails would be cleared, widened, stabilized, and improved. The other half of the perimeter military training trail system would be established over terrain where no trails exist. On Pagan, the term "road" is not applicable, as the vehicular travel paths would not be constructed like a traditional road, but rather corridors would be cleared by military personnel for vehicular maneuvering and mobility.

Training activities would require the use of the planned military training trail shown in Figure 3.2-2. Vehicles would utilize the planned military training trail and existing all-terrain-vehicle pathways and other safely navigable terrain (excluding no maneuver areas). Access to all-terrain vehicle pathways or trails and areas within the High Hazard Impact Area would be restricted and these pathways would not be maintained.

Construction

During training activities, personnel would conduct the following improvements to provide military training trails: vegetation clearing, terrain cutting/filling, lava removal/compaction, and soil compaction. Some heavy equipment, including tractors, dump trucks, and backhoe loaders, would be required during construction of the proposed military training trail network. Because there is currently no road system or traffic on Pagan, there would be no construction impacts on traffic circulation or roadway LOS.

3.2.2 Air Transportation Demand – Pagan

3.2.2.1 Methodology for the Aviation Demand Forecast for the Pagan Airstrip

This air transportation study adopts the existing record of based aircraft and annual operations from FAA Form 5010, Airport Master Record, and the forecast growth rate from the 2013 FAA TAF at the Pagan

Airstrip (TT01) (FAA 2014) as the baseline. Forecast aviation demand for the proposed action is estimated from the annual number of events for different aircraft type within Pagan's restricted area (R-7204) as presented in *Commonwealth of the Northern Mariana Islands Joint Military Training, Unconstrained Training Concept for Tinian and Pagan* (DoN 2014a). Three scenarios – low, medium, and high – are projected in the analysis of forecast aviation demand. The combined forecast demand for the proposed action is the sum of the baseline aviation demand and the aviation demand associated with the proposed action. The estimated aviation demands are the same for both Pagan alternatives.

3.2.2.2 Existing Aviation Demand at the Pagan Airstrip

The existing numbers of based aircraft and annual operations at TT01 are recorded on FAA Form 5010, Airport Master Record (FAA 2014), and FAA TAF (FAA 2013f), and they are listed in Table 3.2-1.

Table 3.2-1. Existing Operations at the Pagan Airstrip

Period	***Based Aircraft***	***Annual Operations***								
	Total	***Itinerant Operations***					***Local Operations***			***Total Operations***
		Air Carrier	***Air Taxi & Commuter***	***General Aviation***	***U.S. Military***	***Total Itinerant***	***Civil***	***U.S. Military***	***Total Local***	
1980	0	0	190	50	0	240	0	0	0	240
2004	0	0	24 (Bell 206)	0	0	24	0	0	0	24
2005	0	0	12 (Bell 206) 6 (Cessna)	0	0	18	0	0	0	18
2006	0	0	14 (Bell 206) 2 (Cessna)	0	0	16	0	0	0	16
2007 [a] (Jan to Oct)	0	0	8 (Bell 206) 2 (Cessna)	0	[a]	10	0	0	0	10

Note:
[a] One of the flights (two operations) within the five recorded flights (10 operations), either by Bell 206 or Cessna, was for the U.S. military.
Legend: U.S. = United States.
Sources: FAA 2013f, 2014; CPA 2008.

The existing operations recorded on FAA Form 5010, Airport Master Record, were based on the counts for a 12-month period ending September 1980. A more recent record was found in the Pagan Airstrip Master Plan, which reported 5–12 annual flights or 10–24 annual operations (each flight includes 2 operations) from 2004 to 2007 by chartered helicopter (Bell 206) and fixed-wing aircraft (Cessna) (CPA 2008); these are listed in Table 3.2-1. The average of the most recent records from the Pagan Airstrip Master Plan is adopted as the baseline in the analysis.

3.2.2.3 Forecast Aviation Demand for the Pagan Airstrip

Baseline Forecast (Without the Pagan Alternatives)

The year-over-year growth rate estimated by the FAA TAF for the number of based aircraft and annual operations for TT01 is 0% (FAA 2013f). The baseline forecast for based aircraft and annual operations at TT01 from 2014 to 2040 without the Pagan Alternative is presented in Table 3.2-2.

Table 3.2-2. Baseline Forecast at Pagan Airstrip

Period	*Based Aircraft*	*Annual Operations*								
	Total	*Itinerant Operations*					*Local Operations*			*Total Operations*
		Air Carrier	*Air Taxi & Commuter*	*General Aviation*	*U.S. Military*	*Total Itinerant*	*Civil*	*U.S. Military*	*Total Local*	
2014–2040	0	0	17	0	0	17	0	0	0	17

Legend: U.S. = United States.
Sources: FAA 2013f, 2014; CPA 2008.

Air Transportation Demand for the Pagan Alternatives

Pagan is anticipated to be used for training 16 weeks per year. The training is envisioned to be expeditionary in nature. Only those infrastructure improvements required to support transportation of training personnel and their immediate logistical requirements would be undertaken. No permanent personnel would be assigned to Pagan (DoN 2014a).

Transportation of personnel and equipment to Pagan by air is only the secondary mode of transportation. The joint high-speed vessel is considered the primary mode (DoN 2014a).

Marine fixed-wing aircraft (KC-130) and Air Force Air Mobility Command C-17, C-130, rotary-wing (CH-53) and tilt-rotor aircraft (MV-22) from ships may provide personnel and equipment lift to Pagan.

The estimated annual aircraft operations in the SUA in Pagan's restricted area for the 16 weeks a year expeditionary operations are presented in Table 3.2-3 (DoN 2014a). The estimated annual aircraft sorties for the 40 weeks a year end state operations is shown in Table 3.2-4.

Table 3.2-3. Estimated Annual Joint Aircraft Operations in Special Use Airspace – Pagan (16 weeks a year expeditionary operations)

Aircraft Type (example)	*Annual No. of Operations*	*Average Minutes/Mission (per single type aircraft)*
		In Mission Area
Tinian R-7204 and W-14		
Fighter (F-18/F-16/ F-35)	2,350	45
Transport Tilt-Rotor (MV-22)	100	45
Transport Rotary Wing (CH-53)	360	25
Attack Helicopter (AH-1/H-60)	160	30
Transport Fixed Wing (C-130)	900	45
Unmanned (RQ-7B Shadow)	200	240

Legend: No. = number.
Source: Personal Communication between Jon Miclot and Greg Dorn, August 27 2014

Table 3.2-4. Estimated Annual Aircraft Sorties – Pagan (40 weeks a year end state operations)

Type of Sorties	*Annual No. of Sorties*	*Estimated Annual No. of Operations*
Tactical Fighter Wing sorties	2,950	5,900
Transport & Aerial Refueling sorties	1,500	3,000
Tilt-Rotor sorties	300	600
Tactical Rotary Wing sorties	160	320
Assault Support sorties	360	720
Estimated Total Annual Operations (40-week)		10,540

Source: Personal Communication between Jon Miclot and Greg Dorn, August 27 2014

In the estimated SUA usage shown in Table 3.2-3, the use of TT01 would be expected for events identified in Pagan's restricted area that involve transport aircraft, unmanned aircraft, some of the fighters, and attack helicopters. Based on Version 4 of the *Description of Proposed Action and Alternatives*, the ground-based control for the unmanned aircraft systems would be established near the improved runway (DoN 2014b).

Three scenarios were analyzed based on 16 weeks a year expeditionary operations if the runway is repaired. The high scenario assumes that all of the events estimated would involve landings and takeoffs at TT01. The medium scenario assumes that 50% of the fighter (such as AV-8 or F-35) and attack helicopter events would require landings and takeoffs at TT01. The low scenario assumes that 25% of the fighter (such as AV-8 or F-35) and attack helicopter events would involve landings and takeoffs at TT01. All three scenarios assume that the events involving transport aircraft and unmanned aircraft would require landings and takeoffs at TT01 and that each event would include two operations (i.e., arrival and departure). It is also assumed that approximately 10 operations for transport tilt-rotor and rotary wing for the no-action alternative. The increases in annual operations at TT01 for the three scenarios are estimated and presented in Table 3.2-5, approximately 2,188 to 4,070 operations.

Table 3.2-5. Proposed Action Aviation Demand Forecast at Pagan Airstrip (16 weeks a year expeditionary operations)

Aircraft Type (example)	*No-Action Alternative*	*Pagan Alternatives*		
		Low Scenario	*Medium Scenario*	*High Scenario*
Fighter	0	588	1175	2,350
Transport Tilt-Rotor	10	100	100	100
Transport Rotary Wing	10	360	360	360
Attack Helicopter	0	40	80	160
Transport Fixed Wing	0	900	900	900
Unmanned	0	200	200	200
Total	20	2,188	2,815	4,070

Note: This table represents additional annual demand over existing uses.
Source: AECOM analysis.

For the 40 weeks a year end state operations, it is assumed that each sortie includes two operations (arrival and departure). If all the estimated aircraft sorties will operate at TT01, the increase in annual operations would be approximately 10,540 operations.

No military aircraft are proposed to be based at TT01. All increases in annual operations would be itinerant U.S. military operations.

If TT01 would be the first port of entry to the U.S. for any foreign allies or participants from overseas military facilities, coordination among the Department of Defense, Department of Homeland Security, and CNMI Customs Services would be accomplished.

Combined Forecast Aviation Demand for TT01

The combined forecast aviation demand is the sum of the baseline aviation demand as shown in Table 3.2-2 and the forecast aviation demand associated with the Pagan alternatives as shown in Table 3.2-5.

The estimated combined forecast aviation demand is presented in Table 3.2-6, approximately between 2,205 and 4,084 operations.

Table 3.2-6. Estimated Combined Forecast Aviation Demand at the Pagan Airstrip

Annual Operations										
Forecast	*Itinerant Operations*					*Local Operations*			*Total*	*Total Percentage Increase*
	Air Carrier	*Air Taxi & Commuter*	*GA*	*U.S. Military*	*Total Itinerant*	*Civil*	*U.S. Military*	*Total Local*		
No-Action Alternative										
Baseline	0	17	0	20	17	0	0	0	37	118%
Pagan Alternatives										
Low Scenario	0	17	0	2,188	2,205	0	0	0	2,205	12,870%
Medium Scenario	0	17	0	2,815	2,832	0	0	0	2,832	16,560%
High Scenario	0	17	0	4,070	4,087	0	0	0	4,087	23, 940%

Legend: GA = General Aviation.
Sources: FAA 2013f, CPA 2008, DoN 2014a, AECOM analysis.

For the 40 weeks a year end state operations, if all the estimated annual aircraft sorties will involve takeoffs and landings at TT01, the total annual operations will be approximately 10,557 operations.

3.2.3 Air Transportation Facility Requirements – Pagan

3.2.3.1 Airfield Requirements

Based on the forecast aviation demand estimated in Section 3.2.2.3, airfield demand/capacity has been analyzed to determine the ability of TT01 to accommodate the projected activity levels with the implementation of the proposed action and to identify the additional airport facilities, if required.

TT01 is currently a civilian airport and would be located within a planned restricted area, R-7204, under the Pagan alternatives. The restricted area contains airspace within which the flight of aircraft is subject to restrictions. It denotes the existence of unusual, often invisible hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. A specific controlling agency or contact facility would be assigned for restricted area R-7204. If R-7204 would be a joint-use restricted airspace, the air traffic control facilities would apply the following procedures:

- If the restricted area is not active and has been released to the controlling agency, the air traffic control facility would allow the aircraft to operate in the restricted airspace without issuing specific clearance for it to do so.
- If the restricted area is active and has not been released to the controlling agency, the air traffic control facility would issue a clearance to ensure that the aircraft would avoid the restricted airspace, unless it is on an approved altitude reservation mission or has obtained its own permission to operate in the airspace and so informs the controlling facility.

If R-7204 is a non-joint-use airspace, the air traffic control facility would issue a clearance to ensure that the aircraft would avoid the restricted airspace, unless it is on an approved altitude reservation mission or has obtained its own permission to operate in the airspace and so informs the controlling facility (FAA 2012b).

It is assumed that the planned restricted area R-7204 would be a joint-use airspace that would be active during the training on Pagan (around 16 weeks per year) and would be inactive for the remaining duration. This assumption allows more flexibility for airstrip operation than the non-joint-use airspace, and allows some civilian usage when there is no training on Pagan.

Similarly, it is assumed that TT01 would be a joint-use facility under the Pagan alternatives. The methodology for the demand/capacity analysis and facility requirements for TT01 is similar to the one adopted for TNI as a joint-use facility.

Airfield Demand/Capacity Analysis

The capacity and delay calculations for TT01 include the following default settings and assumptions:

- *Runway-Use Configuration:* It is assumed that at least 80% of the time, the airport is operated with the runway-use configuration that produces the greatest hourly capacity. Because TT01 has only one runway-use configuration (i.e., a single-runway configuration), this assumption is applicable.
- *IFR Weather Conditions:* The model assumes that IFR weather conditions occur roughly 10% of the time. No historical record of visibility is available for Pagan; however, this default setting is a conservative assumption considering the historical visibility at the nearby TNI as discussed previously, which is well above the VFR visibility minimums (1.0 mile [1.6 kilometers] in the daytime for Class G airspace).
- *Percent Arrivals:* The model assumes that arrivals equal departures.
- *Percent Touch-and-Go Operations:* Most activity at TT01 is for air taxis and itinerant general aviation. It is estimated that the percent of touch-and-go operations would be minimal and insignificant.
- *Taxiways:* The model assumes a full-length parallel taxiway, ample runway entrance/exit taxiways, and no taxiway crossing problems. TT01 does not have parallel taxiways or taxiway exits. With reference to Figure 3-3 of FAA AC150/5060-5, the capacity estimated by the model is reduced by 20% for a conservative estimate to reflect the lack of a taxiway exit.
- *Runway Instrumentation:* The model assumes that the airport has at least one runway equipped with an ILS and has the necessary air traffic control facilities and services to carry out operations in a radar environment. TT01 does not have an ILS at present. For a conservative estimate, the capacity estimated by the model is reduced by 20% to reflect the lack of an ILS.

The assumptions for the fleet mix are similar to those for TNI as discussed in Section 3.1.1.3, except that the heavy aircraft would be C-17 without B747-400.

The input data for the calculations used in the airfield demand/capacity analysis and the results are summarized in Table 3.2-7.

Table 3.2-7. Airport Capacity and Delay – Pagan

Characteristic Description	Input Data
C = Percent of airplanes of more than 12,500 pounds (5,700 kilograms) but not of more than 300,000 pounds (136,100 kilograms)	75.1 to 84.1
D = Percent of airplanes of more than 300,000 pounds (136,100 kilograms)	11.6 to 22.4
Mix Index (C+3D)	119 to 143
	Between 121 to 180
Target level of annual operations	
Low Scenario	2,205
Medium Scenario	2,832
High Scenario	4,087
Output Data	
Runway-Use Configuration	Sketch No. 1 of Figure 2-1, AC 150/5060-5, for a single-runway configuration
Annual Service Volume	153,600
Capacity (operations/hour)	
VFR	39
IFR	38
Percentage of Annual Operations to Annual Service Volume	
Low Scenario	1.4%
Medium Scenario	1.9%
High Scenario	2.7%
Average Range Delay per Aircraft (minutes) [(1)]	
Low	Negligible
High	Negligible

Note: 1. In estimating the average delay per aircraft using Figure 2-2 in Federal Aviation Administration Advisory Circular 150/5060-5, the predominant operations are assumed to be general aviation instead of air carrier for a conservative estimate.
Legend: IFR = Instrument Flight Rules; VFR = Visual Flight Rules.
Sources: FAA 1983, AECOM analysis.

The FAA recommends a detailed planning analysis for airfield enhancements when annual operations reach 60% of the ASV (FAA 2000) and implementation of the enhancements when annual operations approach 80% of the ASV (FAA 2007a). The existing airfield capacity of TT01 is approximately 153,600 ASV, with VFR hourly capacity of 39 operations and IFR hourly capacity of 38 operations. The estimated annual operations for the 16 weeks a year expeditionary operations would reach approximately 1.4% to 2.7% of the ASV for the three scenarios. The estimated demand levels are well below TT01's capacity. Even during the 40 weeks a year end state operations, the estimated annual operations would reach approximately 6.9% of the ASV and are still below TT01's capacity.

Although changes in the assumptions could affect the capacity estimates, no substantial change is anticipated at this time. As shown in Table 3.2-7, the margin between the demand and capacity is sufficient to conclude that TT01 would not experience an airfield capacity constraint with the additional air transportation anticipated under the Pagan alternatives.

Representative Fleet Mix

The existing critical design aircraft defined in the Pagan Airstrip Master Plan for TT01 is Piper PA-31 (CPA 2008).

With reference to the forecast annual operations for transport fixed-wing aircraft shown in Table 3.2-5, the annual operations for large and heavy transport aircraft, such as C-130 or C-17, would be less than 500 per year at TT01. No change in critical aircraft for TT01 is anticipated for the air transportation demand.

Although the use of C-130 or C-17 aircraft would not change the critical aircraft for TT01, an analysis of the facilities requirements for the models of aircraft that would generally represent operations at TT01 under the proposed action was conducted to identify whether any additional facilities are required.

The representative fleet mix for transportation of personnel, gear, and equipment, and the fighter aircraft that may operate at TT01 under the proposed action is summarized in Table 3.2-8.

Table 3.2-8. Representative Fleet Mix – Pagan

Aircraft Type	*Wingspan/Rotor Diameter (feet [meters])*	*Length (feet [meters])*	*Tail Height (feet [meters])*	*Runway Classification based on UFC*	*Runway Design Code based on FAA AC*	*Taxiway Design Group based on FAA AC*
Transport Fixed Wing						
C-130	132.6 [40.4]	97.8 [29.8]	38.1 [11.6]	Class B	C/D-IV	3
C-17	170.0 [51.8]	174.0 [53.0]	55.1 [16.8]	Class B	C/D-IV	5
Fighter						
F-18	40.4 [12.3]	56.0 [17.1]	15.3 [4.7]	Class B	C/D-I	1
Transport Tilt-Rotor						
MV-22	45.7 [13.9]	57.3 [17.5]	22.1 [6.7]	Class A	—	—
Transport Rotary Wing						
CH-53	79.0 [24.1]	99.0 [30.2]	28.3 [8.6]	—	—	—
MH-60S	54.0 [16.5]	65.0 [19.8]	16.7 [5.1]	—	—	—
Attack Helicopter						
AH-1	48.0 [14.6]	58.0 [17.7]	14.1 [4.3]	—	—	—
UH-1	48.0 [14.6]	57.7 [17.6]	14.4 [4.4]	—	—	—

Legend: — = not specified; AC = Advisory Circular; FAA = Federal Aviation Administration; UFC = Unified Facilities Criteria.
Source: AECOM analysis.

Runway Design Code

TT01 is classified as an ARC B-I airport in the Pagan Airstrip Master Plan Final Report (CPA 2008).

The RDCs for the representative fleet mix are shown in Table 3.2-8. The most demanding facility requirements for the RDC would be those for C/D-IV. Table 3.2-9 summarizes the corresponding runway requirements for RDC C/D-IV with reference to FAA AC 150/5300-13A (FAA 2012a).

Table 3.2-9. Runway Geometries – Pagan

Characteristic Description	*Class B Runway (UFC)*	*C/D-IV Runway (FAA)*	*Existing Conditions at Runway 11/29*
Length	Refer to paragraphs below		1,500 feet (500 meters) (Proposed to be 3,000 feet [900 meters] in the Pagan Airstrip Master Plan)
Width	200 feet (61 meters)	150 feet (46 meters)	120 feet
Width of Shoulders (each side)	150 feet (46 meters) (75 feet [23 meters] each side)	50 feet (15 meters) (25 feet [7.6 meters] each side)	None

Legend: FAA = Federal Aviation Administration; UFC = Unified Facilities Criteria.
Source: Department of Defense 2013, FAA 2012a, AECOM analysis.

Runway Classifications based on UFC

The UFC are defined in terms of Class A and B runways and their supporting taxiways, aprons, etc. Aircraft such as C-130 and C-17 operate on Class B runways. MV-22 can operate on Class A runways as rotary-wing aircraft and operate as either a fixed-wing or rotary-wing aircraft on taxiways associated with Class A runways (Department of Defense 2013).

The Class B runway geometries are shown in Table 3.2-9 (Department of Defense 2013).

Runway Length

In estimating the runway length requirements for the representative fleet mix (i.e., C-130, C-17, F-18, MV-22, and the rotary wings) under the Pagan alternatives, UFC 2-000-05N: *100 Series, Operational and Training Facilities* (Department of Defense 2013), ETL 09-6: *C-130 and C-17 LZ, Dimensional, Marking, and Lighting Criteria* (Air Force 2009), and ETL 97-9: Criteria and Guidance for C-17 *Contingency and Training Operations on Semi-Prepared Airfields* (Air Force 1997) are adopted as guidance.

The runway length requirements are summarized in Table 3.2-10.

Table 3.2-10. Runway Length Requirements – Pagan

Aircraft Type	*Max. TGR [(1)] (feet [approx. meters]) (max. takeoff weight)*	*Max. Landing Distance [(1)] (feet [meters]) (max. landing gross weight)*	*Runway Length Requirement (feet [meters])*	*Remarks*
Based on UFC 2-000-05N				
Transport Fixed Wing				
C-130 [(1)]	4,700 [1,400]	2,020 [600]	8,900 [2,700]	Neither the existing 1,500-foot (500-meter) runway nor the 3,000-foot (900-meter) runway proposed in the Pagan Airstrip Master Plan would be sufficient.
Fighter				
F-18 [(1)]	3,680 [1,100]	4,160 [1,300]	7,900 [2,400]	Neither the existing 1,500-foot (500-meter) runway nor the 3,000-foot (900-meter) runway proposed in the Pagan Airstrip Master Plan would be sufficient.
Transport Tilt-Rotor				
MV-22	Not available	0 (vertical landing)	Class A runways are typically less than 8,000 [2,400]	Neither the existing 1,500-foot (500-meter) runway nor the 3,000-foot (900-meter) runway proposed in the Pagan Airstrip Master Plan would be sufficient.
Rotary Wing				
CH-53, MH-60S, AH-1, UH-1	Not available	Not available	1,800 [500]	The existing 1,500-foot (500-meter) runway would not be sufficient. The 3,000-foot (900-meter) runway proposed in the Pagan Airstrip Master Plan would be sufficiently long.
Based on ETL 09-6 (As landing zones for some air crew training and contingency operations)				
Transport Fixed Wing				
C-130 C-17 [(2)]	— —	— —	3,000 [900] 3,500 [1,000]	The existing 1,500-foot (500-meter) runway would not be sufficient. The 3,000-foot (900-meter) runway proposed in the Pagan Airstrip Master Plan may be sufficient for some C-130 contingency operations with added overruns.

Notes: [1] The correction for airport temperature, altitude, gradient, and safety factor on the runway length required for C-130 and F-18 aircraft is not included in the maximum takeoff ground run and maximum landing distance obtained from tables in Unified Facilities Criteria 2-000-05N. The correction is applied to the maximum of the two and shown as the runway length requirement.
[2] The runway length requirement for C-17 aircraft is based on runway condition rating of 20 dry for soil surfaced runway.
Legend: — = not specified; max. = maximum; TGR = Takeoff Ground Run; UFC = Unified Facilities Criteria.
Sources: Department of Defense 2013, Air Force 2009, AECOM analysis.

With reference to UFC 2-000-05N (Department of Defense 2013), the proposed runway length requirement is based on the longest takeoff ground run or landing roll of the fixed-wing aircraft and corrected for altitude (34 feet [10 meters] msl), temperature (85.0 degrees Fahrenheit [29.4 degrees Celsius] mean highest daily, hottest month), and effective gradient (0%); and applied with a safety factor (1.6). The safety factor allows for variation in pilot technique, runway surface conditions, wind, minor mechanical difficulties, and physiological factors. The result is rounded up to the nearest 100 feet (30.5 meters). The corrected runway length requirements for C-130 and F-18 aircraft based on UFC 2-000-05N are 8,900 feet (2,700 meters) and 7,900 feet (2,400 meters), respectively, as summarized in Table 3.2-10.

The corrected runway length requirement for the transport aircraft C-130 at MTOW 155,000 pounds (70,300 kilograms), 8,900 feet (2,700 meters), would significantly exceed the length of the existing Runway 11/29 (1,500 feet [500 meters]), or the ultimate runway length (3,000 feet [900 meters]) proposed in the Pagan Airstrip Master Plan, based on UFC 2-000-05N.

UFC 2-000-05N does not provide the maximum takeoff ground run and landing distance for C-17 aircraft. With reference to the information from the manufacturer, Boeing, the takeoff field length at maximum gross weight is 7,700 feet (2,400 meters) and the landing field length with 160,000 pounds (72,600 kilograms) of cargo is 3,000 feet (900 meters) for C-17 aircraft. The required takeoff field length for the C-17, even before the corrections for altitude, temperature, and safety factor, would significantly exceed the length of the existing Runway 11/29. If the correction factors are applied to the takeoff field length provided by Boeing, C-17 would require 14,600 feet (4,400 meters) at maximum gross weight.

Additionally, ETL 09-6 (Air Force 2009) provides dimensional guidance for planning, design, construction, and evaluation of LZs used for air crew training and contingency operations of C-130 and C-17 aircraft. The ETL advises that the minimum runway length is 3,000 feet (900 meters) for the C-130 and 3,500 feet (1,100 meters) for the C-17, with 300-foot (91-meter) overrun on both thresholds. The overruns must be constructed to the same standards as the runway. This length requirement is based on a runway condition rating of 20 for soil surfaces in dry condition. Typically, a semi-prepared (unpaved) runway with stabilized soil surfaces would have runway condition rating of 20 dry and 10 wet. Unstabilized soil surfaces would have runway condition rating of 20 dry and 4 wet. The runway length requirement for C-17 contingency operations would increase to 7,000 feet (2,100 meters) for a wet condition with a runway condition rating of 4. The existing Runway 11/29 does not provide sufficient length to be an LZ for C-130 and C-17 for air crew training and contingency operations according to the ETL.

The transport tilt-rotor aircraft MV-22 could operate on Class A runways, which are ordinarily less than 8,000 feet (2,400 meters) long. MV-22 also has the option of vertical takeoff and landing. The runway length requirement for MV-22 would not be as critical as the requirements for other military aircraft discussed above.

The existing runway is a turf and gravel runway. Because of the nature of turf runways, landing and takeoff distances are longer than for paved runways. For landing, the distance is longer because less friction is available for braking action. For takeoff, the uneven ground surface and higher rolling resistance increase takeoff distances as compared to paved surfaces. FAA AC150/5300-13A recommended that landing and takeoff distances for aircraft be increased by a factor of 1.2 for turf runways (FAA 2012a). The estimated runway length requirement based on the UFC may need to be further increased by a factor of 1.2 for turf runways.

Recommendations on Runway Length for Transport Fixed-Wing Aircraft

Based on the above analysis, the existing 1,500-foot (500-meter) Runway 11/29 has to be extended to provide some air transportation capability for the Pagan alternatives. The runway length requirement would depend on what the design aircraft is, and may vary from a minimum of 3,500 feet (1,100 meters) with 300-foot (approximately 100-meter) overruns at both ends for contingency operations of C-17 (but with limited weight allowance) to 8,900 feet (2,700 meters) for C-130, or up to 14,600 feet (4,400 meters) for C-17 aircraft at their maximum carrying capacities.

It is recommended that a cost-benefit analysis be completed to determine the optimum runway length given the limitation of the existing environment at Pagan, with due consideration of the following factors and required information:

- *Desirable Carrying Capacity (i.e., weight or load)*: The design aircraft (e.g., C-130 and/or C-17) and its desirable carrying capacity for the Pagan alternatives would be considered. It would be challenging for C-130 and C-17 to operate at their MTOW at Pagan.
- *Subgrade, Subbase, Base Course, and Pavement Materials*: The soil properties and strength of materials on Pagan that would be available for regrading of the runway (e.g., potential subbase and base course materials) and the strength of the subgrade along the proposed runway, typically indicated by the California bearing ratio, would be required. The potential subbase and base course materials are likely to be the materials from the site formation work on Pagan. The subgrade and the added layers of potential subbase and base courses can be compacted and stabilized to improve the performance and load-carrying capacity. Nevertheless, the performance and load-carrying capacity of the existing available materials and subgrade on Pagan may be limited even with compaction and stabilization, and may not meet the desirable loading of the transport aircraft. In that case, it may be more economically viable to design a runway length to match the maximum load-carrying capacity of a semi-prepared (unpaved) runway surface based on existing available materials on Pagan, instead of the desirable carrying capacity required. On the other hand, if construction materials (such as asphalt or cement and aggregate for concrete or other subbase/base course materials) would be delivered to Pagan to strengthen the runway to meet the desirable carrying capacity of the design aircraft, the runway length may be further optimized at a cost. Further discussion of the runway surface or pavement strength is provided below.
- *Existing Topographic Survey and Runway Profile Analysis*: Topographic survey data for existing conditions would be required for an optimum cut-and-fill balance and runway profile analysis. The topographic survey would also indicate the location of the caldera with the Mount Pagan volcano as the center. The approximate location of the caldera boundary is shown in Figure 2.2-3, and it is represented by the cliff line in Figure 2.2-4. It is estimated that a significant increase in cut volume would be required if the runway and the runway safety area were to be extended beyond the caldera boundary or the cliff line to the east; this may not be an economically beneficial option. A preliminary estimation from the aerial map indicates that the available length from the existing threshold 11 to the caldera boundary at the east is approximately 8,000–8,500 feet (2,400–2,600 meters), which may suit a runway of approximately 6,000–6,500 feet (1,800–1,981 meters) long with 1,000-foot (300-meter) runway safety area on two ends.

Runway Length for Rotary Wing

The corrected runway length requirement for rotary-wing aircraft is 1,800 feet (500 meters) according to UFC 2-000-05N (Department of Defense 2013). Runway 11/29 does not have sufficient length for normal takeoff and landing operations of the rotary-wing aircraft. However, if Runway 11/29 were to be extended for the transport fixed-wing aircraft mentioned above, there would be sufficient length for the rotary-wing aircraft as well.

Runway Width

As stated in Table 3.1-15, the width of Class B runway specified in UFC 2-000-05N (Department of Defense 2013) is 200 feet (60 meters), with 75-foot-wide (20-meter) shoulders on each side. The required runway width for ARC C/D-IV is 150 feet (50 meters) with 25-foot-wide (8-meter) shoulders according to FAA AC 150/5300-13A (FAA 2012a).

With reference to the ETL (Air Force 2009), the width of runways for LZs is 60 feet (18 meters) for C-130 and 90 feet (27 meters) for C-17 aircraft with 10-foot-wide (3-meter) shoulders on each side.

It is recommended to increase the existing runway width to 150 feet (46 meters) with 25-foot-wide (7.5-meter) shoulders on each side to meet the FAA ARC C/D-IV standard. Turf runway would be compacted to the same standards as required for the runway safety area for paved runway. The total width of the compacted runway safety area for ARC C/D-IV is 500 feet (153 meters), which would provide a compacted strip wider than required for a Class B runway.

Runway Width for Rotary Wing

The standard width for a rotary-wing runway is 75 feet (23 meters). To support CH-53 or any helicopter with a rotor diameter greater than 70 feet (21 meters), the width of the runway must be 100 feet (30 meters) with reference to UFC 2-000-05N (Department of Defense 2013). Runway 11/29 has sufficient width for the rotary-wing operations.

Runway Grades

The requirements for Class B runway longitudinal grades as specified in UFC 2-000-05N (Department of Defense 2013) are slightly higher (maximum 1%) than the requirements specified in FAA AC 150/5300-13A (FAA 2012a) for AAC D (0% to ±1.5% at the mid portion of runway). The effective gradient of existing Runway 11/29 is approximately 0.5% as estimated from Figure 2.2-5.

If the future Runway 11/29 remains as a turf runway, it must be kept well drained or it would not be able to support an aircraft in wet conditions. It is recommended that the turf runway be graded to provide at least a 2.0% slope away from the center of the runway for a minimum distance of 40 feet (12 meters) on either side of the runway safety area to provide rapid drainage. It is also recommended that drainage swales be constructed with a maximum of a 3.0% slope parallel to the runway and outside of the runway safety area to provide adequate drainage with a low construction cost. Such swales can then be mowed with standard mowing equipment while eliminating drainage pipe and structures (FAA 2012a).

Runway Pavement

The existing turf runway has a weight capacity of 4,000 pounds (1,800 kilograms) for single-wheel aircraft (FAA 2014).

The two largest transport aircraft being proposed, as identified in Table 3.2-8, would be C-17 and C-130 aircraft. The MTOW, maximum payload and operating empty weight are summarized in Table 3.2-11.

Table 3.2-11. Loading Requirements for C-17 and C-130 Aircraft

Requirement	***C-130***	***C-17***	***C-17 Extended***
Wheel Configuration	Two Single Tandem (2S)	Two Triple Tandem (2T)	Two Triple Tandem (2T)
Maximum Normal Takeoff Weight (pounds [kilograms])	155,000 [70,300]	585,000 [265,400]	585,000 [265,400]
Maximum Payload (pounds [kilograms])	41,790 [19,000]	170,900 [77,500]	164,900 [74,800]
Operating Empty Weight (pounds [kilograms])	75,562 [34,300]	276,500 [125,400]	282,500 [128,100]

Source: AECOM analysis.

With reference to ETL 97-9, *Criteria and Guidance for C-17 Contingency and Training Operations on Semi-Prepared Airfields* (Air Force 1997), the maximum weights of C-17 aircraft on different surfaces are limited as summarized in Table 3.2-12.

Table 3.2-12. Allowable Aircraft Weights for C-17 Aircraft on Different Surfaces

Type of Weight	***C-17***
Maximum Gross Weight on Paved Surfaces (pounds [kilograms])	586,000 [265,800]
Maximum Contingency Operating Weight on Semi-Prepared (unpaved) Surfaces (pounds [kilograms])	447,000 [202,800]
Maximum Operating Weight on Matting (pounds [kilograms])	560,000 [254,000]
Operating Weight (pounds [kilograms])	279,000 [126,600]

Source: Air Force 1997.

As shown in Table 3.2-11, the strength of the existing runway is significantly below the strength required to accommodate C-130 or C-17 operations. It cannot even support the operating empty weight of a C-130 or C-17 aircraft.

Strengthening and extending the existing runway recommended. The design strength of the runway must match with the above-mentioned cost-benefit analysis on the design of runway length for an optimum proposal. Methods of strengthening include compaction and stabilization for unpaved surface, or adding a paved surface. There are two major types of stabilizing methods: mechanical and chemical. Mechanical stabilization involves compaction, blending of aggregate, or adding bitumen. Chemical stabilization involves adding material such as lime, cement, or fly-ash, which chemically reacts with the soil or itself to improve the soil's properties. These possible methods depend heavily on the availability of raw materials on Pagan. It is recommended that a detailed site investigation be undertaken to determine the design parameters, construction materials, and methods for strengthening the runway in the design phase.

Without the detailed site investigation, topographic survey, and cost-benefit analysis mentioned above, an initial preliminary assessment is conducted to provide two sample scenarios for the runway on Pagan to demonstrate some possible usages and limitations. The corresponding design requirements are also provided.

- *Sample Scenario for C-130*: For example, a 6,000- to 6,500-foot (1,800- to 2,000-meter) runway may accommodate a C-130 aircraft with a reduced MTOW/limited allowable gross weight to approximately 100,000–120,000 pounds (45,600–54,500 kilograms). This would limit the allowable weight for combined fuel and cargo to approximately 24,000-44,000 pounds (10,900–20,000 kilograms) with a maximum cargo weight of 41,790 pounds (19,000 kilograms). The estimate is based on the flight manual and a factor of safety of 1.6 is included in the runway length requirement. The required semi-prepared runway surface would be designed for a gross weight of at least 100,000–120,000 pounds

(45,400-54,500 kilograms) or ideally 155,000 pounds (70,300 kilograms) (if the factor of safety can be relaxed) for two single tandem and for the required C-130 traffic.

- *Sample Scenario for C-17 Contingency and Training Operations*: As shown in Table 3.2-12, ETL 97-7 (Air Force 1997) limited the maximum contingency operating weight of C-17 aircraft on semi-prepared surfaces to 447,000 pounds (202,800 kilograms), and the operating empty weight of C-17 is approximately 279,000 pounds (126,600 kilograms), which are both more than double the weight of a C-130. For example, a 6,000- to 6,500-foot (1,800- to 2,000-meter) runway with overruns may accommodate some contingency and training operations for C-17 aircraft provided that the semi-prepared runway surface would be designed for a gross weight of at least 305,000 pounds (13,900 kilograms) (including fuel for a one-way flight, e.g., to Andersen Air Force Base, Guam) to ideally 447,000 pounds (202,800 kilograms) for two triple tandem and for the required C-17 traffic.

Based on the *Pagan Airstrip Master Plan Final Report* (CPA 2008), it is recommended to stabilize the drop-off area on the western end of Runway 11/29, adjacent to the beach, with riprap. The location and extent of the riprap is shown in Figure 2.2-5.

Object Clearing Criteria

Safe and efficient operations at an airport require that certain areas on and near the airport are clear of objects or restricted to objects with a certain function, composition, and/or height. The clearing standards and criteria are established to create a safer environment for the aircraft operating on or near the airport. These object clearing requirements for the critical aircraft, i.e., D-IV aircraft, and visual runway, accordance with FAA AC 150/5300-13A (FAA 2012a) are given below.

- Runway Object Free Area
  - Length beyond runway end: 1,000 feet (305 meters)
  - Length before threshold: 600 feet (183 meters)
  - Width: 800 feet (244 meters)
- Runway Safety Area
  - Length beyond departure end: 1,000 feet (305 meters)
  - Length before threshold: 600 feet (183 meters)
  - Width: 500 feet (152 meters)
- Runway Obstacle Free Zone
  - Length beyond runway end: 200 feet (61 meters)
  - Width: 400 feet (122 meters)
- Runway End Establishment Obstacle Clearance Surfaces
  - Approach end of runway:
    - Slope: 20:1
    - Distance from threshold: 0 feet (0 meters)
    - Inner Width: 400 feet (122 meters)
    - Outer Width: 1,000 feet (305 meters)

    - Length to reach outer width: 1,500 feet (500 meters)
    - Length beyond outer width: 8,500 feet (2,600 meters)

- Approach Runway Protection Zone
    - Length: 1,700 feet (518 meters)
    - Inner Width: 500 feet (152 meters)
    - Outer Width: 1,010 feet (308 meters)
- Departure Runway Protection Zone
    - Length: 1,700 feet (518 meters)
    - Inner Width: 500 feet (152 meters)
    - Outer Width: 1,010 feet (308 meters)

Any new permanent construction under the proposed action should be outside the above-listed areas and should not penetrate the clearance surfaces.

Existing obstructions, such as trees, abandoned flagpole, and radio antenna, within the runway object free area shall be removed. Trees shall be trimmed to outside the 7:1 transition slope and obstacle clearance surfaces. Some of the historical remains from the Japanese military period are within the runway safety area and runway object free area. It is recommended to relocate them farther away and try to preserve them with other undisturbed historical remains outside the runway object free area.

The existing threshold 11 would be shifted to the east by approximately 1,000 feet (300 meters) for the runway safety area (or the overrun if required). The proposed pier would be outside the runway protection zone with the relocated threshold 11. No incompatible permanent land uses within the runway protection zones have been identified.

Obstruction Identification Surfaces

In accordance with FAA Order JO 7400.2J Change 3 (FAA 2013g) regarding procedures for handling airspace matters, the obstruction standards in Part 77 regarding military airport imaginary surfaces are applicable to airports operated and controlled by a U.S. military service, regardless of whether use by civil aircraft is permitted. The obstruction standards in Part 77 regarding civil airport imaginary surfaces apply to civil joint-use airports.

The existing CFR Title 14 FAR Part 77 category at TT01 is A for visual utility runway for the use of propeller-driven aircraft of 12,500 pounds (5,700 kilograms) maximum gross weight and less. Because TT01 would be improved for the use of other than a utility runway, the CFR Title 14 FAR Part 77 category for TT01 is B for visual approaches. The Category B FAR Part 77 imaginary surfaces for TT01 include:

- Primary Surface
    - Length beyond runway end: 200 feet (61 meters)
    - Width: 500 feet (152 meters)
    - Elevation: Same as runway centerline
- Transitional Surface
    - Slope: 7:1
    - Extend from the sides of primary surface and the sides of the approach surfaces

- Horizontal Surface
  - Elevation: Proposed runway elevation above msl + 150 feet (46 meters)
  - Radius of arch from primary surface: 5,000 feet (1,500 meters)
- Conical Surface
  - Slope: 20:1
  - Width: 4,000 feet (1,200 meters)
  - Extend outward and upward from periphery of the horizontal surface
- Approach Surfaces
  - Slope: 20:1
  - Inner width: 500 feet (152 meters)
  - Outer width: 1,500 feet (457 meters)
  - Length: 5,000 feet (1,000 meters)
  - Extend outward and upward from each end of the primary surface

Subject to the design of the runway profile, the future runway elevation is preliminarily estimated to be approximately 80–100 feet (24–30 meters) above msl (CPA 2008). The horizontal surface would be at approximately 230–250 feet (70–76 meters) above msl.

Based on U.S. Geological Survey information, the top elevation of the cliff line at the south of Runway 11/29 is approximately 360 feet (110 meters) above msl (U.S. Geological Survey 2006). It is an existing natural terrain penetrating the horizontal surface. The cliff line and the runway centerline would get closer as the runway length increases. The cliff line could be within 1,000 feet (305 meters) from the runway center. The existing Mount Pagan volcano, at a height of approximately 1,870 feet (570 meters) above msl (U.S. Geological Survey 2006) and at a distance of approximately 8,500 feet (2,600 meters) from the north of the runway, penetrates the conical surface.

Figure 3.2-4 illustrates the approximate heights and distances of the cliff line and Mount Pagan to the airstrip. It is recommended to carry out an FAA aeronautical study to determine whether there would be a hazard to air navigation and to specify the traffic pattern for Runway 11/29 to suit the terrain and aircraft category.

Taxiway System

There is no existing taxiway system for Runway 11/29. It is proposed to provide turnarounds at both ends of the runway.

Markings and Navigation and Lighting Aids

There are no existing marking or navigation and lighting aids on Runway 11/29. If the future Runway 11/29 would remain as a turf runway, it is recommended to add threshold location markers. One type of permanent marker is a threshold strip of concrete pavement, 60 feet (18.5 meters) wide by 10 feet (3 meters) long, painted white. No portion of the concrete pavement should be more than 1.5 inches (38 millimeters) above the surrounding grade level. Frangible cones may also be used for this purpose. Low-mass cones, frangible reflectors, and low-intensity runway lights are recommended to be used to mark the landing strip boundary with preferred intervals at 200 feet (61 meters). These boundary markers must be located outside the runway safety area. Installation of windsocks to indicate wind direction is recommended.

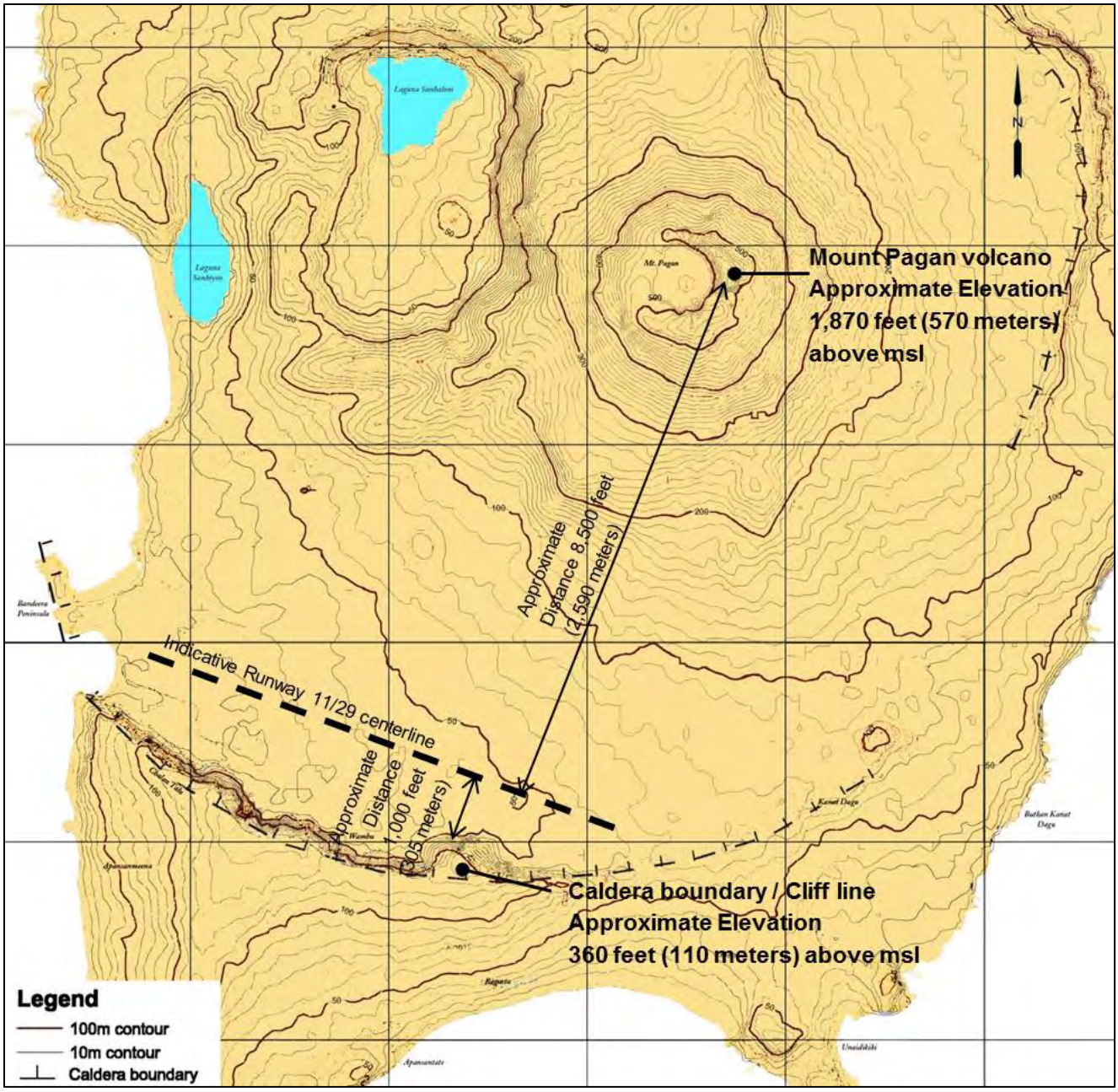


Figure 3.2-4. Natural Terrain around the Pagan Airstrip
Source: U.S. Geological Survey 2006.

Airport Weather Reporting Equipment

The National Weather Service, Weather Forecast Office Guam has responsibilities for aviation advisories and forecasts for Guam and the CNMI and surrounding ocean areas, including the tropical Pacific from 130E to 160E. Pagan is within its responsible areas; however, there is no existing aviation weather reporting station at TT01.

It is recommended to add a supplementary aviation weather reporting station at TT01 to record weather information at the airport, and to include Pagan in the regular Terminal Aerodrome weather forecast and METAR weather report for the Northern Mariana Islands, similar to Saipan, Tinian, and Rota Islands.

Aircraft Parking Apron

A parking apron is recommended for loading/unloading of gear and equipment. The location would be outside the runway object free area. A short taxiway would be provided to connect the apron to the runway. The pavement of the apron and connecting taxiway would be similar to the runway.

3.2.3.2 Airport Support Facility Requirements

Aviation Fuel Facilities

Public fuel service is not available at TT01. The transport aircraft for the proposed action would be refueled using an expeditionary forward arming and refueling point located on the Pagan airstrip. No permanent structures are required. Because of the recurrent nature of training, a fuel bladder containment berm is envisioned because this would facilitate such use of the forward arming and refueling point site, which would be equipped with expedient refueling systems (DoN 2014a).

It is recommended to locate the refueling facility outside the runway object free area of Runway 11/29; otherwise, a site selection analysis is recommended to ensure compliance with the latest standard.

Fuel delivery to Pagan would consist of KC-130 off-loading approximately 5,000 gallons (18,930 liters) of jet fuel per delivery (DoN 2014a). Jet A fuel typically weighs 6.8 pounds per gallon (0.8 kilogram per liter). 5,000 gallons (18,930 liters) of jet fuel weighs approximately 34,000 pounds (15,500 kilograms). As discussed above, the maximum allowable weight for the runway may be limited by the length, surface or pavement material, and design parameters of the runway. Subject to the outcome of the cost-benefit analysis for the runway design, the fuel delivery to Pagan may be limited to less than 5,000 gallons (18,930 liters) per delivery.

Aircraft Rescue and Firefighting

Any ARFF vehicles or facilities, if required for the training exercises and to support the refueling systems for the training period, would need to be provided by the U.S. military and accounted for under the proposed action.

3.2.3.3 Airport Security

Fencing is recommended for perimeter control and to keep out animals, particularly cows and goats.

3.2.3.4 Summary of Recommended Airport Facility Requirements

Based on the airfield demand/capacity analysis described above, TT01 would not experience airfield capacity (operational) constraints with the additional air transportation demand under the proposed action.

The following improvements and new facilities for air transportation are recommended for consideration:

- Extend, regrade, and strengthen the existing Runway 11/29.
- Add turnarounds at the two runway ends.
- Install a permanent marker at thresholds and along the landing strip boundary, such as low-intensity runway lights for possible operations at night.
- Install windsocks.
- Add a supplementary aviation weather reporting station and include Pagan in the Terminal Aerodrome weather forecast and METAR weather report.
- Construct a new aircraft parking apron and associated taxiway for U.S. military use.
- Install a perimeter fence for safety purposes.
- Stabilize the drop-off area at the western end of the Runway 11/29 with riprap.

It is recommended to carry out a cost-benefit analysis to determine the optimum option for the runway length, surface or pavement materials, and design parameters. A detailed site investigation and topographic survey would be required for this cost-benefit analysis in the design phase.

In addition, the following specific improvements required for envisioned military training on Pagan are identified in the *Commonwealth of the Northern Mariana Islands Joint Military Training, Unconstrained Training Concept for Tinian and Pagan* (DoN 2014a). They are listed below for easy reference.

- A forward arming and refueling point for Pagan's landing strip to provide fuel, ordnance loading, and arming/dearming in support of helicopter flight operations and other training.
- A fuel bladder containment berm to facilitate the use of the forward arming and refueling point, which would be equipped with expedient refueling systems.
- A biosecurity quarantine protocol would be developed for aircraft transporting military equipment and personnel arriving and departing Pagan.

Existing obstructions within the runway object free area should be removed. Trees should be trimmed to outside the transition slope and obstacle clearance surfaces. The historical remains from the Japanese military period, which are within the runway safety area and runway object free area, would be relocated. It is recommended to preserve them with other undisturbed historical remains outside the runway object free area.

It is also recommended to carry out an FAA aeronautical study to determine whether there is a hazard to air navigation and to specify the traffic pattern for Runway 11/29 to suit the terrain and aircraft category.

3.2.4 Marine Transportation – Pagan

3.2.4.1 Future Baseline Conditions

There is no current functional dock or appreciable number of vessel visits to Pagan. With no other projects or recolonization planned on Pagan, there is no indication that these baseline conditions would change outside of the proposed action.

3.2.4.2 Project-Generated Travel Demand

During operations, personnel would arrive and depart via air or marine transport at the beginning and end of each 2-week training period. Marine transport would involve amphibious ships and regular marine transportation (high-speed vessels and dock landing ships). All training equipment would arrive with personnel. Advance personnel and equipment could arrive sooner and depart later to perform preparations and demobilization for training exercises.

There is a future potential to expand the training tempo for Pagan from the proposed 16 weeks per year to 40 weeks per year. Expansion of the training tempo would include the construction of a 64,000-square-foot (595-square-meter) concrete pier on the west end of Red Beach, to the lee side of Bandera Peninsula (DoN 2011). The proposed pier, the location of which is shown in Figure 3.2-1, would be suitable for berthing of JHSVs in fair weather, allowing transfer of only roll-on/roll-off cargo. To protect the pier and docked vessels, construction of a 300-foot (91-meter) breakwater could be included. The breakwater would extend northwest from the end of Bandera Peninsula. Construction of this pier and breakwater would increase capacity for transfer of cargo and personnel to and from marine vessels, as transfer to amphibious ships would no longer be required.

Upon completion of construction of the pier and breakwater, the capacity of cargo and personnel transfer would increase versus current proposed conditions.

3.2.4.3 Project-Generated Restriction of Open Waters

Within the military operations area, the only access restrictions would be within the areas of the training ranges. DZs and restricted areas of sea space would reflect training range R-7204, extending 12 nautical miles (22 kilometers) from the entire shoreline of Pagan. This area may be closed to the public on a full-time or intermittent basis. Potential safety hazards from the presence of nonparticipating vessels in areas of military training require limiting public access to the DZ. Range Control activities would be conducted to maximize safety for the public and for military units. The Range Control facility would remotely survey the range and communicate with personnel involved in training for any conflict before and during use. Procedures would be implemented for the immediate cessation of training if a vessel were to enter the DZ. If a vessel inadvertently enters a restricted area, Range Control would interrupt the training process so that the vessel would then be cleared and training could resume. Active training would be conducted for 16 weeks per year, with the potential to be increased to 40 weeks per year.

3.2.4.4 Construction Conditions

As there is no current vessel traffic or dock facilities on Pagan, there would be no impact on marine transportation. Transfer of cargo and passengers to smaller draft (lightering) vessels (as were used previously [Government of the Northern Mariana Islands 1978]) or construction of a new dock would be required for landing large cargo on Pagan. Until the potential future dock and breakwater are constructed, all marine transportation would require transfer to smaller-draft vessels. Multiple marine vessel visits would be required to transfer materials and personnel required for any construction or modification of training ranges or facilities.

3.2.4.5 Deficiencies/Requirements

There are no deficiencies or requirements in data associated with Pagan.

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CHAPTER 4. CONCLUSIONS

4.1 TINIAN

4.1.1 Ground Transportation

The existing capacity of the Tinian roadway network facilities and the travel demand for the proposed action were evaluated. Based on this analysis, Tinian roadways would continue to operate at acceptable levels of service with the proposed action. Fences and gates would be installed that would restrict access to the MLA and select training areas. Improvements to existing roadways would be required and new additional roadways and ECFs would need to be constructed to support military training activities on Tinian. Recommended roadway improvements are shown in Figure 3.1-6 and are summarized in Table 3.1-5.

4.1.2 Air Transportation

The existing capacity of the TNI facilities and the air transportation demand for the proposed action were analyzed. Based on the airfield demand/capacity analysis, TNI would not experience airfield capacity (operational) constraints with the additional air transportation demand under the proposed action.

No additional runway pavement or strengthening of existing pavement is recommended. The existing runway length at TNI would be sufficient to accommodate the fleet mix with reduced MTOW (i.e., limited allowable gross weight) for B747-400, C-17, and C-130 aircraft.

The following improvements and new facilities for air transportation are recommended:

- Install runway centerline lights
- Replace the MIRLs with HIRLs
- Construct a new aircraft parking apron and associated taxiway
- Modify the security fence to 7 feet (2.1 meters) high with three strands of barbed wire on a single extension arm [1]

In addition, the following specific improvements required for envisioned military training on Tinian are identified in the *Commonwealth of the Northern Mariana Islands Joint Military Training, Unconstrained Training Concept for Tinian and Pagan* (DoN 2014a) and the airport laydown plans for expeditionary operations and end state operations. They are listed below for easy reference.

For the expeditionary operations:

- Combat aircraft loading area for loading aviation ordnance
- Hot cargo pads for munitions staging and equipment

[1] Denotes improvement works that are also identified by the CPA and the CEDS Planning Commission (CEDS 2009, CPA 2009b).

- Aviation ordnance arm and dearm pad
- Helicopter landing pad (Landing helicopter dock pad)
- Field carrier landing practice area (Concrete pad for arresting gear)
- Landing signal officer's shack (a movable unit)
- Refueling area (aircraft parking locations for refueling while the aircraft is operating, including expeditionary fuel bladders)
- A biosecurity quarantine protocol would be developed for aircraft transporting military equipment and personnel arriving and departing Tinian.

Additional for the end state operations:

- Airport Traffic Control tower
- Medium intensity approach lighting system [1]
- Hazardous cargo pad (expanded from the hot cargo pad in the expeditionary state)
- Aviation ordnance arm and dearm pads (relocated and expanded from the aviation ordnance arm and dearm pad in the expeditionary state)
- Aviation bulk fuel storage (a separate facility from the bulk fuel storage near the port)
- Hot fuel pits (at the same location as the expeditionary fuel bladders in the expeditionary state)
- Hangars and maintenance building
- Vertical/Short takeoff Landing/Optical Landing System
- Localizer [1, 2]
- Glideslope [1, 2]
- TACAN
- Full parallel military taxiway

The airport laydown plans showing the above-listed facilities in TNI are depicted on Figure 3.1-4 and Figure 3.1-5.

A communication tower at the base camp, for both expeditionary and end state operations, is identified in the preliminary analysis as potential obstruction to air navigation with height greater than the Part 77 imaginary surfaces. Under CFR Title 14 FAR Part 7, Subpart B, FAA Form 7460-1, Notice of Proposed Construction or Alternation must be filed before construction. The notice to the FAA must be submitted on or before an application for a license from the Federal Communications Commission is submitted, if

[2] Denotes improvement works that are also recommended in the West Tinian Master Plan Update (CPA 2001).

applicable. The FAA will conduct an aeronautical study to determine whether the aeronautical effects of the proposed construction would constitute a hazard to air navigation.

4.1.3 Marine Transportation

Analysis of the facilities on Tinian shows that additional capacity exists that could accommodate the proposed action. The capacity of marine transportation required by the proposed action has not been quantified at this time, and therefore analysis is not possible. Proposed construction of a biosecurity facility, including vehicle wash-down capabilities, would reduce impacts of the proposed action on current port facilities. A bulk fuel storage facility, also part of the proposed action, would require increased fuel deliveries to Tinian to fill these tanks with regular unleaded gasoline, diesel, and aviation fuel. Aviation fuel is currently not being delivered to Tinian. A short pipeline system from the wharf to the proposed bulk fuel storage facility is recommended to facilitate offloading fuel from vessels. If present port capacity is insufficient, increases in capacity would be possible with upgrades. Upgrades could include repair of the main wharf, dredging of the harbor entrance, construction of additional ramps for AAV use, installation of lights for night operation, or improved port equipment for loading/unloading vessels. A structural study of the Port of Tinian, which will indicate any limitations and required improvements, will be conducted upon the selection of a preferred alternative.

The DZs of the proposed training ranges have the potential to disrupt existing marine traffic patterns by excluding vessels from waters used as regular shipping lanes. The degree of disruption depends on the frequency and length of closure of the DZs.

4.2 PAGAN

4.2.1 Ground Transportation

The existing conditions of roadway facilities on Pagan and the travel demand for the proposed action were analyzed. Based on this analysis, no specific construction activities would be required to support maneuvering operations.

Personnel would move along the landscape and train in a manner similar to combat conditions. Vehicles would move along the existing all-terrain vehicle pathway as well as other terrain that they could safely navigate (excluding no maneuver areas). No specific construction activities would occur to support maneuver operations. Access to all-terrain vehicle pathways or trails and areas within the HHIA would be restricted.

4.2.2 Air Transportation

The existing capacity of the Pagan Airstrip (TT01) and the air transportation demand for the proposed action were analyzed. Based on the airfield demand/capacity analysis, TT01 would not experience airfield capacity (operational) constraints with the additional air transportation demand under the proposed action.

The following improvement and new facilities for air transportation are recommended for consideration:

- Extend, regrade, and strengthen the existing Runway 11/29.
- Add turnarounds at the two runway ends.
- Install a permanent marker at thresholds and along the landing strip boundary, such as low-intensity runway lights for possible operations at night.
- Install windsocks.

- Add a supplementary aviation weather reporting station and include Pagan in the Terminal Aerodrome weather forecast and METAR weather report.
- Construct a new aircraft parking apron and associated taxiway for U.S. military use.
- Install perimeter fence for safety purposes.
- Stabilize the drop-off area at the western end of the Runway 11/29 with riprap.

It is recommended to carry out a cost-benefit analysis to determine the optimum option for the runway length, surface or pavement materials, and design parameters. Detailed site investigation and topographic survey would be required for this cost-benefit analysis in the design phase.

In addition, the following specific improvements required for envisioned military training on Pagan are identified in the *Commonwealth of the Northern Mariana Islands Joint Military Training, Unconstrained Training Concept for Tinian and Pagan* (DoN 2014a). They are listed below for easy reference.

- A forward arming and refueling point for Pagan's landing strip to provide fuel, ordnance loading, and arming/dearming in support of helicopter flight operations and other training
- A fuel bladder containment berm to facilitate the use of the forward arming and refueling point, which would be equipped with expedient refueling systems
- A biosecurity quarantine protocol would be developed for aircraft transporting military equipment and personnel arriving and departing Pagan.

The airfield elements proposed at Pagan are depicted on Figure 3.2-1.

Existing obstructions within the runway object free area would be removed. Trees would be trimmed to outside the transition slope and obstacle clearance surfaces. The historical remains from the Japanese military period, which are within the runway safety area and runway object free area, would be relocated. It is recommended to preserve them with other undisturbed historical remains outside the runway object free area.

It is also recommended that an FAA aeronautical study be carried out to determine whether there is a hazard to air navigation and to specify the traffic pattern for Runway 11/29 to suit the terrain and aircraft category.

4.2.3 Marine Transportation

All existing marine transportation facilities on Pagan are unusable. If the future training tempo increases to 40 weeks per year, the end state would include a constructed pier and possible breakwater. The pier and breakwater would improve marine transportation on Pagan, allowing for docking of vessels and transfer of roll-on/roll-off cargo, which is impossible under current conditions. There is currently no appreciable level of marine transportation in the waters off Pagan. It is assumed that no vessel traffic would be disrupted, and no further analysis is required.

CHAPTER 5. REFERENCES

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Appendix A
Meeting Minutes

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MEETING ATTENDANCE LIST

CNMI Joint Military Training EIS/OEIS - SITE VISIT DEC 2013

Date/Time: DEC 5, 2013 0900

Location: DPW

Topic: TRAFFIC/GROUND TRANSPORTION

NAME	ORGANIZATION/TITLE	E-MAIL	OFFICE PHONE	CELL PHONE
JAMES CAMPE	CARDNO TEC/NOISE ANALYST	james.campe@cardnotec.com	530 888-7183	530 819-3640
Sonya P. Dancoe	D.P.W./Highway Administrator	spd.dpwtsdc@gmail.com	670-285-5515	670-287-7368
NONO BOSTRE	DPW - Highway	nono_tsd@yahoo.com	670 235-9570	670-487-4024
ED HIPOLITO	AECOM	edgar.hipolito@aecom.com	671 4888325	671 4888325
Martha Spengler	Cardno TEC-AECOM-JV Deputy Project Mgr EIS	martha.spengler@cardnotec.com	808.528.1445 EC	808 694.9968

2015

PROJECT DESCRIPTION	ROUTE NO.	PHASE	FY 2011 & Prior Years	FY2012 FEDERAL	FY2013 FEDERAL	FY2014 FEDERAL	FY2015 FEDERAL
Highway Planning, Technology Transfer & Training Activities	75	Misc.	$180,000 *$180,000*	$180,000 *$360,000*	$100,000 *$460,000*	$100,000 *$560,000*	$100,000 *$660,000*
Program Administration & Construction Engineering	75	Misc.	$300,000 *$300,000*	$180,000 *$480,000*	$900,000 *$1,380,000*	$900,000 *$2,280,000*	$900,000 *$3,180,000*
Route 100 Road Improvements Environmental Assessment and Preliminary Engineering	100	EA	$450,000 $100,000 *$550,000*				
Route 10 Hazard Elimination & Overlay	10	PE Const.	$150,000 $250,000 *$400,000*		$2,300,000 *$2,300,000*	$2,500,000 *$4,800,000*	
Route 10 100 Emergency Repairs	10-100	Const.(THP) Const. EP.	$21,629 $500,000 $554,000 *$1,075,629*				
Route 103 Road & Drainage Improvements	103	PE	$250,000 *$250,000*				
Route 11 Road & Drainage Improvements Phase II		PE	$300,000 *$300,000*				
Route 21 Hazard Elimination and Overlay	21	PE Const	$75,000 $100,000 *$175,000*		$250,000.00 *$250,000*		
Route 24 Hazard Elimination and Overlay	24	PE Const	$50,000 $100,000 *$150,000*		$250,000.00 *$250,000*		
Route 27 Hazard Elimination and Overlay	27	PE Const	$75,000 $100,000 *$175,000*		$250,000.00 *$250,000*		
Cross Island Road Improvement Phase II A	31	PE/SUMBA Const	$8,000				
Cross Island Road Improvements Phase IIB	31	PE Const	$1,042,300 $4,585,536 *$5,627,836*				
Cross Island Road Improvements Phase III	31	Const.	$2,046,662.29 $505,371 *$2,552,033.29*	$4,447,966.71 *$7,000,000.00*			
Route 36 Windward/Chalan Kalabera Development (SAFETEA-LU)	36	PE Const	$1,200,000 *$1,200,000*			$10,800,000.00 *$10,800,000*	
Tun Herman Pan Road & Drainage Improvements, Phase II	35	ROW Const.	$500,000 *$500,000*			$1,000,000.00 *$1,000,000*	$1,000,000.00 *$2,000,000*
Beach Road/Tun Segundo Street Intersection Traffic Signal System	33	PE Const	$50,000 $100,000 *$150,000*	$1,016,681 *$1,016,681*	$450,000.00 *$1,466,681*		
Chalan Pale Arnold Hazard Elimination Phase I, II, III	30	PE	$300,000 $323,000 *$623,000*				
Route 33 Beach Road Seashore Protection Feasibility Study	33	PE	$270,000 *$270,000*				
Beach Road Hazard Elimination Project Preliminary Engineering Phase I, II, III	33	PE Const	$1,000,000 *$1,000,000*				$2,500,000 *$2,500,000.00*
Route 302 Naftan Road Preliminary Engineering	302	PE Const	$200,000 $200,000 *$400,000*				
Traffic Signal System Upgrade	75	Const	*$2,200,000*				
Road Stripping, Pedestrian Marking and Signage Improvements	Island Wide	PE Const	*$1,500,000*				
Preliminary Engineering Route 310 Tapochao Road	310	Planning (ROW)		$50,000 *$50,000*			
SPN/TIN Ferry Feasibility Study (De-ob TMC)	75		$170,000.00				
Preliminary Engineering Route 316 Savanna Road	315	PE (ROW)		$50,000 *$50,000*			
Gualo Rai Road Preliminary Engineering	317	Planning (ROW)		$50,000 *$50,000*			
REPROGRAM FUNDS TOTAL:			*$2,046,662.29*	*$2,696,662*	*$0*	*$10,800,000*	*$0*
Other (ER, Discretionary, etc.) TOTAL:				$0	$0	$10,800,000	$0
FISCAL ALLOCATION TOTAL:			*$2,696,662.29*	*$3,277,986*	*$4,500,000*	*$15,300,000*	*$4,500,000*
GRAND TOTAL:			*$2,696,662.29*	*$5,974,648*	*$4,500,000*	*$16,300,000*	*$4,500,000*
FISCAL ALLOCATION TOTAL OBLIGATED:			*$2,696,662.29*	*$5,974,648*	$0	$15,300,000	*$4,500,000*
FISCAL ALLOCATION TO HQ (Others):			$0	$0	$0	$0	$0

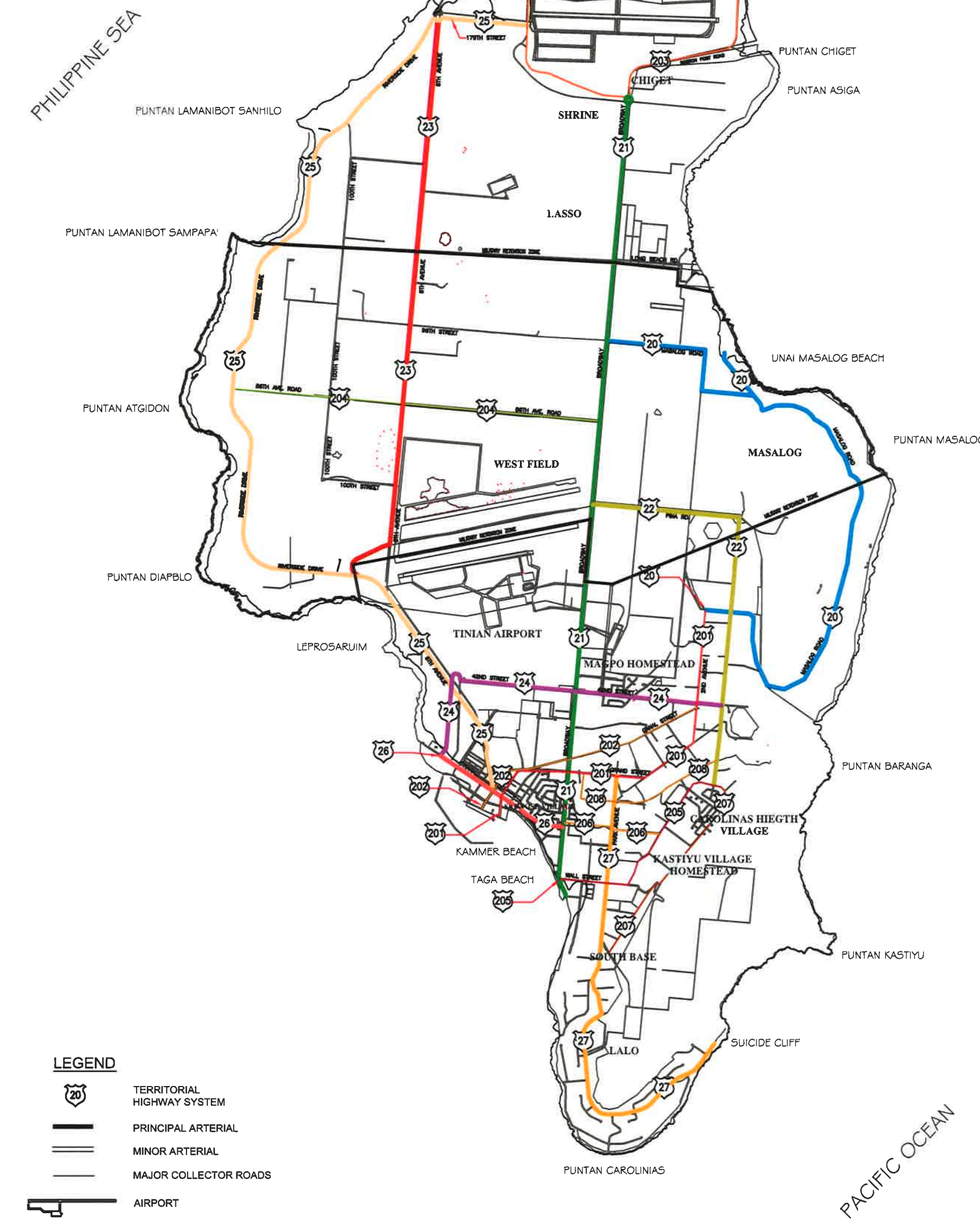
NOTES: Unobligated funds are moved to next fiscal year for obligation.
Reprogram 2,046,662.29 from FY 2011 to FY 2012 projects.

GENERAL HIGHWAY ROUTE MAP OF TINIAN

GRAPHIC SCALE

1000 0 1000 2000 3000

IN METERS



LEGEND

- TERRITORIAL HIGHWAY SYSTEM
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- MAJOR COLLECTOR ROADS
- AIRPORT

TINIAN ROUTE MAP)

TOTAL LENGTH: 61.91 MILES

ROUTE NO.	LOCATION/DESCRIPTION	LENGTH/MILES	INTERSECTION FROM	INTERSECTION TO
20	MASALOG ROAD	6.63	?	?
21	BROADWAY	7.07		
22	PINA ROAD	3.59		
23	8TH AVENUE	5.04		
24	42ND. STREET	3.08		
25	RIVERSIDE DRIVE	9.39		
26	SAN JOSE ROAD	1.23		
27	PARK AVENUE	4.28		

ROUTE NO.	LOCATION/DESCRIPTION	LENGTH/MILES	INTERSECTION FROM	INTERSECTION TO
201	GRAND STREET	3.21	?	?
202	CANAL STREET	2.14		
203	BASTON POST ROAD	7.12		
204	86TH. AVENUE ROAD	3.15		
205	WALL STREET	1.82		
206	?	0.82		
207	KASTIYU ROAD	1.86		
208	?	1.48		

4.3.2 Tinian

All the 18 study roadway segments on Tinian are identified as a 2-lane local collector, with a roadway capacity of 5,000 vehicles per day as listed in Table 17. The operational analysis indicates that, as shown in Table 26, all roadways are operating at LOS A under the existing conditions. A roadway LOS summary map for Tinian is shown in Figure 16.

Table 26: Roadway Segment LOS on Tinian

Segment Number	Road	Roadway Type	LOS E Capacity	2008 ADT	LOS	Over Capacity?
T-1	Riverside Drive	2-Lane Collector (local)	5,000	25	A	N
T-2	Riverside Drive	2-Lane Collector (local)	5,000	25	A	N
T-3	No Name	2-Lane Collector (local)	5,000	50	A	N
T-4	8th Avenue (north of 86th Ave.)	2-Lane Collector (local)	5,000	50	A	N
T-5	8th Avenue (south of 86th Ave.)	2-Lane Collector (local)	5,000	90	A	N
T-6	86th Avenue	2-Lane Collector (local)	5,000	100	A	N
T-7	Broadway Road (Route 21)	2-Lane Collector (local)	5,000	180	A	N
T-8	Broadway Road (north of 42nd Street)	2-Lane Collector (local)	5,000	390	A	N
T-9	Broadway Road (south of 42nd Street)	2-Lane Collector (local)	5,000	1,470	A	N
T-10	42nd Street	2-Lane Collector (local)	5,000	150	A	N
T-11	8th Avenue (north of 42nd Street)	2-Lane Collector (local)	5,000	180	A	N
T-12	No Name	2-Lane Collector (local)	5,000	310	A	N
T-13	8th Avenue (north of Canal Street)	2-Lane Collector (local)	5,000	300	A	N
T-14	Route 202	2-Lane Collector (local)	5,000	1,520	A	N
T-15	Route 201	2-Lane Collector (local)	5,000	2,240	A	N
T-16	Broadway Road (south of Route 201)	2-Lane Collector (local)	5,000	300	A	N

2 LAND USE AND SOCIOECONOMIC ISSUES

2.1 Population

The Commonwealth of the Northern Marianas Islands (CNMI) has a population of 84,546 (2007 estimate). The official 2000 census count was 69,221 including residents and non-residents which is approximately a 60 percent increase from the 1990 population of 43,345. Saipan's and Tinian's population have risen proportionally more than Rota's population. By 2000, 90 percent of the CNMI total population lived on Saipan, while only 5 percent lived on Rota and 5 percent lived on Tinian. Correspondingly, the population density has increased dramatically in Saipan from 836 persons per square mile in 1990 to 1342 in 2000; population density also rose from 54 to 90 in Tinian, and increased from 70 to 100 in Rota. Table 1 and Table 2 summarize the populations and population density on the CNMI, respectively.

Table 1: Population by Island - 1920 to 2000

Year	Total	Number of persons			
		Saipan	Rota	Tinian	N. Islands
2000	69,221	62,392	3,283	3,540	6
1995	58,846	52,698	3,509	2,631	8
1990	43,345	38,896	2,295	2,118	36
1980	16,780	14,549	1,261	866	104
1973	14,333	12,382	1,104	714	133
1967	10,986	9,035	1,078	610	263
1958	8,290	6,654	969	405	262
1935	4,297	3,194	788	24	291
1930	3,829	2,915	644	43	227
1925	3,493	2,639	487	180	187
1920	3,398	2,449	651	112	186

Source: 2002 CNMI Statistical Yearbook: Census reports for respective years: 1920-1935 for Natives Only and Census 2000 population and housing Profile

4.1.2 Tinian

Figure 10 depicts all the study roadway segments on Tinian. Roadway characteristics for the study segments on the island of Tinian are summarized in Table 15.

Table 15: Roadway Segments on Tinian

Segment Number	Road	# of Lanes	Characteristics
T-1	Riverside Drive	2	• Undivided
T-2	Riverside Drive	2	• Undivided
T-3	NA	2	• Undivided
T-4	8th Avenue (north of 86th Ave.)	2	• Undivided
T-5	8th Avenue (south of 86th Ave.)	2	• Undivided
T-6	86th Avenue	2	• Undivided
T-7	Broadway Road (Route 21)	2	• Undivided
T-8	Broadway Road (north of 42nd Street)	2	• Undivided
T-9	Broadway Road (south of 42nd Street)	2	• Undivided
T-10	42nd Street	2	• Undivided
T-11	8th Avenue (north of 42nd Street)	2	• Undivided
T-12	NA	2	• Undivided
T-13	8th Avenue (north of Canal Street)	2	• Undivided
T-14	Route 202	2	• Undivided
T-15	Route 201	2	• Undivided
T-16	Broadway Road (south of Route 201)	2	• Undivided
T-17	Route 21	2	• Undivided
T-18	NA	2	• Undivided

2.4.2 Tinian

Tinian is the third largest island of the Mariana Islands. It is located approximately 4.5 km southeast, across the Saipan Channel, from Saipan. It has a land area of 101.01 km^2 (39 sq. mi.). Tinian is primarily an agricultural community with most of its population residing in San Jose followed by Marpo Valley. The majority of the areas in Tinian have been leased to the U.S. Federal Government for military contingency purposes. The "Military Retention Zone" (MRZ) boundary divides the island into northern and southern segments and approximately divides the island's two census Districts. Figure 4 provides a census district map of the island of Tinian.

District 1 includes Tinian International Airport, which is positioned atop a plateau in the central west corner of the island inside the MRZ. Along the island's northwestern coast is the new home to a Voice of America (VOA) radio relay station. The United States Information Agency, which has headquarters in Washington, D.C., chose Tinian as the site to build a new radio relay station to transmit VOA broadcasts. The VOA currently broadcasts more than 900 hours of programming weekly in 47 languages.

District 2 which ties in the rest of the island, contains the main village of San Jose on the southwestern coast and the low density residential area of Marpo. The village of San Jose holds most of the island's housing stock and all of the commercial and institutional uses. The Tinian Harbor lies along the coast of San Jose village and features berthing, transshipment and cold storage facilities. This 100 acre harbor has a 1000 foot long commercial dock. The island's power generation plant is in San Jose as well.

In 1989, the people of Tinian voted to accept casino gambling as an economic development opportunity. Tinian Dynasty Hotel and Casino first opened to public in 1998. With an estimated annual revenue of $150 million, it is the first five star hotel and casino in the entire CNMI. It is located on the southwest side of Tinian facing Taga Beach.

There are several planned developments, golf course facilities, and military plan in Tinian that are either under construction or will begin construction in the near future. These new projects are expected to draw an increased number of visitors to the island. Descriptions and statuses of these planned developments are provided below.

- Bridge Investment Group (BIG) (300 hotel condominiums and 100 townhouses and private villas) – Construction of the project has started with the building of the construction workers barracks and the main project will soon begin.

- Marianas Resort Development Company (MRDC) (405 rooms and 18-hole golf course) – The project has started with the submission of a preliminary EA study, and the detailed design of the hotel and golf course has been engaged.

- Neo Goldwings Paradise (NGP) (1,000 rooms and 18-hole golf course) – A public hearing for the casino conditional license has been scheduled. The company is currently negotiating with the Department of Public Lands to lease public land for the project.

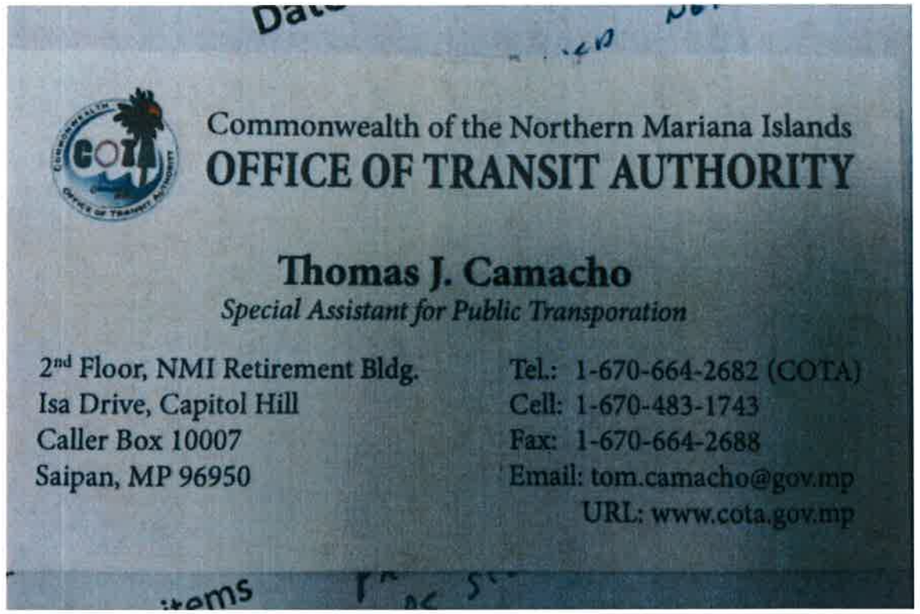
- Military Warm Base – The Environmental Impact Statement (EIS) for the military build is underway and construction is projected to begin in 2010.

4.2.2 Tinian

Existing average daily volumes on selected roadways in Tinian are relatively low compare to those in Saipan. Roadways that provide access around the island in general carry daily traffic range from 25 to 400 vehicles. The segment on Broadway Road south of 42nd Street carries roughly 1,470 vehicles per day. The two major routes, Routes 201 and 202, that provide access in and out of the San Jose Village area carry the highest amount of daily traffic on Tinian, with approximately 1,520 vehicles per day on Route 202 and 2,240 vehicles per day on Route 201.

4.2.3 Rota

Daily traffic volumes on Rota are the lowest among the three islands, with average daily traffic on study roadways ranging from 350 to 1,970 vehicles.



Commonwealth of the Northern Mariana Islands
OFFICE OF TRANSIT AUTHORITY

Thomas J. Camacho
Special Assistant for Public Transporation

2nd Floor, NMI Retirement Bldg.
Isa Drive, Capitol Hill
Caller Box 10007
Saipan, MP 96950

Tel.: 1-670-664-2682 (COTA)
Cell: 1-670-483-1743
Fax: 1-670-664-2688
Email: tom.camacho@gov.mp
URL: www.cota.gov.mp


Ledge Light
TECHNOLOGIES
Neal S. Ganslaw
Director, Software Development
88D Howard Street
New London, CT 06320
Phone: 860.444.0138 • Fax: 860.444.0274
Email: nganslaw@ledgelight.com
www.LedgeLight.com

Commonwealth of the Northern Mariana Islands (CNMI) Joint Military Training (CJMT)
Environmental Impact Statement (EIS)/Overseas EIS (OEIS)
Project Meeting Notes
December 5, 2013
0900-1000 Chamorro Standard Time (ChST)
DPW Highway Division, Saipan, CNMI; FHB Building, Highway Admin Office

Attendees:
DPW-Highway Division: S. Dancoe, N. Bostre
TEC-AECOM Pacific Joint Venture (JV): J. Campe, E. Hipolito, M. Spengler

Introductions and Purpose of Meeting

a. Introductions
b. M. Spengler stated the purpose of the meeting was to gather information and site reconnaissance for transportation and noise study to support the CNMI Joint Military Training EIS/OEIS in assessing existing conditions and potential effects of locating range and training areas on Tinian and Pagan On-going Planning Tasks.

Attachments

1. Meeting Attendance List
2. TTIP (Territorial Transportation Improvement Plan)
3. General Highway Route Map of Tinian
4. Tinian LOS table and other scans from CNMI Comprehensive Highway Master Plan 2008 (5 pages)
5. Business Card for Thomas J. Camacho, CNMI Office of Transit Authority
6. Business Card for Neal S. Ganslaw, Ledge Light (conducting existing roadway condition study)

Discussion

Ground Transportation Needs

1. Pictures of existing roadway facilities:

No Photos at DPW. Ed Hipolito will take roadway photos on Tinian

2. List of roadway network improvements [ongoing and any future planned/funded/scheduled improvements]:

Tinian Hazard Elimination Project for Route 21, Route 24 and Route 27 ongoing. Basis of Design provided (not attached) which discusses scope of the project which include mostly pavement and shoulder delineation improvements. The project improvements on Broadway end at the MLA border. There are no other Tinian projects in the current TTIP.

3. Pictures and description of any existing transit and/or pedestrian and bicycle facilities:

Bicycle/Transit Facilities do not exist. Pedestrian facilities do not exist in the MLA. There is a newly formed agency CNMI Office of Transit Authority (COTA). A COTA contact was provided by DPW.

4. Estimate of existing vehicle demand: Weekday a.m. and p.m. peak hours and daily? Vehicle type/classification and average vehicle occupancy? Are the CNMI Comprehensive Highway Master Plan 2008 volumes reasonable?

CNMI Comprehensive Highway Master Plan 2008 has the latest numbers available. (Data from the Master Plan was provided by DPW/.) There has been no traffic count conducted. However, there is potentially a reduction like Saipan due to the decrease in population.

5. Estimate of future vehicle demand [2% annual growth rate assumption reasonable]

No growth. Population has decreased from 2000 to 2010.

6. According to DPW, Pagan related questions need to be addressed to the NMI's Mayor's office.

Other Transportation Discussions

- DPW planning to form a planning organization which includes COTA to determine a comprehensive list of projects and prioritize them. This will be the basis of the updated TTIP.
- DPS-NHS has grant-funded ongoing project that provides roadway system information (pavement condition, pavement width, etc.) The consultant working on the project is Ledge Light Technologies. Guam email contact for Victor Pangelinan (vpangelinan@ledgelight.com) and Femi Bajomo (tbajomo@ledgelight.com) provided by DPW. According to DPW, the Tinian data has already been collected and they are waiting for the data/report to be delivered from the consultant.

MEETING ATTENDANCE LIST

CNMI Joint Military Training EIS/OEIS - SITE VISIT DEC 2013

Date/Time: DEC 5, 2013 0900
Location: DPW
Topic: TRAFFIC/GROUND TRANSPORTION

NAME	ORGANIZATION/TITLE	E-MAIL	OFFICE PHONE	CELL PHONE
JAMES CAMPE	CARDNO TEC/AECOM	james.campe@cardnotec.com	530 888-7183	530 879-3640
Sonya P. Dancoe	D.P.W. Highway Administrator	spd.dpwtsd@gmail.com	670-285-6518	670-287-7368
NONO BOSTRE	DPW - Highway	nono_tsd@yahoo.com	670 235-9570	670-987-4024
ED HIPOLITO	AECOM	edgar.hipolito@aecom.com	671 4888325	671 4888325
Martha Spengler	Cardno TEC-AECOM-JV Deputy Project Mgr EIS	martha.spengler@cardnotec.com	808.528.1445	808 694-9968

ATTACHMENT 1

2015

PROJECT DESCRIPTION	PROJECT NO.	PHASE	[illegible] Years	FEDERAL	FEDERAL	FEDERAL	FEDERAL
Highway Planning, Technology Transfer & Training Activities		Misc.	$180,000 $180,000	$180,000 $180,000	$100,000 $100,000	$100,000 $100,000	$100,000 $100,000
Program Administration & Construction Engineering	75	Misc.	$300,000 $300,000	$180,000 $180,000	$900,000 $1,100,000	$900,000 $2,200,000	$900,000 $3,100,000
Route 100 Road Improvements Environmental Assessment and Preliminary Engineering	100	EA	$450,000 $100,000 $550,000				
Route 10 Hazard Elimination & Overlay	10	PE Const.	$150,000 $250,000 $400,000		$2,300,000 $2,300,000	$2,300,000 $2,300,000	
Route 10/100 Emergency Repairs	10,100	Const.(TMP) Const. ER	$21,029 $500,000 $554,000 $1,075,029				
Route 103 Road & Drainage Improvements	103	PE	$250,000 $250,000				
Route 11 Road & Drainage Improvement Phase II		PE	$300,000 $300,000				
Route 21 Hazard Elimination and Overlay	21	PE Const	$75,000 $100,000 $175,000		$250,000.00 $250,000		
Route 24 Hazard Elimination and Overlay	32	PE Const	$50,000 $100,000 $150,000		$250,000.00 $250,000		
Route 27 Hazard Elimination and Overlay	27	PE Const.	$75,000 $100,000 $175,000		$250,000.00 $250,000		
Cross Island Road Improvements Phase II A	31	PE/ROW/EA Const	$8,000				
Cross Island Road Improvements Phase IIB	31	PE Const	$1,040,300 $6,985,536 $8,025,836				
Cross Island Road Improvements Phase III	31	Const.	$2,046,662.29 $965,371 $3,012,033.29	$4,447,966.71 $3,000,000.00			
Route 16 Windward/Chalan Kalahesa Development (SAFETEA-LU)	16	PE Const	$1,200,000 $1,200,000			$10,800,000.00 $10,800,000	
Tun Herman Tun Road & Drainage Improvements, Phase II	33	ROW Const	$500,000 $500,000			$1,000,000.00 $1,000,000	$1,000,000.00 $1,000,000
Beach Road/Tun Sepulde Street Intersection Traffic Signal System	33	PE Const	$50,000 $100,000 $150,000	$1,016,681 $1,016,681	$430,000.00 $1,446,681		
Chalan Pale Arnold Hazard Elimination Phase I, II, III	16	PE	$300,000 $333,000 $633,000				
Route 33 Beach Road Seashore Protection Feasibility Study	33	PE	$270,000 $270,000				
Beach Road Hazard Elimination Project Preliminary Engineering Phase I, II, III	33	PE Const.	$1,500,000 $1,000,000				$2,500,000 $2,500,000.00
Route 102 Mailing Road Preliminary Engineering	102	PE Const.	$200,000 $290,000 $490,000				
Traffic Signal System Upgrade	75	Const.	$1,500,000				
Road Striping, Pedestrian Marking and Signage Improvement	Island Wide	PE Const.	$1,000,000				
Preliminary Engineering Route 310 Tinochao Road	310	Planning (SCOT)		$50,000 $50,000			
SPN/TDY Ferry Feasibility Study (Decals TMC)	75		$170,000.00				
Preliminary Engineering Route 116 Sarvanta Road	116	PE (SCOT)		$50,000 $50,000			
Obyan Rd Road Preliminary Engineering	317	Planning (SCOT)		$50,000 $50,000			
REPROGRAM FUNDS TOTAL:			$3,046,662.29	$3,000,000	$0	$10,800,000	$0
Other (ER, Discretionary, etc.) TOTAL:				$0	$0	$10,800,000	$0
FISCAL ALLOCATION TOTAL:			$3,046,662.29	$3,377,886	$1,000,000	$13,300,000	$4,500,000
GRAND TOTAL:			$3,046,662.29	$3,874,648	$1,000,000	$13,300,000	$4,500,000
FISCAL ALLOCATION TOTAL OBLIGATED:			$3,046,662.29	$3,874,648	$0	$13,300,000	$4,500,000
FISCAL ALLOCATION TO HQ (Unlocal):			$0	$0	$0	$0	$0

NOTES: Unobligated funds are moved to next fiscal year for obligation.
Reprogram 2,046,662.29 from FY 2011 to FY 2013 projects.

ATTACHMENT 2 (more legible copy available on request)

TINIAN ROUTE MAP

ATTACHMENT 3

4.3.2 Tinian

All the 18 study roadway segments on Tinian are identified as a 2-lane local collector, with a roadway capacity of 5,000 vehicles per day as listed in Table 17. The operational analysis indicates that, as shown in Table 26, all roadways are operating at LOS A under the existing conditions. A roadway LOS summary map for Tinian is shown in Figure 16.

Table 26: Roadway Segment LOS on Tinian

Segment Number	Road	Roadway Type	LOS E Capacity	2008 ADT	LOS	Over Capacity?
T-1	Riverside Drive	2-Lane Collector (local)	5,000	25	A	N
T-2	Riverside Drive	2-Lane Collector (local)	5,000	25	A	N
T-3	No Name	2-Lane Collector (local)	5,000	50	A	N
T-4	8th Avenue (north of 86th Ave.)	2-Lane Collector (local)	5,000	50	A	N
T-5	8th Avenue (south of 86th Ave.)	2-Lane Collector (local)	5,000	90	A	N
T-6	86th Avenue	2-Lane Collector (local)	5,000	100	A	N
T-7	Broadway Road (Route 21)	2-Lane Collector (local)	5,000	180	A	N
T-8	Broadway Road (north of 42nd Street)	2-Lane Collector (local)	5,000	390	A	N
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T-14	Route 202	2-Lane Collector (local)	5,000	1,520	A	N
T-15	Route 201	2-Lane Collector (local)	5,000	2,240	A	N
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ATTACHMENT 4 – Page 1 of 5

2 LAND USE AND SOCIOECONOMIC ISSUES

2.1 Population

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ATTACHMENT 4 – Page 2 of 5

4.1.2 Tinian

Figure 10 depicts all the study roadway segments on Tinian. Roadway characteristics for the study segments on the island of Tinian are summarized in Table 15.

Table 15: Roadway Segments on Tinian

Segment Number	Road	# of Lanes	Characteristics
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ATTACHMENT 4 – Page 3 of 5

2.4.2 Tinian

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ATTACHMENT 4 – Page 4 of 5

4.2.2 Tinian

Existing average daily volumes on selected roadways in Tinian are relatively low compare to those in Saipan. Roadways that provide access around the island in general carry daily traffic range from 25 to 400 vehicles. The segment on Broadway Road south of 42nd Street carries roughly 1,470 vehicles per day. The two major routes, Routes 201 and 202, that provide access in and out of the San Jose Village area carry the highest amount of daily traffic on Tinian, with approximately 1,520 vehicles per day on Route 202 and 2,240 vehicles per day on Route 201.

4.2.3 Rota

Daily traffic volumes on Rota are the lowest among the three islands, with average daily traffic on study roadways ranging from 350 to 1,970 vehicles.

ATTACHMENT 4 – Page 5 of 5

ATTACHMENT 5

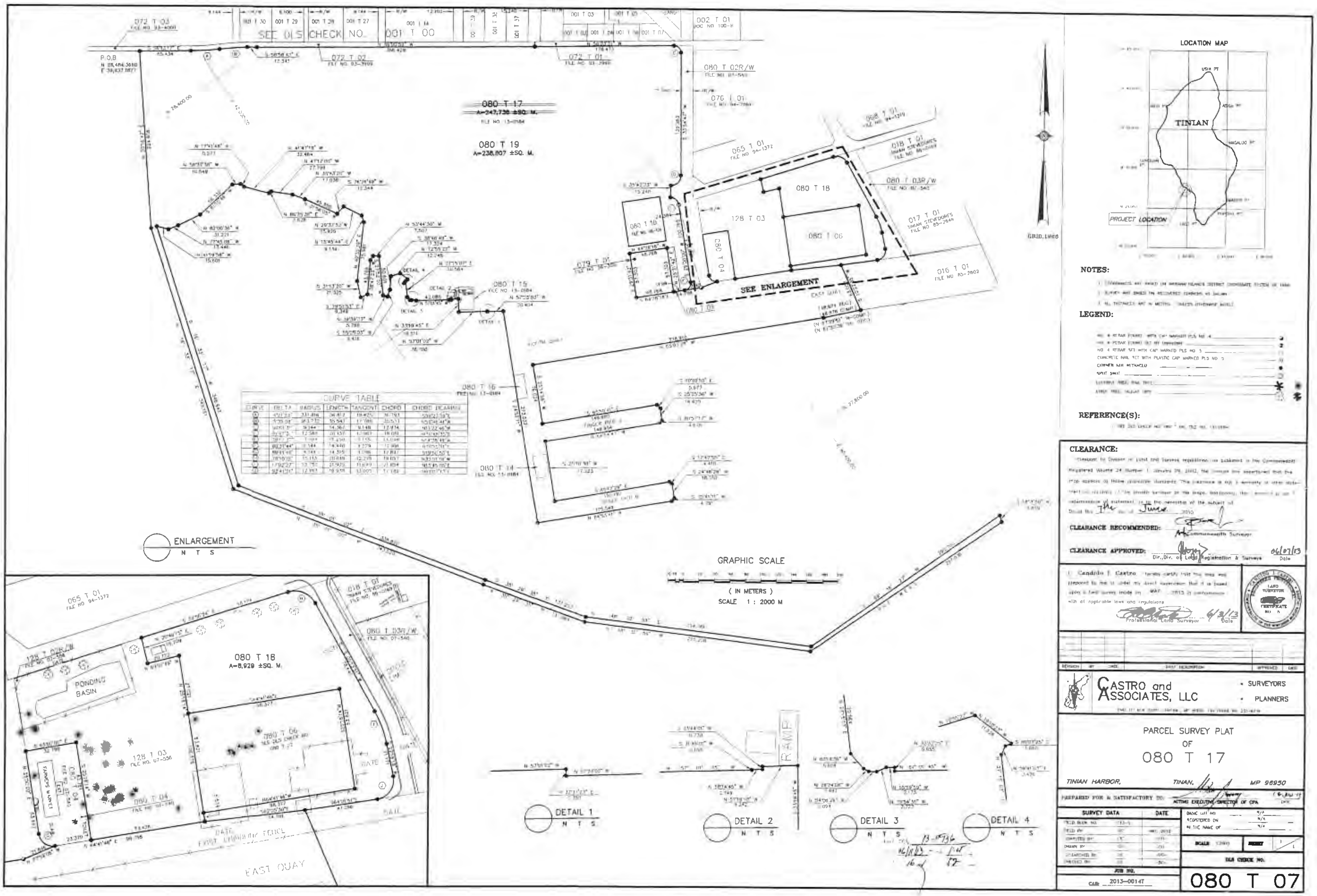
ATTACHMENT 6

MEETING ATTENDANCE LIST

CNMI Joint Military Training EIS/OEIS - SITE VISIT DEC 2013

Date/Time: Dec 6, 2013 1000
Location: TINIAN INTERNATIONAL AIRPORT
Topic: AIRSPACE/NOISE

NAME	ORGANIZATION/TITLE	E-MAIL	OFFICE PHONE	CELL PHONE
JAMES CAMPE	CardnoTEC/Noise Analyst	james.campe@cardnotec.com	530-888-7183	530 919-3641
ED HIPOLITO	AECOM	edgar.hipolito@aecomcom	671 477 8325	671 488 9325
Martha Spengler	Cardno TEC/ Deputy Project Mgr EIS	martha.spengler@cardnotec.com	~~671-6~~ 868.528.1415 808.694.9968 →	
JOSEPH MENDIOLA	CPA-TINIAN	mendiolajmm@gmail.com	(670) 433-9294	(670) 285-3595
GERALD CRISOSTOMO	CPA-Tinian	Cpatinian@pticom.com	(670) 433-9294/6	(671) 888-9914


LOCATION MAP
TINIAN
PROJECT LOCATION
NOTES:
LEGEND:
REFERENCE(S):
CLEARANCE:
CLEARANCE RECOMMENDED:
Commonwealth Surveyor
CLEARANCE APPROVED:
Dir., Div. of Land Registration & Surveys
Professional Land Surveyor
CASTRO and ASSOCIATES, LLC
• SURVEYORS
• PLANNERS
PARCEL SURVEY PLAT
OF
080 T 17
TINIAN HARBOR, TINIAN, MP 96950
SURVEY DATA
DATE
DLS CHECK NO.
080 T 07
CAR 2013-00147
080 T 17
A=247,738 ±SQ. M.
080 T 19
A=238,807 ±SQ. M.
SEE ENLARGEMENT
080 T 18
128 T 03
080 T 06
080 T 04
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CURVE TABLE
GRAPHIC SCALE
(IN METERS)
SCALE 1 : 2000 M
ENLARGEMENT
N T S
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A=8,929 ±SQ. M.
PONDING BASIN
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DETAIL 1
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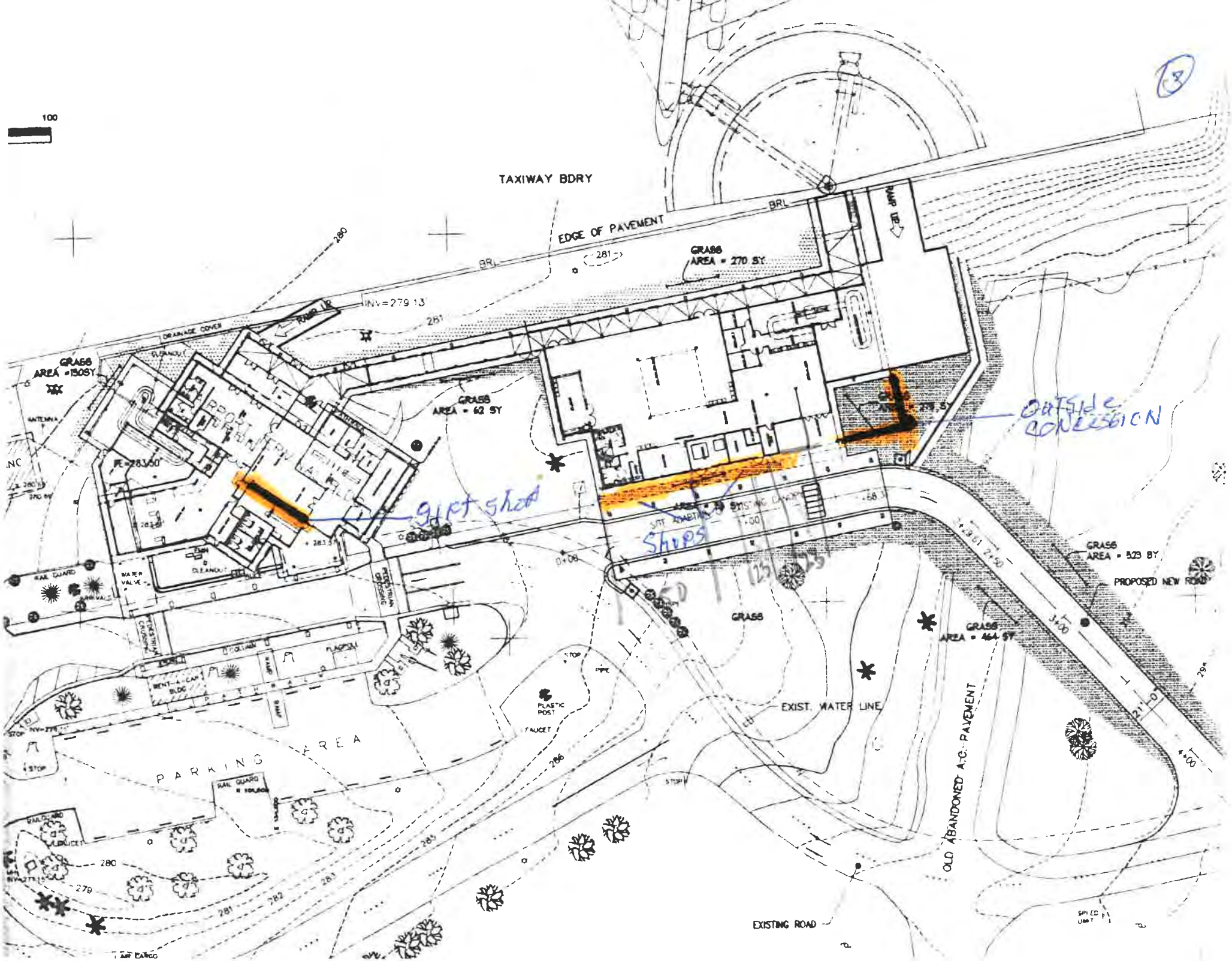
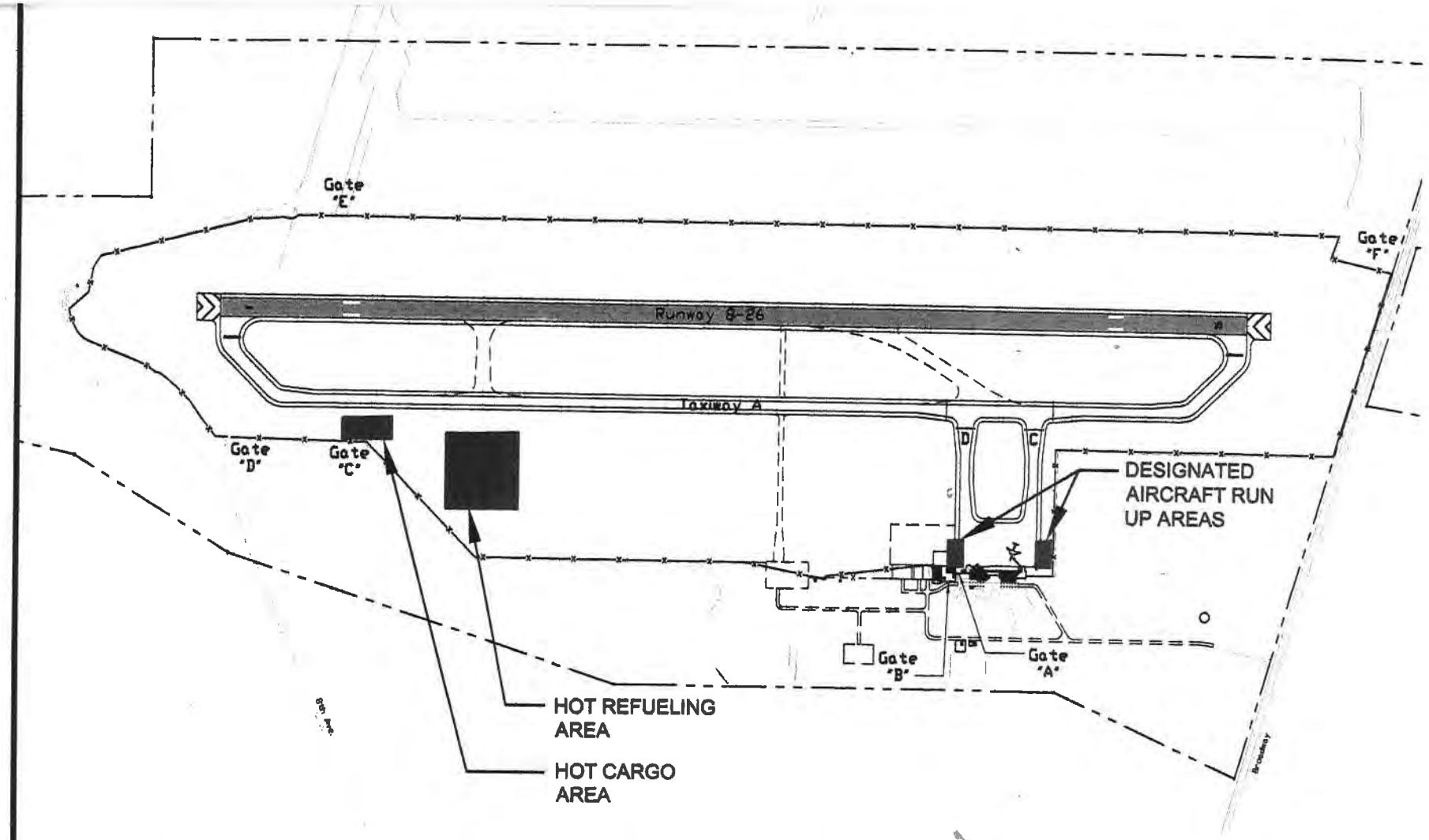

100
TAXIWAY BDRY
EDGE OF PAVEMENT
BRL
RAMP UP
GRASS AREA = 270 SY
INV=279.13
DRAINAGE COVER
GRASS AREA = 150SY
GRASS AREA = 62 SY
PORT AUTHORITY
FF=283.50
GIFT SHOP
OUTSIDE CONCESSION
SHOPS
GRASS AREA = 523 SY
PROPOSED NEW ROAD
GRASS
GRASS AREA = 464 SY
EXIST. WATER LINE
OLD ABANDONED A.C. PAVEMENT
PARKING AREA
RENT-A-CAR BLDG
RAIL GUARD
WATER VALVE
PEDESTRIAN CROSSING
PLASTIC POST
FAUCET
EXISTING ROAD
SPICED UNIT



West Tinian Airport Military Land Use Plan

APPENDIX E-2

PREPARED BY:
COMMONWEALTH PORTS AUTHORI
Engineering Department
Telephone: 237-6518/19
Fax: 664-3533
Email: cpa.engr@ptlcom.com Sept. 11, 2

Commonwealth of the Northern Mariana Islands (CNMI) Joint Military Training (CJMT)
Environmental Impact Statement (EIS)/Overseas EIS (OEIS)
Project Meeting Notes
December 6, 2013
1000-1130 Chamorro Standard Time (ChST)
Tinian Airport, Tinian, CNMI; CPA Office

Attendees:
Commonwealth Ports Authority: Tinian: J. Mendiola, G. Crisostimo
TEC-AECOM Pacific Joint Venture (JV): J. Campe, E. Hipolito, M. Spengler

Introductions and Purpose of Meeting

a. Introductions
b. M. Spengler stated the purpose of the meeting was to gather information and site reconnaissance for Air transportation, sea transportation, and noise study to support the CNMI Joint Military Training EIS/OEIS in assessing existing conditions and potential effects of locating range and training areas on Tinian and Pagan.

Attachments

1. Meeting Attendance List
2. Tinian Seaport Parcel Map
3. West Tinian Airport Terminal Layout
4. West Tinian Airport Military Land Use Plan

Discussion

Tinian International Airport (TNI)

TNI discussions

- Tinian airport is planned for 747 plane traffic. However, the Air Force conducted their own runway strip strength test and based on the report results, the Air Force would not land one of their types of planes on TNI due to inadequate strength. CPA has requested the report but the Air Force has denied the request.

- CPA Tinian Ports monitors all flights, including military, to assess the appropriate fees. CPA stated that the Flight Service Station collects the data. Data will be provided on Dec 9, 2013 to Jim Campe and Martha Spengler. (It was in fact picked up by Steve Keith on Dec 11, 2013.)

- JoyAnn Deleon Guerrero, CPA (670-237-6503) in Saipan has flight data on private and after hour flights.

- SN5 cargo vessel still does daily shipments between Saipan and Tinian. However, ever since the Super Shuttle was decommissioned two years ago, the cost of living has increased dramatically. A $100,000 house 5 years ago now costs $200,000 due to the shipment of construction materials. Jet

Fuel is also not available on Tinian due to the Super Shuttle being decommissioned. Cost of Gasoline is $6/gallon

- There is no Air starter at the Tinian Airport. If the jet engine shuts off, the plane could be grounded for a while.

- Although Customs and Border Patrol (CBP) has designated Tinian as a point of entry, TSA / CBP are only on Saipan. Arrangements need to be made to bring staff over to Tinian to clear international flights.

- Departure Terminal, built in 2004, has not been used due to seismic, septic, and ADA issues. Project currently out for bid to solve these issues and render the terminal usable. (During tour, Gerald noted termites and out dated CCTV issues.

Air Transportation Data Needs

- Copy of latest **Master Plan Report** for **Tinian International Airport (TNI)**: Available at CPA Engineering. Contact Wendi Prater.
- Airport Reference Code (ARC): PGWT
- Critical aircraft: Current aircraft (Cherokee and Cessna about 3000 flights, Twin Prop for Cargo) Military (C130, F18s)
- Length of Runway: 8600 feet
- Width of Runway 08/26 shoulders: runway 150', shoulders 25', total 200'
- Taxiway width and shoulder width: taxiway 75', shoulders vary from 10'-15'
- Taxiway numbering (which is B and C?) width: (see attachment) Width 75'
- Taxiway pavement condition, if available: CPA says pavement is good
    - Pavement management report: No Pavement Testing just daily AOA report for FOD etc.
    - Any designated apron for general aviation? E.g. is the apron area adjoining Hangar One designated for general aviation only? See pictures but only one Apron. Hangar being used by Star Marianas. Military setups on west side of Airport in Hard Packed area.
    - Any designated cargo apron? Only one Apron.
    - Is there any landside access (e.g. gate) to the Hard Packed Area to the southwest of the airport, adjacent to parallel Taxiway A? Where is it? Gate "C" see attached West Tinian Airport Land Use Plan
    - Layout of the existing airport boundary fence and security gates: See attached West Tinian Airport Land Use Plan
    - Provide a copy of the Airport Layout Plan (in CADD): Request ALP in CADD from CPA Engineering, Wendi Prater.

- What are the planned developments? Please confirm the following planned developments (details of these planned developments to be provided - we found these online but without any details):
    - Instrument Landing System (ILS): On Hold due to future maintenance costs that is not AIP funded, other technologies like GBAS.

- Tinian Airport Fuel Farm: Discussions for Fuel Farm at one point but currently no fueling on Tinian due to lack of jet fuel supply, due to shipment issues. Also there is no available jet starter (APU) at TNI so jets need to keep certain engines running during offloading.
- ARFF Building Relocation: No Matching local funds but project is designed and ready to go.
- High Speed Taxiway B: No funding, but hopefully funds will free up since the Saipan Airport Runway project is close to completion.
- Taxiway E and ARFF Access Road: Taxiway E and the ARFF Access Road are both part of the ARFF Building Relocations Project. (See West Tinian Airport Military Land Use Plan)
- Security Access System: On hold since TSA is not on Tinian. Currently only lock and key security.
- Perimeter Security Fence Replacement: currently fence is 6' (7' with barbed wire) and doesn't meet requirements. However, no funding and low priority.
- Photographs of the existing airport facilities. Gerry Crisostomo escorted Ed Hipolito and Jim Campe toured the AOA and Terminal facilities.

- Terminal info: Existing Terminal being used for Departure and Arrival. The 2004 Departure terminal has not been opened due to the seismic, septic, and ADA issues.
  - Passenger Terminal layout plan, showing the interior areas (see attached Terminal Layout Plan and Pictures. Joe Mendiola stated that the CADD or larger version of the Layout Plan will be available with Wendi Prater, CPA Engineering)
  - No. of check-in counters: two in existing facility and three in new
  - No. of security channels: See pictures, currently one, but Gerald Crisostomo stated that TSA wanted a certain layout in the new Departure Terminal.
  - Apron layout plan: Request from Wendi Prater, CPA. Also see West Tinian Military Land Use Plan.

Pagan Airstrip (TT01)

- CPA has no authority over Pagan and all data need requests need to go through the NMI Mayor's Office

MARINE Transportation

Tinian Sea Port:

1. Pictures of port facilities. Pictures were taken after the meeting.
2. List of port facilities [current, and any scheduled improvements].
   A. Bio-hazard Incinerator not currently being used due to lack of certification.
   B. 4 security cameras / 4 light posts (Need two more cameras/posts to cover port) paid by Port Security Grant.
   C. CPA office

D. CPA boat & Safety

E. Bulk Plant/Fuel Farm

F. Private Stevedore

G. Biosecurity/Brown Treesnake facility: 3-4 Container capacity. Facility rarely used since there are no direct commercial shipments from Guam. Currently military shipments from Guam are cleared before they leave Guam. (While this is current practice, increased activity on Tinian will likely require bio-security inspections for incoming shipments.)

H. Small Marina/Boat Ramp

I. 2000+feet wharf

J. Only currently planned improvement: Design Build project for Salt water Hydrant system (fire response).

3. Estimate of port capacity [instantaneous and annual] [cargo and passengers] [current and w/ planned improvements]. Port is over 2000' (400' is unusable). 1600' to accommodate 3 tankers or barges. Port has a 24' draft requirement and hasn't been dredged in a long time. Potential of 1500 passengers at any given time. However, port does not have any scheduled or major uses at this time.

4. Level of port use from 2005-2013 [annual vessel visits, cargo v. passengers] Joe Mendiola will email data.

5. Level of port use from 2005-2013 [annual by cargo type & number of passengers] Joe Mendiola will email data.

6. Location of known shipping lanes or any other heavy vessel use of open water around Tinian: No major use at this time.

7. Current vessel routes: CJMT team to provide a map. Joe Mendiola will sketch on map current routes.

8. There is a proposed Hotel at the South end of the port which would accommodate 2 ferries. This part of the wharf is unusable due to the old port metal structure that would be in the way. Approximately 400' long.

Pagan Sea Port

- CPA has no authority over Pagan and all data need requests need to go through the NMI Mayor's Office

Action Items

- CPA to provide flight data from Flight Service Station.

- CPA to provide port usage data.
- CJMT team to provide map of Guam Tinian Saipan and Rota. CPA to draw vessel routes on map.

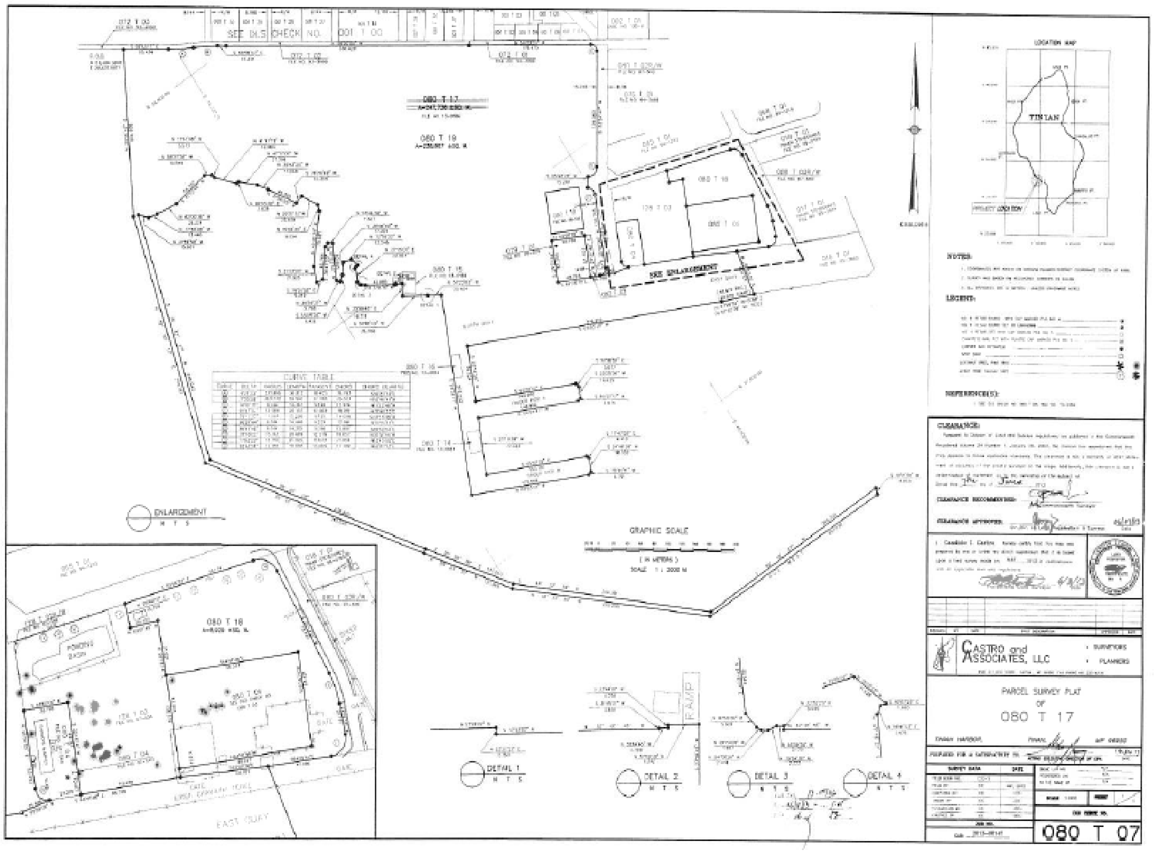
MEETING ATTENDANCE LIST

CNMI Joint Military Training EIS/OEIS - SITE VISIT DEC 2013

Date/Time: Dec 6, 2013 1000
Location: TINIAN INTERNATIONAL AIRPORT
Topic: AIRSPACE/NOISE

NAME	ORGANIZATION/TITLE	E-MAIL	OFFICE PHONE	CELL PHONE
JAMES CAMPE	CardnoTEC/ Noise Analyst	james.campe@cardnotec.com	530-888-7183	530 919-3641
ED HINOLITO	AECOM	edgar.hinolito@aecom.com	671 477 8325	671 488 5525
Martha Spengler	Cardno TEC/ Deputy Project Mgr EIS	martha.spengler@cardnotec.com	~~671~~ 808.528.4115 808.674.9968	
JOSEPH MENDIOLA	CPA-TINIAN	mendiola_jmm@gmail.com	(670) 433-9294	(670) 285-3595
GERALD CRISOSTOMO	CPA-Tinian	cpatinian@pticom.com	(670) 433-9294	(671) 888-9914

ATTACHMENT 1



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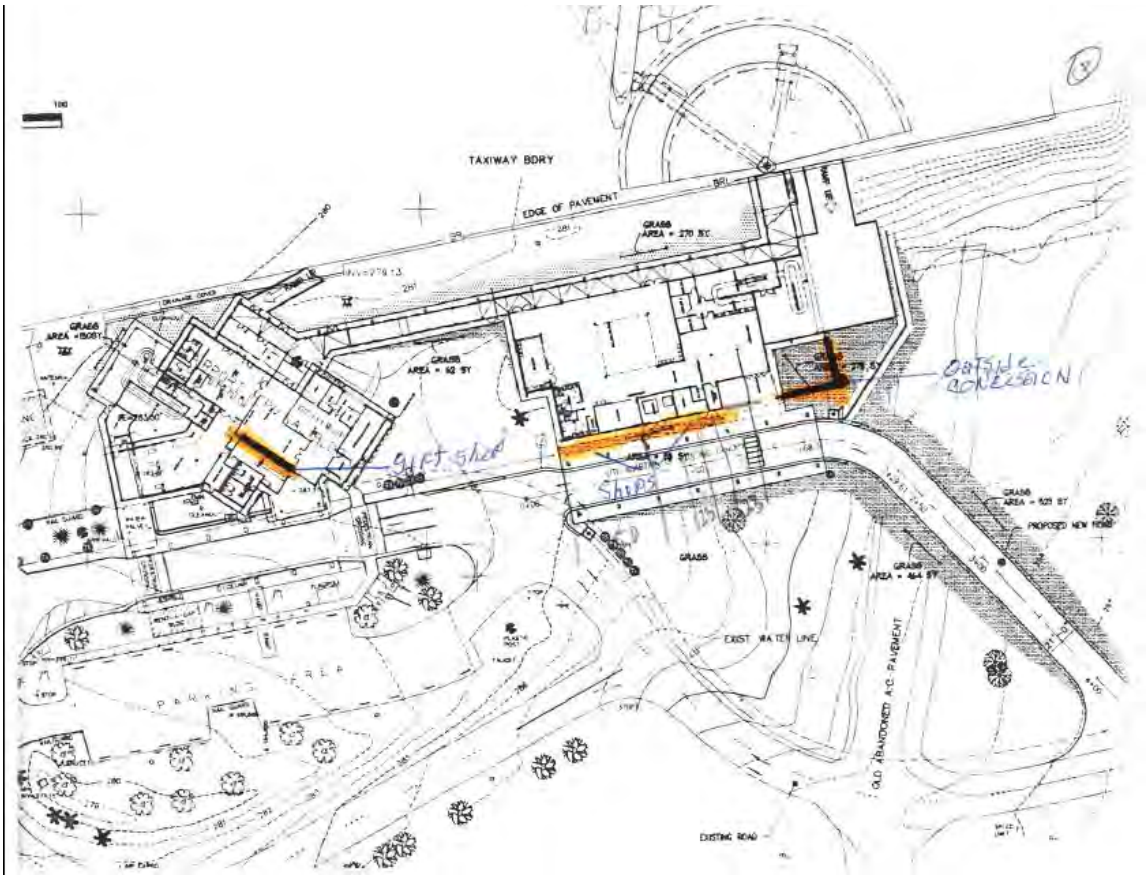

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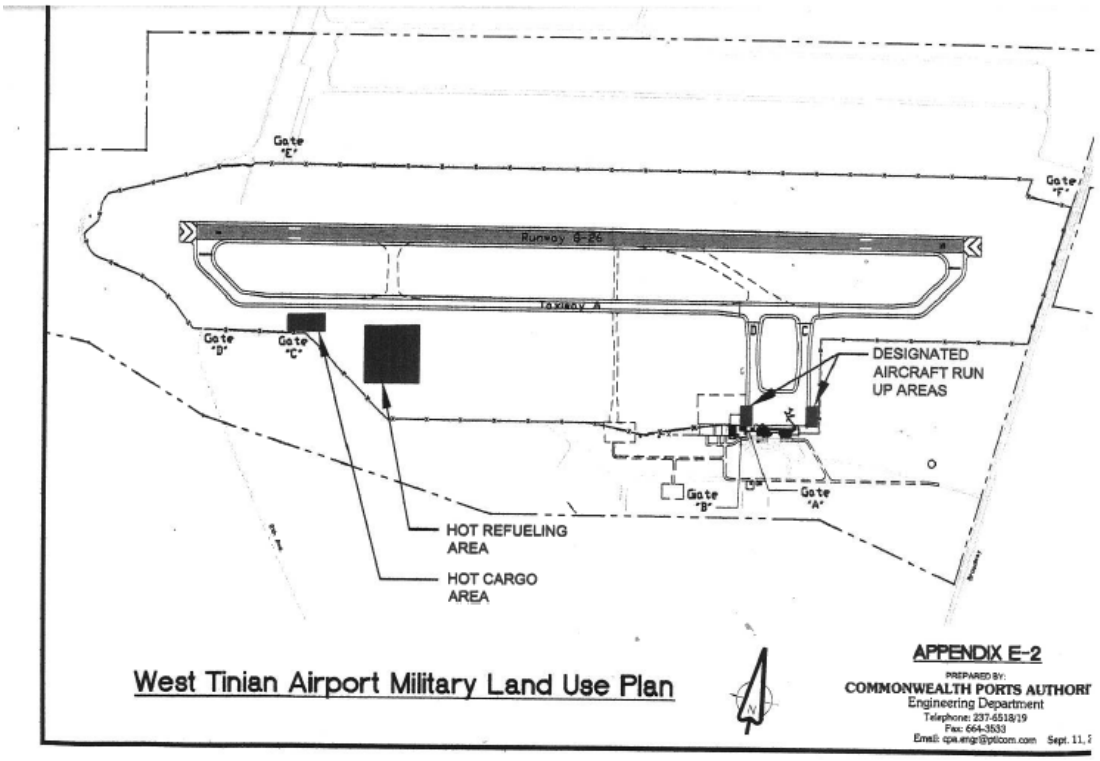

ATTACHMENT 4

Appendix B
Tinian Hazard Elimination Project Information

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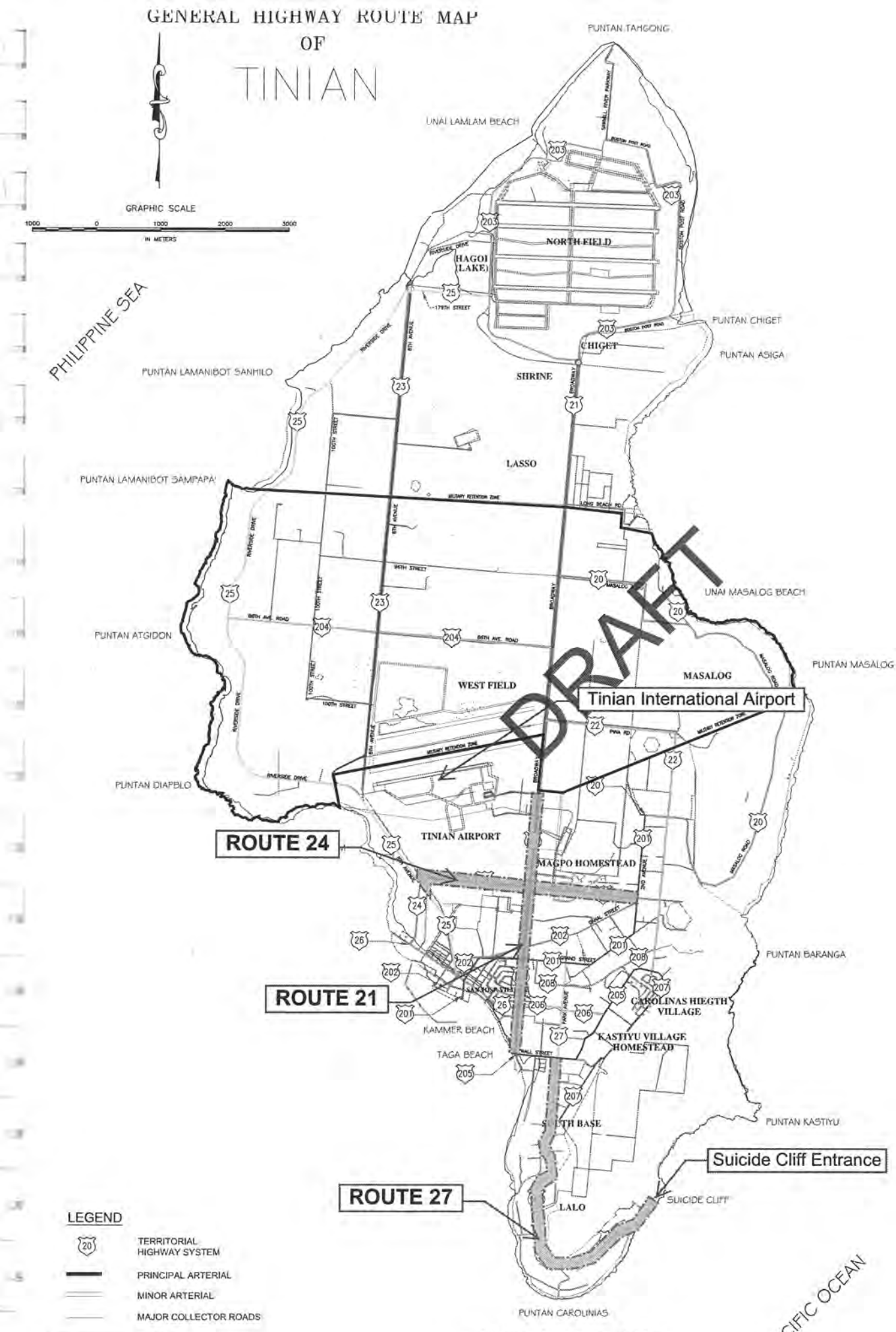


Figure 1. Overall Map

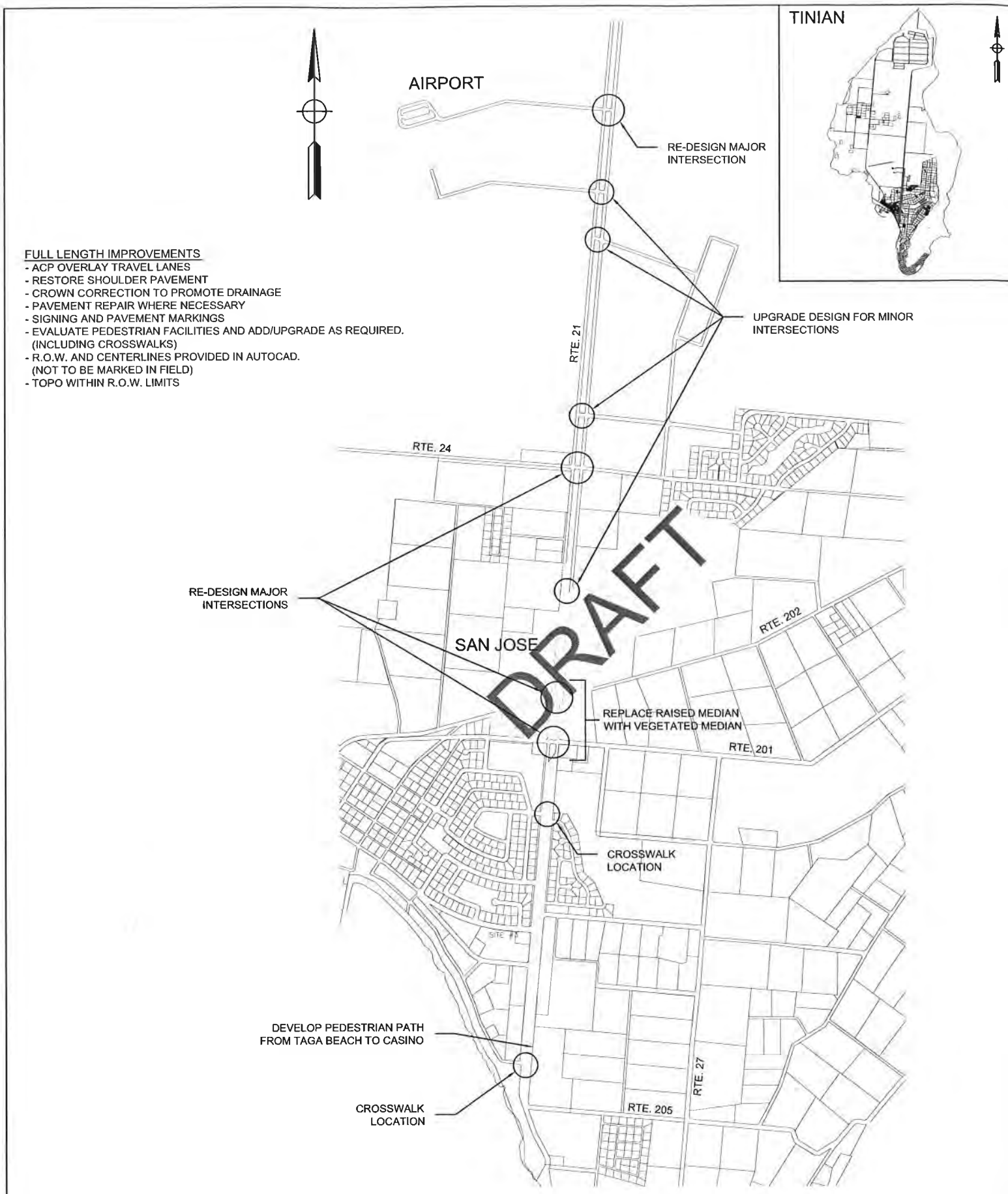
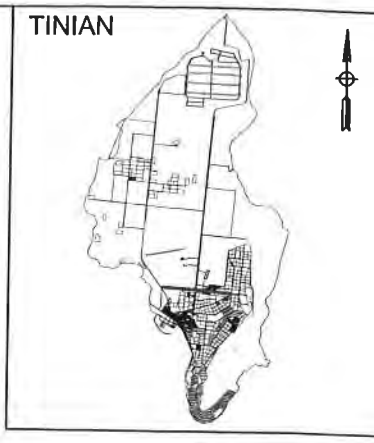


Figure 2. Route 21 Improvements



FULL LENGTH IMPROVEMENTS

ROUTE 24 WEST OF ROUTE 21

- PAVEMENT REPAIR
- R.O.W. AND CENTERLINES PROVIDED IN AUTOCAD. (NOT TO BE MARKED IN FIELD)
- SIGNING AND PAVEMENT MARKINGS BASED ON USGS OR OTHER AVAILABLE MAPPING.

FULL LENGTH IMPROVEMENTS

ROUTE 24 EAST OF ROUTE 21

- SIGNING AND PAVEMENT MARKINGS
- CLEAR ZONE INVENTORY AND HAZARD MITIGATION DESIGN
- R.O.W. AND CENTERLINES PROVIDED IN AUTOCAD. (NOT TO BE MARKED IN FIELD)
- TOPOGRAPHICAL SURVEY TO EXTEND 12' BEYOND THE WIDTH OF THE PAVED SURFACE ON EITHER SIDE

Figure 3. Route 24 Improvements

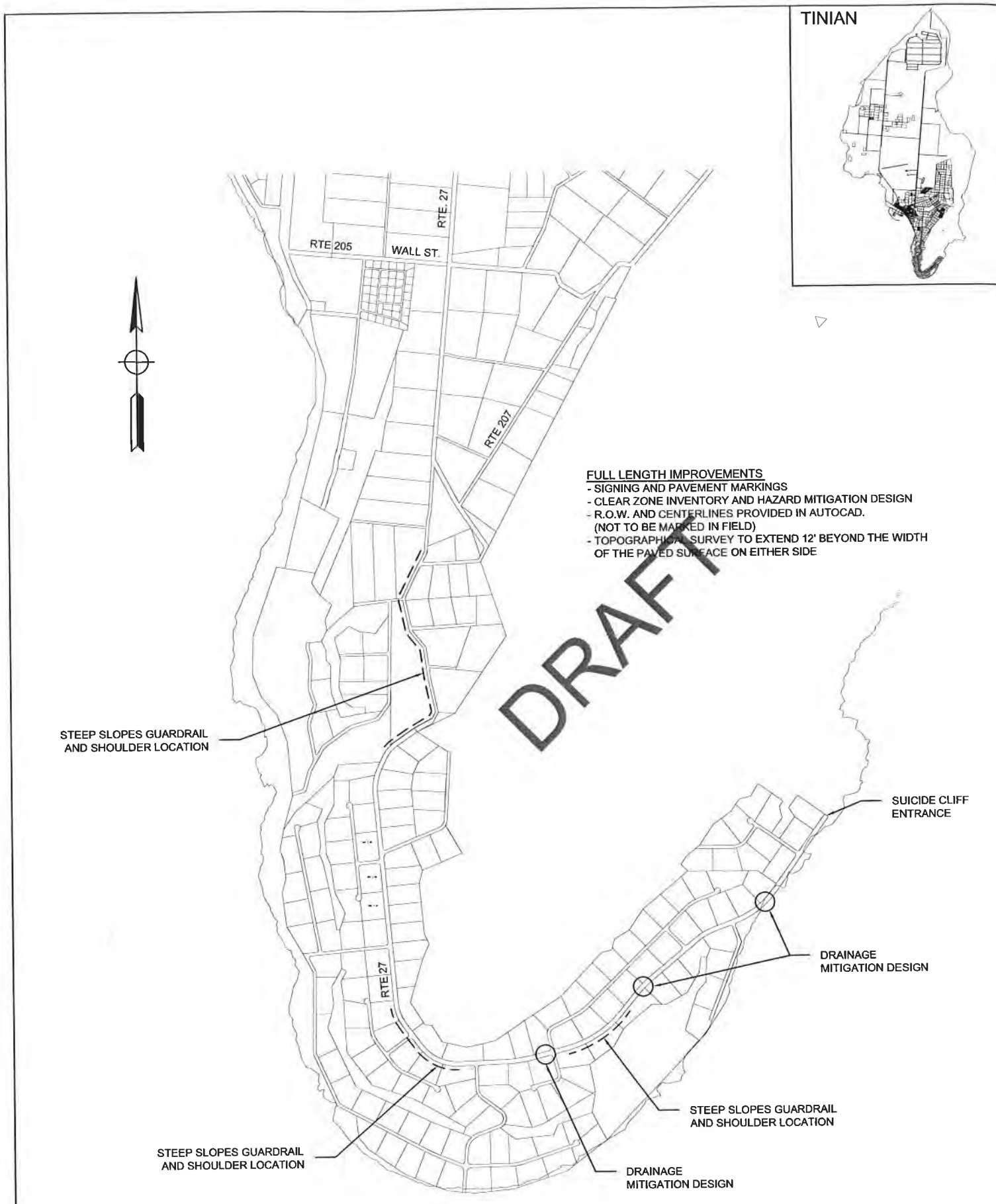


Figure 4. Route 27 Improvements

Appendix C
Meeting Records for Socioeconomic Interviews

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Agency Name: **CPA Tinian International Airport**

Date: *January 28, 2014 at Tinian International Airport; 1:30 PM to 2:30 PM*

Attendees:

Attendee Name	Organization	Title	Email	Telephone
Joseph Mendiola	CPA Tinian	Ports Manager	mendiola@cpa.gov.mp	670-433-9294
Gerald Crisostomo	CPA Tinian	Assistant Ports Manager	cpatinian@pticom.com	670-433-9294
Meagan Ostrem	MARFORPAC	NEPA Specialist	Meagan.ostrem.ctr@usmc.mil	808-477-8983
Elisse Takara	NAVFAC Pacific	NEPA Planner	Elisse.takara@navy.mil	808-472-1253
Scott Glenn	TEC JV	Socioecon Team	Scott.glenn@cardnotec.com	808-528-1445
David Kiernan	TEC JV	Socioecon Team	David.kiernan@cardnotec.com	850-765-5678

Meeting Record

1. **Introduction**
2. **Overview of SIAS**
3. **Interview Method**
4. **Questions**

1. Please describe the general functions of Tinian International Airport, what are your goals and mission?

   CPA Tinian is responsible for the airport and seaport. Both are under the supervision of the Tinian Port Manager. We monitor the coming and going of every vessel to the island. Manager of airport and the harbor master is same person.

   This is a certified airport for air carriers. We handle commuter flights, jets, charter flights. We operate from 6 AM to 8 PM. Flights after those hours are paid for by the military or the commercial flyer. We operate 7 days a week. The airport never shuts down unless a disaster occurs. The FAA mandates that certified airports have to be open to the public all the time.

   Tinian airport can be classified up to C class aircraft because of the ARFF building, the runway extensions, and charter flying. Tinian is not a controlled airport, meaning we do not have a control tower. The Saipan flight tower controls planes for here. Two airlines, Freedom Air and Star Marianas, provide commuter traffic. Occasionally, a private Lear jet comes in from Macau for the Dynasty. The Marines came on 737 airbuses during Forager Fury II.

2. Do you have data on annual passengers/cargo from Tinian? Is that data available?

   This will be shared in a follow up communication.

3. What are your major sources of funding, the CNMI government? Federal money?

   We are an autonomous agency of the CNMI government. We charge landing fees so we have a revenue source that covers operating costs. Our biggest expenditures are gas then labor.

4. Where does money used to fund employees come from?

   Port fees pay for employees.

5. Where does money used to fund facilities and equipment come from?

   FAA counts scheduled flights but not charter flights for funding purposes. CPA prefers to have scheduled flights because it helps project budgets more consistently and supports more staff. Statistics to FAA are based on scheduled flights and so do not reflect the full usage of the airport. CPA provides numbers on military flights to the FAA.

   For the runway expansion project, we used FAA and local money in anticipation of direct flights that would come for the Dynasty.

   For example, FAA is funding the new Air Rescue Firefighting (ARFF) Building. The ARFF has two fire trucks. There is a 90/10 split with the FAA. FAA wants to protect the truck, but the truck requires a lot of maintenance. The old ARFF station was too small, with not enough space to train personnel. The original cost projection for the new ARFF was $4 million but will likely cost about $6 million now. We have to bid it out. The new ARFF will have a training room, a conference room, a command center, and parking for three trucks. It is designed anticipating larger aircraft like international flights coming into the airport.

   Most equipment is for maintenance. The weather service station funded by the National Weather Service. Trucks, mowers, etc., are purchased in-house with funds from service fees.

6. What type of cooperation currently occurs between the military and Tinian International Airport? Are there ever conflicts or logjams created by military and commercial use?

   We have an annual training that is much smaller scale than what is being proposed. Smaller exercises have problems and there is concern that larger exercises will create larger problems.

   Geiger Fury was our first experience with military training. We learned a lot about requirements for military use of airports. They brought in so many troops and equipment. The military lease agreement gives military unlimited use of the airport, such as landing a C-130 or other military aircraft, though it is still a civilian airport. For the Rota and Saipan airports, the military has to pay after exceeding a certain number of landings and weight. We can charge if the military uses a charter. This is the same for oceangoing vessels.

7. How many full-time equivalent staff members were employed at the Tinian International Airport in fiscal year 2012?

   We have 28 staff members (including one at the seaport). Sometimes our hires go to Saipan. Our employees are all local residents. Some are green card holders.

8. How would you characterize the current capacity of the airport relative to demand for commercial use? Is there excess capacity or not enough capacity to handle existing traffic?

   We have seen tremendous growth in commercial activity with the development of the hotel and casino, especially from Asia. Sometimes we get up to 200 customers a day coming through the airport. We do about 20 flights, mainly between 2 AM and 7 AM for the tourists. You can hear the flights in town, though not from inside your house.

   Tourists subsidize flights because they come over in large groups and the airline has to make a lot of flights to Tinian that go back to Saipan empty, and then vice versa, so the locals try to fly on the off leg.

   We think airlines get enough tourists to have scheduled flights. Star Marianas is also almost on a regular schedule already.

   Freedom Air has regularly scheduled flight. Star Marianas is on charter basis, because to have regularly scheduled flight you have to have FAA approval. Now, most of their flights are night time flights because that's when China Airlines comes in. Once they announce on 24-hour schedule, then they are mandated to have an airline running 24 hours a day. The FAA approval process mostly consists of putting in a flight schedule that is set on date and time. Star Marianas said the airline is still waiting to get FAA approval of regular flights. Arctic Circle has a charter but only comes here a few times, maybe five times since it started.

9. What other improvements would be needed for direct flights from Asia (e.g., customs, immigration, TSA, baggage handling)?

   Currently, international charter flights have to fly to Saipan first and then Tinian. These flights usually need 90 days' notice so CPA can meet the federal requirements to process the passengers into Tinian.

   If an airline from Korea, for instance, wanted to set up a route directly to Tinian, the TSA and Customs and Border Patrol (CBP) would have to be set up at Tinian airport. They have not set up here because there are no international flights because there are other constraints to accepting international flights such as the lack of jet fuel.

10. What are some of your upcoming CIP projects?

    - Tinian Airport Fuel Farm would incorporate a fuel farm to expand the potential aircraft that could land at the airport. There is no jet fuel supply here, which limits the aircraft that can travel to Tinian and return. There have been discussions for a fuel farm at one point but it is currently on hold. It would be dependent on direct charter flights from Asia or the military. A fuel farm would help with military/civilian co-use and could be a factor for Divert. The military needs one on Tinian anyway. Is the military open to a joint fuel farm and helping with the ARFF?

    - Tinian Airport High Speed Taxiway B has no funding. We hope funds will free up since the Saipan Airport has completed its renovation. It was initially funded through local CIP

funds and started construction in 2002-2003. The first contractor defaulted, so the bonding company hired another company to complete it, which meant that there wasn't enough money to complete it. Having this would provide faster access to Runway A and save fuel. It would also facilitate co-use with the military by reducing the military impact on commuters, who have to wait when the military uses the airport because the military planes block the runway. It would be great if Red Horse (Rapid Expeditionary Deployable Heavy Operational Repair Squadron Engineers) built it.

- Tinian Airport Tinian Security Access System is on hold because the TSA is not active on Tinian. We currently have only lock and key security. There is no funding and it's low priority. If international flights to Tinian started, then the TSA would have to get active.

- Tinian Airport Perimeter Security Fence Replacement needs to happen. Currently, the fence is 6 feet (7 feet counting the barbed wire) and it doesn't meet FAA requirements. The requirement is now 9 feet plus 1 foot of barbwire. The current fence was built under older specifications. The FAA requires the fence to be re-done but there is no funding. If it is not replaced by a certain deadline, the Tinian airport will lose its certification and have to shut down. Likely, it will be replaced last minute once it becomes clear the airport will have to shut down otherwise.

- Tinian Airport West Terminal has been completed, but it is delayed because of deficiencies. Departure terminal was constructed in 2005. It needs ADA-compliant and structural upgrades and a quarantine area. A bid was put out to correct the deficiencies.

- Tinian Airport Instrument Landing System Improvements are on hold due to future maintenance costs that are not funded yet. It is not known when funding will come through for that.

11. What are some of the CPA concerns with increased military training on Tinian?

    The biggest concern of the CJMT is the proposed restrictions on airspace. The main concern is flying between Tinian and Saipan. Currently, it is a seven-minute flight time. When the range is hot, it could be a 20- to 30-minute flight time. One cannot fly single-engine aircraft more than two miles out into the ocean per FAA regulations. This would impact the ships as well in terms of fuel and travel time.

    Scheduled flights would likely be reduced because the airlines would have to use larger planes that consume more fuel, so they would wait until there are enough passengers to justify the flight. For our purposes, single-engine planes use less fuel and are more efficient. The cost could double, but income won't increase. Two airlines would not be able to survive and would probably consolidate into one airline. There will be fewer flights but more expensive, so import costs will go up. The impact might be less on tourism, especially if there are direct charter flights, and more on local Saipan and Tinian people.

    We also experienced how loud the military is during the training exercises like Forager Fury II. They fly in the F-18s during the early morning and the noise impact is big. Now they want

to shoot 50 mm howitzer and 155 mm guns. If you go to North Field now you can see how quiet it is; you can hear sound in Tinian and the southern end of Saipan. The military used dynamite to knock down some trees and we could hear that. Dynamite is nothing compared to that size of artillery. You can't compare our situation to the mainland because the mainland has too much ambient noise. This affects the community more than the airport, but the airport gets impacted because people get tired of the noise and call the airport to complain.

The concentration of the CJMT will be up in North Field. Most flights coming in from Saipan use North Field direction for visual flying. There is a risk that the hot ranges could close the Saipan Airport to international flights because the 7-mile approach is very close to North Field. The military is working with FAA and CNMI on that issue.

The military blocks civilian use of the Tinian airport when it doesn't coordinate properly. Tinian is a civilian airport and the military has to accommodate civilian flights. CPA gets tax dollars so the civilian comes first. If commercial activity is restricted, then it can limit eligibility for CPA funding. Forager Fury II coordinated closely with CPA Tinian to avoid commuter impacts, but the first time for the training was a total mess and military came unannounced and entered the safety area. Now, when military comes, we do a briefing and make sure they are in compliance. There is a need for consistent standard operating procedures for all the military departure flights from airports coming to Tinian. We need someone from the Marines who can sign documents like how the Air Force has it set up. The Marines have to send their document for signature to Japan and Hawaii; they need a coordinator in the Marianas who can take care of everything.

5. Open Topic

CPA Tinian Airport and the Department of Public Safety work together closely. If DPS is lacking resources to combat a fire, we send out our truck. That's the small island way. We also have our tri-annual training exercise that takes place here.

There is talk about restarting ferry service between Saipan and Tinian. This would affect scheduled flights because most passengers preferred to take the ferry. Dynasty had a ferry and people took it as part of the package deal to stay at the Dynasty. It was rarely used for cargo.

The majority goods transferred from Saipan to Tinian come by boat. Freedom Air runs the "cargo express" among Tinian, Saipan, and Rota. Mail comes by small plane.

6. Conclusion & Action Items

Additional Follow-up Information:

a. How does the FAA fund CIP projects?
b. How many annual passengers and how much cargo depart from Tinian airport and seaport to Saipan (and other destinations if available)?
c. Please update the status on the following items:
    a. Relocation of the Aircraft Rescue and Fire Fighting Facility (ARFF) building, funding for it, and acquisition of a 1,500-gallon ARFF vehicle;
    b. Installation of a new water line and funding for it; and
    c. Instrument Landing Improvements.

Agency Name: **Star Marianas Airlines, Inc.**

Date: *January 30, 2014 at Star Marianas; 8:00 AM to 9:00 AM*

Attendees:

Attendee Name	Organization	Title	Email	Telephone
Shaun Christian	Star Marianas	Chief Operating Officer	schristian@starmarianasair.com	670-433-9899
Donna Cabrera	Star Marianas	Dispatch Manager	Cabrera.donna@gmail.com	670-433-9987/9997
Meagan Ostrem	MARFORPAC	NEPA Specialist	Meagan.ostrem.ctr@usmc.mil	808-477-8983
Elisse Takara	NAVFAC Pacific	NEPA Planner	Elisse.takara@navy.mil	808-472-1253
Scott Glenn	TEC JV	Socioecon Team	Scott.glenn@cardnotec.com	808-528-1445
David Kiernan	TEC JV	Socioecon Team	David.kiernan@cardnotec.com	850-765-5678

Meeting Record

1. **Introduction**
2. **Overview of SIAS**
3. **Interview Method**
4. **Questions**

    1. Please describe the services Star Marianas provides. Do you provide both cargo and passenger services?

        Star Marianas is a Tinian-based "on-demand" air carrier that provides both passenger and cargo services. Star Marianas has about 115-120 employees most of whom (65%) are U.S. residents. 70% of employees are Tinian-based, 28% are Saipan-based, and 2% are Rota–based.

        Star Marianas is in the process of moving away from an on-demand model to a schedule model. This change should be complete by mid-February.

        Star Marianas has 7 piper Cherokee Sixes, which are single engine airplanes. And 3 twin engine Navajo aircraft. Recently bought one more Navajo that is on its way out here – the twin engine craft are used for flights to Rota.

        Passenger service – Provide passenger services mainly Saipan-Tinian route. About 30% of customers are local (locals offered a discount) and 70% tourist (rough estimate). Tourists are primarily Chinese visitors on tours organized through the Dynasty. Tinian airport is not equipped for direct international service so Star Marianas bring Dynasty tours over to Tinian from Saipan.

        Cargo services – Tinian-Saipan is primarily bread and perishables for stores and schools. Star Marianas is working on an agreement to transport specimens for the Tinian Health Center to

Saipan hospital. Cargo to Rota comes from Guam or Saipan and is primarily to keep markets stocked with goods, the last time the barge was able to access Rota port was 1.5 months ago, and prior to that 3 months; we take everything for the stores there, there is a group of store owners organizing the cargo shipments, we charter the airplane to them and they determine what gets put on it – primarily frozen goods and perishables, beer etc. Out of Rota, outbound cargo is increasing, store owners realize they are able to cover inbound costs by offering farmers $0.20/lbs to send produce to Guam (primarily) and Saipan.

2. How many flights per day/year does Star Marianas provides? How many are inter-island, within the CNMI?

   48,000 flights last year; about 90% were Tinian-Saipan; number of passengers – CPA has all the reports on it. Averaging about 4,000 flights per month this year. The Tinian-Saipan route is most popular; non-Saipan/Tinian transport is primarily cargo.

3. About how much fuel is used for an interisland flight (between Tinian and Saipan)? How much of this is used at takeoff and to get to altitude?

   About 6 gallons for Cherokee for flight round trip/ 2-3 gallons per leg; about 10.3 miles point to point one leg; project using 10 gallons for twin engine per leg.

   All piston-engine fuel, so all planes use Avgas (100 Octane LL) fuel; twin engines are turbo-charged so consume more fuel/hour than single-engine; budget 15 gallons/hour for single engine and 50 gallons/hour for twin engine.

4. What has been the average price you have paid for a gallon of fuel lately?

   Cost of fuel delivered to Saipan is $10/gallon.

5. Who is your customer base? Do you distinguish between CNMI resident and non-resident (tourist) customers? Do you know an approximate breakdown of local vs. visitors?

   About 30% of customers are local (locals offered a discount) and 70% tourist (rough estimate). Typical package tour has a couple of people on Saipan for a few days and on Tinian for a few days.

6. When military operations have occurred on Tinian, has there been any effect on your business?

   Military is like bulls in china shop when they come out here; military shuts down taxiway; FAA said military is no longer able to refuel in the apron area (because military did it during Geiger Fury by offloading fuel bladders and ended up shutting down Charlie taxiway); FAA stuck them out at west end of the airport, which effectively blocks the parallel taxiway, which requires planes to back taxi on the runway against oncoming traffic, which creates big logistical issue, safety concerns, and additional costs; there is a plan to put in a high-speed taxiway; until that happens there is an operational burden.

Airspace – We tend to blend ok. The military understands this is a civilian airport and commercial aircraft have the right away. The military might ask to shut down airport for an hour, then is not ready for the window and delays, and then asks to move the window, which cannot be done. This is not consistent with lease agreement, which says the military will not adversely affect civilian operations; the military does occasionally adversely affect the civilian use of the airport.

Star Marianas has been contracted to fly for military, and has done ration pickups, passenger services, and have done flight to test merchant marine responses.

7. How does the number of flights and length of each flight figure into your business model? (Note: discussion quickly turned to how the proposed 3-mile SDZ would affect operations).

   14 CFR 135.183 titled Performance Requirements: Land Aircraft Operated Over Water States: No person may operate a land aircraft carrying passengers over water unless- a.) It is operated at an altitude that allows it to reach land in the case of engine failure; b) It is necessary for takeoff or landing; c) It is a multiengine aircraft operated at a weight that will allow it to climb with the critical engine inoperative, at least 50 feet per minute, at an altitude of 1,000 feet above the surface; or d) It is a helicopter equipped with helicopter flotation devices. This basically means that a single engine aircraft must be within gliding distance of shore at all times, except for the purposes of taking off and landing. For us, given the current flight path, glide distance can be achieved with 1,500 feet of altitude, but if have to go 3 miles out, would have to go up to 5,000 feet (altitude) (estimated) to be at glide distance. Star Marianas single engine aircraft are not equipped to operate under instrument flight rules therefore the 14 CFR 135 visual flight rule regulation apply which require cloud clearances of 500 feet below, 1000 feet above, and 2000 feet horizontal from clouds. As a general rule cloud ceilings sit at around 2,000 feet above ground level so would have to fly around and avoid clouds. Extra distance and altitude requires much more fuel time and the risk is much greater for cancellations (e.g., yesterday would have been no flights at all). The current flight path is optimal but if we need to go three miles out the problems would be so great that we would not be able to operate our current fleet of single engine aircraft.

   Twin engine planes could still theoretically do an on-demand model; Star Marianas has slowly been adding twin-engine planes. The cost structure is different though. They require more fuel per engine and have greater maintenance requirements - there are hourly limits to how long you can operate an engine before needing to do maintenance; so double maintenance requirements. FAA prefers there to be two pilots in a twin engine plane and insurance premiums are higher. With Cherokee (single-engine), the break-even point is 3 passengers so will need to wait longer for more people to fill seats or charge for the extra empty seats. With Navajo (twin-engine), we need 5 passengers to break even. If there is a switch to twin-engine then there would be fewer flights and costs would be much greater. Would need to increase prices by a third or double them.

   Chinese tourists might not care if the price of a ticket to Tinian doubled, but locals would be impacted. There is a chance though that the price increase could greatly affect tourism visits.

The Dynasty/Tour company protested an increased cost of only $5, so a large increase would create problems with the tour companies. They might look elsewhere.

Trips to Tinian are not totally dependent on air cost, but the quality of the environment may affect visits. Hardly any of the tourists to Tinian gamble, 90% of tourists are not coming to utilize the casino, they are coming because they are from Shanghai, Chengdu (full of smog) and want to experience pristine tropical destination that is as close to America as they can get without a U.S. visa; live-fire/bomb dropping would deter these tourists causing them to go somewhere else. Dynasty used to market Tinian as a lower-cost destination to go after lower end/budget tourist market; certainly upper scale come over and mainly go to Saipan; new investment group that bought Dynasty is trying to upgrade image to that of like Hyatt; Tinian is competing with other tropical destinations in a four-hour flight radius from mainland China to Tinian.

8. What changes to air transportation in the CNMI do you see occurring if direct flights from Asia to Tinian are initiated?

   Tinian International airport is not equipped to receive international flights. "Not equipped" means there are TSA, immigration, hospital limitations (because hospital not equipped to take care of large jet accident), there is no jet fuel, fire trucks are capable of supporting large aircraft but the position of the fire building is not in the correct location because it should be able to see entire runway operations and access entire airport in 2 minutes; there are design factors for international flight requirements (ICAO Annex 9).

   Some private charter jets from China fly to Saipan, clear customs and quarantine, fly over to Tinian, then do another Saipan leg before going back to China to refuel.

5. Open Topic

Trying to switch to scheduled flights from charter/on-demand flights. There is concern that DOT and FAA have different interpretations. We want to post notices that we have flights at 2 AM (for instance) and can catch empty legs at reduce price on the way back. FAA says that constitutes publishing a schedule; we don't see that changing our current operations.

If turn back over the airport for military use it would effectively put a giant net up between the airports on Tinian and Saipan rendering the Tinian airport useless (based on economics) for the majority of its intended use; we feel strongly there needs to be a reevaluation.

Rates for other routes are affected by cost of Tinian-Saipan; passenger service covers management cost to help reduce cost of other cargo to Rota. (i.e., flights from Tinian-Saipan subsidize cargo flights to Rota)

6. Conclusion & Action Items

Additional Follow-up Information:

a. Can you provide passenger data? How many are residents versus tourists? ***(We do not have a reliable method of tracking the difference between the tourists and local customers. CPA has all of the total passenger counts that would include Star and Freedom Air Totals.)***

b. What is the FAA regulation on glide distance? 14 CFR 135.183…modified in question 7.

c. What is the ICAO Annex on flight requirement design standards? **ICAO Annex 9 (Facilitation)**

Agency Name: **Arctic Circle Air**

Date: *February 1, 2014 at Arctic Circle Air Office; 12:30 PM to 1:10 PM*

Attendees:

Attendee Name	Organization	Title	Email	Telephone
J. A. "Andy" Nehring	Arctic Circle Air	General Manager	jan_jan999@yahoo.com	670-989-6669
Scott Glenn	TEC JV	Socioecon Team	scott.glenn@cardnotec.com	808-528-9582

Meeting Record

1. **Introduction**
2. **Overview of SIAS**
3. **Interview Method**
4. **Questions**

1. Please describe the services Arctic Circle Air provides. Do you provide both cargo and passenger services?

   Arctic Circle Air provides regular and chartered passenger and cargo transportation between Saipan, Tinian, Rota, and Guam. Arctic Circle provides chartered passenger transportation to Pagan. They are the only airline with an airplane capable of landing on the airstrip on Pagan. Passengers to Pagan tend to be military or government, or people wanting to live on the island for a few days or weeks.

2. How large is your fleet of planes presently? Are there plans to increase or decrease the size of your fleet?

   The fleet consists of twin-engine planes. Each engine burns about 30 gallons/hour, for a total of approximately 1 gallon/minute counting both engines. There are no plans to increase or decrease the fleet size.

3. What are the major factors that influence your costs structure? Which are most important?

   Aside from labor, the cost of fuel and fleet maintenance are the major factors affecting cost structure.

4. What conditions or changing factors may lead to changes in your business plan or economic structure?

   Increased fuel costs or alternative routes (if sufficiently different from the current route) would affect business viability. A route deviation of requiring a 3-mile distance would not affect the cost of operations because the twin-engine plane carries enough fuel for a round trip flight plus a buffer of 45 minutes worth of gas.

5. Open Topic

All commercial travel crosses North Field, following the ILS (instrument landing system) pathway. Any restrictions around the ILS or over the channel between Tinian and Saipan would have a significant effect on air transportation.

6. Conclusion & Action Items

Additional Follow-up Information:

a. How many and what kind of planes are in the fleet?

   Right now we have only one aircraft – a Britten Norman Turbo Islander BN-2T. Plans are to add one or two more in the next 6 months.

b. How many annual passengers do you carry? How many of the passengers are tourists versus local residents?

   80% of our flying is cargo flying between Saipan-Rota and Guam-Rota-Saipan

   Most passengers are locals who use to fly with Freedom Air, and about 20% of passengers are going to Rota Resort as tourists.

Agency Name: **Freedom Air**

Date: *February 3, 2014 at Freedom Air Ticketing and Reservation Center; 8:30 AM to 9:40 AM*

Attendees:

Attendee Name	Organization	Title	Email	Telephone
Dennis Cruz	Freedom Air	Station Manager	freedomairspn@pticom.com	670-288-5882/5005
Edward Lynch	MARFORPAC	NEPA Specialist	Edward.lynch.ctr@usmc.mil	808-477-8480
Scott Glenn	TEC JV	Socioecon Team	Scott.glenn@cardnotec.com	808-528-1445

Meeting Record

1. **Introduction**
2. **Overview of SIAS**
3. **Interview Method**
4. **Questions**

1. Please describe the services Freedom Air provides. Do you provide both cargo and passenger services?

   We have as many as 135 passengers a day on the Saipan-Tinian route. We use single-engine Cherokee planes that carry up to six passengers. There are 13 scheduled flights a day. If there are more passengers, then we do more flights. Lately passenger counts are down because of competition from Star Marianas. Our license allows both scheduled and charter flights. We also have a twin-engine plane that can carry 30 passengers scheduled for three trips a week, but we need parts for it, so it is Guam waiting for the parts. Aircraft parts are not cheap. We got a new engine overhauled at $500,000. You can buy a second-hand engine for $300,000, but only 200 to 500 flight hours before it has to be overhauled.

   For cargo, we have a 330 Sherpa that can carry 6,000 pounds. We can fly from here to anywhere. We do a regular charter on Thursday and Sunday between Guam and Saipan. We also have a seven-seat Navajo twin-engine that flies Saipan-Rota-Guam and can carry 1,000 pounds. When the 30-seat plane is operational, we sometimes remove the seats and fill it with mail. Cargo can be lab specimens, hazmat, or anything someone needs to send.

2. About how much fuel is used for an interisland flight (between Tinian and Saipan)? How much of this is used at takeoff and to get to altitude?

   For the Cherokee we use about 1.5 drums (a drum is 55 gallons) of fuel on a regular day. For busy days, we may use up 2 or 3 drums. A round trip flight from Tinian to Saipan is 4 to 5 gallons.

3. What has been the average price you have paid for a gallon of fuel lately?

   The fuel our single-engine planes use is avgas (aviation gas). The twin-engine planes use jet fuel. We order an isotainer (6,000 gallons) of avgas at a cost of $56,000. The fuel itself is $30,000, but the transportation cost is another $20,000. There are no bulk fuel transportation options because none of the major fuel companies bring in avgas anymore. Freedom Air used to buy drums from Mobil, but that stopped, so Freedom Air has to order it directly. Other users of avgas are Star Marianas and small charter flyers. Mobile only brings in jet fuel now.

   Because we buy fuel directly, we are asking the government to try to do something about the custom fee on importing the fuel to help bring down cost.

4. Who is your customer base? Do you distinguish between CNMI resident and non-resident (tourist) customers? Do you know an approximate breakdown of local vs. visitors?

   We have maybe a half and half tourist/local split. We are not part of the Dynasty package tour, so we get tourists who are here for other reasons. Locals are also customers, especially for medical referral. No local rate is offered. We do not have numbers for distinguishing tourist or local customers.

5. When military operations have occurred on Tinian, has there been any effect on your business?

   During Forager Fury II, there were no changes to our operations. When the military does training involving the runway, the CPA issues a notice to reroute. It's never a "no fly" notice. When we have to deviate the flight, we make sure we're in glide distance. It's not too much and there's no difference to fuel use. We don't have to change the flight times. This might change though if the proposed action is implemented.

6. What do you think the most important factors are that bring tourists to the CNMI? How do you see these factors trending into the future?

   There is a travel company that brings tourists to Tinian and it has another company that takes people around the island. Some tourists just show up by taxi and do self-tour. People go for the beauty and history. Some tourists go for the casino, but they are mainly the Star Marianas passengers.

7. How does the number of flights and length of each flight figure into your business model?

   Competition has lowered the number of flights we do. We reached out to PDI (Pacific Development, Inc.) to set up arrangement to feed tourists to our airline. Sometimes we don't have business for two months. When Star Marianas had that crash, people came to us. Some high ranking people on Tinian are supporting Star Marianas. That's not fair to us. There are two airlines. The mayor should support having two airlines not help only one. There's too much politics.

8. How does the number of flights and length of each flight affect travelers, including tourists?

   If there is more training on Tinian and we have to reroute, then that could affect our price. We have to talk to the military. If we keep having to reroute, then we will have to raise the price. We don't want to raise the price. People know the trip is the same, so if we tell the customer we raised the price because of the military's needs, then the public go to the politicians to talk to the military. Our license allows us to set prices. We don't offer a local discount, but we are considering it. We are still working out pricing with PDI. Star Marianas charges the same price for tourists and local between 6 AM and 6 PM. In the evening, they give a local discount.

   We used to have a special rate for medical referrals, but the hospital started using a travel agency so we went back to the normal rate.

9. What changes to air transportation in the CNMI do you see occurring if direct flights from Asia to Tinian are initiated?

   Direct flights from China to Tinian wouldn't affect us as much as it would affect Star Marianas. We are more reliant on locals and independent tourists, not Dynasty-driven Chinese tourism.

5. Open Topic

A fuel farm on Tinian with avgas and JF4 (for helicopters) wouldn't affect our operation. Our twin-engines are JETA (similar to JP4) and would be able to fly there and refuel.

Larger planes cut across Tinian all the time just because they want to and can. It causes problems for us. Military airplanes are fast and worry our pilots.

6. Conclusion & Action Items

Additional Follow-up Information:

a. How many and what kind of planes are in the fleet?
b. How many annual passengers do you carry? How many of the passengers are tourists versus local residents?

Appendix D
Tinian Roadway Elevation Profiles

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Tinian
Proposed Roadway Elevation Profile Segments

0 2,000 4,000 6,000 Feet

0 500 1,000 1,500 Meters

PREPARED BY:
AECOM on behalf of
Naval Facilities Engineering Command, Pacific

Date: 5/30/2014

Coordinate System: UTM Zone 55 North
Projection: Transverse Mercator
Datum: D WGS 84

LEGEND

- Road Segment Dividing Points

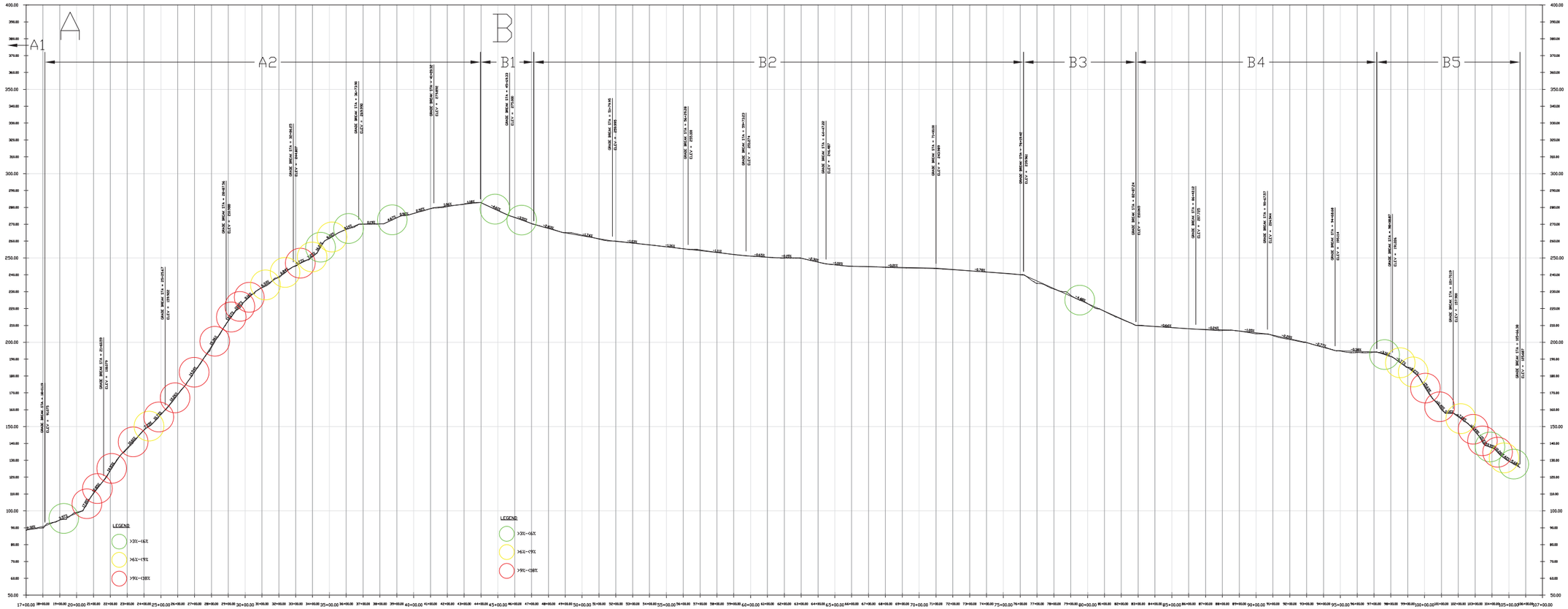
Roadway Improvement Segments*

- Repair Existing Road for Public Use
- Construct New Paved Road
- Construct New Gravel Road
- Establish Military Training Road
- Repair Existing Road for General Use
- Improve Road ROW for Utilities
- Perimeter Patrol Road
- Tracked Vehicle Transit Lane
- Tracked Vehicle Training Trail
- Historic WWII Bomb Pits
- Major Contour Interval (20 ft)
- Minor Contour Interval (5 ft)
- High Hazard Impact Area (HHIA)
- Base Camp Site Plan Area
- Primary MSA Area
- Temporary MSA Area
- IBB Area
- Military Lease Area

The 1- or 2- digit letter labels correspond to the roadway segment elevation profiles.

Data Sources: NAVFAC PAC, USGS, MFP,TECOM, TEC-AECOM Pacific JV

Path: P:\PDD\60225032 CJMT (DTP) EIS\06 GIS\6.3 Layouts\d\Transportation_Study_Task11\DRAFT_V3\CJMT_Road_Profile_Segments_30MAY2014.mxd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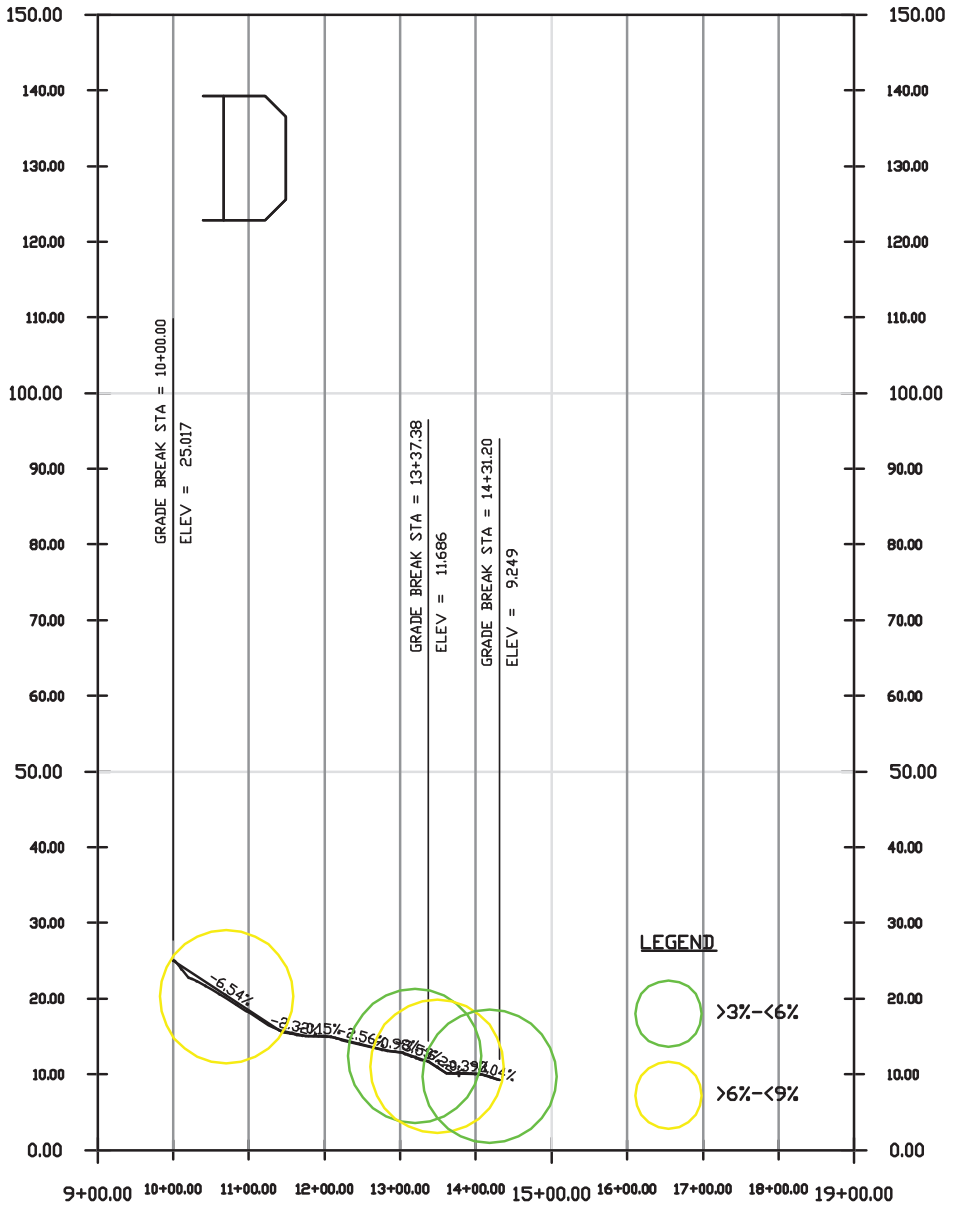
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ELEV = 25.017
GRADE BREAK STA = 13+37.38
ELEV = 11.686
GRADE BREAK STA = 14+31.20
ELEV = 9.249
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-2.32%
-2.56%
LEGEND
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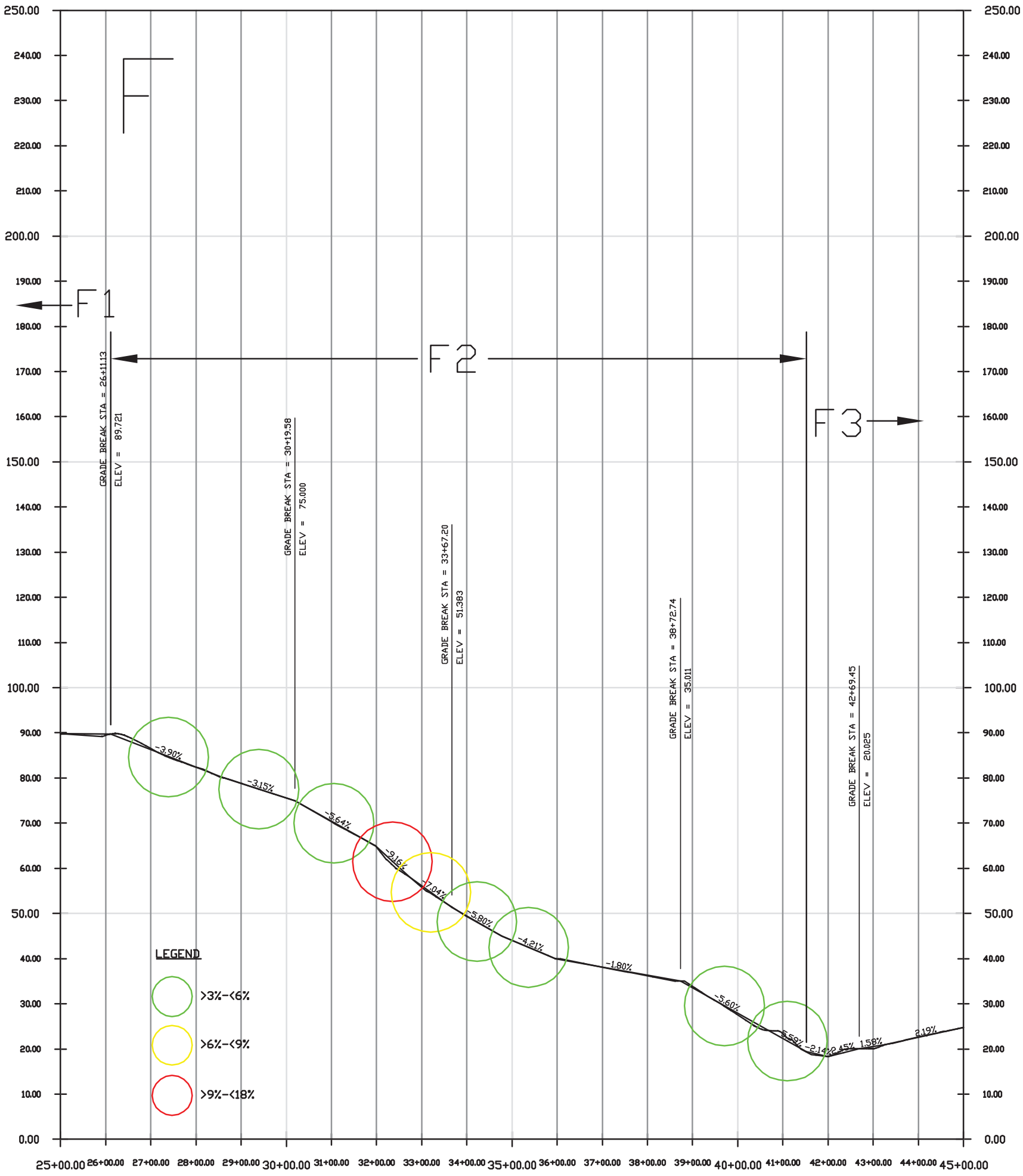
F1
F2
F3
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ELEV = 89.721
GRADE BREAK STA = 30+19.58
ELEV = 75.000
GRADE BREAK STA = 33+67.20
ELEV = 51.383
GRADE BREAK STA = 38+72.74
ELEV = 35.011
GRADE BREAK STA = 42+69.45
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-1.80%
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35+00.00
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37+00.00
38+00.00
39+00.00
40+00.00
41+00.00
42+00.00
43+00.00
44+00.00
45+00.00

G

G1

G2

G3

G4

GRADE BREAK STA = 10+00.00
ELEV = 120.457

GRADE BREAK STA = 14+47.07
ELEV = 103.915

GRADE BREAK STA = 18+51.60
ELEV = 94.930

GRADE BREAK STA = 24+39.57
ELEV = 82.518

GRADE BREAK STA = 29+21.36
ELEV = 75.057

GRADE BREAK STA = 33+65.93
ELEV = 53.135

GRADE BREAK STA = 38+02.46
ELEV = 30.000

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-5.59%
-0.13%

LEGEND

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>6%-<9%

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GRADE BREAK STA = 42+18.28
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LEGEND
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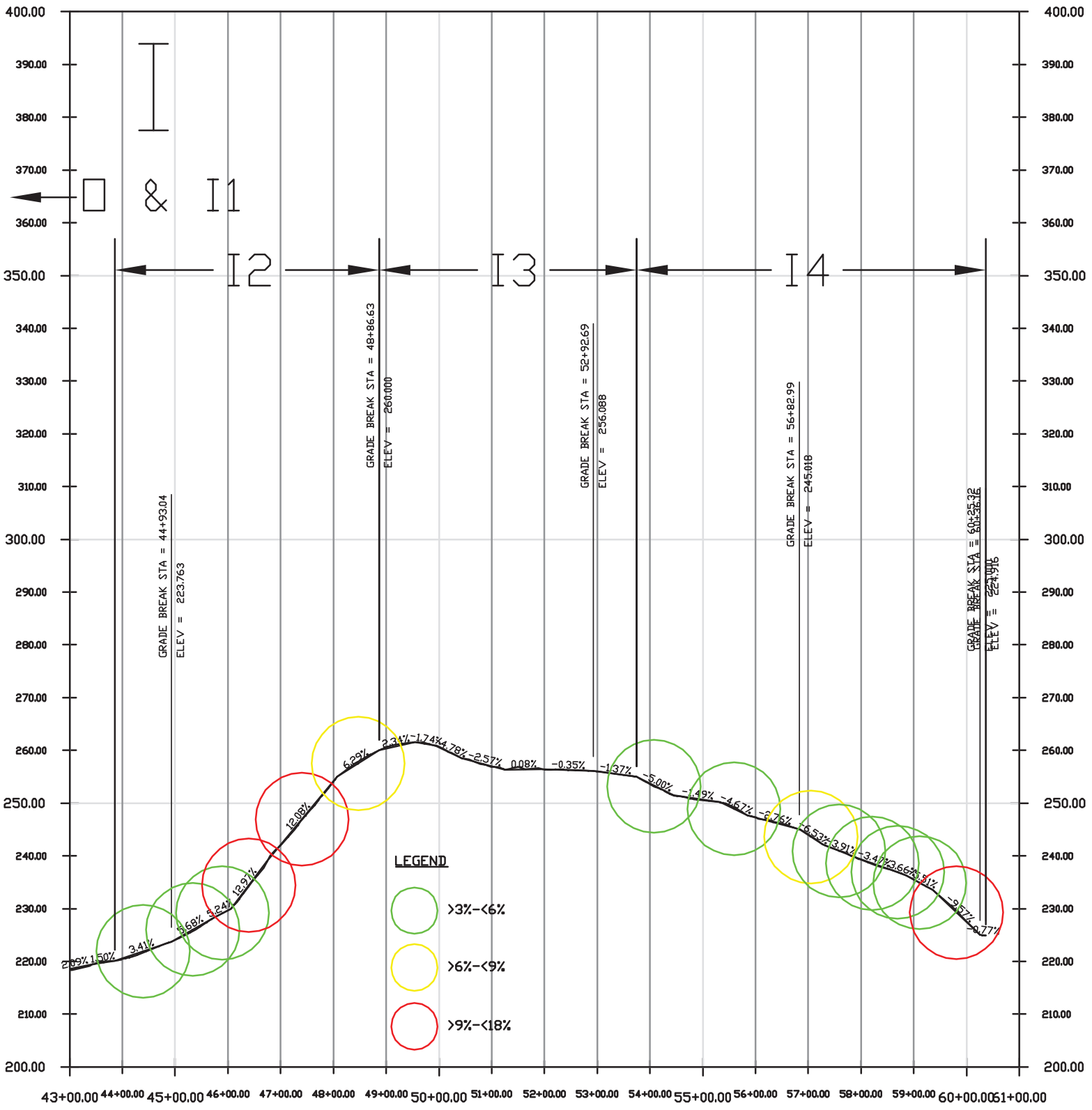
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220.00
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I1
I2
I3
I4
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GRADE BREAK STA = 52+92.69
ELEV = 256.088
GRADE BREAK STA = 56+82.99
ELEV = 245.018
GRADE BREAK STA = 60+25.32
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3.41%
3.68%
5.24%
12.91%
12.08%
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2.31%
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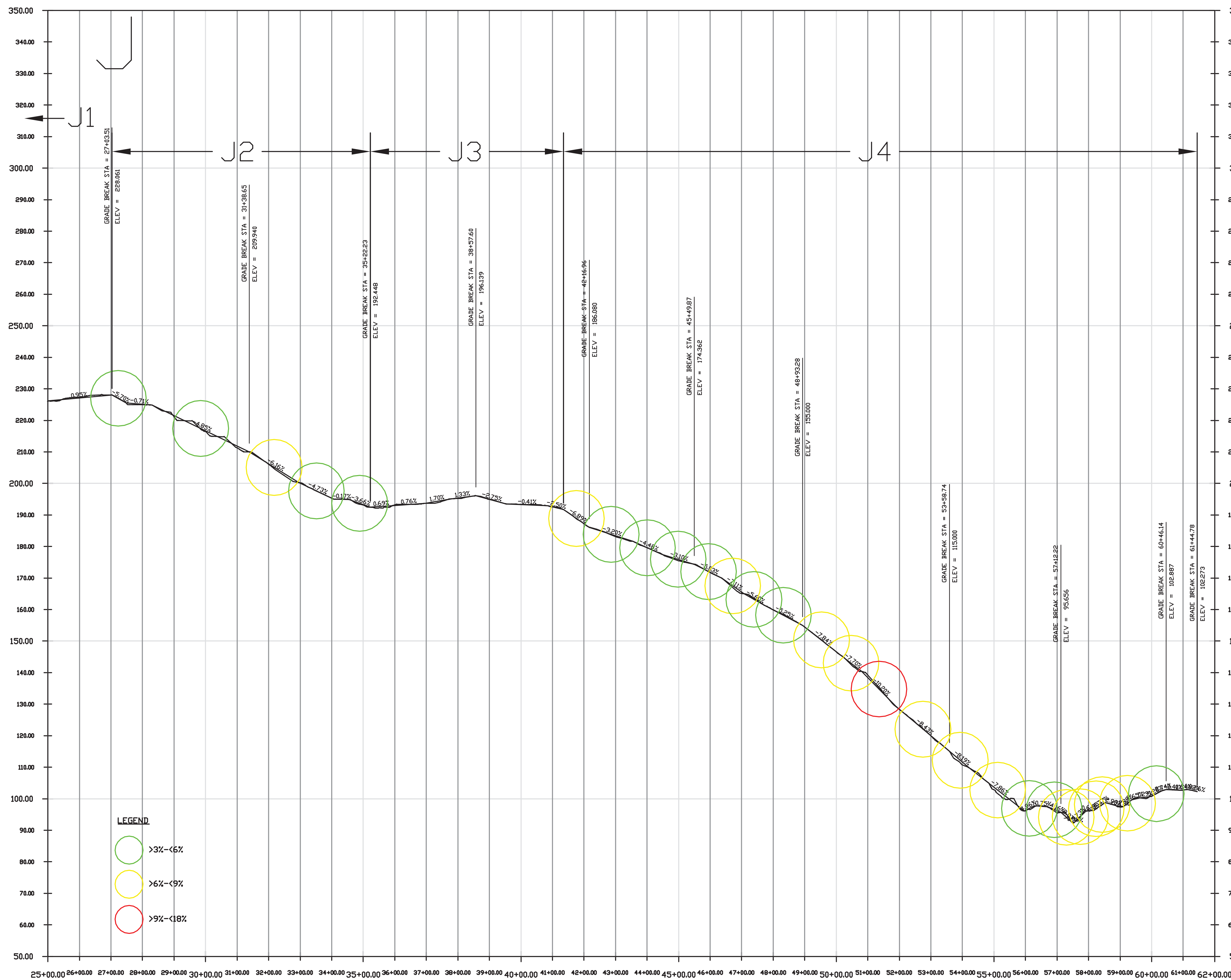
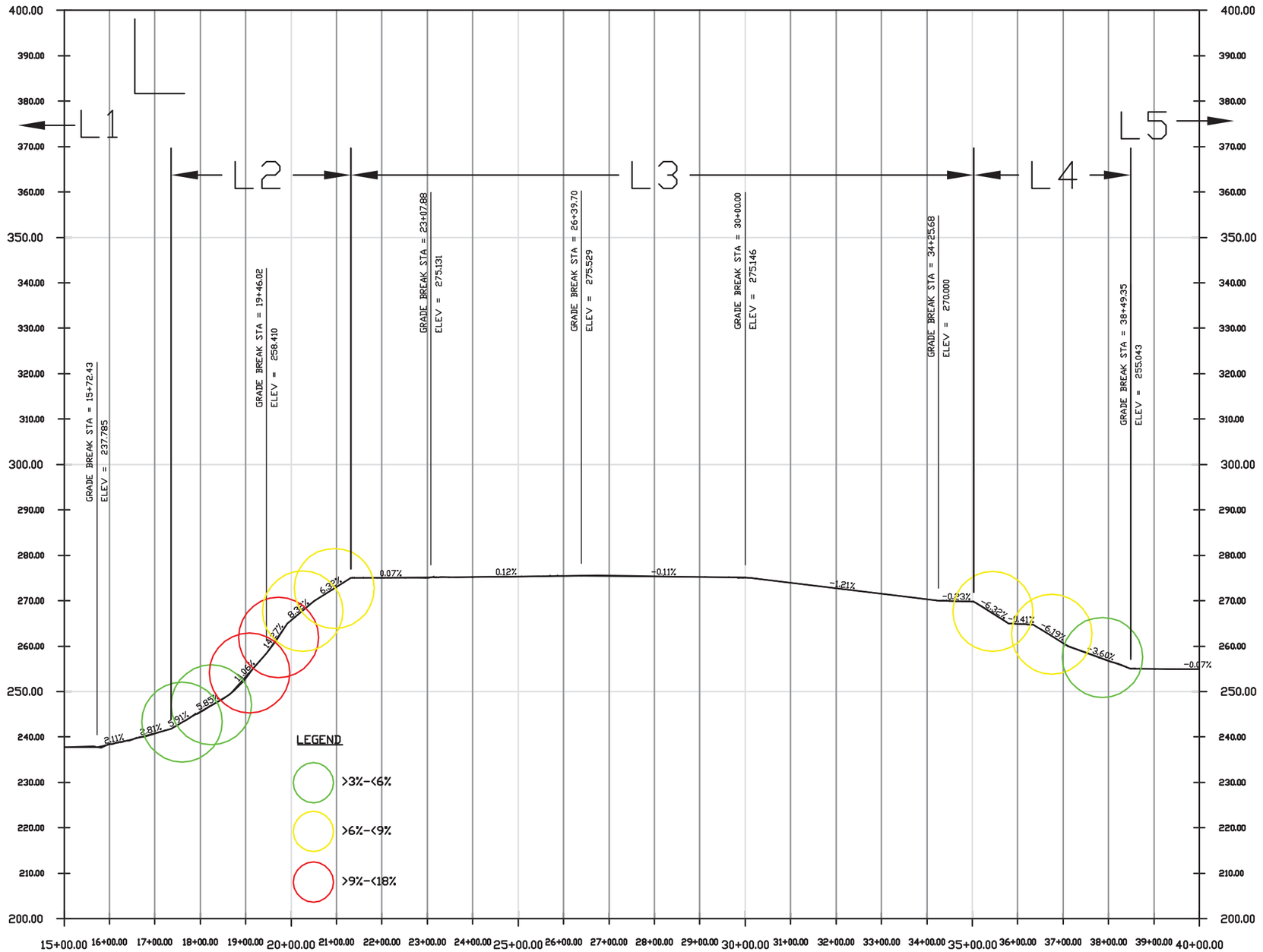
>9%-<18%
43+00.00
44+00.00
45+00.00
46+00.00
47+00.00
48+00.00
49+00.00
50+00.00
51+00.00
52+00.00
53+00.00
54+00.00
55+00.00
56+00.00
57+00.00
58+00.00
59+00.00
60+00.00
61+00.00



J1
J2
J3
J4
GRADE BREAK STA = 27+03.51
ELEV = 228.061
GRADE BREAK STA = 31+38.65
ELEV = 209.940
GRADE BREAK STA = 35+22.23
ELEV = 192.448
GRADE BREAK STA = 38+57.60
ELEV = 196.139
GRADE BREAK STA = 42+16.96
ELEV = 186.080
GRADE BREAK STA = 45+49.87
ELEV = 174.362
GRADE BREAK STA = 48+93.28
ELEV = 155.000
GRADE BREAK STA = 53+58.74
ELEV = 115.000
GRADE BREAK STA = 57+12.22
ELEV = 95.656
GRADE BREAK STA = 60+46.14
ELEV = 102.887
GRADE BREAK STA = 61+44.78
ELEV = 102.273
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%


L1
L2
L3
L4
L5
GRADE BREAK STA = 15+72.43
ELEV = 237.785
GRADE BREAK STA = 19+46.02
ELEV = 258.410
GRADE BREAK STA = 23+07.88
ELEV = 275.131
GRADE BREAK STA = 26+39.70
ELEV = 275.529
GRADE BREAK STA = 30+00.00
ELEV = 275.146
GRADE BREAK STA = 34+25.68
ELEV = 270.000
GRADE BREAK STA = 38+49.35
ELEV = 255.043
2.11%
2.81%
5.91%
9.85%
11.06%
14.27%
8.93%
6.33%
0.07%
0.12%
-0.11%
-1.21%
-0.23%
-6.32%
-9.41%
-6.19%
-3.60%
-0.07%
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%
400.00
390.00
380.00
370.00
360.00
350.00
340.00
330.00
320.00
310.00
300.00
290.00
280.00
270.00
260.00
250.00
240.00
230.00
220.00
210.00
200.00
15+00.00
16+00.00
17+00.00
18+00.00
19+00.00
20+00.00
21+00.00
22+00.00
23+00.00
24+00.00
25+00.00
26+00.00
27+00.00
28+00.00
29+00.00
30+00.00
31+00.00
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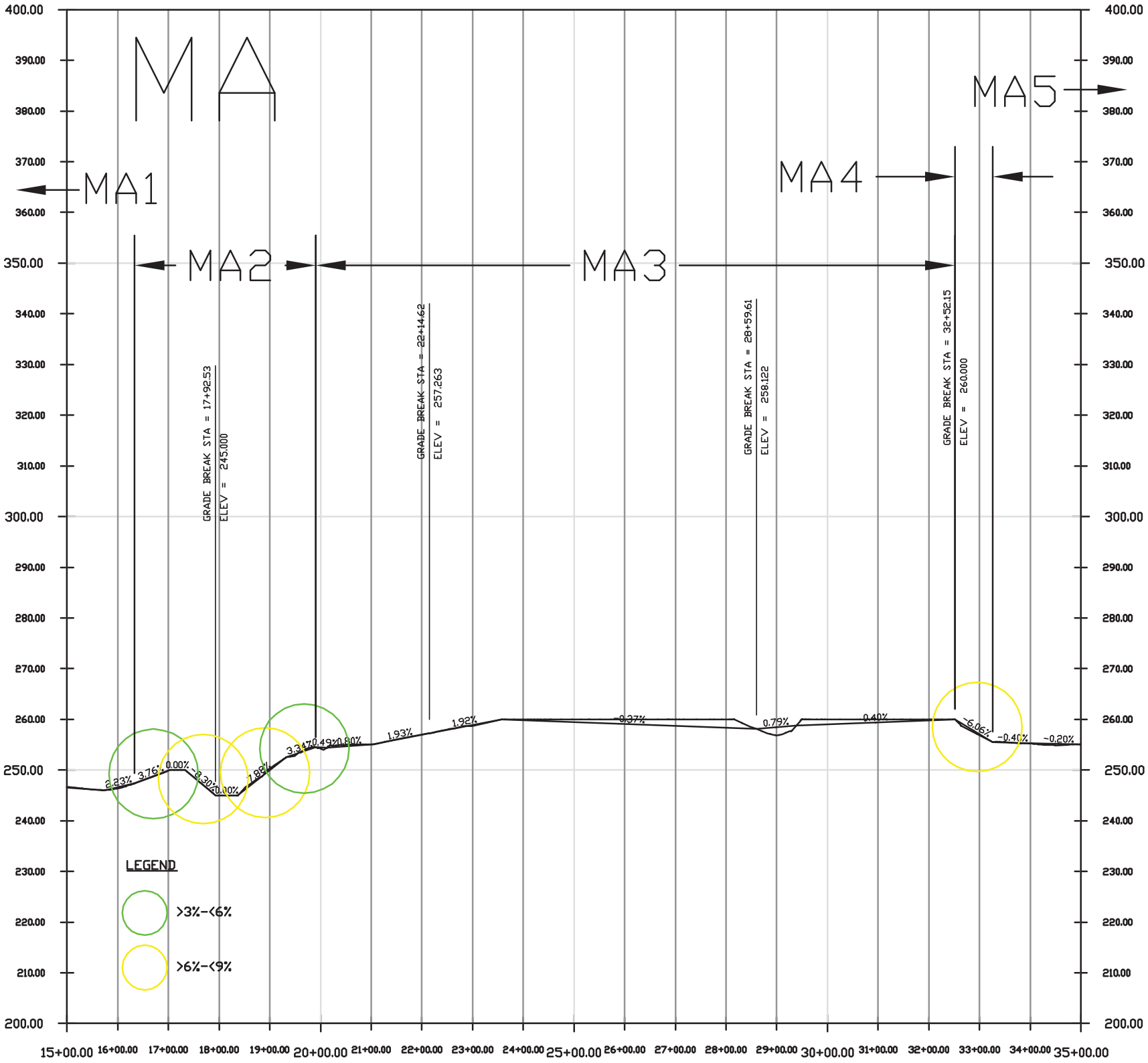
37+00.00
38+00.00
39+00.00
40+00.00


MA
MA1
MA2
MA3
MA4
MA5
GRADE BREAK STA = 17+92.53
ELEV = 245.000
GRADE BREAK STA = 22+14.62
ELEV = 257.263
GRADE BREAK STA = 28+59.61
ELEV = 258.122
GRADE BREAK STA = 32+52.15
ELEV = 260.000
2.83%
3.76%
0.00%
-3.30%
0.00%
1.88%
3.34%
0.49%
0.80%
1.93%
1.92%
-0.37%
0.79%
0.40%
-6.06%
-0.40%
-0.20%
LEGEND
>3%-<6%
>6%-<9%
400.00
390.00
380.00
370.00
360.00
350.00
340.00
330.00
320.00
310.00
300.00
290.00
280.00
270.00
260.00
250.00
240.00
230.00
220.00
210.00
200.00
15+00.00
16+00.00
17+00.00
18+00.00
19+00.00
20+00.00
21+00.00
22+00.00
23+00.00
24+00.00
25+00.00
26+00.00
27+00.00
28+00.00
29+00.00
30+00.00
31+00.00
32+00.00
33+00.00
34+00.00
35+00.00

MC

MC1

MC2

MC3

MC4

GRADE BREAK STA = 30+00.00
ELEV = 241.378

GRADE BREAK STA = 33+48.81
ELEV = 240.247

GRADE BREAK STA = 37+44.63
ELEV = 249.698

GRADE BREAK STA = 43+20.02
ELEV = 259.997

GRADE BREAK STA = 47+60.35
ELEV = 264.978

GRADE BREAK STA = 52+04.25
ELEV = 268.064

GRADE BREAK STA = 54+91.32
ELEV = 270.027

-0.01%
-3.67%
-2.22%
0.05%
6.45%
0.09%
2.99%
0.31%
4.93%
0.03%
1.90%
0.14%
1.36%
1.77%
-0.30%
0.32%

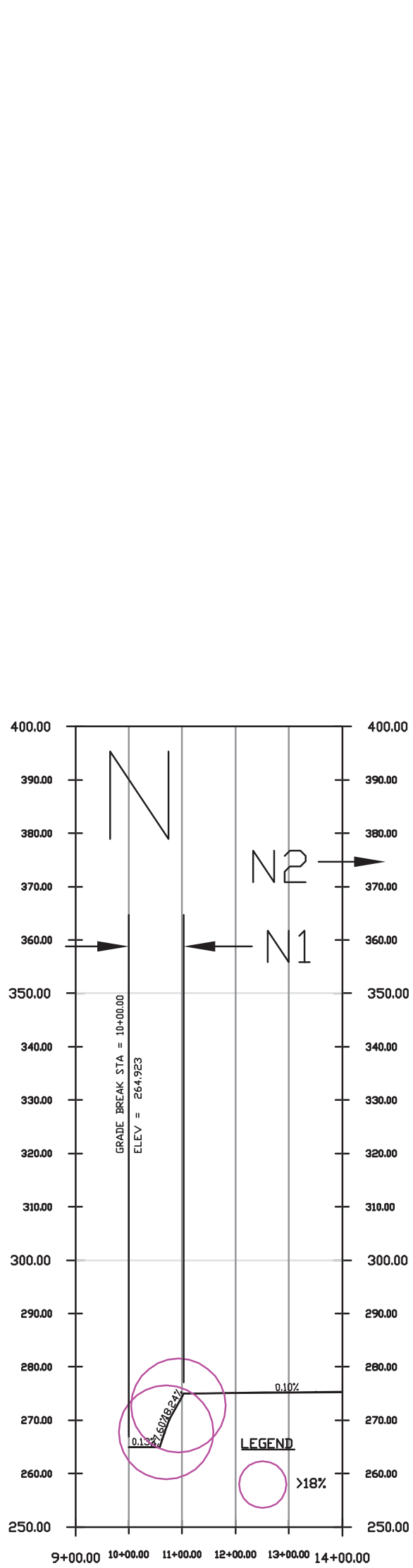
LEGEND

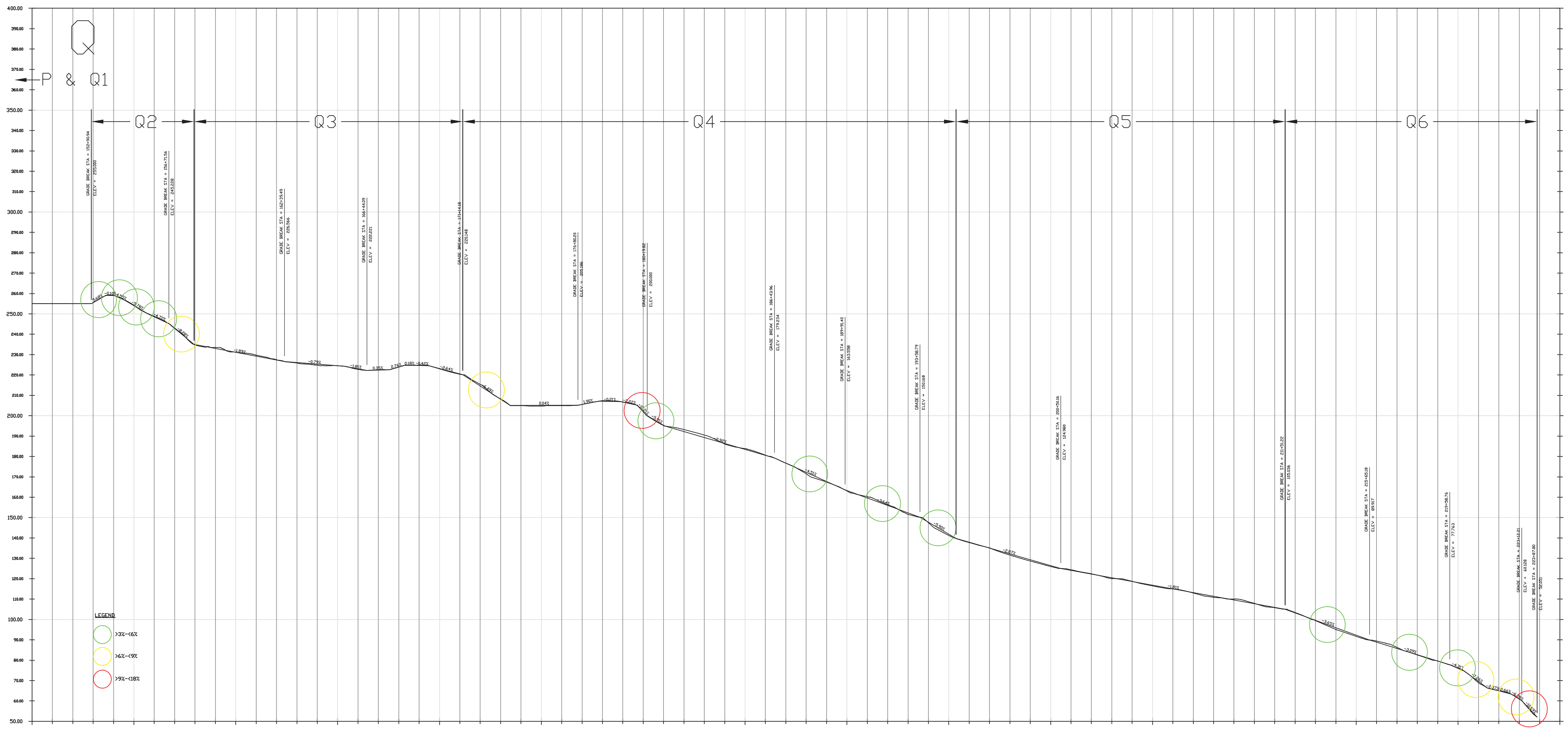
>3%-<6%

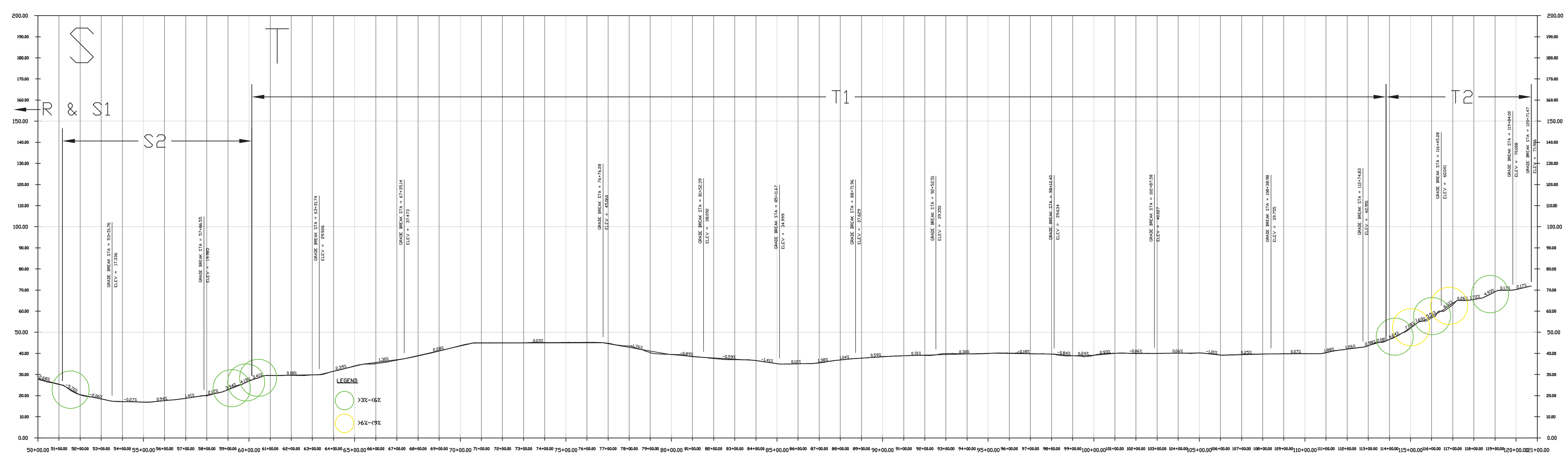
>6%-<9%

400.00 390.00 380.00 370.00 360.00 350.00 340.00 330.00 320.00 310.00 300.00 290.00 280.00 270.00 260.00 250.00 240.00 230.00 220.00 210.00 200.00

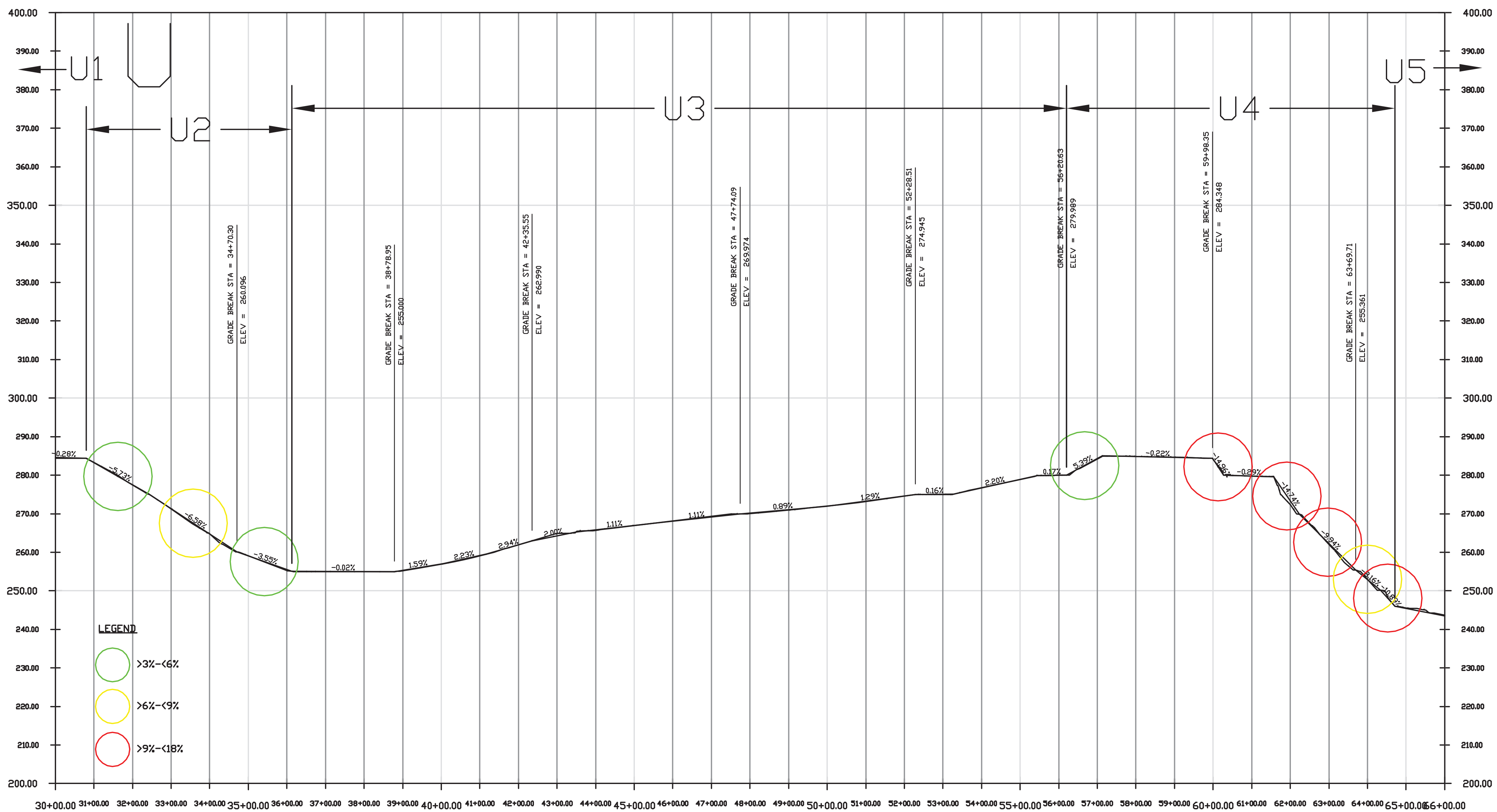
28+00.00 29+00.00 30+00.00 31+00.00 32+00.00 33+00.00 34+00.00 35+00.00 36+00.00 37+00.00 38+00.00 39+00.00 40+00.00 41+00.00 42+00.00 43+00.00 44+00.00 45+00.00 46+00.00 47+00.00 48+00.00 49+00.00 50+00.00 51+00.00 52+00.00 53+00.00 54+00.00 55+00.00 56+00.00


N
N2
N1
GRADE BREAK STA = 10+00.00
ELEV = 264.923
0.10%
-7.60%
8.24%
0.13%
LEGEND
>18%
400.00
390.00
380.00
370.00
360.00
350.00
340.00
330.00
320.00
310.00
300.00
290.00
280.00
270.00
260.00
250.00
9+00.00
10+00.00
11+00.00
12+00.00
13+00.00
14+00.00

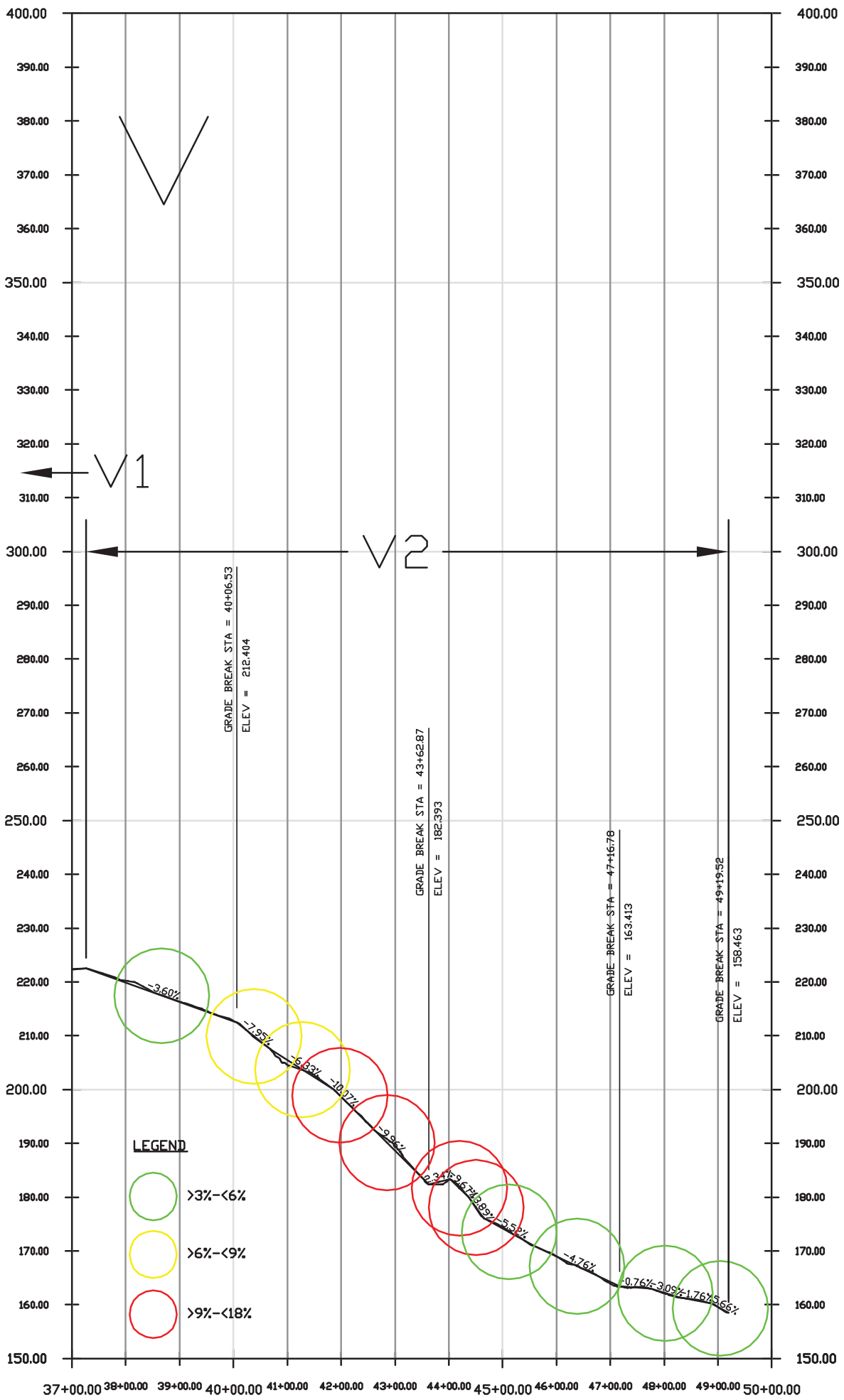

Q
P & Q1
Q2
Q3
Q4
Q5
Q6
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%
150+00.00
155+00.00
160+00.00
165+00.00
170+00.00
175+00.00
180+00.00
185+00.00
190+00.00
195+00.00
200+00.00
205+00.00
210+00.00
215+00.00
220+00.00
225+00.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00

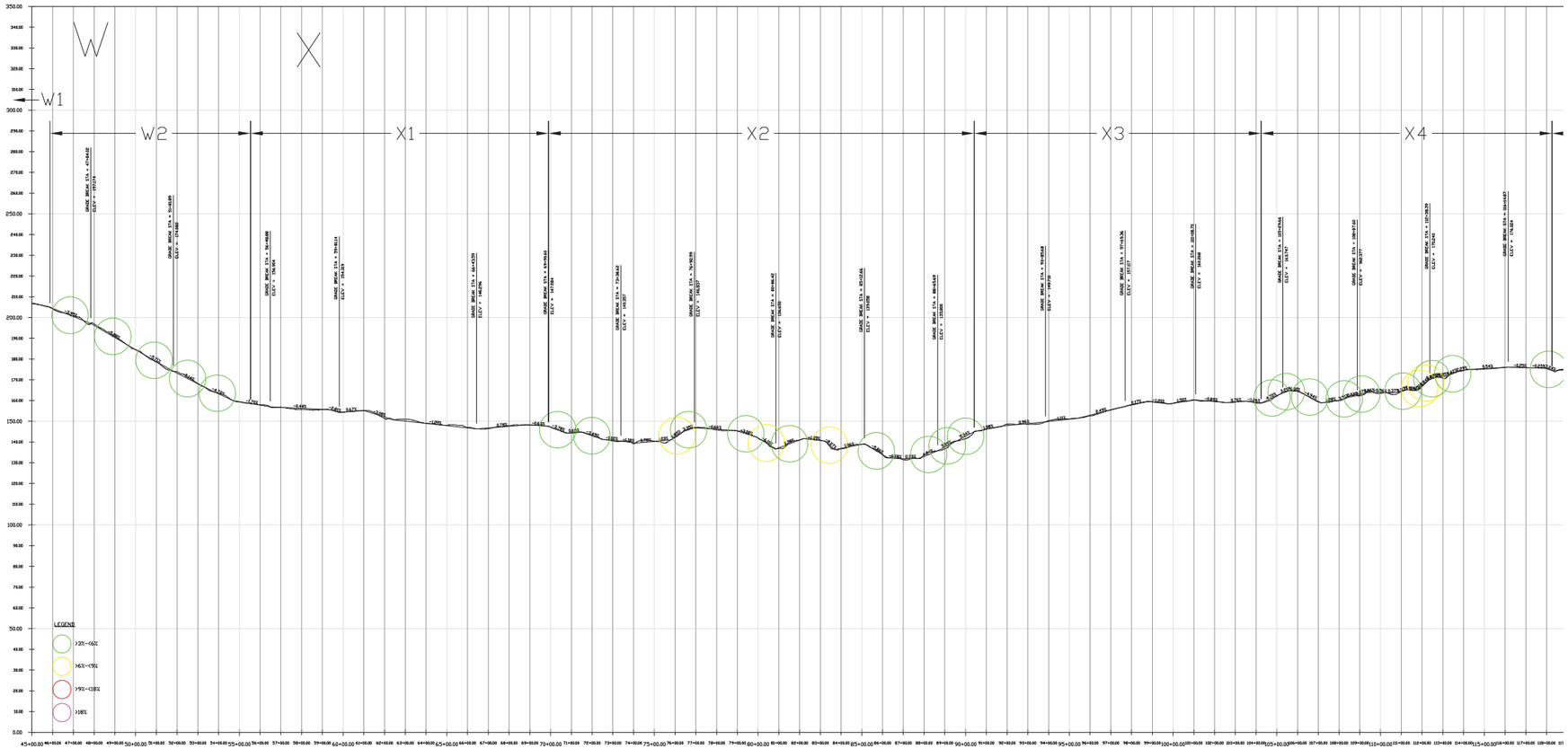


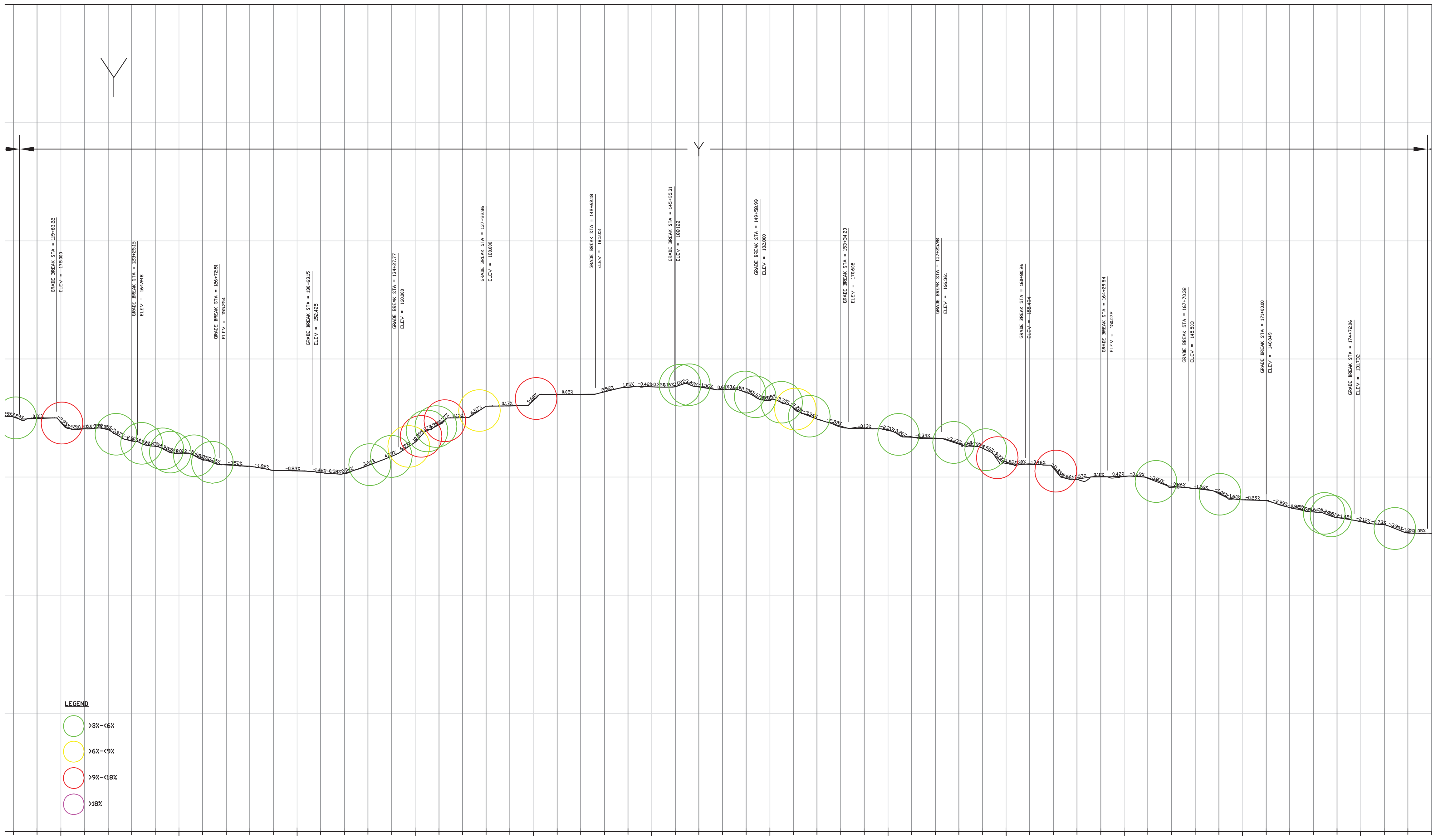
S
T
R & S1
S2
T1
T2
LEGEND
>3%-<6%
>6%-<9%

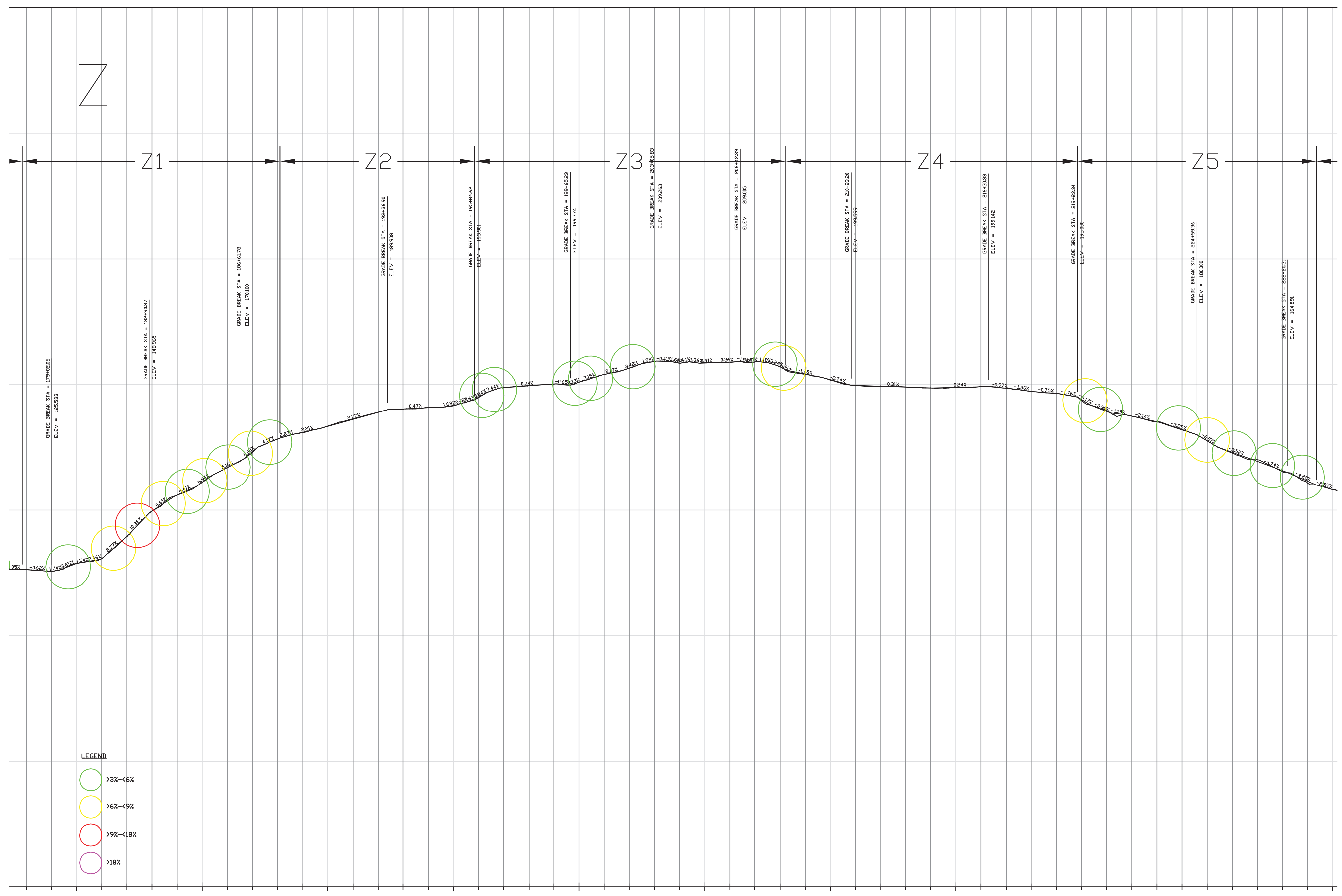


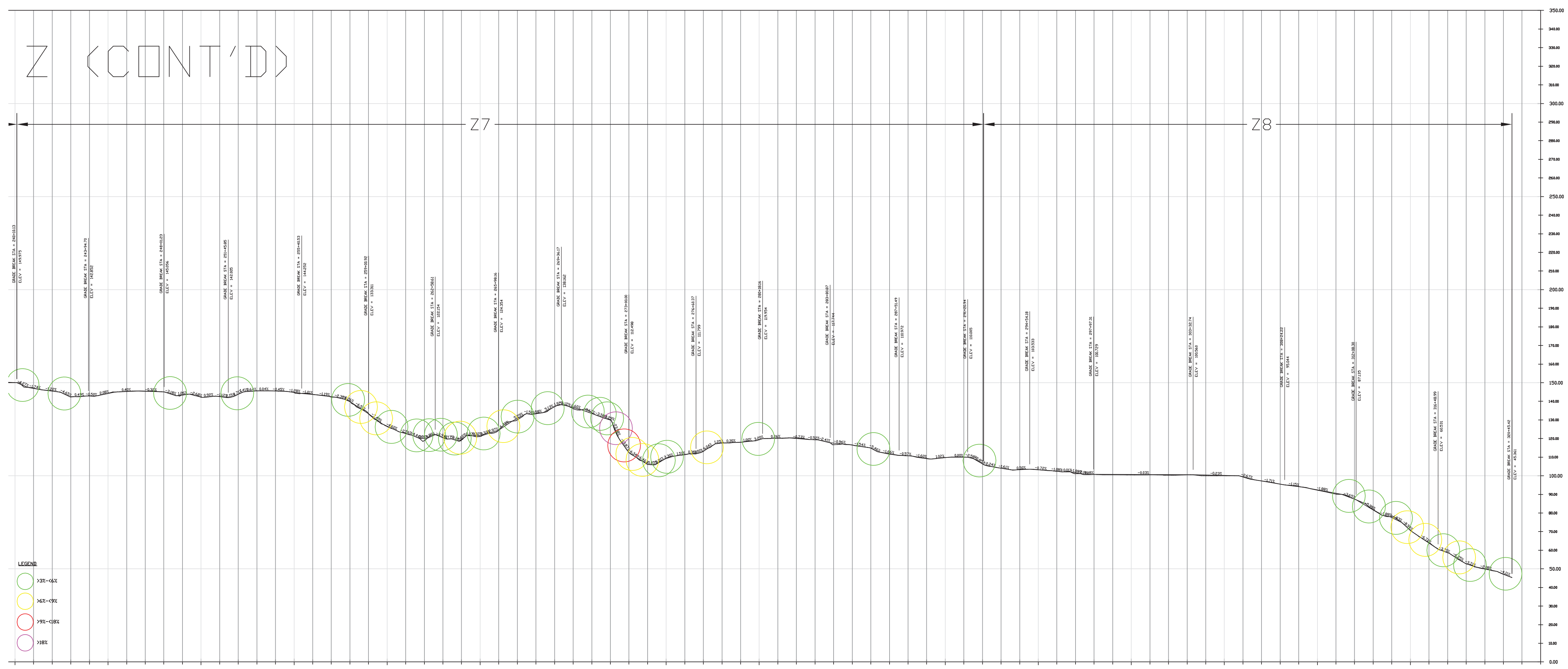
U1
U2
U3
U4
U5
GRADE BREAK STA = 34+70.30
ELEV = 260.096
GRADE BREAK STA = 38+78.95
ELEV = 255.000
GRADE BREAK STA = 42+35.55
ELEV = 262.990
GRADE BREAK STA = 47+74.09
ELEV = 269.974
GRADE BREAK STA = 52+28.51
ELEV = 274.945
GRADE BREAK STA = 56+20.63
ELEV = 279.989
GRADE BREAK STA = 59+98.35
ELEV = 284.348
GRADE BREAK STA = 63+69.71
ELEV = 255.361
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%


400.00
390.00
380.00
370.00
360.00
350.00
340.00
330.00
320.00
310.00
300.00
290.00
280.00
270.00
260.00
250.00
240.00
230.00
220.00
210.00
200.00
190.00
180.00
170.00
160.00
150.00
V1
V2
GRADE BREAK STA = 40+06.53
ELEV = 212.404
GRADE BREAK STA = 43+62.87
ELEV = 182.393
GRADE BREAK STA = 47+16.78
ELEV = 163.413
GRADE BREAK STA = 49+19.52
ELEV = 158.463
-3.60%
-7.95%
-6.93%
-10.17%
-9.86%
-9.67%
-8.89%
-5.52%
-4.76%
-0.76%
-3.09%
-1.76%
-5.66%
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%
37+00.00
38+00.00
39+00.00
40+00.00
41+00.00
42+00.00
43+00.00
44+00.00
45+00.00
46+00.00
47+00.00
48+00.00
49+00.00
50+00.00

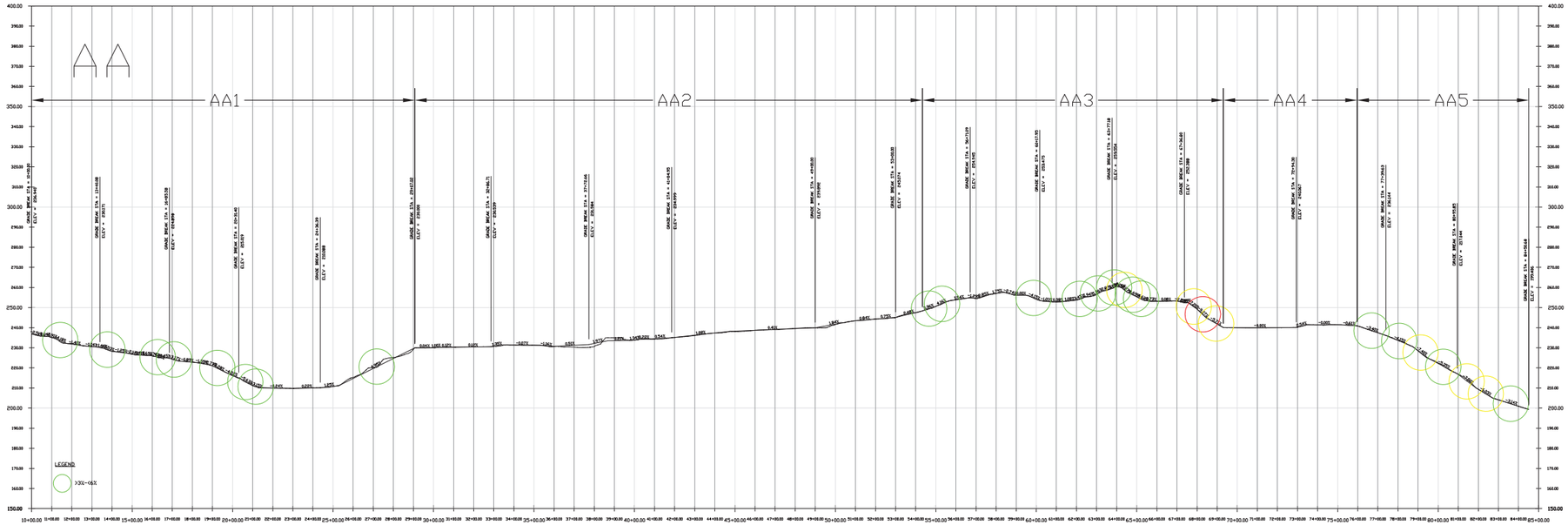

W
X
W1
W2
X1
X2
X3
X4
LEGEND
>3%
2%-3%
1%-2%
<1%

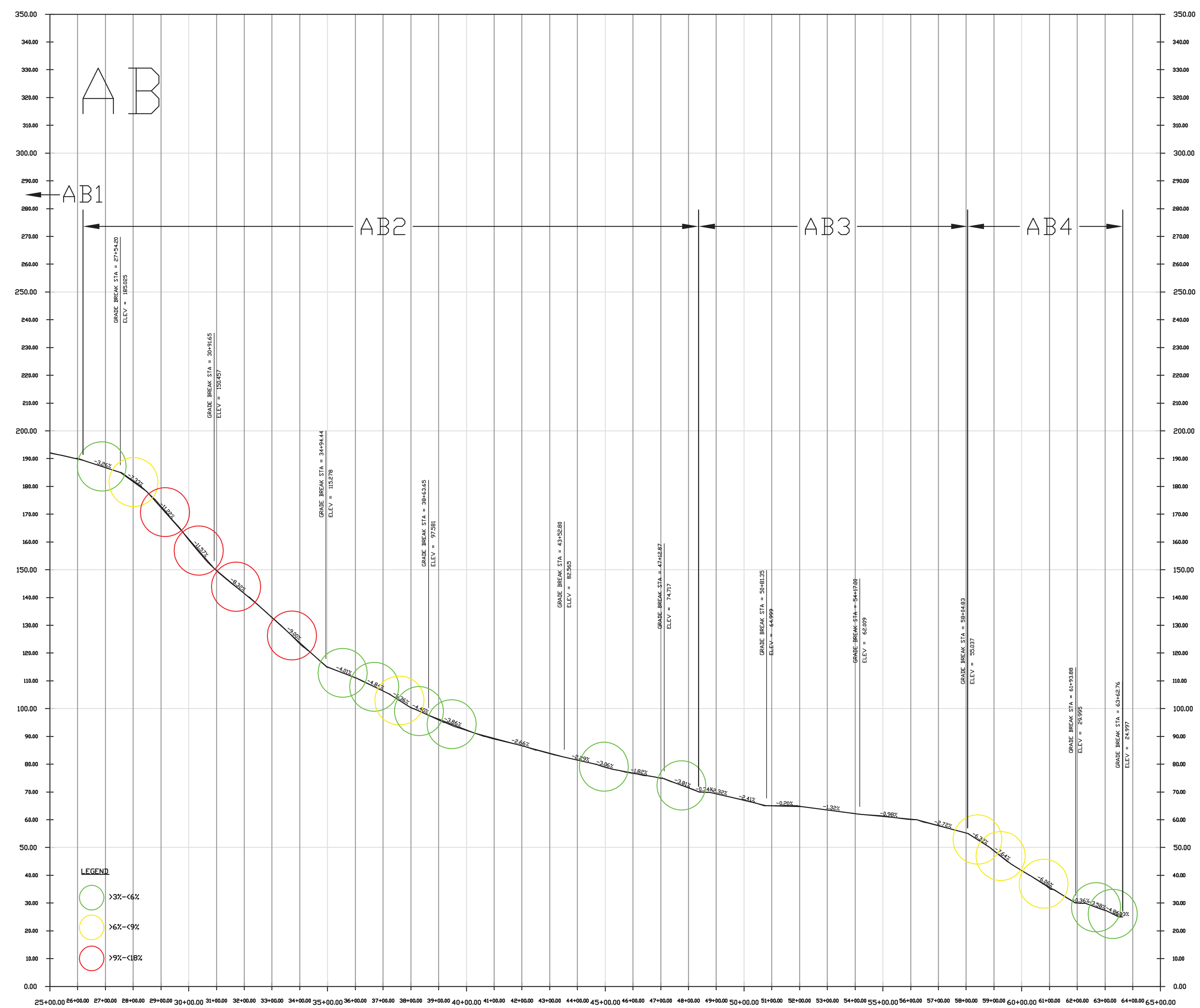

Y
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%
>18%


Z
Z1
Z2
Z3
Z4
Z5
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%
>18%

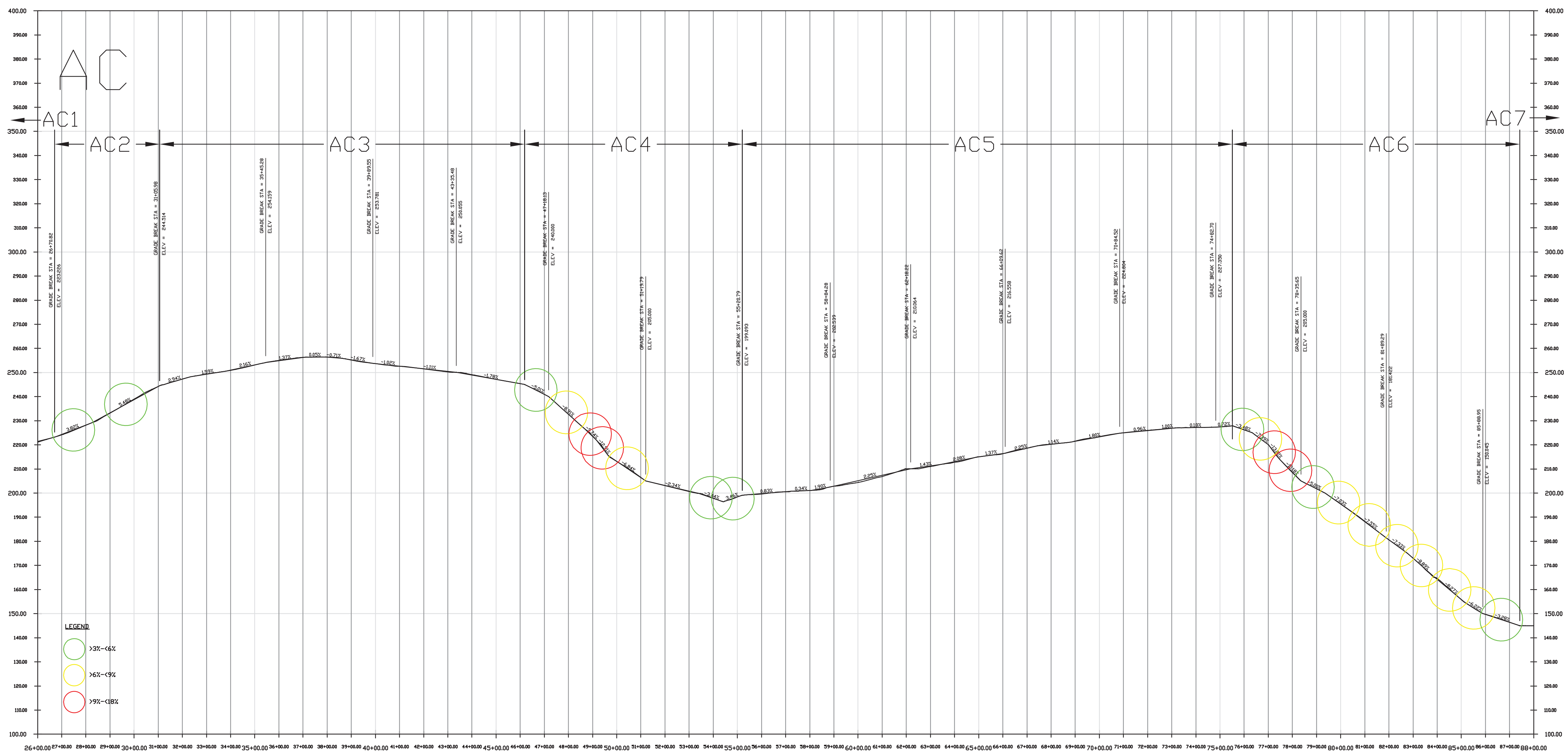


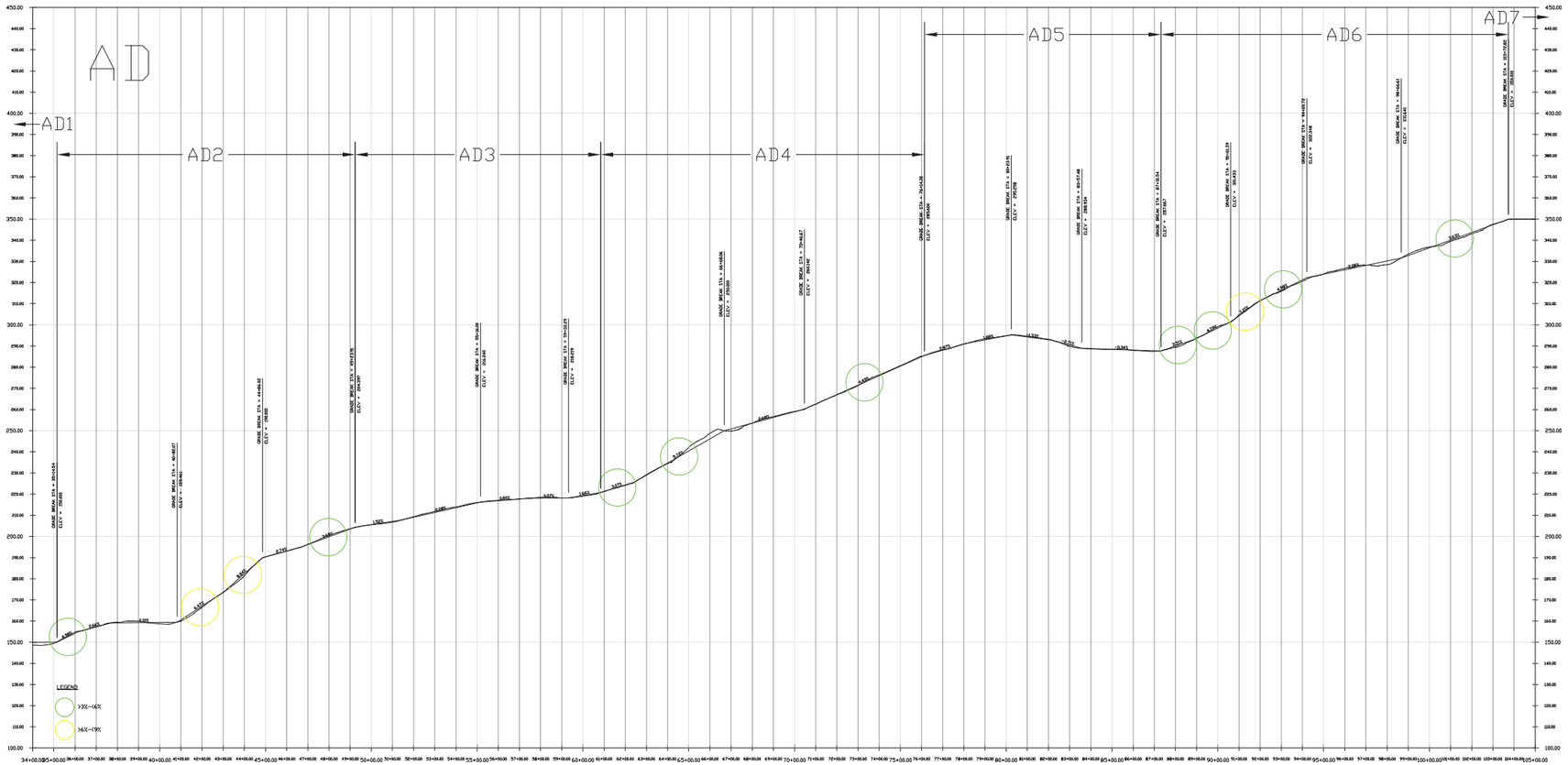
Z (CONT'D)
Z7
Z8
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%
>18%

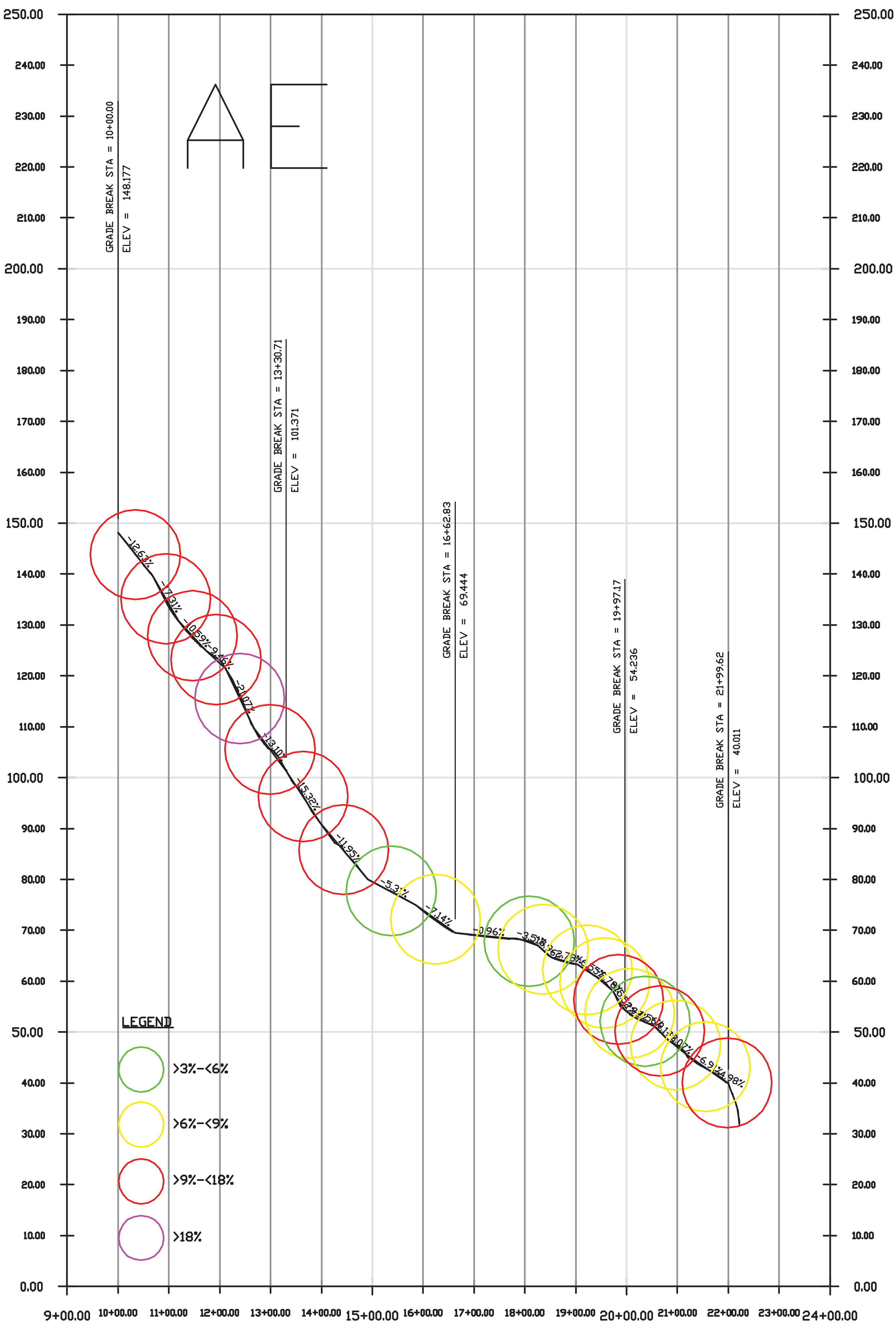

AA1
AA2
AA3
AA4
AA5
LEGEND
>3G-6G

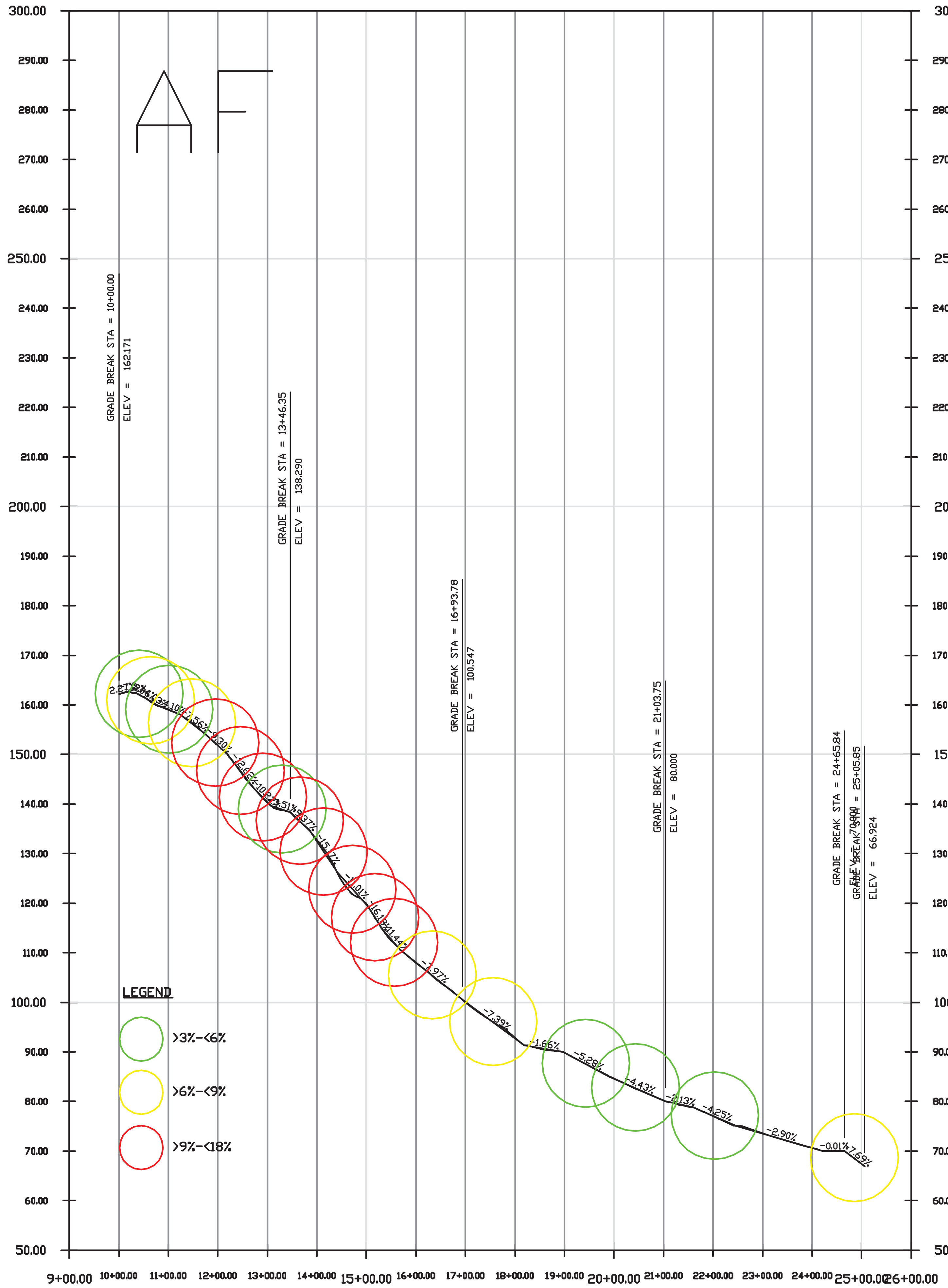


AB
AB1
AB2
AB3
AB4
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%


AC
AC1
AC2
AC3
AC4
AC5
AC6
AC7
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%


AD
AD1
AD2
AD3
AD4
AD5
AD6
AD7
LEGEND
>3%
<6%
>6%
<9%


AE
GRADE BREAK STA = 10+00.00
ELEV = 148.177
GRADE BREAK STA = 13+30.71
ELEV = 101.371
GRADE BREAK STA = 16+62.83
ELEV = 69.444
GRADE BREAK STA = 19+97.17
ELEV = 54.236
GRADE BREAK STA = 21+99.62
ELEV = 40.011
-12.63%
-7.31%
-0.59%
-9.46%
-21.07%
-13.10%
-15.32%
-11.95%
-5.31%
-7.14%
-0.96%
-4.98%
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%
>18%
250.00
240.00
230.00
220.00
210.00
200.00
190.00
180.00
170.00
160.00
150.00
140.00
130.00
120.00
110.00
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
9+00.00
10+00.00
11+00.00
12+00.00
13+00.00
14+00.00
15+00.00
16+00.00
17+00.00
18+00.00
19+00.00
20+00.00
21+00.00
22+00.00
23+00.00
24+00.00


AF
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%
GRADE BREAK STA = 10+00.00
ELEV = 162.171
GRADE BREAK STA = 13+46.35
ELEV = 138.290
GRADE BREAK STA = 16+93.78
ELEV = 100.547
GRADE BREAK STA = 21+03.75
ELEV = 80.000
GRADE BREAK STA = 24+65.84
ELEV = 70.000
GRADE BREAK STA = 25+05.85
ELEV = 66.924
-7.97%
-7.39%
-1.66%
-5.28%
-4.43%
-2.13%
-4.25%
-2.90%
-0.01%
-7.69%
300.00
250.00
200.00
150.00
100.00
50.00
9+00.00
10+00.00
11+00.00
12+00.00
13+00.00
14+00.00
15+00.00
16+00.00
17+00.00
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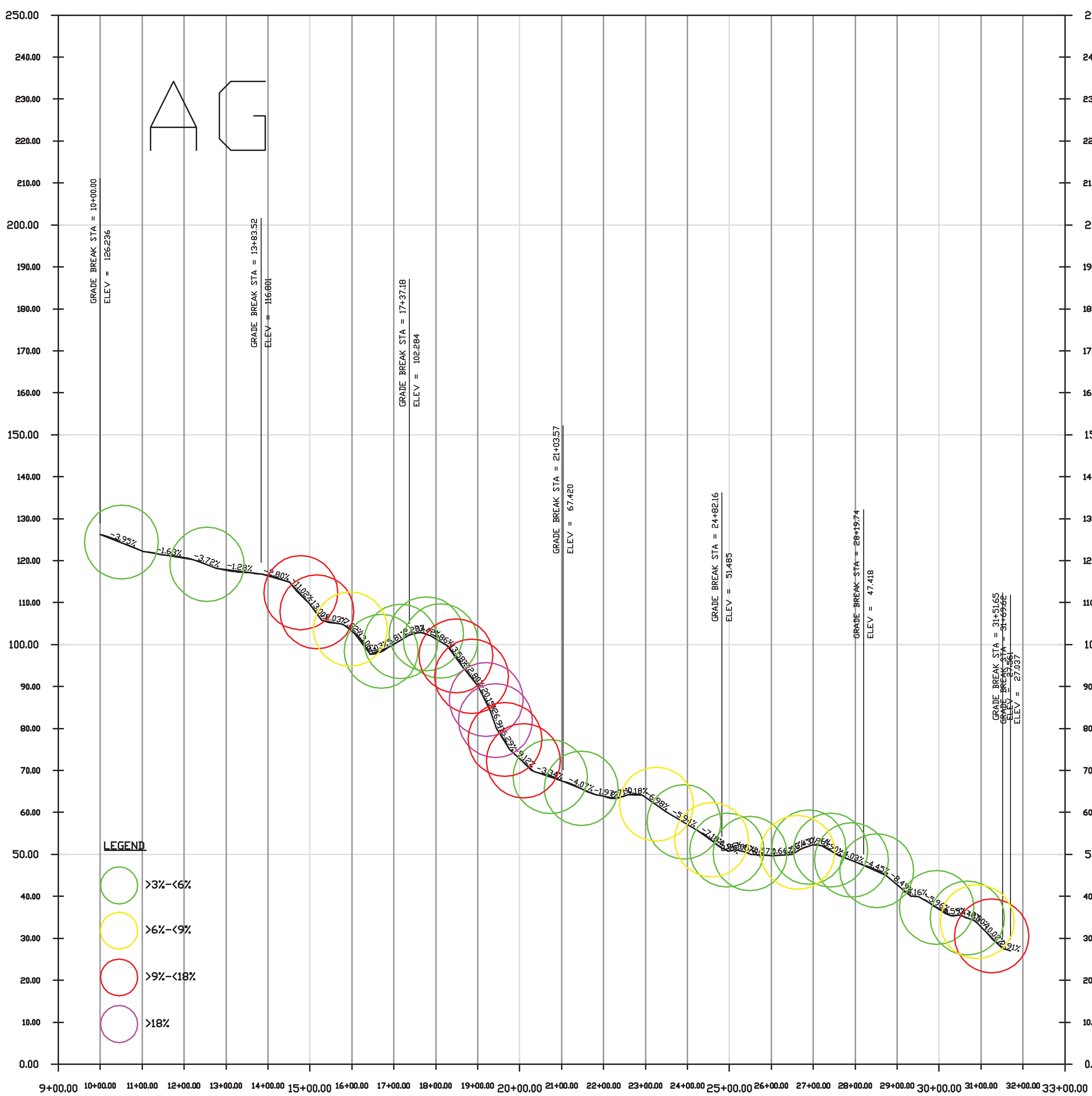
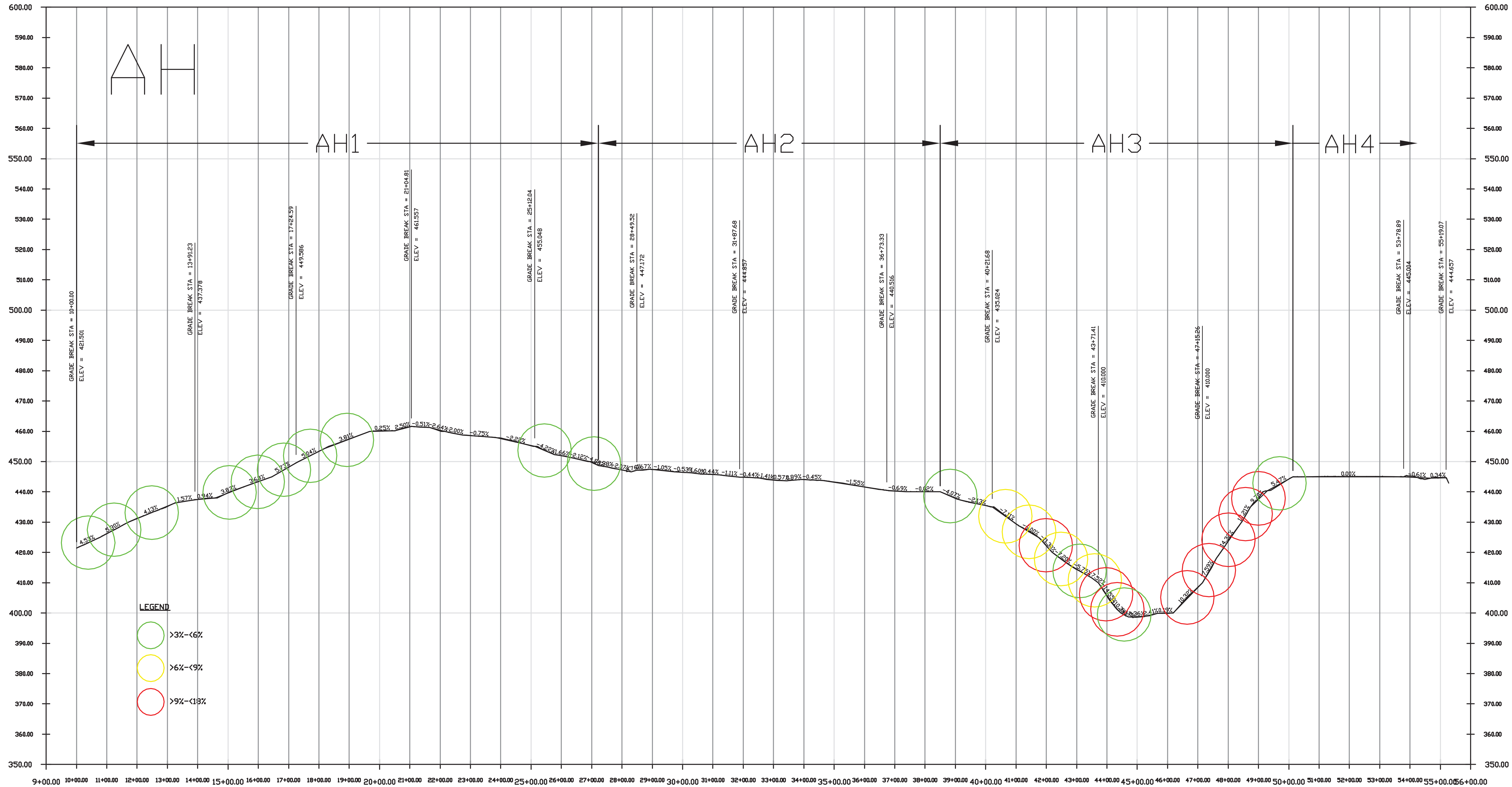
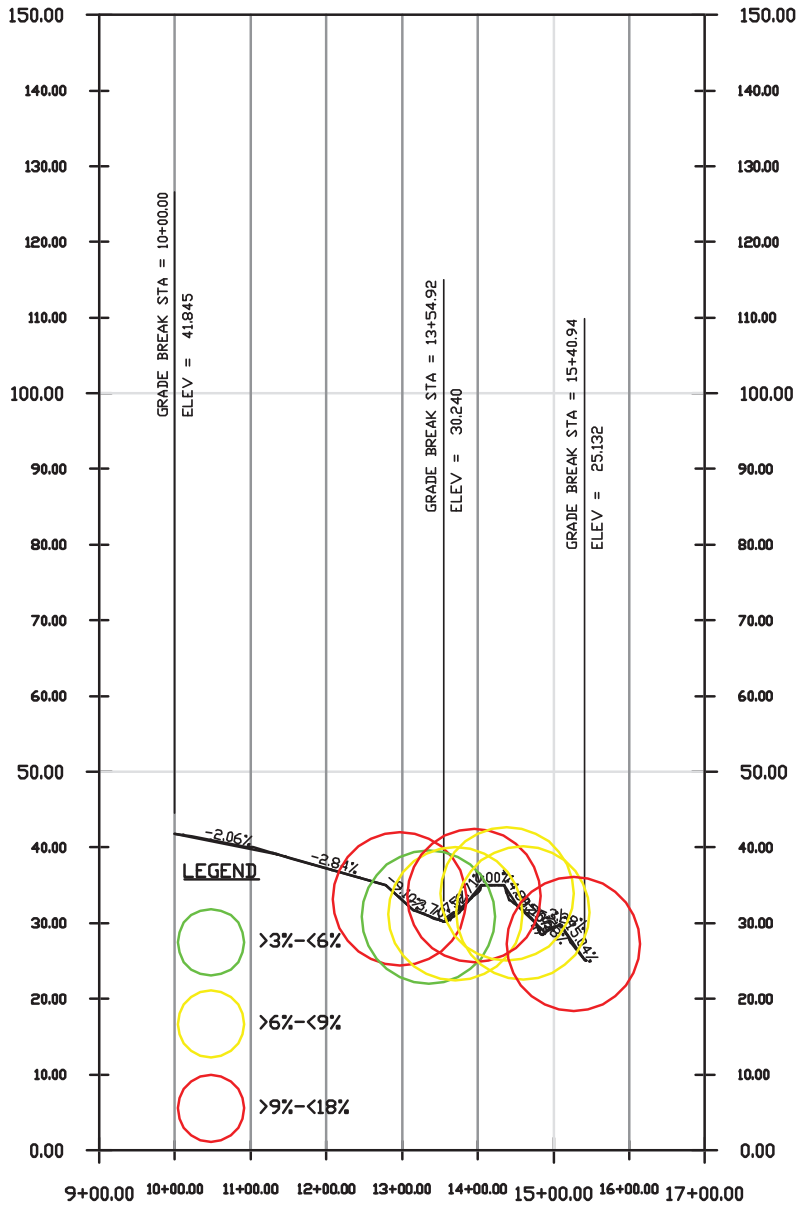
26+00.00

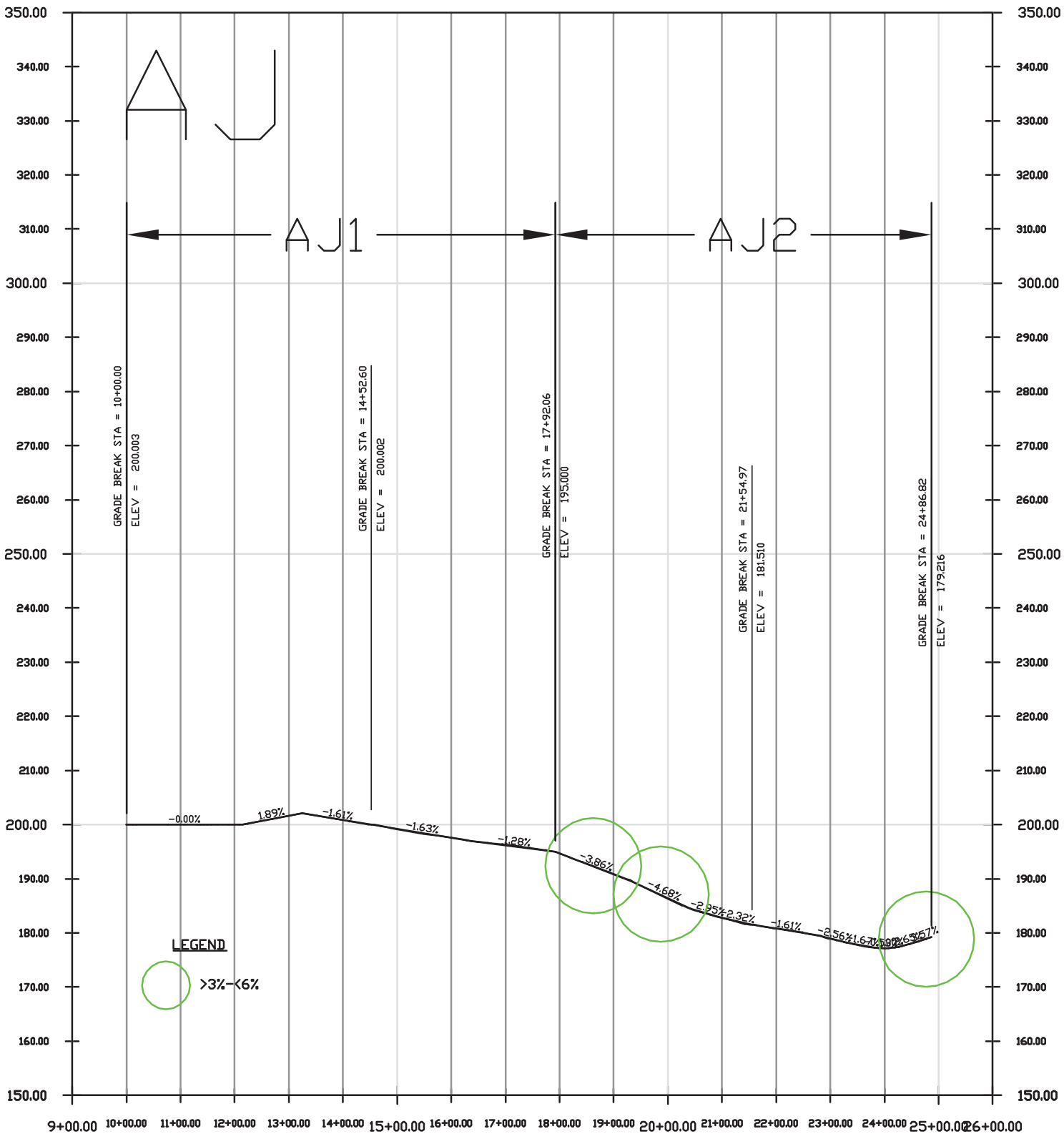


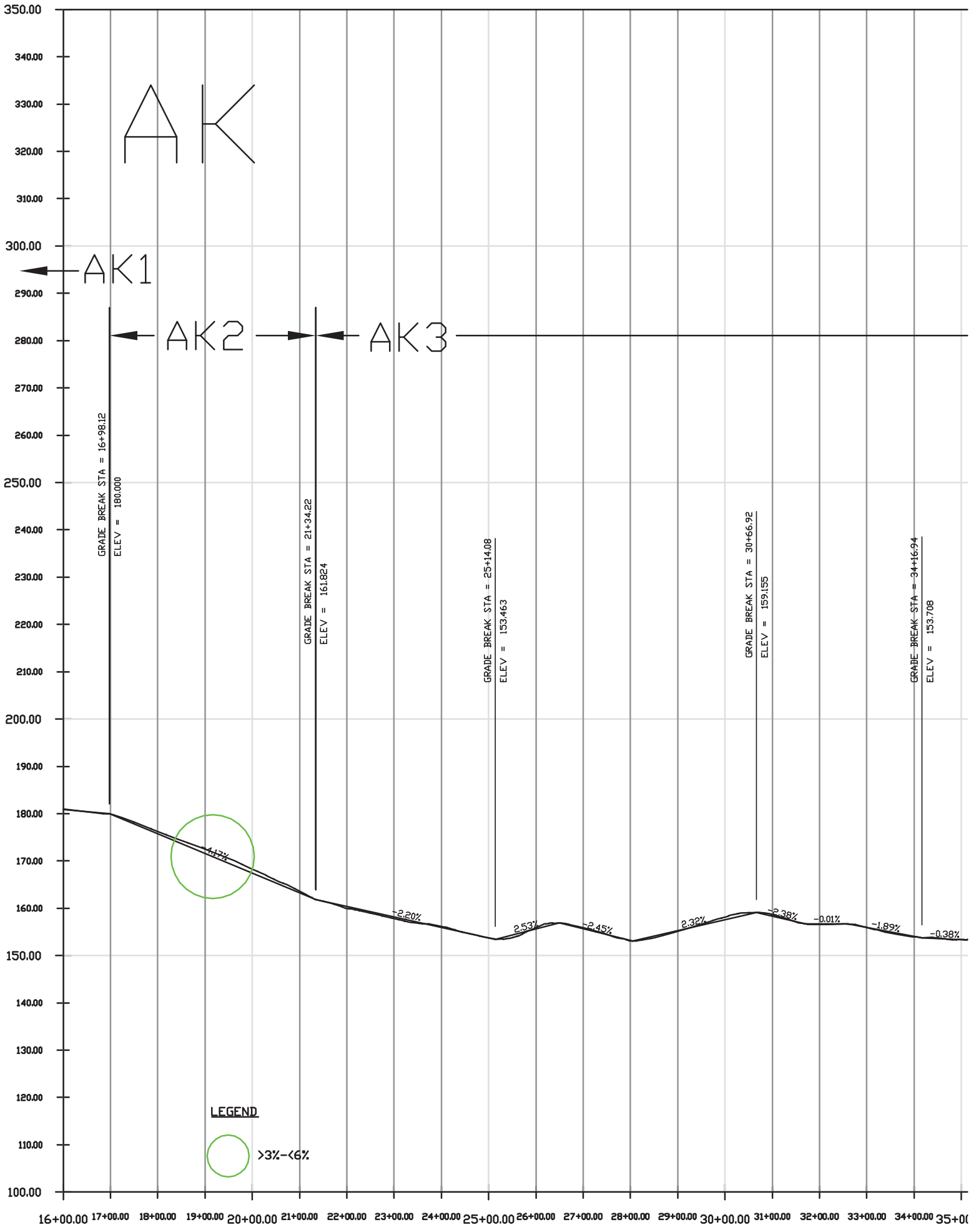
AG
GRADE BREAK STA = 10+00.00
ELEV = 126.236
GRADE BREAK STA = 13+83.52
ELEV = 116.801
GRADE BREAK STA = 17+37.18
ELEV = 102.284
GRADE BREAK STA = 21+03.57
ELEV = 67.420
GRADE BREAK STA = 24+82.16
ELEV = 51.485
GRADE BREAK STA = 28+19.74
ELEV = 47.418
GRADE BREAK STA = 31+51.65
ELEV = 27.037
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%
>18%
250.00
200.00
150.00
100.00
50.00
0.00
9+00.00
10+00.00
15+00.00
20+00.00
25+00.00
30+00.00
33+00.00



AH
AH1
AH2
AH3
AH4
GRADE BREAK STA = 10+00.00 ELEV = 421.501
GRADE BREAK STA = 13+91.23 ELEV = 437.378
GRADE BREAK STA = 17+24.59 ELEV = 449.586
GRADE BREAK STA = 21+04.81 ELEV = 461.557
GRADE BREAK STA = 25+12.04 ELEV = 455.048
GRADE BREAK STA = 28+49.52 ELEV = 447.172
GRADE BREAK STA = 31+87.68 ELEV = 444.857
GRADE BREAK STA = 36+73.33 ELEV = 440.516
GRADE BREAK STA = 40+21.68 ELEV = 435.024
GRADE BREAK STA = 43+71.41 ELEV = 410.000
GRADE BREAK STA = 47+15.26 ELEV = 410.000
GRADE BREAK STA = 53+78.89 ELEV = 445.004
GRADE BREAK STA = 55+19.07 ELEV = 444.657
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%


GRADE BREAK STA = 10+00.00
ELEV = 41.845
GRADE BREAK STA = 13+54.92
ELEV = 30.240
GRADE BREAK STA = 15+40.94
ELEV = 25.132
-2.06%
-2.84%
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%
150.00
140.00
130.00
120.00
110.00
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
9+00.00
10+00.00
11+00.00
12+00.00
13+00.00
14+00.00
15+00.00
16+00.00
17+00.00


AJ1
AJ2
GRADE BREAK STA = 10+00.00
ELEV = 200.003
GRADE BREAK STA = 14+52.60
ELEV = 200.002
GRADE BREAK STA = 17+92.06
ELEV = 195.000
GRADE BREAK STA = 21+54.97
ELEV = 181.510
GRADE BREAK STA = 24+86.82
ELEV = 179.216
-0.00%
1.89%
-1.61%
-1.63%
-1.28%
-3.86%
-4.68%
-2.95%
2.32%
-1.61%
-2.56%
1.63%
-2.57%
LEGEND
>3%-<6%
350.00
340.00
330.00
320.00
310.00
300.00
290.00
280.00
270.00
260.00
250.00
240.00
230.00
220.00
210.00
200.00
190.00
180.00
170.00
160.00
150.00
9+00.00
10+00.00
11+00.00
12+00.00
13+00.00
14+00.00
15+00.00
16+00.00
17+00.00
18+00.00
19+00.00
20+00.00
21+00.00
22+00.00
23+00.00
24+00.00
25+00.00
26+00.00


AK
AK1
AK2
AK3
GRADE BREAK STA = 16+98.12
ELEV = 180.000
GRADE BREAK STA = 21+34.22
ELEV = 161.824
GRADE BREAK STA = 25+14.08
ELEV = 153.463
GRADE BREAK STA = 30+66.92
ELEV = 159.155
GRADE BREAK STA = 34+16.94
ELEV = 153.708
-4.17%
-2.20%
2.53%
-2.45%
2.32%
-2.38%
-0.01%
-1.89%
-0.38%
LEGEND
>3%-<6%
350.00
340.00
330.00
320.00
310.00
300.00
290.00
280.00
270.00
260.00
250.00
240.00
230.00
220.00
210.00
200.00
190.00
180.00
170.00
160.00
150.00
140.00
130.00
120.00
110.00
100.00
16+00.00
17+00.00
18+00.00
19+00.00
20+00.00
21+00.00
22+00.00
23+00.00
24+00.00
25+00.00
26+00.00
27+00.00
28+00.00
29+00.00
30+00.00
31+00.00
32+00.00
33+00.00
34+00.00
35+00

AL

AL1

AL2

GRADE BREAK STA = 95+53.75
ELEV = 200.005

GRADE BREAK STA = 99+00.00
ELEV = 194.946

GRADE BREAK STA = 102+50.06
ELEV = 178.197

GRADE BREAK STA = 108+51.93
ELEV = 160.000

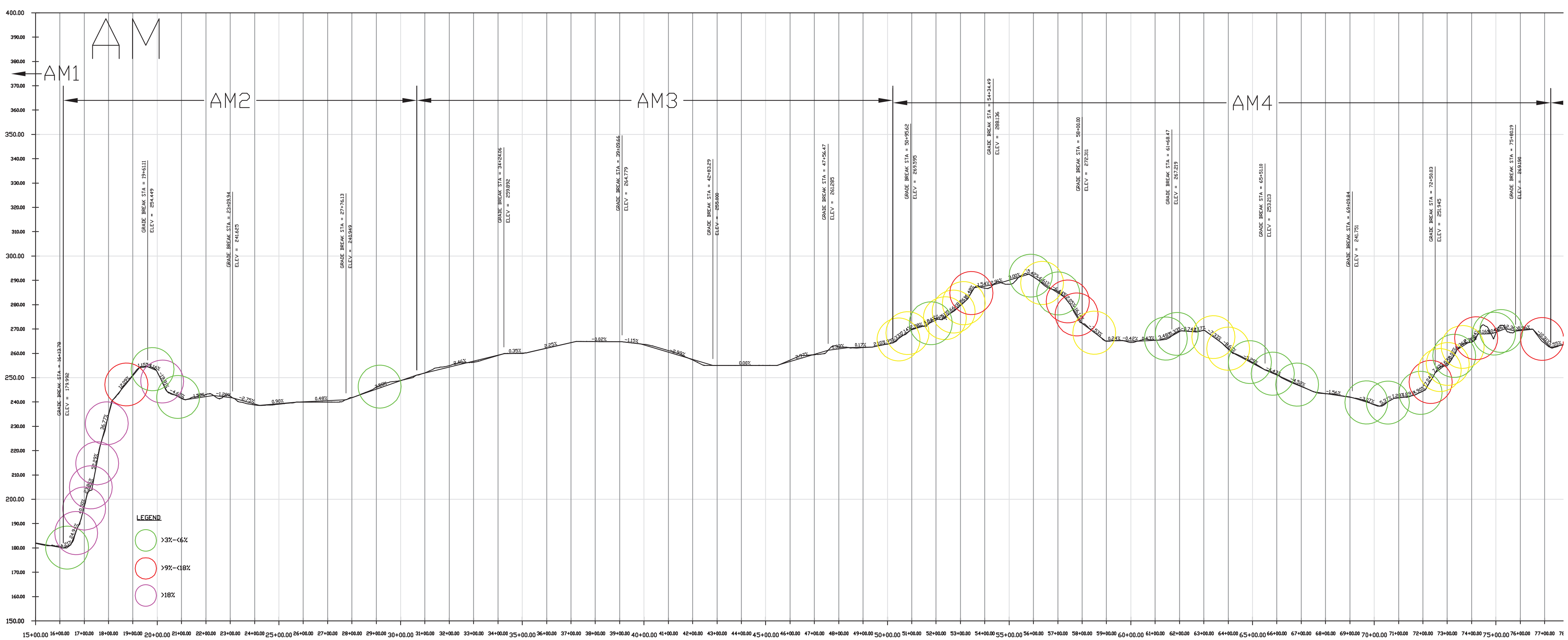
GRADE BREAK STA = 113+46.38
GRADE BREAK STA = 113+62.06
ELEV = 146.121
ELEV = 145.553

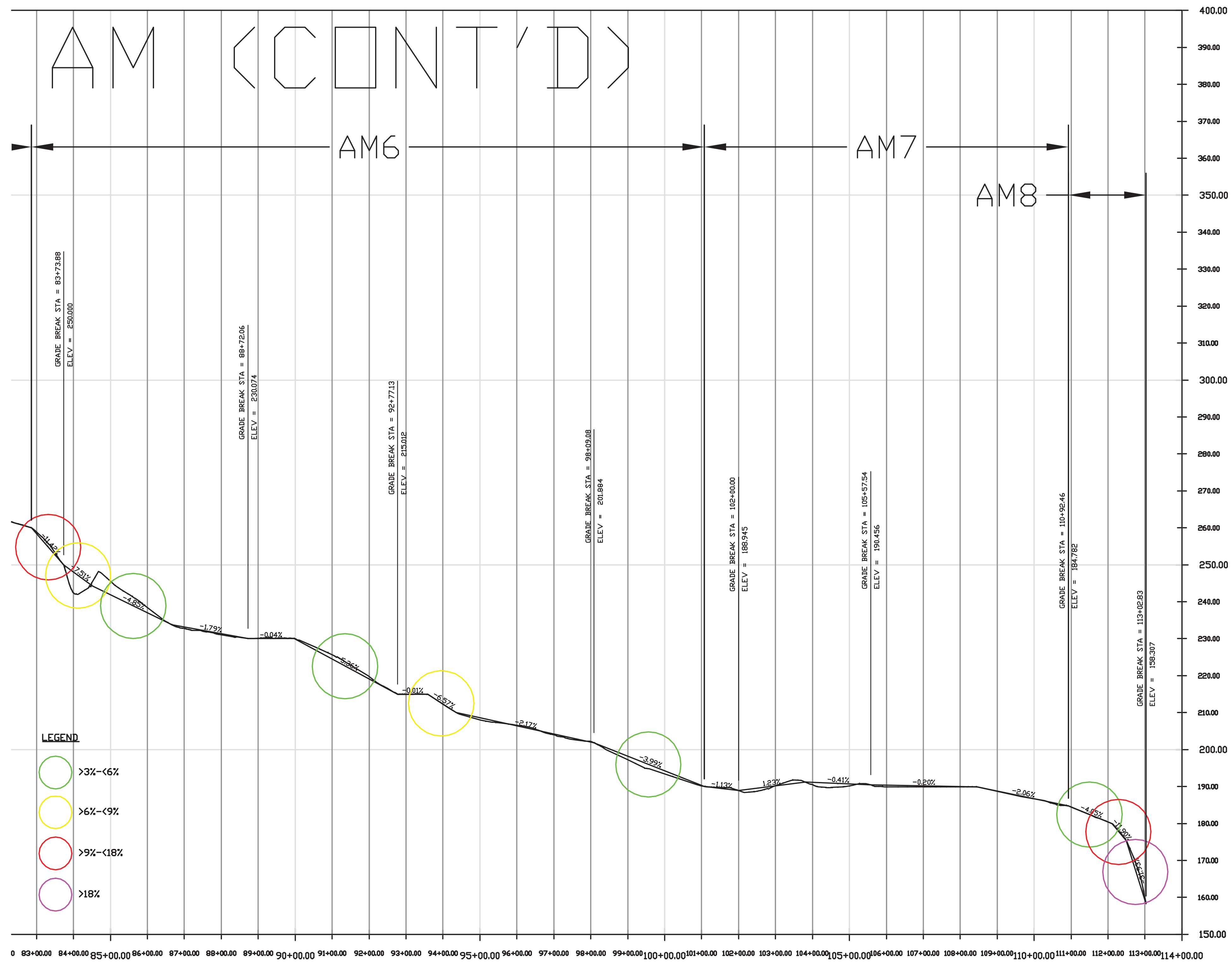
0.00%
-4.98%
-2.42%
-4.78%
-1.57%
-2.92%
-2.66%
-3.45%

LEGEND
>3%-<6%

350.00
340.00
330.00
320.00
310.00
300.00
290.00
280.00
270.00
260.00
250.00
240.00
230.00
220.00
210.00
200.00
190.00
180.00
170.00
160.00
150.00
140.00
130.00
120.00
110.00
100.00

90+00.00 91+00.00 92+00.00 93+00.00 94+00.00 95+00.00 96+00.00 97+00.00 98+00.00 99+00.00 100+00.00 101+00.00 102+00.00 103+00.00 104+00.00 105+00.00 106+00.00 107+00.00 108+00.00 109+00.00 110+00.00 111+00.00 112+00.00 113+00.00 114+00.00 115+00.00


AM
AM1
AM2
AM3
AM4
LEGEND
>3%-<6%
>9%-<18%
>18%



AM (CONT'D)
AM6
AM7
AM8
GRADE BREAK STA = 83+73.88
ELEV = 250.000
GRADE BREAK STA = 88+72.06
ELEV = 230.074
GRADE BREAK STA = 92+77.13
ELEV = 215.012
GRADE BREAK STA = 98+09.08
ELEV = 201.884
GRADE BREAK STA = 102+00.00
ELEV = 188.945
GRADE BREAK STA = 105+57.54
ELEV = 190.456
GRADE BREAK STA = 110+92.46
ELEV = 184.782
GRADE BREAK STA = 113+02.83
ELEV = 158.307
-7.51%
-4.85%
-1.79%
-0.04%
-5.36%
-0.01%
-6.57%
-2.17%
-3.99%
-1.13%
1.23%
-0.41%
-0.20%
-2.06%
-4.05%
-11.90%
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%
>18%
400.00
390.00
380.00
370.00
360.00
350.00
340.00
330.00
320.00
310.00
300.00
290.00
280.00
270.00
260.00
250.00
240.00
230.00
220.00
210.00
200.00
190.00
180.00
170.00
160.00
150.00
83+00.00
84+00.00
85+00.00
86+00.00
87+00.00
88+00.00
89+00.00
90+00.00
91+00.00
92+00.00
93+00.00
94+00.00
95+00.00
96+00.00
97+00.00
98+00.00
99+00.00
100+00.00
101+00.00
102+00.00
103+00.00
104+00.00
105+00.00
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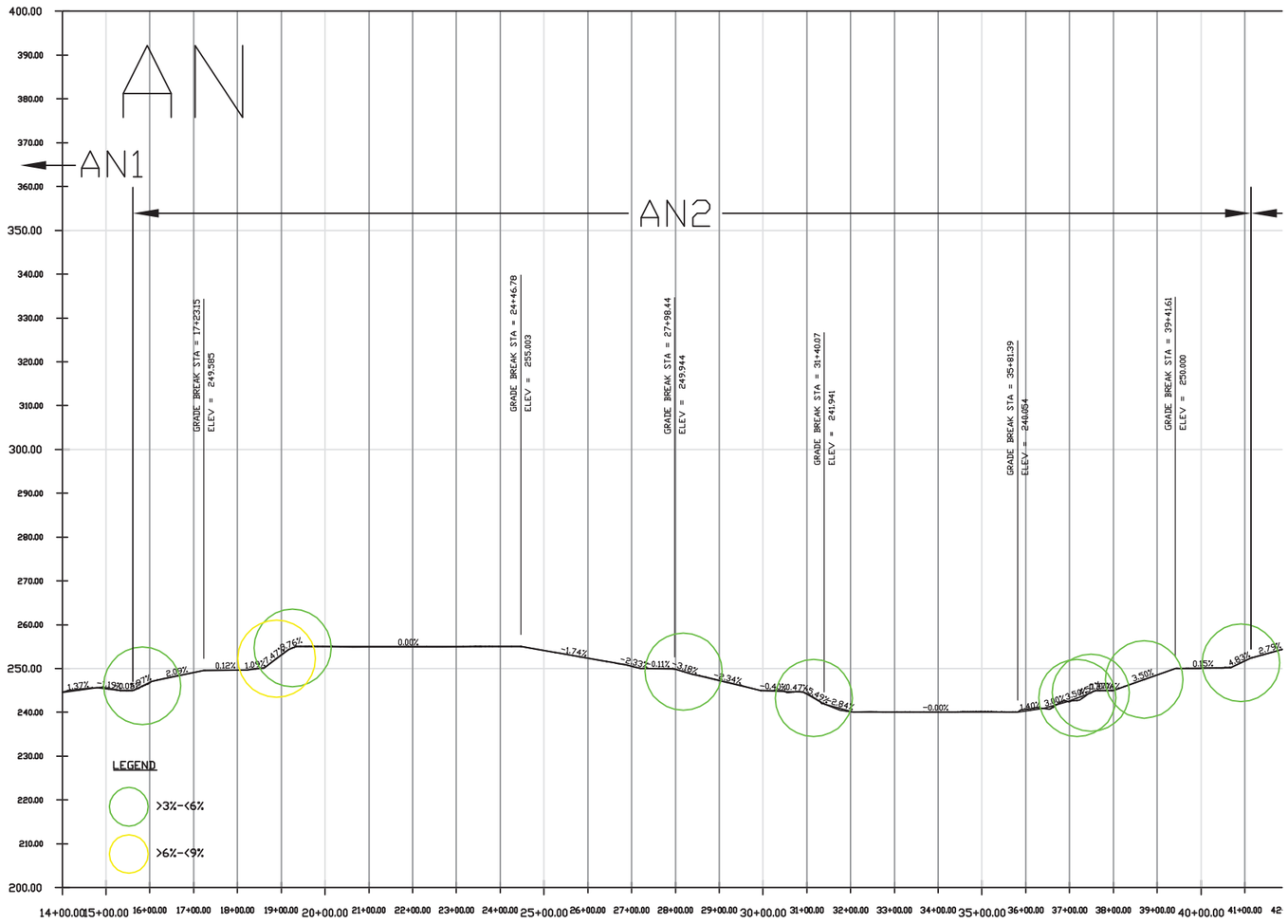
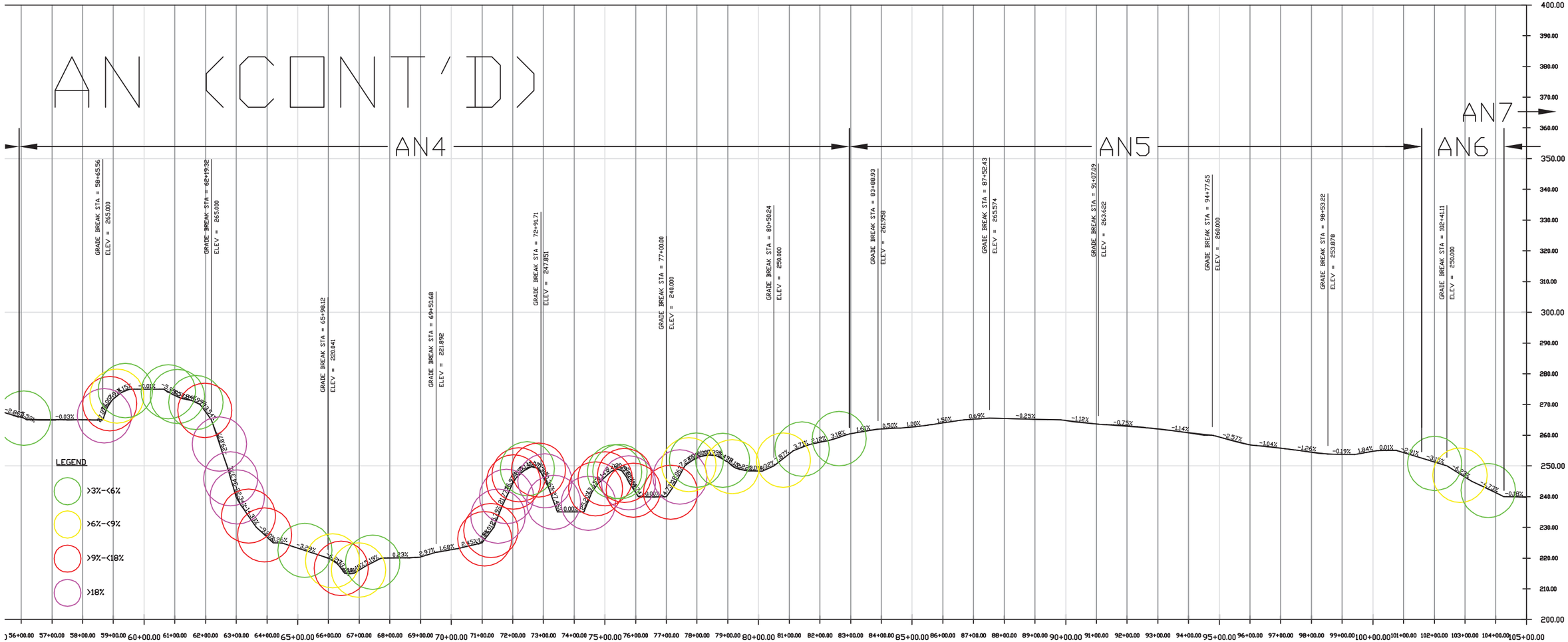
111+00.00
112+00.00
113+00.00
114+00.00


AN
AN1
AN2
GRADE BREAK STA = 17+23.15
ELEV = 249.585
GRADE BREAK STA = 24+46.78
ELEV = 255.003
GRADE BREAK STA = 27+98.44
ELEV = 249.944
GRADE BREAK STA = 31+40.07
ELEV = 241.941
GRADE BREAK STA = 35+81.39
ELEV = 244.054
GRADE BREAK STA = 39+41.61
ELEV = 250.000
LEGEND
>3%-<6%
>6%-<9%
400.00
390.00
380.00
370.00
360.00
350.00
340.00
330.00
320.00
310.00
300.00
290.00
280.00
270.00
260.00
250.00
240.00
230.00
220.00
210.00
200.00
14+00.00
15+00.00
16+00.00
17+00.00
18+00.00
19+00.00
20+00.00
21+00.00
22+00.00
23+00.00
24+00.00
25+00.00
26+00.00
27+00.00
28+00.00
29+00.00
30+00.00
31+00.00
32+00.00
33+00.00
34+00.00
35+00.00
36+00.00
37+00.00
38+00.00
39+00.00
40+00.00
41+00.00
42

AN (CONT'D)


AN4
AN5
AN6
AN7
GRADE BREAK STA = 58+65.56
ELEV = 265.000
GRADE BREAK STA = 62+19.32
ELEV = 265.000
GRADE BREAK STA = 65+98.12
ELEV = 220.041
GRADE BREAK STA = 69+50.68
ELEV = 221.892
GRADE BREAK STA = 72+91.71
ELEV = 247.851
GRADE BREAK STA = 77+40.00
ELEV = 240.000
GRADE BREAK STA = 80+50.24
ELEV = 250.000
GRADE BREAK STA = 83+88.93
ELEV = 261.958
GRADE BREAK STA = 87+52.43
ELEV = 265.574
GRADE BREAK STA = 91+97.09
ELEV = 263.622
GRADE BREAK STA = 94+77.65
ELEV = 260.000
GRADE BREAK STA = 98+53.22
ELEV = 253.878
GRADE BREAK STA = 102+41.11
ELEV = 250.000
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%
>18%
400.00
390.00
380.00
370.00
360.00
350.00
340.00
330.00
320.00
310.00
300.00
290.00
280.00
270.00
260.00
250.00
240.00
230.00
220.00
210.00
200.00
56+00.00
57+00.00
58+00.00
59+00.00
60+00.00
61+00.00
62+00.00
63+00.00
64+00.00
65+00.00
66+00.00
67+00.00
68+00.00
69+00.00
70+00.00
71+00.00
72+00.00
73+00.00
74+00.00
75+00.00
76+00.00
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79+00.00
80+00.00
81+00.00
82+00.00
83+00.00
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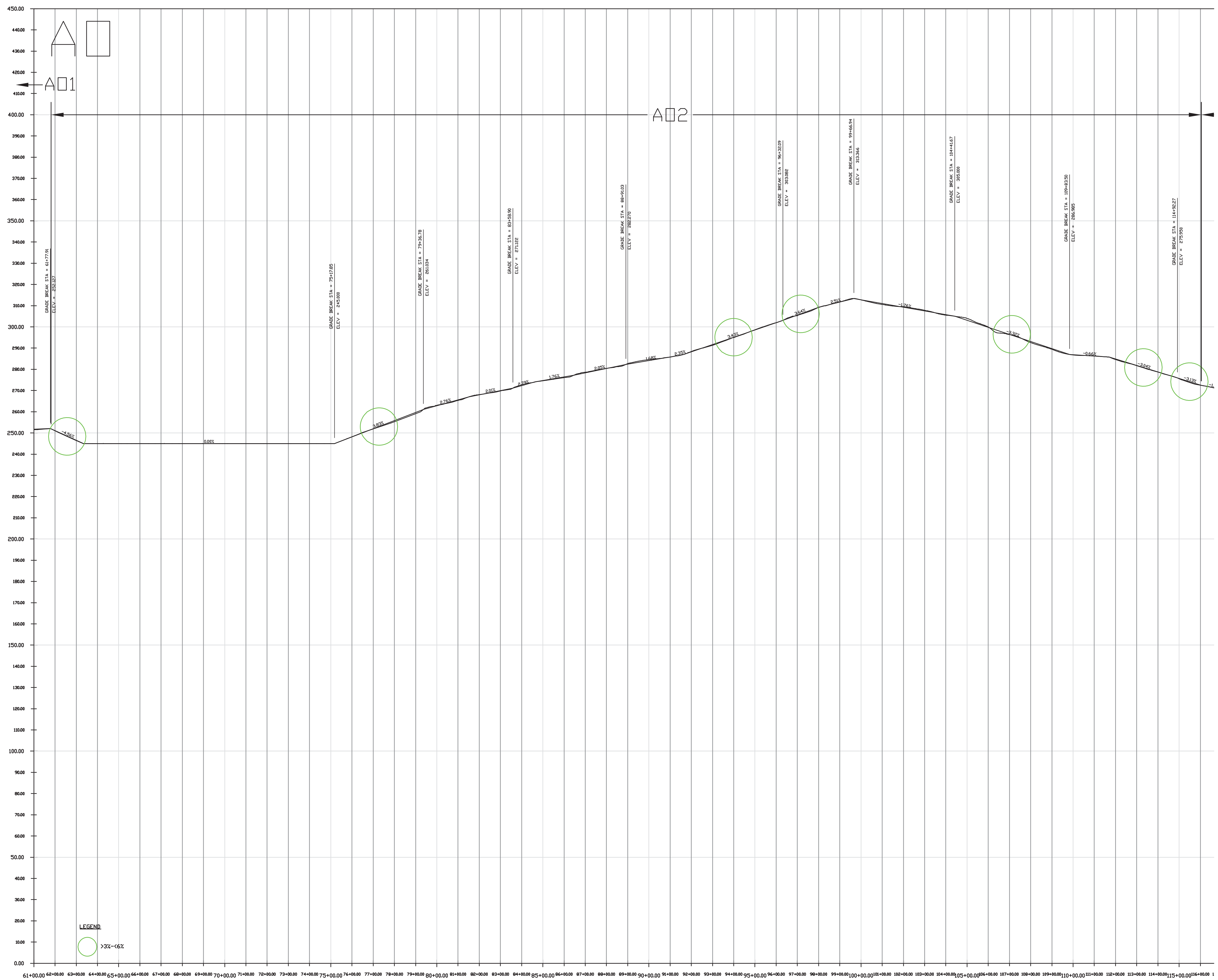
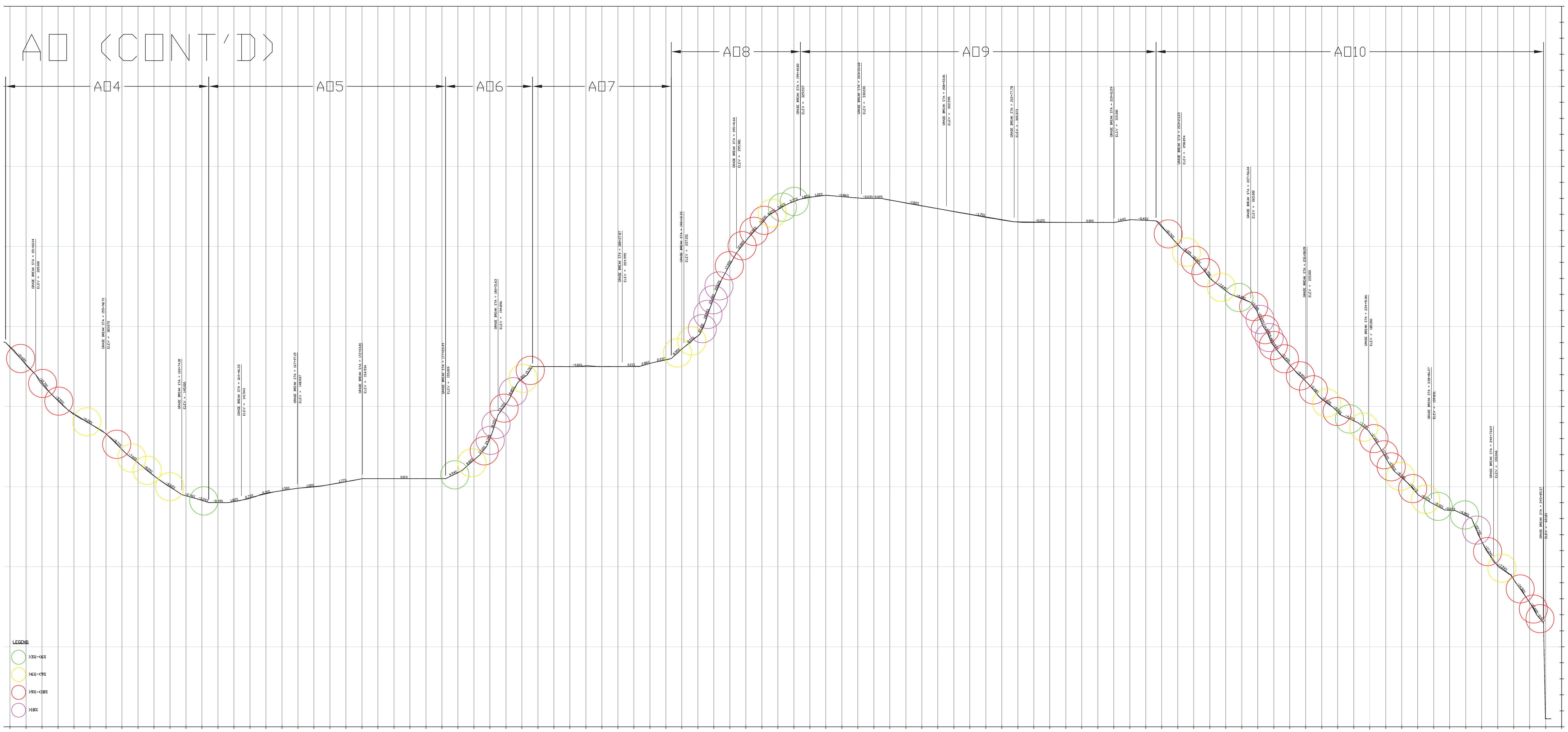
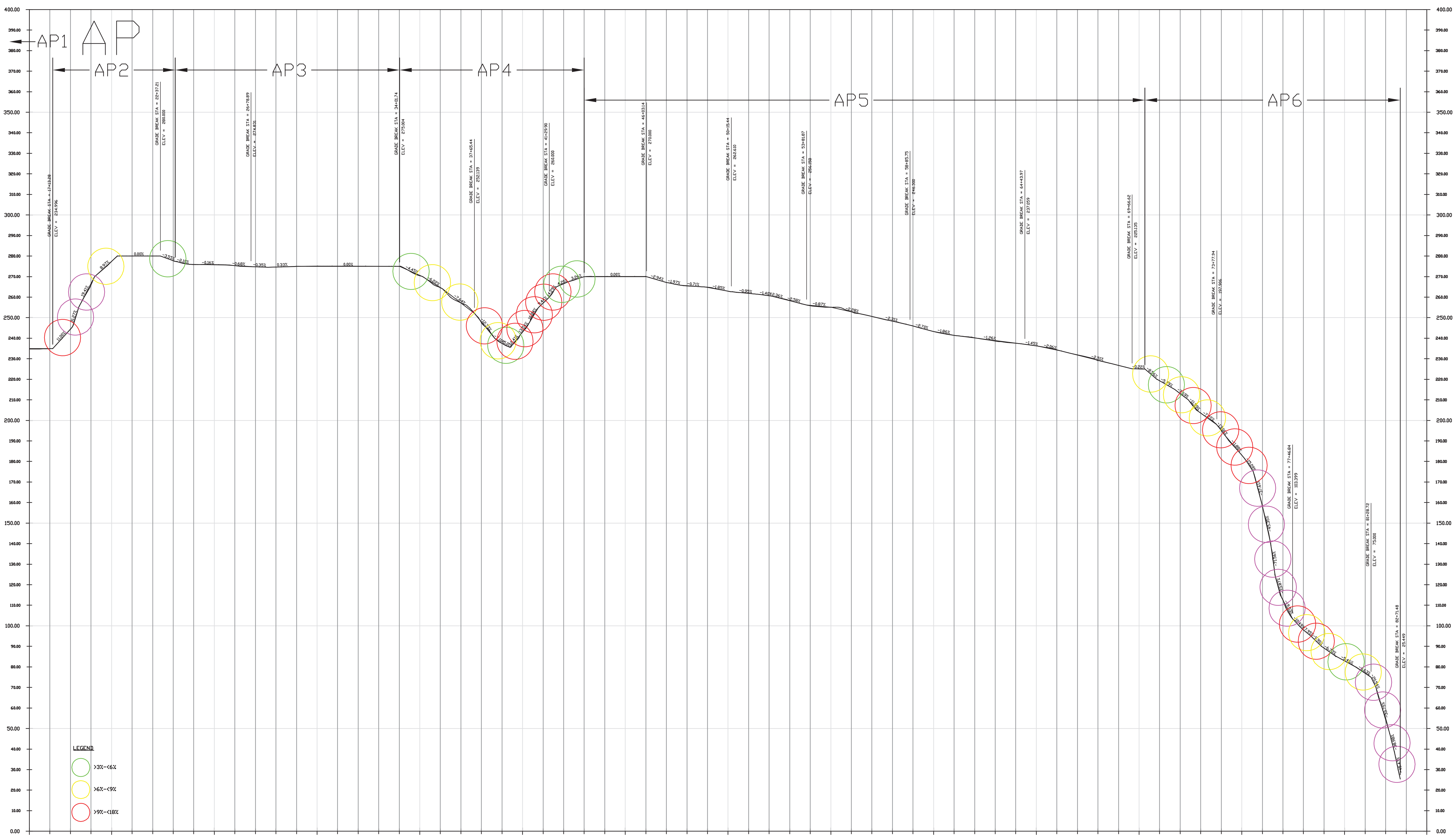
105+00.00

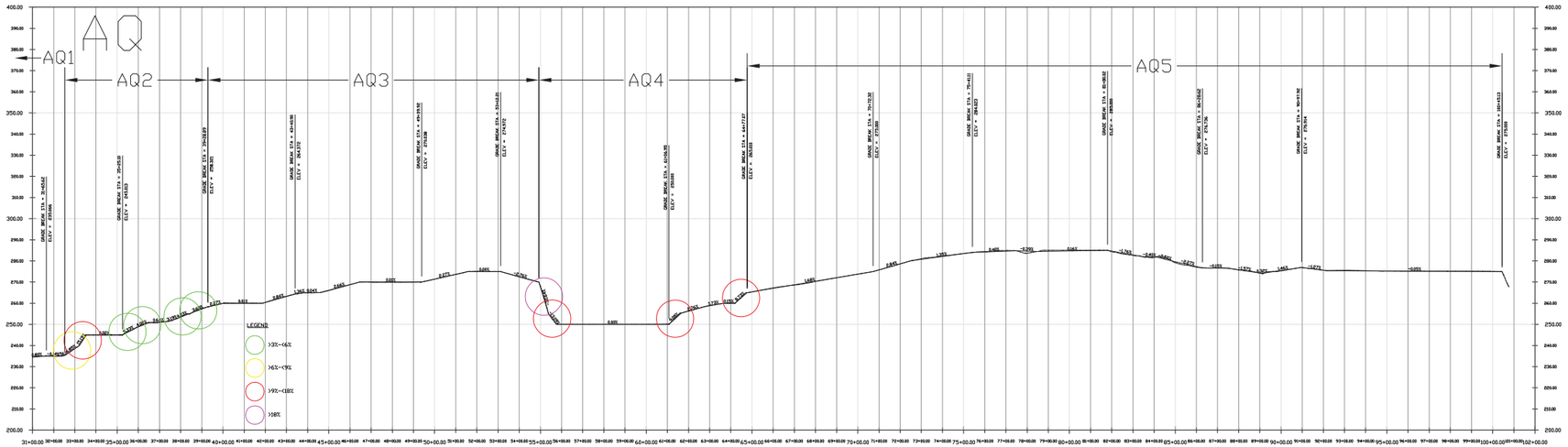

GRADE BREAK STA = 61+77.91
ELEV = 252.127
−4.56%
0.00%
GRADE BREAK STA = 75+17.85
ELEV = 245.000
3.83%
GRADE BREAK STA = 79+36.78
ELEV = 261.034
2.76%
2.01%
GRADE BREAK STA = 83+58.90
ELEV = 271.122
2.79%
1.76%
2.05%
GRADE BREAK STA = 88+91.03
ELEV = 282.270
1.68%
2.35%
3.43%
GRADE BREAK STA = 96+32.09
ELEV = 303.082
3.64%
2.51%
GRADE BREAK STA = 99+66.94
ELEV = 313.366
−1.76%
GRADE BREAK STA = 104+41.67
ELEV = 305.000
−3.32%
GRADE BREAK STA = 109+83.50
ELEV = 286.985
−0.66%
−3.04%
GRADE BREAK STA = 114+92.27
ELEV = 275.950
−3.13%
LEGEND
>3%-<6%

A0 (CONT'D)





AP
AP1
AP2
AP3
AP4
AP5
AP6
LEGEND
>3%-<6%
>6%-<9%
>9%-<18%


AQ
AQ1
AQ2
AQ3
AQ4
AQ5
LEGEND
>3%~6%
>6%~7%
>7%~16%
>16%