DCN: 7932

103-06A – NMC26A – Community Input
Navy/MC – Naval Air Station Joint Reserve Base
Willow Grove - PA
BRAC COMMISSION – FY 2005
COFF:_____ DISPOSITION: Permanent

NAS JRB Willow Grove

Final Document Submission
To the
Defense Base Closure
And Realignment Commission

17 August 2005

GOVERNOR'S OFFICE
OF GENERAL COUNSEL

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS
OFFICE OF CHIEF COUNSEL
BUILDING 7-1
FORT INDIANTOWN GAP
ANNVILLE, PENNSYLVANIA 17003-5002

OFFICE OF CHIEF COUNSEL
(717) 861-8503
Fax (717) 861-8265
DSN 491-8503

August 17, 2005

The Honorable Anthony J. Principi
Chairman
Defense Base Closure and Realignment Commission
2521 S. Clark St., Ste. 600
Arlington, VA 22202

Re: Final Submission of Materials on NAS JRB Willow Grove

Dear Chairman Principi:

On behalf of the Governor's Base Development Committee and the Suburban Horsham Willow Grove Chamber of Conference Regional Military Affairs Committee, I am submitting three copies of additional supplemental materials related to NAS JRB Willow Grove. The providers of these materials, and data previously submitted with regard to this installation, certify that, to the best of their knowledge, information and belief, any data submitted is true and correct based on the sources of the information.

Thank you and your staff again for reviewing this material. Please feel free to contact me if you have questions or need additional information.

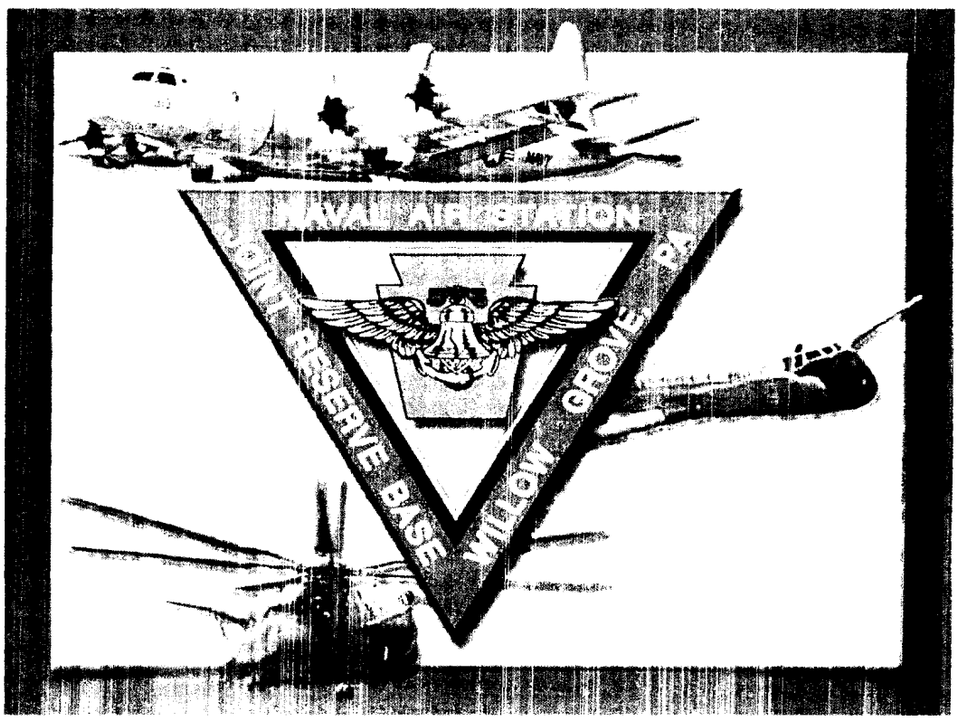
Sincerely,

Dennis T. Guise
Chief Counsel

Table of Contents

TAB A	DRAFT Recommendations (Alternatives)
TAB B	ANG Issues
TAB C	Navy Issues
TAB D	Supplemental Material on Jointness
TAB E	Supplemental Material on Homeland Security
TAB F	Encroachments (Joint Land Use Study)
TAB G	Cost Savings
TAB H	Data Certification for Econsult

The purpose of this document submission is to supplement materials presented to the Commission at the July 5, 2005 visit to Willow Grove, at the July 7 regional hearing and at the August 1, 2005 meeting with BRAC staff. Materials submitted herewith and with prior submissions on behalf of Willow Grove are certified to contain data that is true and correct to the best of the providers' knowledge, information and belief.

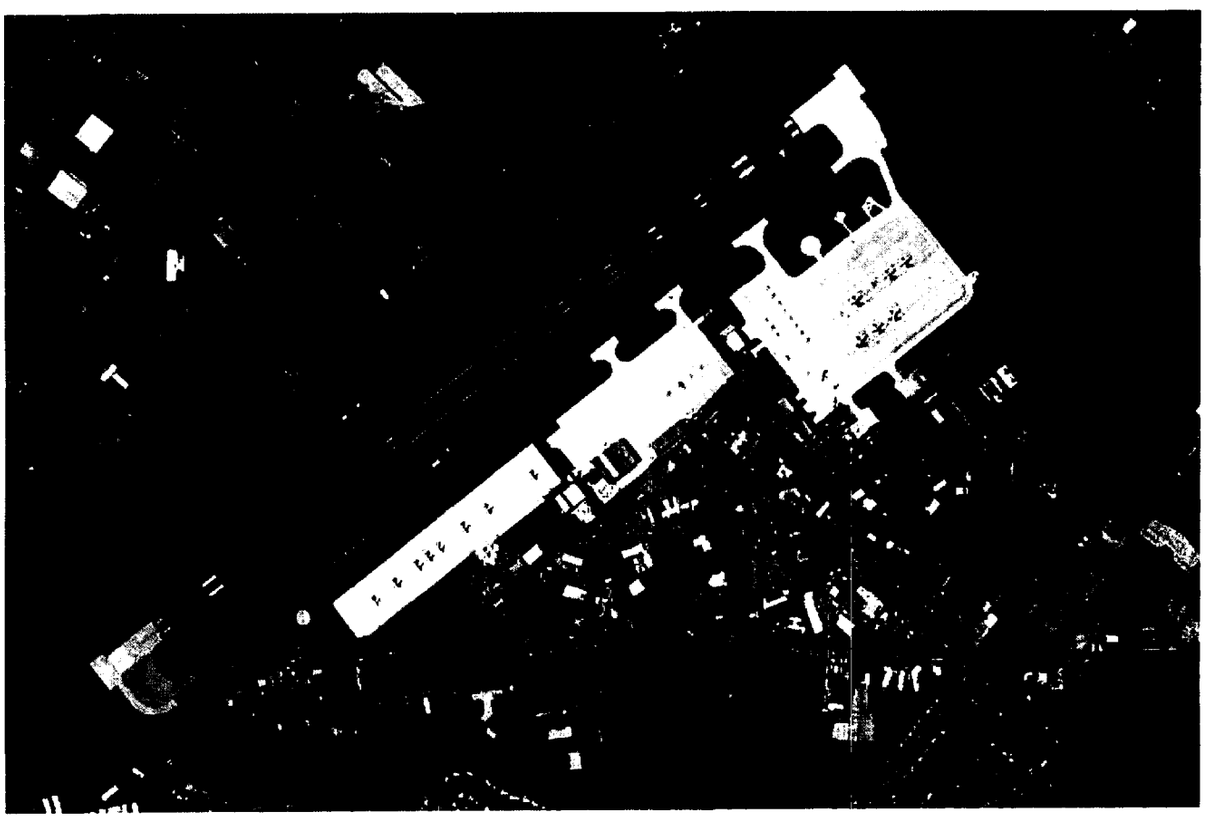


A

NAS JRB
Willow Grove

TAB A

17 August 2005



DRAFT RECOMMENDATIONS FOR NAS JRB WILLOW GROVE

This draft assumes that the 2005 BRAC Commission Report will be in much the same format as 1995 Report. The alternatives are arrayed in order of preference. The submission of alternative wording does not diminish the conviction of the providers that the substantial deviations from the final criteria and the overall joint nature of NAS JRB Willow Grove fully justify the selection of Alternative One (Preferred Option).

ALTERNATIVE 1 (Preferred Option):

Commission Recommendation

The Commission finds that the Secretary of Defense deviated substantially from final criteria 1, 2 and 3. Therefore the Commission recommends the following: NAS JRB Willow Grove (and Willow Grove ARS) will remain open. The Commission finds this recommendation is consistent with the force structure plan and final criteria.

ALTERNATIVE 2

Commission Recommendation

The Commission finds that the Secretary of Defense deviated substantially from final criteria 1, 2 and 3. Therefore the Commission recommends the following: Realign NAS JRB Willow Grove by relocating VR-52/64 and associated facilities to McGuire AFB, Cookstown, NJ. Relocate the minimum amount of manpower and equipment to support intermediate maintenance workload and capacity for Tire and Wheel, non-destructive inspections and Aviation Life Support System equipment to McGuire AFB. Relocate intermediate maintenance workload and capacity for Aircraft Components, Aircraft Engines, Fabrication and Manufacturing and Support Equipment to Fleet Readiness Center East, Marine Corps Air Station, Cherry Point, NC. Maintain MAG-49 at Willow Grove, and realign Cambria Regional Airport, Johnstown, PA, by relocating Marine Light Attack Helicopter Squadron 775, Detachment A, to include all required personnel, equipment and support to Willow Grove. Retain all Army Reserve units presently stationed at Willow Grove and relocate other Army Reserve units to Willow Grove at a new Armed Forces Reserve Center with a new organizational maintenance facility. In consultation with the Pennsylvania Army National Guard, relocate units and subordinate headquarters of the Pennsylvania Army National Guard 56th Stryker Brigade to Willow Grove. Maintain military flying operations at Willow Grove under the aegis of the Willow Grove Air Reserve Station. Retain the Willow Grove Air Reserve Station and the 111th Fighter Wing and 913th Airlift Wing and associated units. The Commission finds this recommendation is consistent with the force structure plan and final criteria.

ALTERNATIVE 3

Commission Recommendation
The Commission finds that the Secretary of Defense deviated substantially from final criteria 1, 2 and 3. Therefore the Commission recommends the following: Realign NAS JRB Willow Grove by relocating VR-52/64 and MAG-49 and associated facilities to McGuire AFB, Cookstown, NJ. Relocate the minimum amount of manpower and equipment to support intermediate maintenance workload and capacity for Tire and Wheel, non-destructive inspections and Aviation Life Support System equipment to McGuire AFB. Relocate intermediate maintenance workload and capacity for Aircraft Components, Aircraft Engines, Fabrication and Manufacturing and Support Equipment to Fleet Readiness Center East, Marine Corps Air Station, Cherry Point, NC. Realign Cambria Regional Airport, Johnstown, PA, by relocating Marine Light Attack Helicopter Squadron 775, Detachment A, to include all required personnel, equipment and support to McGuire AFB. Retain all Army Reserve units presently stationed at Willow Grove and relocate other Army Reserve units to Willow Grove at a new Armed Forces Reserve Center with a new organizational maintenance facility. In consultation with the Pennsylvania Army National Guard, relocate units and subordinate headquarters of the Pennsylvania Army National Guard 56th Stryker Brigade to Willow Grove. Maintain military flying operations at Willow Grove under the aegis of the Willow Grove Air Reserve Station. Retain the Willow Grove Air Reserve Station and the 111th Fighter Wing and 913th Airlift Wing and associated units. The Commission finds this recommendation is consistent with the force structure plan and final criteria.

ALTERNATIVE 4

Commission Recommendation
The Commission finds that the Secretary of Defense deviated substantially from final criteria 1, 2 and 3. Therefore the Commission recommends the following: Realign NAS JRB Willow Grove by relocating VR-52/64 and MAG-49 and associated facilities to McGuire AFB, Cookstown, NJ. Relocate the minimum amount of manpower and equipment to support intermediate maintenance workload and capacity for Tire and Wheel, non-destructive inspections and Aviation Life Support System equipment to McGuire AFB. Relocate intermediate maintenance workload and capacity for Aircraft Components, Aircraft Engines, Fabrication and Manufacturing and Support Equipment to Fleet Readiness Center East, Marine Corps Air Station, Cherry Point, NC. Realign Cambria Regional Airport, Johnstown, PA, by relocating Marine Light Attack Helicopter Squadron 775, Detachment A, to include all required personnel, equipment and support to McGuire AFB. Retain all Army Reserve units presently stationed at Willow Grove and relocate other Army Reserve units to Willow Grove at a new Armed Forces Reserve Center with a new organizational maintenance facility. In consultation with the Pennsylvania Army National Guard, relocate units and subordinate headquarters of the Pennsylvania Army National Guard 56th Stryker Brigade to Willow Grove. Maintain military flying operations at Willow Grove under the aegis of the Willow Grove Air Reserve Station with future consideration of establishing a joint military/civilian airport at this site. Retain the Willow Grove Air Reserve Station and the 111th Fighter Wing and 913th Airlift Wing and associated units. The Commission finds this recommendation is consistent with the force structure plan and final criteria.

B

NAS JRB Willow Grove

TAB B

17 August 2005

Point Paper on Air National Guard Issues

Issue: The Adjutants General Association of the United States (AGAUS) and individual governors and adjutants general have strenuously objected to the Air Force recommendations with regard to Air National Guard units. In Pennsylvania, these objections have focused on the 111th Fighter Wing, Willow Grove Air Reserve Station, and has resulted in litigation in Pennsylvania (Rendell *et al* v. Rumsfeld, Civ. Act. No. 2:05-cv-3563) and elsewhere.

Background: The Air Force plan for the Air National Guard has impacts on 73 Air Guard units. But this huge loss of capacity accounts for only five percent of the BRAC-related savings estimated by the Air Force. Five states will lose all flying missions. Twenty-three locations become enclaves where flying units are disbanded and aircraft moved to other locations leaving small pockets of support personnel behind. Nearly 17,000 of the most experienced flying and maintenance people in the Air Force will face relocation decisions.

Hearing: At Defense Base Closure and Realignment Commission hearing on August 11, 2005 in Washington, some of the Commissioners expressed disappointment that the Adjutants General and the Air Force had not reached agreement on a plan for the future of the Air National Guard. In response to comments made at the hearing, the Adjutant General of Pennsylvania, Major General Jessica L. Wright, sent a letter to Chairman Principi, which is attached to this document.

Way-Ahead: We believe the BRAC Commission has a unique opportunity to make law put the process of transformation of the Air National Guard back on track and act as a positive influence to encourage the Air Force and Air National Guard to reach a solution through collaboration, consultation and cooperation. The Commission should seize this opportunity to fix the Air Force FTF problem. They can do this by voting down all of the DoD BRAC recommendations that apply to the ANG. And, then adding language, which will become law, requiring the new SECAF and the new CSAF to collaborate and consult with the ANG, the Governors, and affected members of Congress about Future Total Force transformation of the Air Force. The Commission should require frequent and regular progress reports to the House and Senate Armed Services Committees on established goals and intermediate milestones demonstrating progress. This kind of collaboration is possible, but by design, not easy. But, it is certainly feasible, as shown by the Army National Guard's approach to transformation of its units.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS
THE ADJUTANT GENERAL
BUILDING S-0-47
FORT INDIANTOWN GAP
ANNVILLE, PENNSYLVANIA 17003-5002

August 15, 2005

The Honorable Anthony J. Principi
Chairman
Defense Base Closure and Realignment Commission
2521 S. Clark St., Ste. 600
Arlington, VA 22202

Dear Chairman Principi:

At your August 11, 2005 hearing on Air National Guard issues, a number of matters were discussed that warrant comment. As the Adjutant General of the only state with an Air National Guard unit slated for "deactivation" under the DoD BRAC report, I believe it's important to reinforce some of the points made by the representatives of the Adjutants General Association and to refute some of the comments made by the Air Force representatives.

First off, I want to again thank you, your fellow Commissioners and your fine staff for your service in undertaking the daunting task of reviewing and making decisions on the DoD BRAC recommendations. I appreciate your efforts to obtain additional input on Air National Guard issues and to try to reach an outcome that will take account of state and federal concerns. I believe Generals Lempke, Valvala, Maguire and Haugen did an outstanding job of describing how the DoD and Air Force recommendations will damage the very military values that this BRAC round was supposed to support.

The reason for the "firestorm" of controversy that Admiral Gehman described is clear: It is not that the Air Force "messed with" the Guard; it is that the Air Force messed up the process, the analyses and the results. While giving lip service to maintaining the Air National Guard as full partner in the Total Force, they showed a lack of respect and understanding for the federalism that underlies the roles and missions of the National Guard.

In his briefing to your Commission and in answers to your questions, Major General Gary Heckman of AF/XP gave a carefully worded account of the Air Force's interaction with the National Guard Bureau and the Adjutants General on plans for Air National Guard units. General Heckman's remarks certainly illustrate the problem with the Air Force approach to, and understanding of, Guard-related issues. He said the Air Force briefed the TAGs on the "reasons for what we're doing along with the fundamental principles that founded our analysis." He said he interacted with the Air Directorate of the NGB more closely than he did with major commands. He even asserted that he went to the trouble to give the adjutants general, who are major (two-star) generals, the same briefings he gave four-star generals in the major commands and the Pentagon, as if this somehow met the requirements for coordination and cooperation with the Air Force's partners in the National Guard.

I was hoping that one of the Commissioners would have asked General Heckman what he told me and the other the adjutants general about plans for our specific ANG units, and when he told us. You know the answer: Nothing and never. Why didn't the Air Force do what the Army did and involve state officials in a cooperative dialogue about their plans?

Commissioner Newton asked the TAG panel why the BRAC Commission should give the Adjutants General more time to work with the Air Force on Future Total Force plans through the normal planning processes when they have already had two years and couldn't reach an agreement. It's true that the Air Force has been working on its BRAC plans for years, but the TAGs were not consulted or otherwise involved in BRAC-related decision-making by the Air Force at any time before May 13. This is not a case where the consultative process broke down; it's a case where the Air Force didn't even try. As Maj Gen Haugen from North Dakota observed at the hearing, the TAGs have an excellent record of working with the Air Force and accomplishing programmatic changes and unit movements through the regular planning and budgeting process. The reason to put this back on track is simple: It's the right way to deal with the kind of transformation proposed by the Air Force.

The Chief of the National Guard Bureau, LTG H. Steven Blum, called on the Commission to adopt the DoD recommendations as submitted and then let him fix them and address the states' concerns. General Blum is no doubt in a difficult situation: He recognizes the Air Force recommendations have to be changed, and he urges flexibility to do so. As Chief of the National Guard Bureau, he is under pressure to comply with the DoD positions. The way to accomplish the goals described by General Blum is for the Commission to reject the DoD recommendations for the ANG and put this process back on the right track involving future total force planning in a coordinated manner. This is the best way to give LTG Blum, the Air Force and the TAGs and governors, the chance to work together effectively.

Homeland defense and homeland security are issues of great importance to Pennsylvania, to our nation as a whole and to your Commission. The Air Force representatives said the enclaves of expeditionary combat support forces left at some ANG flying installations in the BRAC recommendations helped meet the governors' needs for homeland defense and homeland security. I would ask how they made this needs assessment and which governors and adjutants general were consulted. As General Valvala pointed out, the enclave concept came as complete surprise to the adjutants general when it was announced on May 13. The enclave concept seems ill-defined. The Air Force panel said it would leave security police, firefighters, medics, engineers and others behind in non-flying units to support the governors, but, as was pointed out, some of these functions, like firefighters, only exist at units with flying operations.

I note that the Air Force apparently concluded that southeastern Pennsylvania doesn't need the enclaved homeland security forces they see as supporting the needs of the governors since only the small 270th EIS is kept at this key strategic location in the Philadelphia suburbs. Needless to say, the Air Force never asked me or Governor Rendell what ANG forces we would like in this area to address these urgent needs. We would have told them that we need to

maintain military flying operations in this key location with a well-trained, ready and reliable National Guard force to respond to both state and federal contingencies.

Finally, Secretary Dominguez addressed General Blum's call for a flying unit in every state with the astonishing observation that there is a flying wing in every state and it's called the Civil Air Patrol. Secretary Dominguez went to some pains to insist he wasn't saying the CAP had the capabilities of the Air National Guard. But the fact that he would even draw this comparison shows just how far the Air Force is willing to go to try to justify their unsupportable recommendations for programmatic changes to ANG units.

The CAP, an auxiliary of the Air Force, is a great organization whose volunteers perform valuable service flying small, single-engine, low capacity aircraft in search and rescue, reconnaissance and similar low-intensity missions. Pennsylvania provides more financial support to the CAP than all but one or two other states, but the CAP does not function under state command and control, as does the National Guard. Its volunteers, nearly half of whom are youth, are neither trained nor equipped to respond to the kinds of contingencies we face. Finally, I should note that DoD will close a CAP operating location in Southeastern Pennsylvania if you approve the recommendation to close NAS JRB Willow Grove.

Thank you again for holding the hearing on August 11. I know that some of the Commissioners expressed disappointment or frustration that the Adjutants General and the Air Force had not come to a solution. It is grossly unfair to blame the TAGs and the states for this situation or to expect the TAGs to produce in a period of weeks a substitute for the plan the Air Force has developed, without consultation or coordination, over a period of years. The Air Force told you that, "in prior rounds of BRAC, National Guard leaders could not bring themselves to embrace the needed change," but that "this time, that courage is evident." In my view, real courage is evident in the adjutants general and governors who have stood up to DoD and sought to get this process back on the right track. I know that it will take courage and foresight for the Commission to vote down the DoD recommendations for the Air National Guard, and I urge you to do so.

Sincerely,

JLWright

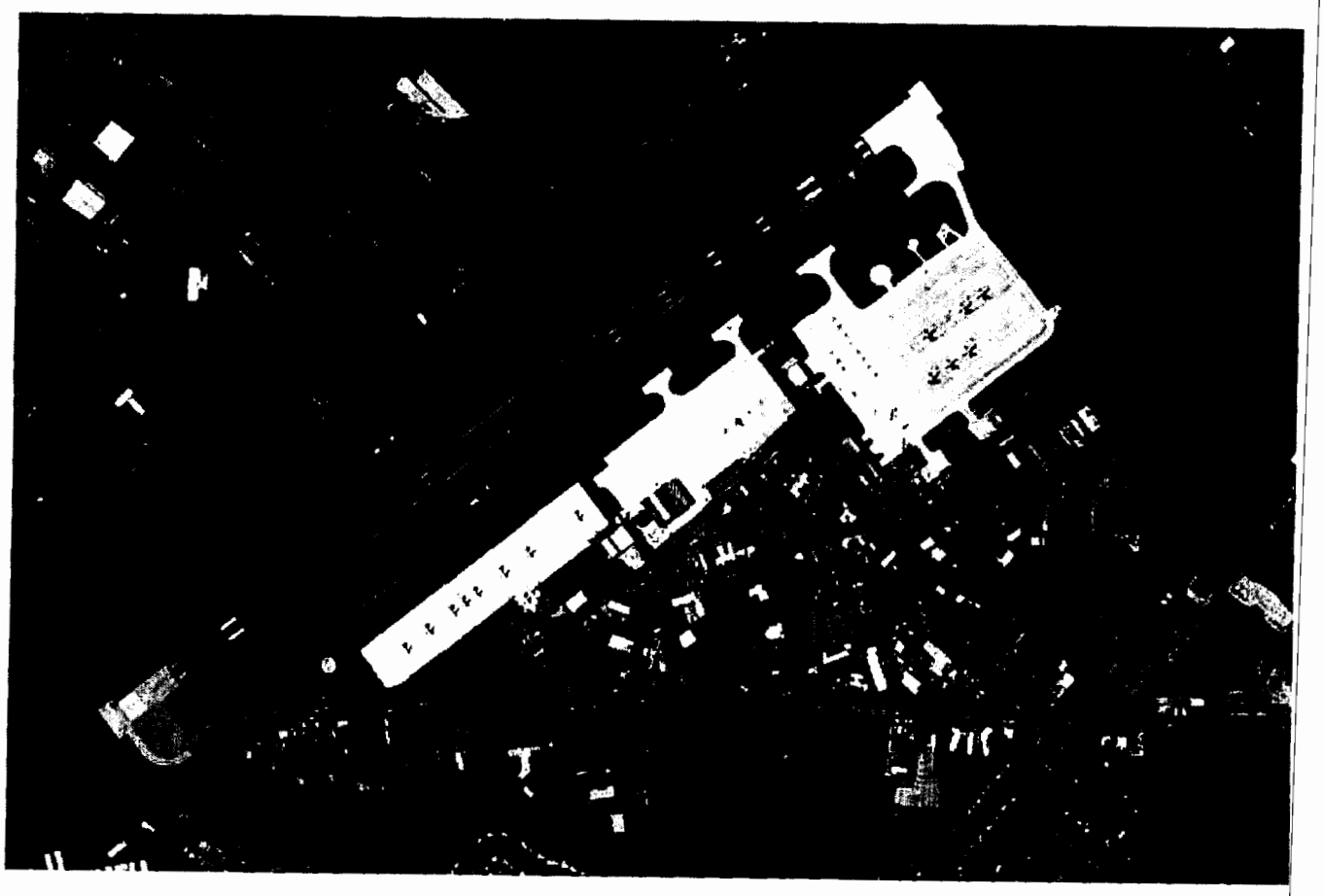
JESSICA L. WRIGHT
Major General, PAARNG
The Adjutant General

C

NAS JRB Willow Grove

TAB C

17 August 2005



Point Paper on Navy Analysis of NAS JRB Willow Grove

Issue: Navy Evaluation of N0084 (Close NAS JRB Willow Grove) was based on assumptions – not clear joint analysis. The decision was based on subjective military judgment rather than accurate military value. AFRES, ANG, Army Reserve, and other Federal Agencies were not considered by Navy.

1. NAS JRB Willow Grove appears to have been analyzed jointly only by the Joint Service Group – Education and Training (specialized Skill Training Subgroup). However, the group only compared Navy activity data – not the entire spectrum of the base which includes Army Reserve, AF Reserve, AF Guard, and USMC Reserve, along with other federal agencies.[1]
    a. In this subgroup – NAS JRB Willow Grove was the only Reserve Base considered.
2. According to DON deliberations, Intermediate Maintenance Activities, when NAS JRB Willow Grove was considered within Navy in the Maintenance area – Intermediate Aircraft Maintenance (AIMD) – Aircraft Components area;[2]
    a. NAS JRB Willow Grove – did score a total of **15th** out of 184 examined by this group.
    b. Navy was considered separately than the Willow Grove Air Force maintenance capabilities.
    c. NAS Willow Grove and Willow Grove AFR scored higher than McGuire AFB in the AIMD areas
    d. Of five Navy Reserve facilities scored – NAS Willow Grove scored higher than the other five facilities in all areas examined except one. And, in final scoring – NAS JRB Willow Grove scored higher than all but one Navy reserve facility.
3. It is difficult to find objective Homeland Defense and Support to Civil Authorities data; therefore it appears three critical assets where overlooked or not considered. With emerging NORTHCOM and DoD requirements, the strategic local of NAS JRB Willow Grove, it is hard to see how the importance of these Navy assets were overlooked. (Additionally, the AF Reserve and AF Guard assets were not considered).
    a. USNR VR (transport) assets: Two highly manned, combat tested squadrons were not considered as assets for HLD & Support to Civil Authorities. Both units over 90% manned.
        i. Master C-130 JRB facility. Since there are 3 transport units currently assigned to NAS JRB Willow Grove, and the base does have a superior IMD department (by Navy's own standard), then it does appear that a future – master C-130 base (Joint Base) should have been considered.

[1] JCG Section 4, Education & Training, Vol VI, page 9
[2] DoN Deliberative Documents, page I-28

b. USNR VP (patrol & reconnaissance) assets: This squadron was not considered for critical emerging and future capabilities for National Maritime Strategy, although the JRB Base and the squadron is the closest asset to the National Capitol Region for several HLD & Support to Civil Authorities missions. The unit is 100% manned.

c. USMCR Helicopter heavy lift. Along with the Marine Wing Support Services, the Marine Corp heavy lift capabilities would be critical during support to Civil Authorities in response to/or execution of Homeland Defense request by DoD for support to Civil Authorities

4. NAS JRB Willow Grove is an experienced surge, mobilization, and contingency operation asset for Reserve and Guard forces. McGuire AFB does not appear to have this Reserve and Guard mobilization experience.
5. DoN has suggested disestablishing VP-66 (Patrol & Reconnaissance Squadron). VP-66 is fully manned, combat ready and fully tested in any operational mission. This disestablishment appears to be in concert with BRAC recommendations, which is force structure shaping vice excess capacity analysis. VP-66 is one third the cost of any active duty patrol squadron.
6. NAS JRB Willow Grove is strategically located; less than 30 minutes flight time to National Capitol Region and closer to NY area. It has easy access to major recruiting markets. The 4,500 Guardsman and Reservist will most likely not move to new sites due to additional transportation requirements.
7. The Navy has recognized NAS JRB Willow Grove by, among other things, awarding it a major safety award (see attached).

Certification:

This point paper contains data from DoD documents and other public sources. It is certified to a true and accurate representation of such data to the best of the knowledge, information and belief of the preparers.

NAS JRB Willow Grove Claims Top Reserve Safety Ashore Prize

Story Number: NNS030213-10
Release Date: 2/13/2003 2:05:00 PM

By Senior Chief Journalist (SW) Doug Hummel, Naval Air Station Joint Reserve Base Willow Grove Public Affairs

NAVAL AIR STATION JOINT RESERVE BASE WILLOW GROVE, Pa. (NNS) -- "Making sure that safety is in everybody's toolbox every day is the only way to ensure that the base's safety program is a success."

That's the feeling of Dennis Bing, who has been the base's occupational safety and health manager for the past 15 years.

"Safety is everyone's job" is the attitude station personnel adopted, and that was a big contributing factor to Naval Air Station Joint Reserve Base (NAS JRB)Willow Grove winning the Commander, Naval Reserve Forces Command FY2002 Activity Award for Achievement in Safety Ashore, according to Bing and Cmdr. James L. Bounds, the base's safety officer.

Stressing the use of the Navy's Operational Risk Management Process when looking at any and every safety issue was key to getting the entire station aboard with the safety program, said Bounds. That message was re-enforced during monthly meetings with the Enlisted Supervisors Safety Council, a group of frontline civilian and military supervisors who took the message back to their work centers and made it work.

"Everyone who works on this base should have their name on this award, because they are the ones who won this for the base," said Bounds. "The leadership of the air station got the ball rolling by really embracing the program, and they set the tone for all hands to follow."

Among the list of yearly safety accomplishments racked up by Willow Grove, the one Bounds is most proud of was the base's safety fair.

"That event put dealing with solutions to safety situations into the hands of the people who work here," said Bounds about the first-time event. "People from around the base put on their 'safety hats' and presented safety tips to their co-workers on topics that impact their safety at work and in day-to-day life."

Other highlights included: the lowest workman's compensation costs and mishap rates in the claimancy; a score of 78 on the Naval Inspector General Oversight Inspection, which is the fourth highest score to date in the Navy; inspections of 206 buildings and the base's housing facilities; developing a Weapons of Mass Destruction Rapid Action plan, serving as a model for the Reserve Force; and the establishment of the first Disaster Preparedness Organization within the Reserves.

"Everyone has to have a part in safety," said Bing. "We have to protect ourselves. It's not just up to the safety officer, the senior enlisted or the department's safety petty officer to protect everybody that works for them. You have to have an interest and an investment in safety to make sure you, your shipmate or your co-worker are working in a hazard-free work environment."

NAS JRB Willow Grove will now go forward to represent the Reserve shore commands and compete for the FY2002 Secretary of the Navy Activity Award for Achievement in Safety Ashore.

For related news, visit the Naval Air Station Joint Reserve Base Willow Grove, Pa. Navy NewsStand page at www.news.navy.mil/local/nasjrbwg.

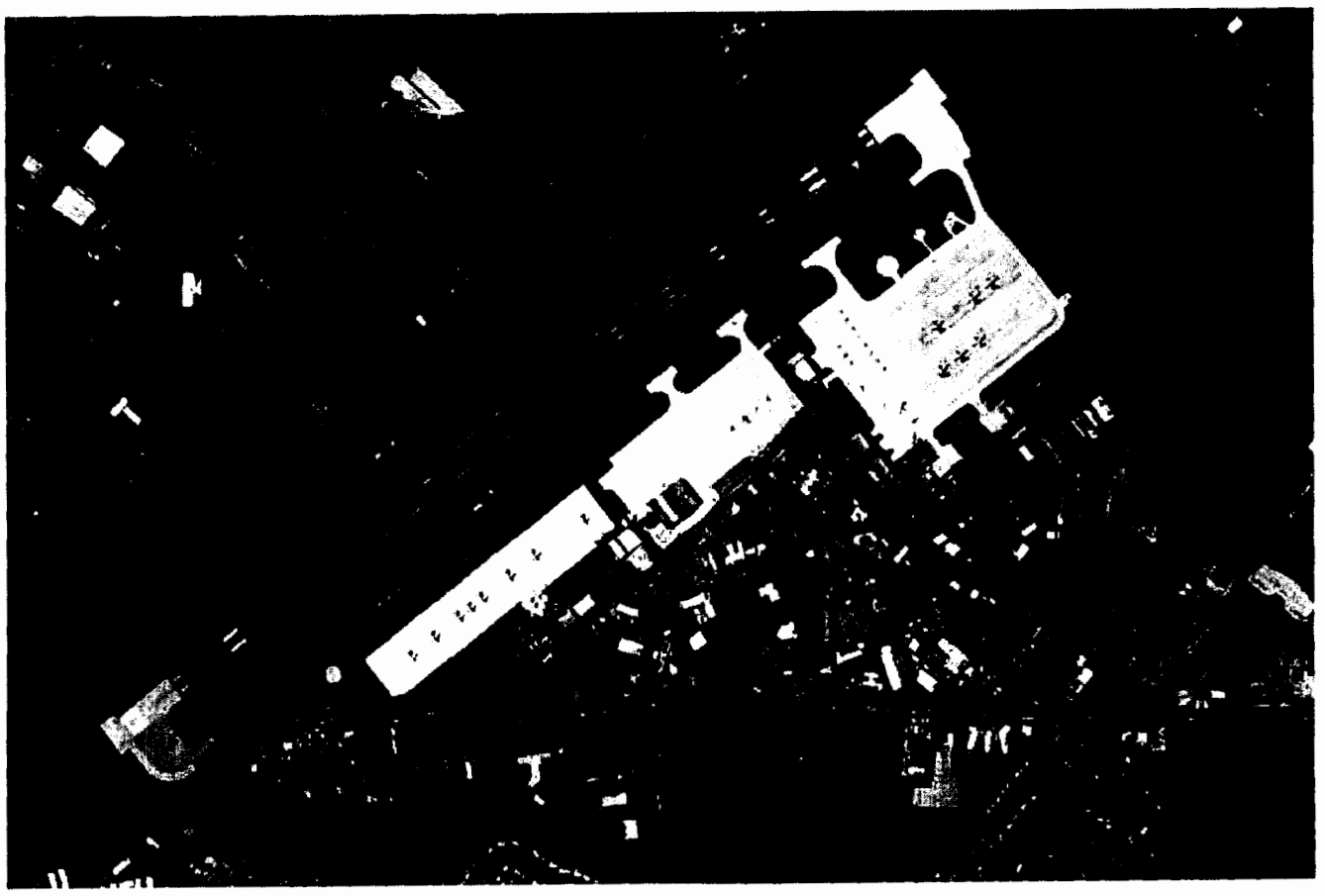
E-mail this story to a friend | Send a comment about this story

D

NAS JRB Willow Grove

TAB D

17 August 2005



Supplemental Point Paper
Jointness

Statement of the Problem: Not only were there substantial evaluation errors related to the joint nature of NAS JRB Willow Grove, the DoD recommendations for this installation completely failed to recognize the joint opportunities that Willow Grove provides today and can provide in the future.

Purpose: The DoD recommendations for NAS JRB Willow Grove deviate substantially from this criterion in several significant ways. The point paper submitted on 1 August describes many aspects of the joint operations at Willow Grove and emphasizes the point that it has taken ten years to get where we are today. The purpose of this supplemental point paper is to describe one very recent example of a joint exercise involving elements from Willow Grove. This also reinforces the huge importance of proximity to training ranges.

Joint Basing: In his 3 August 2005, CSAF Sight Picture[1], General John P. Jumper, Chief of the Staff of the United States Air Force, observed:

> Modern warfare is Joint warfare. In addition to saving scarce funds, this move to Joint Basing will allow us to build closer relationships and forge stronger ties between services. We will not only train as we fight, we will live as we fight.

General Jumper recognized, correctly, that "establishing joint bases will take time." As noted above, it has taken ten years for Willow Grove to progress to the point it has reached today. It makes no sense to throw out these years of experience and success in building the joint relationships that form the foundation of a successful joint base.

Despite the fact that Willow Grove should already be considered a Joint Center of Excellence, the Department of the Navy, which made the effective recommendation to close Willow Grove, did not evaluate NAS JRB Willow Grove jointly and assign a joint military value. In fact, a joint analysis for NAS JRB Willow Grove as a total force structure is not provided and can not be found. Taking this point a step further, it is clear that the Willow Grove installation was, if anything, penalized for being joint in the military value evaluations of the separate services. No joint process procedures can be found that assigns joint military value to a facility. This is a serious and substantial deviation from the final selection criteria.

Joint Training: On 3 August 2005, the elements of the Pennsylvania National Guard and other components exercised a significant joint training exercise at Fort Indiantown Gap. This illustrates the potential for joint training as well as the importance of the proximity to training locations:

Paxton Lightning Live Fire Joint Close Air Support Exercise

- Recently the Pennsylvania National Guard planned, rehearsed and executed a one-day joint live fire exercise (LFX) that included ground and air elements from the Pennsylavnia Army and Air National Guards.

[1] http://www.af.mil/media/viewpoints/csaf_joint_basing.html. A copy of the text of the CSAF Sight Picture is attached.

- The primary participants were:
  - 2-112 Infantry Battalion (PAARNG) assigned to the Stryker Brigade (SBCT)
  - 103 Fighter Squadron, 111th FW, from NAS JRB Willow Grove.
- Active duty SBCTs 1,2, &3 have all identified the importance of joint air/ground integration. Previous Pa National Guard LFX's identified joint planning and execution as essential.
- The objective was to develop the most realistic joint training exercise with available resources executing all tasks trained throughout the training period.
  - The Operation Iraqi Freedom scenario was set to simulate Anti Iraqi Forces (AIF) arrayed against Coalition Forces.
  - The operation was to conduct patrols to destroy encountered AIF, gain actionable intelligence and reduce asymmetrical threat to forward operating base. Conduct roadblocks and convoy to deny AIF infiltration and counter Improvised Explosive Device (IED) operations. Conduct company size raid to deny AIF the ability to mass and/or exfiltrate.
- A key component was to plan, integrate, clear, manage, and assess employment of all lethal and non-lethal fires to include combat maneuver operations, direct and indirect fires (artillery/mortar), close air support (CAS), non-lethal CAS Show of Force, Information Operations (Commando Solo)and civil military operations.
- In summary this exercise served to greatly enhance joint maneuver warfare through the elimination of "stove-pipe" training.
  - Every level of command had to be integrated and focused on the decisive operation. It gets both air and army leaders out of their comfort zone and make them more agile and adaptive.
  - A summary of personnel, sorties, and munitions involved follows and demonstrates this training under the control of the Pa National Guard is only possible with the higher than normal 111FW A-10 sorties generated to cover the full scope of the exercise.

TOTAL AIR NATIONAL GUARD AIRMEN (all PaANG except where noted)

103FS	40 (Aircrew, Maintenance, Intel)
193SOS	20 (Aircrew, Maintanence, Intel)
193 DET1	10 (ALO, JTAC, ROMAD personnel <Battlefield Airmen> from Pa, NY, Ga* ANGs)
140 Wx Flt	3 (weather support to joint exercise)
* GaANG	JTAC preparation for deployment in support of OIF

TOTAL SORTIES: 13 (6 MSNS of 2 x A-10, 1 MSN of EC-130 Commando Solo)
A-10 missions
First 3 missions (6 sorties) performed Counter Mortar / Armed Recce /C4ISR function ISO force movement
Expended 24 BDUs (practice bombs) and 200 rds 30mm
Last 3 missions (6 sorties) were preplanned Close Air Support missions in support of assault operations
Expended 24 BDUs, 800 rds 30 MM, 14 2.75 rockets
EC 130J one psychological operation and counter IED mission
Fort Indiantown Gap Range personnel fired 6 Smokey SAMS:
5 as RPGs and 1 as an SA-7

TOTAL ARMY NATIONAL GUARD SOLDIERS

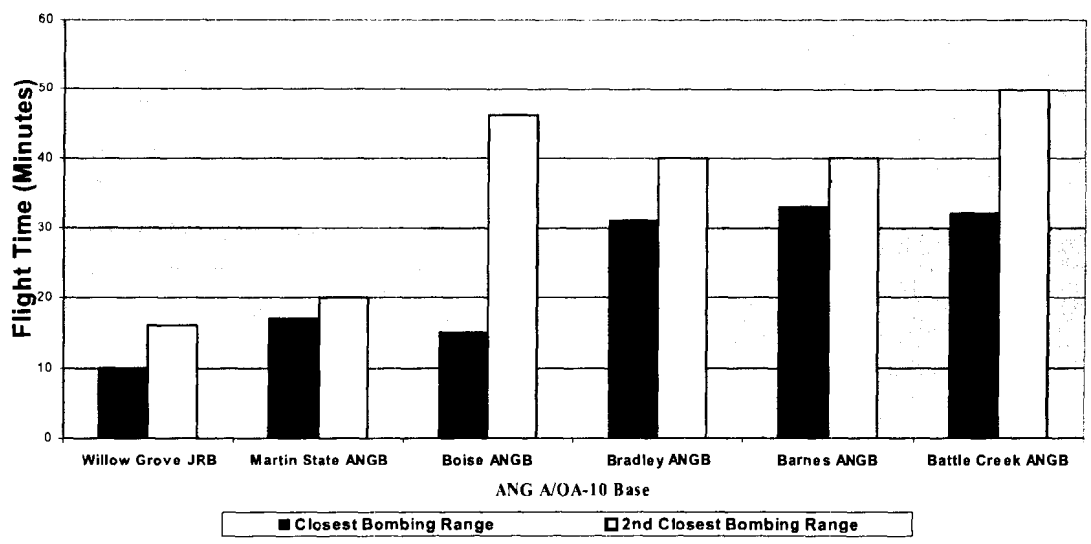
Bravo company 2-112 INF	92 (Infantry unit conducting raid on insurgent position)
Alpha Company 2-112 INF	74 (Infantry unit conducting security/blocking action)
1-108 FA	70 (Artillery Fire support)
BN HQS	112 (operational control including AF Air Liaison and Weather)
OPFOR	26 (opposing force to include demonstrators)

MUNITIONS EXPENDED

- 2-112 IN
  - 9280 rds 5.56 ball, 800 rds 7.72 ball, 20 rds, 20 rds 81mm mortar including WP marking rd
- 1-108 FA
  - 24 rounds 155mm artillery

Proximity to Joint Training Opportunities: One of the Air Force BRAC principles states that squadrons should be located within operationally efficient proximity to DoD-scheduled airspace, ranges, MOAs and low level routes. NAS JRB Willow Grove and Willow Grove ARS offer all these advantages. It is located in close proximity to the air to ground range at Fort Indiantown Gap where the 111th Fighter Wing routinely and regularly participates in joint training with the Army units it supports. In his testimony before the BRAC Commission on 11 August 2005, Major General Gary Heckman, AF-XP, said that "the location of the training mission was a huge consideration because most of the time that is what squadrons are doing particularly in the fighter world."[2] NAS JRB is located in close proximity to training ranges and this "huge consideration" was not given proper weight.

Willow Grove is Located in Closer Proximity to Training Ranges than other Bases:



[2] Uncertified Transcript, Hearing of Defense Base Closure and Realignment Commission, 1 p.m., 11 August 2005, pages 66-67.

Conclusion: It's abundantly clear that the Air Force and the Navy each did its own separate evaluation without accurately evaluating or assigning proper military value to the total joint base. The services and several Joint Cross Service Groups (JCSG) justify BRAC recommendations by creating or enhancing Joint Centers of Excellence (JCE) – however, there are no definitions or glossary references to what JCE is. Assumptions are made regarding joint military services, that they would understand and accept that DoD knows what a JCE is and would not merely collocate forces, personnel, and units under the guise of creating or enhancing JCE. In this case (NAS JRB Willow Grove including Willow Grove Air Reserve Station), has clear joint operations, maintenance, training, and synergies which were deconstructed at an existing accepted joint facility to merely co-locate functions at non-joint facilities. Thus, current and future operational readiness of the total force for joint warfighting, training, and readiness is seriously degraded by the action to close NAS JRB Willow Grove (which includes Willow Grove ARS), a serious and substantial deviation from the BRAC Criterion.

CHIEF's Sight Picture

3 August 2005

2005 Base Realignment and Closure (BRAC) -- Joint Basing

The Department of Defense recently released the largest BRAC proposal in our history, including the recommendation to close ten Air Force installations and realign 62 more. These changes maximize our warfighting capabilities, realign our infrastructure within the future defense strategy, eliminate excess physical capacity, and capitalize on opportunities for joint operations. They also include a concept called "joint basing" where two or more adjacent or nearby DoD installations are run by a designated service -- be it Army, Navy, or Air Force. By consolidating installation support services at conjoined or nearby bases under one Military Department, the Department of Defense hopes to save $2.3B over 20 years.

Under this BRAC recommendation, the Air Force will become the lead installation support provider at six locations (Charleston AFB/Naval Weapons Station Charleston, Joint Base McGuire-Fort Dix, Joint Base Andrews-Naval Air Facility Washington, Joint Base Elmendorf-Fort Richardson, Lackland AFB / Randolph AFB / Fort Sam Houston, and Langley AFB / Fort Eustis.) The Air Force will be the supported service at one Army (Joint Base Lewis-McChord) and three Navy locations (Joint Base Pearl Harbor-Hickam, Navy Guam/Andersen AFB, and Joint Base Anacostia-Bolling-Naval Research Laboratory.)

Modern warfare is Joint warfare. In addition to saving scarce funds, this move to Joint Basing will allow us to build closer relationships and forge stronger ties between services. We will not only train as we fight, we will live as we fight.

The Air Force has a long and successful history of working toward common goals in a joint environment without compromising Air Force principles and the well being of our people -- joint basing will be no different. Our guiding precepts as we move forward with joint basing are:

- Maintain uncompromised warfighting capability, including expeditionary combat support forces
- Preserve our installations as fighting positions and training platforms for our expeditionary force
- Airmen will command Airmen -- our unity of command at home station will remain intact
- Airmen open and operate airfields -- airfields will be operated and maintained by Airmen
- Provide quality services at the best value

Establishing joint bases will take time. We are working with the Army and Navy to ensure that we

do it smartly and are mindful of the lessons learned from past joint basing initiatives. The Office of the Secretary of Defense expects to establish the basic implementation policy by the end of this summer, with work on common standards and metrics continuing in the following months. Together, we will undertake pilot projects to explore how to best establish mutually acceptable joint basing agreements. However, until these projects are complete and BRAC is signed into law, it is premature to enter into any additional cooperative or inter-service joint basing agreements.

Joint basing will neither lower our standards nor compromise our warfighting capabilities. Combining capabilities and eliminating unnecessary duplication and redundancy will save scarce funds and result in more efficient installations from which we, and our sister services, will more effectively project combat power for our Nation.

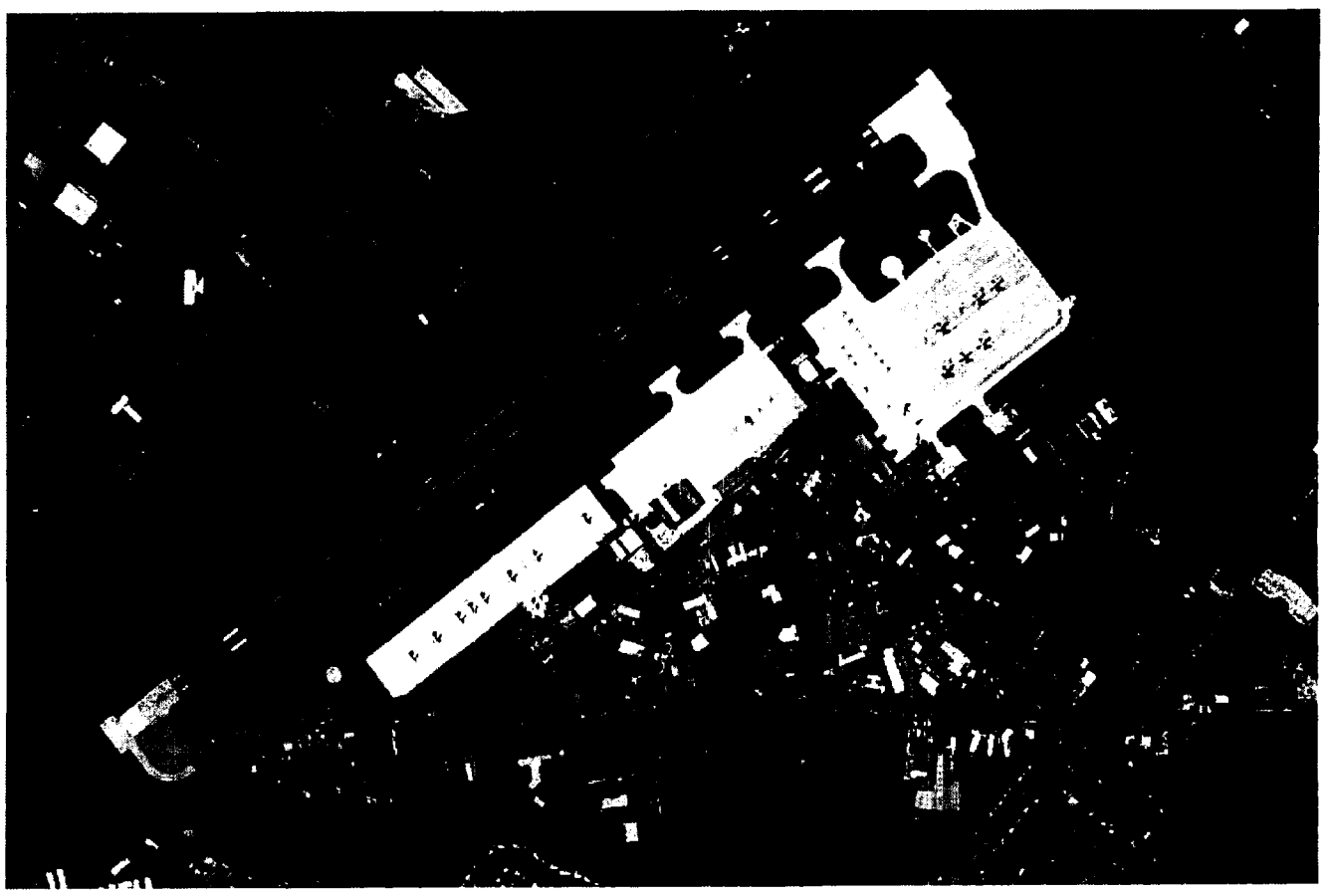
AIR FORCE
Air & Space Power

E

NAS JRB Willow Grove

TAB E

17 August 2005



Supplemental Point Paper

Home Land Defense and Homeland Security Issues

Statement of the Problem: DoD recommended closing NAS JRB Willow Grove despite the fact that it is a key defense asset in a strategic location in close proximity to Philadelphia, the Northeast Corridor, and the National Capitol Region. Its usefulness as a staging area for homeland defense and homeland security missions depends on the continued viability of flight operations at this site. Abandoning this asset in the face of homeland defense and homeland security threats and in light of the newly issued DoD Strategy for Homeland Defense and Civil Support[1] makes no sense. The DoD recommendation violates final section criterion # 2. In addition to the issues described in our previous submissions (July 7 and August 1), we submit the following

Issue:

Support for CERFP. Nationwide, there are twelve 120 member regional response teams (NGCERFP) to help civil authorities deal with CBRNE incidents. The Pa CERFP is one of two in FEMA Region III, the other in the West Virginia National Guard.

This Pennsylvania CERFP team will be heavily dependent on the Air Guard for victim extraction and medical services. The plan for our team is to have Air Guard firefighters a primary extraction personnel since it fits their training and the Air Guard portable field hospital as primary medical service, again matching up to their go to war equipment and skill sets. We recently sent our first contingent of firefighters for special training for this team with the intent to train cadres at all three wings. Deactivation of the 111FW eliminates 30 firefighters to support this mission and1/3 of our statewide capability. Willow Grove is in a key strategic location, so it is probable that the impacts of this loss in Southeastern Pennsylvania will be even greater.

The DoD's recommendation to make major cuts in the Air National Guard nationwide and in Pennsylvania does not support the expanded roles and missions of the National Guard in the homeland security arena. The 120-member regional response units know as National Guard CBRNE Enhanced Response Force Package (NGCERFP) are heavily dependent on Air Guard Medical and Civil Engineers (firefighters). The deactivation of the 111FW is completely inconsistent with many of the precepts of DoD's own recently issued "Strategy for Homeland Defense and Civil Support.

Glossary:
CBRNE: Chemical, Biological, Radiological, Nuclear and Explosives
CERFP: CBRNE Enhanced Response Force Package

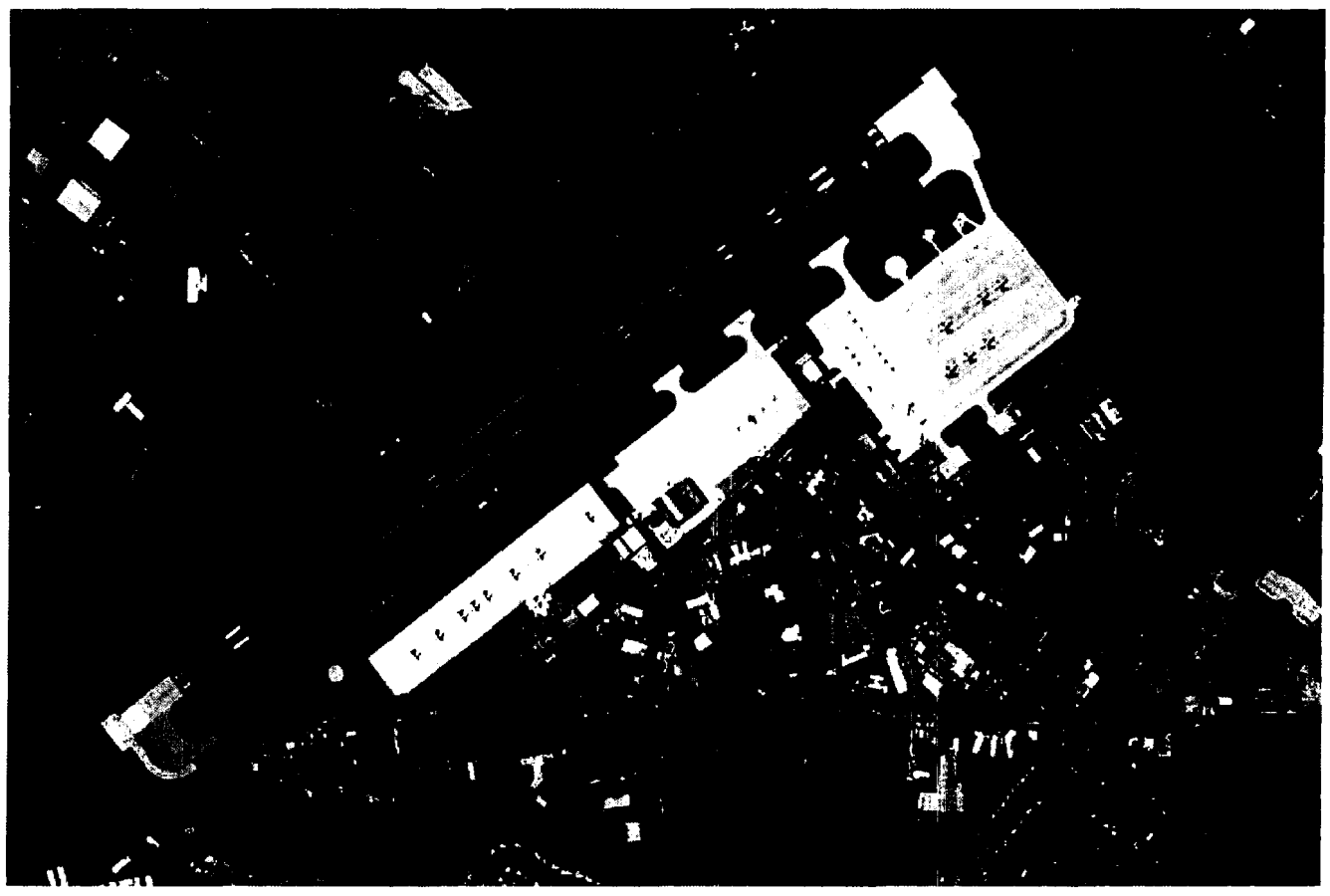
[1] Strategy for Homeland Defense and Civil Support – DoD – June, 2005

F

NAS JRB Willow Grove

TAB F

17 August 2005



Point Paper
ENCROACHMENT ISSUES AT NAS JRB WILLOW GROVE

Background: Staff of the Defense Base Closure and Realignment Commission asked representatives of the Willow Grove community about encroachments at NAS JRB Willow Grove. As used in this context, "encroachment" refers to neighboring development that might affect present and future air operations. The encroachment issue is a shorthand reference to maintaining Air Installation Compatible Use Zones or Zoning at installations with flying operations.

As stated in our testimony at the Pennsylvania Regional Hearing before the BRAC Commission, "there are no significant encroachment issues at Willow Grove,"[1] particularly considering its location in a densely populated suburban area. The existing encroachment questions at the east end of the installation are manageable. The west end of the field is relatively free from encroachment, and offers opportunities for DoD and the affected local jurisdictions to undertake an effective partnership to safeguard the field's operating flexibility and future availability.

The overall assessment of the encroachment situation was confirmed by a similar statement made by the NAS JRB Willow Grove Commanding Officer during the BRAC Commission Chairman's visit to the base on July 5, 2005 to the effect that the base has "relatively minor encroachment issues." He also said "we have basically an average encroachment situation. . . . We have more issues than some bases that are relatively remote but fewer issues than others that are closer to large metropolitan areas."[2]

Joint Land Use Study. A Joint Land Use Study (JLUS) for the NAS JRB Willow Grove Area was completed in December 2001.[3] That study was based on data from two DoD Air Installation Compatible Use Zone studies (AICUZ), one from 1977, and a second one completed in 1999 and issued in April 2001. The general conclusion of the JLUS is that, except for an area to the Southeast of the base, most of the balance of surrounding area has "... compatible land uses with density and intensity of use that compliment the NAS."[4]. In the area to the Southeast, the JLUS recommendation is that zoning regulations be adopted that correct any non-conforming land uses once that non-conforming use ceases in order to achieve long-term compatibility without unduly harming current landowners.[5]

A deeper insight into the intentions of the community can be gleaned from a more detailed reading of the JLUS. It was noted in comparing the two AICUZ studies that aircraft operations had decreased by over 65% between 1977 and 1999[6], resulting in a more than tenfold decrease in noise impact in both affected area and population[7]. Additionally there has been a further reduction in operations that have occurred since

---

[1] Uncertified hearing Transcript, pg 81 second paragraph – testimony of Ret. Gen. William Lynch, of the Pennsylvania BRAC Regional Hearing held July 7, 2005 at the Cannon Office Building, Washington, DC
[2] Statement of Captain Harry Meyers to BRAC Commission Chairman during July 5 presentation on base.
[3] Horsham Township Joint Land Use Study issued December, 2001
[4] Ibid. Pg 4, paragraph 1, last sentence.
[5] Ibid. Pg 4. paragraph 2
[6] Ibid Pg 3, paragraph 6
[7] Ibid. Pg 22, Table 3

the JLUS was concluded (from 32,000 landings and take-offs in 2001, to approximately 27,000 in 2004).

The Advisory Board for the JLUS concluded that the safety and noise restrictions should be left at the boundaries established by the 1977 AICUZ:

> The Advisory Board is aware that DoD has conducted several rounds of base closures in the past few years, which have resulted in the reassignment of military missions and units to other bases. The bases to which missions and units were transferred were selected, in part, because they had the physical capacity to accommodate the additional missions and units. With the potential for further rounds of base closure and consolidation, the Advisory Board recognizes that the physical capacity exists for NAS/JRB to accommodate a mission as large as that which existed when the 1977 AICUZ was prepared. Accordingly, the Advisory Board conducted this JLUS with the view that the mission of NAS/JRB could potentially return to the 1977 or greater level. The Advisory Board believes that the interests of the community and NAS/JRB will be best served by JLUS Report recommendations that, if implemented, will preclude non-compatible development not just in the current actual AICUZ impact area, but in the potential impact area as well. The Advisory Board is concerned that without strong constraints on future non-compatible development, the chances could be considerable increased that NAS/JRB will become a candidate for closure.[8]

The conclusions of the JLUS have not yet been implemented by the Horsham Township Council, although current zoning regulations in effect are loosely based on the 1977 AICUZ results, and all of the actions to remove and/or top trees which were in the airfield safety/Clear Zone areas have been accomplished. We have been assured that Horsham Township Council stands ready to implement the zoning change recommendations as outlined in the JLUS once the current BRAC Closure recommendation is resolved. The community and the local governing body are in agreement to take the necessary actions to minimize encroachment issues at the Willow Grove base, and to enhance its ability to support current and possible future missions.

Conclusion: Encroachments are not a significant problem at NAS JRB Willow Grove and the few encroachment issues in no way justify closure of the installation or curtailment of air operations there. Willow Grove is in a key strategic location, in a rich recruiting and retention environment. One of the consequences of being located in proximity to the homes of so many people who see the installation as a resource of regional and national importance is that there will be more potential encroachment issues. As the JLUS demonstrates, any such issues at Willow Grove are manageable.

[8] Ibid. Pg 27, paragraph 1

Wyle Report
WR 01-17
HORSHAM TOWNSHIP JOINT LAND USE STUDY

Prepared For

HORSHAM TOWNSHIP JOINT LAND USE
ADVISORY BOARD
1025 Horsham Road
Horsham, PA 90245

Prepared By

William Albee
Wyle Acoustics Group
WYLE LABORATORIES
2001 Jefferson Davis Highway
Suite 701
Arlington, Virginia 22202

(J/N 10348)

December 2001

This study was prepared under contract with the Township of Horsham, Pennsylvania with financial support from the Department of Defense, Office of Economic Adjustment. The content and recommendations of the study reflect the views and opinions of the Horsham Township Joint Land Use Study Advisory Board and not necessarily the views or opinions of the Office of Economic Development, the Department of Defense.

Executive Summary

Motivated by changing noise and safety considerations, and a desire on the part of Horsham Township and Naval Air Station/Joint Reserve Base (NAS/JRB) Willow Grove officials, the Township Council authorized the preparation of a Joint Land Use Study (JLUS) to assess the impact of Township planning and development decisions on the operations and missions of the Naval Air Station (NAS). The Study Area surrounds the NAS and includes portions of Horsham Township, Upper Moreland Township, Warrington Township, and areas of Montgomery and Bucks Counties, Pennsylvania.

The JLUS was performed between January 2000 and November 2001. The goal of the JLUS is to ensure the integrity and utility of the NAS/JRB while protecting the public health, safety, and welfare of area residents.

The Horsham Township JLUS Advisory Board (Advisory Board) was formed to conduct the JLUS and to make recommendations to improve and/or facilitate continuing land use and development compatibility between the NAS/JRB mission and the needs of the surrounding communities. The jurisdictions and organizations responsible for zoning and land use regulation within the Study Area were represented on the Advisory Board. (see Appendix A)

The Advisory Board met periodically to determine and develop content, compile and provide information, review and evaluate technical input provided by the consultants, stakeholders and the public. Through these Advisory Board meetings, public work sessions, and technical input from the most recent Air Installation Compatible Use Zone (AICUZ) Requirements Update prepared by the Navy (released April 2001), the Advisory Board was able to reach consensus and formulate a set of recommendations regarding future land use and development surrounding the Naval Air Station.

Within the JLUS Study Area, this report sets forth a series of recommended revisions to the participating Townships zoning and building code regulations and zoning maps. These zoning and building code recommendations are intended to achieve the purposes of protecting the public health, safety, and welfare of present and future area residents through the judicious application of compatible land use planning principals and practices.

The Department of Defense (DoD) first defined the NAS/JRB Willow Grove Air Installation Compatible Use Zone (AICUZ) in 1977. Because of significant changes in the mission, resulting in a reduction in annual operations by over 65 percent, and the aircraft fleet operating at the air field, the Navy updated its AICUZ in 1999, and released the AICUZ Requirements Update to the public in April 2001. The AICUZ Requirements Update, addressed in Section 5.0 of this report, contains four recommendations that are directly related to this JLUS. They are:

- Seek Airfield Compatible Land Use controls in the areas of Montgomery County and Bucks County surrounding NAS/JRB Willow Grove where they do not exist, particularly in the area of Accident Potential Zones (APZ) and height restrictions;

- Seek an update to the existing airfield zoning in the areas surrounding NAS/JRB Willow Grove.
- Initiate action to remove and/or top trees, which violate airfield safety/Clear Zone criteria in the northern Clear Zone.
- Examine the Final Bird-Aircraft Strike Hazard Plan for NAS/JRB Willow Grove and implement recommendations, as appropriate.

This JLUS was undertaken to develop a set of feasible zoning recommendations for all affected jurisdictions that will achieve and maintain both near and long term compatible land use in the vicinity of NAS/JRB Willow Grove. Overall, the Advisory Board found that there are existing incompatible land uses southeast of the airfield. Given the close proximity of higher density commercial and residential development in this area and its age and condition, special consideration was given to preserving the character of the area while attempting to address noise and accident potential issues through revisions to the Horsham Township Zoning Ordinance. Most of the remaining area surrounding NAS/JRB Willow Grove consists of compatible land uses with density and intensity of use that compliment the facility.

Recognized in this Report is the prospect of establishing nonconforming land uses through zoning ordinance modifications. Therefore, the Advisory Board has recommended that any nonconforming use resulting from these recommendations not be subject to corrective action. Instead, this report recommends that the Township's zoning ordinances be constructed to allow (grandfather) the nonconforming uses until such nonconforming use is discontinued. The goal of the recommendation is to achieve long-term compatibility, while not penalizing existing property owners. To achieve the near and long term compatible land use goals, the Advisory Board recommends that Horsham Township Council adopt the recommended modifications to the existing zoning ordinance and building code. The specific proposed amendments are presented in Section 7 of this report. The Advisory Board further recommends that each jurisdiction in the Study Area develop appropriate amendments to its zoning code to address noise, accident potential zones, height requirements, and disclosure of potential impacts, consistent with the specific recommendations to Horsham Township. Full implementation is necessary to protect the public health, safety and welfare and achieve the goal of land use compatibility between the NAS and surrounding townships.

Table of Contents

Executive Summary i

1.0 Introduction 1-1
2.0 JLUS Goal and Objective 2-1
3.0 Location 3-1
4.0 JLUS Process 4-1
4.1 Study Participants 4-1
4.2 Study Area Boundary 4-1
4.3 Study Development and Process 4-4
4.4 Study Criteria 4-7
4.5 Meetings 4-8
4.6 Public Participation 4-8
5.0 AICUZ Summary 5-1
5.1 General 5-1
5.2 AICUZ Noise Analysis 5-1
5.3 AICUZ Safety Analysis 5-5
5.4 AICUZ Impact Analysis 5-7
5.5 AICUZ Recommendations 5-8
6.0 Findings and Conclusions 6-1
7.0 Recommendations 7-1
7.1 Proposed Amendment To Horsham Township Zoning Ordinance 7-1
7.2 Proposed Horsham Township Building Code Revisions 7-17
7.3 Zoning Code Revisions for Other Jurisdictions 7-17
7.4 Actions Proposed for NAS/JRB Willow Grove 7-17
7.5 Implementation Plan 7-18

Appendices

APPENDIX A: JLUS Advisory Board A-1
APPENDIX B: Full Text of Proposed Revision of Horsham Township Zoning Ordinance B-1
APPENDIX C: Building Requirements for a Minimum Sound Level Reduction C-1
APPENDIX D: Maximum Noise Level (Lmax) Comparisons D-1
APPENDIX E: Discussion of Noise and Its Effect on the Environment E-1
APPENDIX F: Environmental Restoration Program F-1
APPENDIX G: Orlando, Florida Zoning Code -- Aircraft Noise Overlay District G-1

Table of Contents - *continued*

List of Figures

1 NAS/JRB Willow Grove Area Map 3-2
2 Joint Land Use Study Area Boundary 4-3
3 Existing Land Uses Overlaid With 1999 AICUZ APZs and Noise Contours 4-5
4 1999 AICUZ Imaginary Surfaces for Height Limitations 4-6
5 1977 and 1999 AICUZ Noise Contour Comparison 5-4
6 Comparison of 1977 and 1999 AICUZ Accident Potential Zones 5-6
7 Current Horsham Township Airport Zoning District Map 7-3
8 Base MAP Overlaid with Recommended Military Airport Overlay District and Disclosure District 7-4

List of Tables

Table

1 Flight Obstructions 4-7
2 Aircraft Mix at Willow Grove (from AICUZ) 5-2
3 Areas and Estimated Populations of Populated Areas Within the Off-station Noise Exposure Contours (from AICUZ) 5-3

1.0 Introduction

The Horsham Township Council, in cooperation with the Horsham Planning Commission, Environmental Advisory Board, Chamber of Commerce, and Water and Sewer Authority, the Upper Moreland Township, Warrington Township, NAS/JRB Willow Grove, and the Department of Defense, Office of Economic Adjustment participated in the formulation of this JLUS. The Board unanimously supports adoption of the recommendations contained herein by the respective Township elected officials. As detailed in this report, encroachment of urban development, including schools, places of worship, and places of assembly, into the high noise and accident potential environments is incompatible for both residents and the military. Actions taken to implement these recommendations will help to solidify the townships in their desire to support, preserve, and protect the military presence in our community, and protect residents from nuisance and risk.

The Advisory Board is grateful to the Department of Defense (DoD) who recognized the long standing problem of urban encroachment and its impact on operating missions and activities and the health and safety of nearby civilian residents by initiating the Air Installation Compatible Use Zone (AICUZ) Program in the early 1970's. The intent of this program is to provide information to local governments about noise and accident potential from base operations, and to encourage communities to adopt land use controls that will ensure compatible development in areas adversely affected by military operations. In 1985 DoD initiated the JLUS program, which utilizes and builds upon the ACUIZ data in a community-based planning context. The objectives of a JLUS are to:

- Encourage cooperative land use planning between military installations and the surrounding communities to facilitate compatible development and growth with the military mission; and,
- Seek ways to reduce the operational impacts on the adjacent land; and,
- Protect the public health, safety, and welfare.

The DoD Office of Economic Adjustment (OEA) provides community-planning assistance to state and local governments to study encroachment issues in an open participatory forum. It is the community and its leadership who decide on the most proper arrangement and use of land consistent with community planning goals and objectives. The viewpoints of the Navy and DoD are considered in the context of the study, but in the end, it is the views, recommendations, and findings of the respective townships that will determine the final results.

OEA provided technical and financial support to the Horsham Township JLUS Advisory Board in the development of this JLUS. The study was initiated in January 2000 and completed in November 2001. Guidelines for preparing a JLUS are designed to ensure full participation by all stakeholders, including the military installation, the surrounding jurisdictions, and individual members of the public who wish to participate. The JLUS is the community's planned response to the presence of the military installation and its activities. OEA has considerable expertise in land use planning at the local level, and the authority to support

local government planning across the country. It offers technical assistance in the organization, planning, and implementation of JLUS recommendations. However, the JLUS report, findings, and recommendations are those of the sponsoring local government partners and the Advisory Board.

2.0 JLUS Goal And Objective

The primary goal of this JLUS is to propose a set of feasible land use planning, zoning, and building code recommendations that will achieve and maintain compatible land use in the vicinity of NAS/JRB Willow Grove in both the near and long term. Due to the proximity to the airfield, Horsham Township is more affected than the other jurisdictions participating in the JLUS. All of the participating jurisdictions view the airfield as a valuable asset, and are willing participants in seeking compatibility between the military mission and land uses within the areas of impact. The JLUS will produce the intended beneficial effect only if affected jurisdictions implement the recommended compatible development controls. All members of the Advisory Board committed themselves to this goal and to the following objectives:

1. Preserve the low density residential and non-residential character where it still exists;
2. Assure that future development is consistent with the adopted and approved Township Comprehensive Land Use Plans;
3. Protect the public health, safety, and welfare of residents living in proximity to NAS/JRB Willow Grove from aircraft noise and accident potential related to Runways 15 and 33; and,
4. Protect the existing flight corridors to and from NAS/JRB Willow Grove.

3.0 Location

NAS/JRB Willow Grove lies approximately 15 miles north of Philadelphia in the township of Horsham, Pennsylvania (see Figure 1), and serves as a base and training ground for Naval, Air Force and Army aircraft. The installation is within the geographic confines of the Philadelphia Metropolitan Area (which includes the City of Philadelphia, Bucks, Chester, Delaware and Montgomery counties in Pennsylvania and Camden, Gloucester, Salem and Burlington counties in New Jersey). This area is strongly influenced by the economic and social development pressures of the City of Philadelphia and the physical expansion exerted by these pressures on the outlying suburban communities. As such, growth pressures from the regional center directly impact Horsham Township and the surrounding areas creating increased demand for available space for housing and industrial development, forcing a change in use from agricultural and rural open spaces to the more intensive land uses.

Existing land-use patterns in the vicinity of NAS/JRB Willow Grove are changing and reflect increased development since the 1977 AICUZ Study. The areas to the south of the airport are essentially fully developed. The areas to the north, which contain wooded areas and land used for agriculture, have been experiencing increased development pressure.

The population of Montgomery County, PA has grown over 31% since 1960. The populations of the Townships where NAS/NRB Willow Grove is located have increased 145% and 351% respectively. Between 1980 and 1990, the number of housing units in these townships has increased 49% and 138%, respectively. These growth rates are slowing as available land areas are built out. The Montgomery County Planning Commission reports indicate 1998 population estimates of 23,197 for Horsham Township, and 20,293 for Montgomery Township, with moderate predicted increases in population through the year 2010 in these areas. The recently released 2000 census estimates that Horsham Township has grown to 24,232 and that Montgomery Township has grown to 22,025.

NAS/JRB Willow Grove occupies a substantial portion of Horsham Township and over the past 60 years, has become a significant part of the economic life of the community. Its aircraft operations, as with any airfield, can have negative impacts on the safety and environment of nearby residents as a result of noise and the potential for aircraft accident. The purpose of the JLUS is to adequately address these impacts in order to assess community needs in relationship to the needs of the military mission and to balance those needs in a fair and equitable manner. To this end, NAS/JRB Willow Grove and Horsham, Upper Moreland, and Warrington Township representatives collaborated to produce this JLUS.

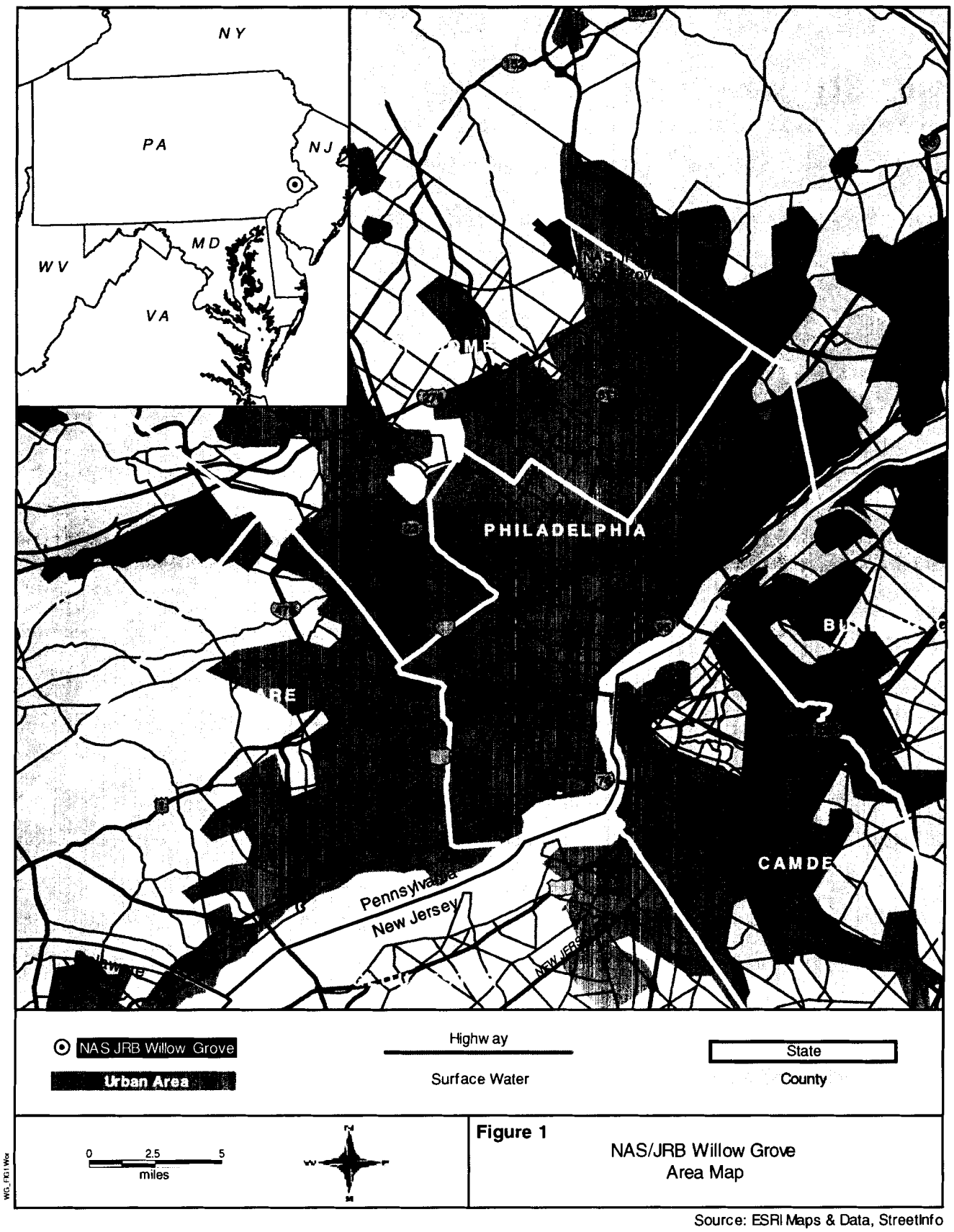


Figure 1
NAS/JRB Willow Grove
Area Map

Source: ESRI Maps & Data, StreetInfo

wyle laboratories

4.0 JLUS Process

4.1 Study Participants

The Horsham Township JLUS Advisory Board was formed to develop the scope of work, conduct the study, make recommendations that will improve and/or facilitate continuing compatibility between the NAS/JRB mission and the needs of the surrounding communities, and to develop an implementation plan for its recommendations. The following jurisdictions and organizations were represented on the Advisory Board. The individual representatives are listed in Appendix A:

LOCAL ENTITIES:

Horsham Township (JLUS Sponsor)
Upper Moreland Township
Warrington Township
Horsham Planning Commission
Horsham Environmental Advisory Board
Horsham Chamber of Commerce
Horsham Water and Sewer Authority

NAVY:

Naval Air Station/Joint Reserve Base Willow Grove

DoD:

Department of Defense, Office of Economic Adjustment

TECHNICAL CONSULTANTS:

Wyle Laboratories Acoustics Group (Consultant)
Parsons Brinckerhoff Quade & Douglas, Inc. (Consultant)

All Advisory Board members participated in developing findings, conclusions, and recommendations. While not every Advisory Board member necessarily agreed completely with everything in this JLUS Report, no member suggested including minority opinions on any issue.

4.2 Study Area Boundary

One of the first Advisory Board tasks was to define the JLUS Study Area. The Advisory Board consensus was to define an area large enough in size to address all current and possible future scenarios for the NAS/JRB Willow Grove mission and the impact of its missions on the townships. The Advisory Board defined a rectangular study area encompassing all of the area covered by the 1977 AICUZ noise contours and APZ's. This study area is considered sufficiently inclusive to enable the Advisory Board to assess all potential impacts of the installation on the Townships, including military training exercises

and air shows, as well as the Townships planning and zoning actions that could affect the operations and utility of the installation. Included in its assessment of the installation operations was a review of the Comprehensive Plans for the physical, social and economic development of the area's townships, current and proposed development activity in the study area, the Townships' capital improvement programs and the overall character of the greater surrounding communities. To achieve this objective, the Advisory Board defined the Horsham Township JLUS Study Area as the entire area within the boundary shown on the regional map in Figure 2.

Several of the graphics in this report were either lifted directly from the 1999 AICUZ Report or were used as a base upon which additional information was added. The base images contain some minor spelling or other errors that were not corrected for use in this report. Considerable effort was made to insure that all substantive information in the graphics is correct.

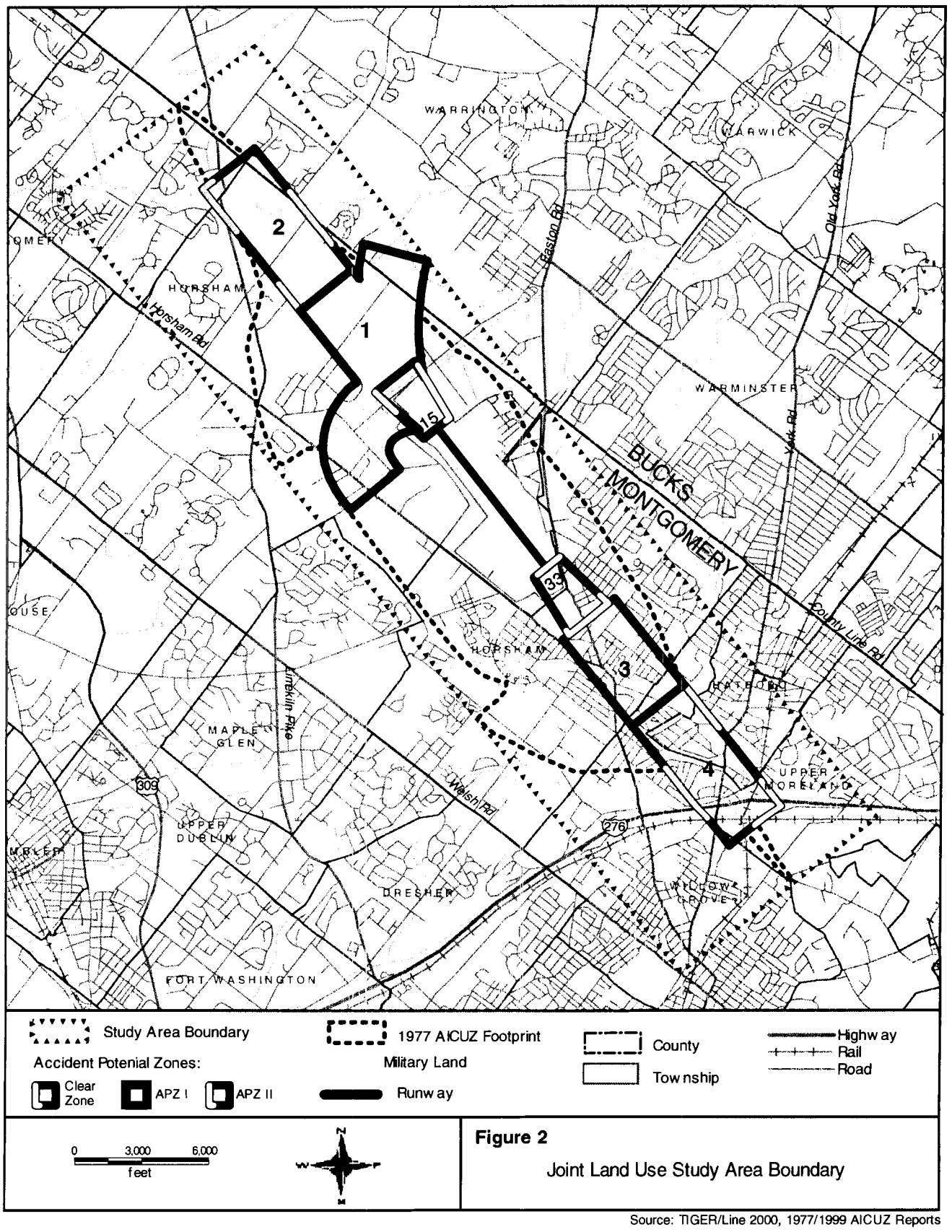


Figure 2

Joint Land Use Study Area Boundary

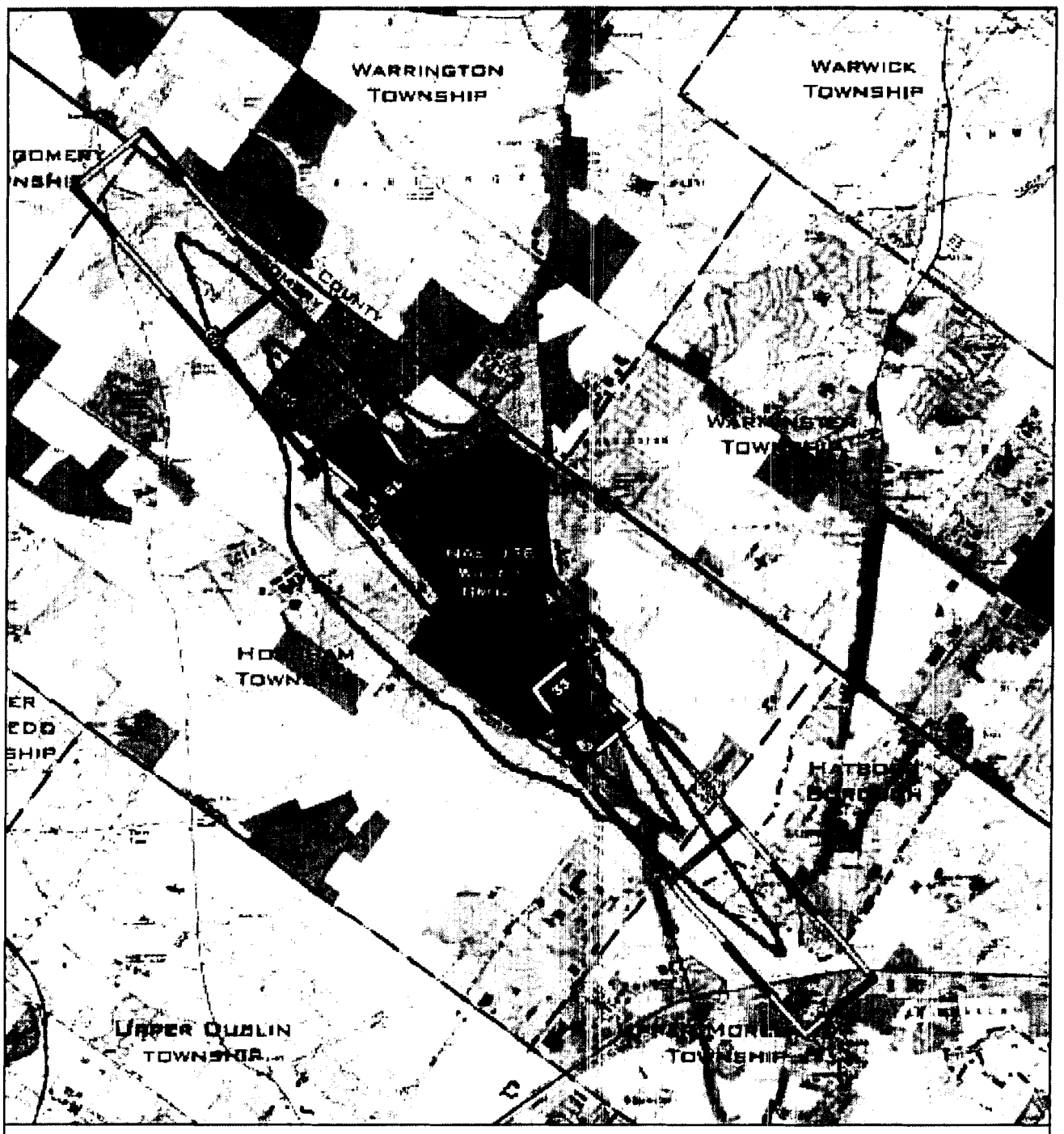
Source: TIGER/Line 2000, 1977/1999 AICUZ Reports

wyle laboratories

4.3 Study Development and Process

This JLUS is based on information collected from the participating jurisdictions and organizations, DoD, the 1977 and 1999 AICUZ reports, FAA regulations and guidelines, the Pennsylvania State Department of Aviation, and the study consultants. Throughout the process, a series of meetings provided opportunities for representatives of all the jurisdictions, NAS/JRB Willow Grove, OEA and the consultants to work together on the JLUS. All meetings were open to the public.

Zoning maps were obtained from the participating jurisdiction's planning offices, and the noise contours and accident potential zone overlays were extracted from the 1999 AICUZ Report. A base map showing the Existing Regional Land Uses was extracted from the 1999 AICUZ Report because no GIS based maps containing this information were available from the local jurisdictions. Noise contours and APZs from the 1999 AICUZ Report and zoning districts from the participating jurisdiction's zoning maps were then overlaid on the base map (Figure 3). An additional map (Figure 4) was developed to show the area around NAS/JRB Willow Grove where height limitations are necessary to comply with Federal guidelines. (Table 1 identifies the flight obstructions that are geographically located on the height limitations map in Figure 4). These maps were used to develop the provisions of the Military Airport Overlay District recommended in Section 7 of this report, which if adopted, must be reflected on the official zoning maps of the affected jurisdictions.



Noise Contour
Accident Potential Zones:
Clear Zone
APZ I
APZ II
Military
Residential - Low Density
Residential - Medium
Residential - High
Institutional
Commercial
Agricultural/Residential
Park
Country Club
Industrial
Cemetery

Figure 3
Existing Land Uses Overlaid With
1999 AICUZ APZs and Noise Contours

Source: Willow Grove 1999 AICUZ Report

wyle laboratories

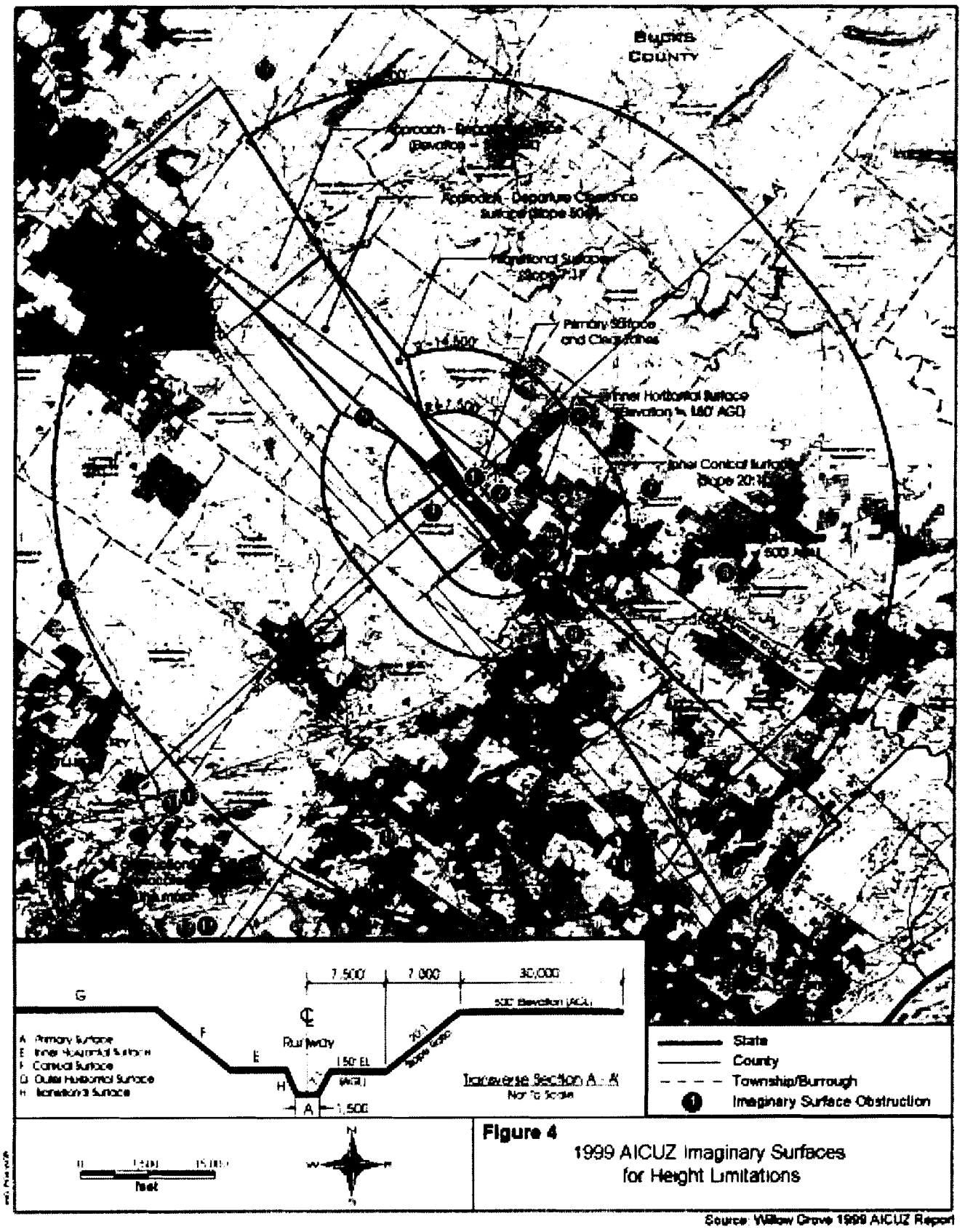


Figure 4
1999 AICUZ Imaginary Surfaces for Height Limitations

Source: Willow Grove 1999 AICUZ Report

wyle laboratories

Table 4-1. Flight Obstructions

Number	Bearing (degrees)	Distance (NM)	Height (MSL)	OBSTRUCTION
1	014	0.5	424	NXX Control Tower
2	097	0.4	478	NXX Rotating Beacon
3	198	1.2	464	Horsham Water Tower
4	272	0.3	474	ASR-8 Antenna
5	315	2.4	546	Whilemarsh Memorial
6	064	2.7	428	Hartville Water Tower
7	093	3.0	468	NJP Rotating Beacon
8	119	4.7	518	Tower
9	160	3.7	600	Microwave Tower
10	204	6.9	987	Cheltenham Antenna
11	215	10.0	1,421	Roxboro Antenna Farm
12	218	9.3	790	Antenna
13	231	7.0	685	Towers
14	233	7.8	582	Towers
15	255	7.5	515	Center Square Tower
16	325	6.6	685	Highpoint Water Tower
17	347	9.0	1,034	Doylestown Tower

The Advisory Board reviewed existing zoning ordinances, which govern current and future land use and development in the vicinity of NAS/JRB Willow Grove, and compared these with the noise and safety impact zones described in the Willow Grove 1977 and 1999 AICUZ documents. Of particular concern are the land uses within the high noise impact zones in the APZ and CZ areas. Within these boundaries, noise impact contours and APZs provide further definition of compatible and non-compatible land uses. Land use issues and controls have been formulated based on the existing operations identified in the 1999 AICUZ Report and possible future operational growth scenarios. Full implementation of the zoning recommendations in this JLUS by all jurisdictions in the study area will minimize noise impacts, maximize safety, and provide sufficient compatibility between the community and military mission needs for the foreseeable future.

4.4 Study Criteria

The 1999 AICUZ noise level contours were overlaid on the study maps and depicted in 5 decibel (dB) intervals from 60 to 70 dB Day-Night Average Sound Level (DNL). Only the DNL 65 dB contour from the 1977 AICUZ was depicted on the study maps to show the significant noise level reduction over time and to help define the boundaries of the Study Area rectangle. DNL is the most widely accepted means for describing the impact of aviation noise on communities. It is the standard noise descriptor used by Federal agencies to describe all forms of transportation noise. The single-number DNL for aircraft noise represents that average annual day and is calculated by the NOISEMAP computer model which accounts for the number of flights, the type of operation (arrival, departure, or touch-and-go), the type of aircraft, the flight track flown, and the time of day of the operation. Nighttime operations are penalized in NOISEMAP by a factor of 10 (each operation between 10 PM and 7 AM is counted 10 times) to reflect the fact that most people find noise at night to be more disruptive than daytime noise and that the background (ambient) noise level is typically lower at night.

Accident potential is also discussed in the AICUZ Reports. In 1998, Horsham Township incorporated only one of the APZs from the 1977 AICUZ report into its zoning ordinance. To reflect the significant changes in the APZs in the 1999 AICUZ Report, Horsham Township will need to further update and amend its zoning ordinances, incorporating to the extent practicable the DoD guidelines for land use in APZs. The DoD guidelines recommend that no residential development be allowed in the two close-in APZs at either end of a runway just beyond the Clear Zones, and that only low-density single family residential development (1-2 dwelling units to the acre) be allowed in the outer APZs. This supports the Advisory Board's vision to:

- Preserve the low density residential and non-residential character where it still exists;
- Assure that future development is consistent with the adopted and approved Township Comprehensive Land Use Plans;
- Protect the public health, safety, and welfare of residents living in proximity to NAS/JRB Willow Grove from aircraft noise and accident potential related to Runways 15 and 33; and,
- Protect the existing flight corridors to and from NAS/JRB Willow Grove.

4.5 Meetings

The Advisory Board held the first JLUS meeting on January 16, 2000, and set the third Wednesday of each month at 7:00 PM as the regular meeting date and time. The JLUS was initiated at that time with the full expectation that the AICUZ update would be finalized and the report issued early in 2000. Though publication of the AICUZ report was delayed until April 2001, the Advisory Board decided to proceed with the JLUS using the preliminary noise and accident potential data that was available. The Advisory Board held monthly meetings through November 2000, with the exception of July, and then suspended further meetings pending formal release to the public of the final AICUZ report. Subsequently, the Advisory Board held meetings in June through November, 2001 to discuss the final AICUZ in the context of the Horsham Township Comprehensive Land Use Plan and to provide direction to the consultant regarding the JLUS Report. The Advisory Board meeting dates and summaries are available for inspection and copying at the Horsham Township Offices located at 1025 Horsham Road.

4.6 Public Participation

All of the JLUS Advisory Board meetings were open to the public and were attended by interested citizens. The JLUS Report was circulated for public comment on September 17, 2001 for a 30-day period. A public meeting was held on October 17, 2001. Comments received at that meeting were considered by the Advisory Board in preparation of this JLUS Report.

5.0 AICUZ Summary

5.1 General

The purpose of the AICUZ program is to provide empirical data on noise and accident potential in the vicinity of NAS/JRB Willow Grove and to promote a pattern of development that is compatible with the military flying missions and operations of the airfield. The Advisory Board accepts as fact and input to the JLUS the technical data and the analysis contained in the NAS/JRB Willow Grove AICUZ Study. The Advisory Committee is responsible for the recommendations and implementation strategy contained in this JLUS

An AICUZ Study was originally prepared in 1977 for the Willow Grove Naval Air Station. In 1994, the Station's name was changed to NAS/JRB Willow Grove to more accurately represent the activities and population of the Station. The AICUZ Study was updated starting in 1999 to reflect the current and future uses of the Station, which changed substantially between 1977 and 1999. The final AICUZ Update Report was released to the public in April 2001. Copies are available for review at the Horsham, Upper Moreland, and Warrington Township Municipal Buildings.

5.2 AICUZ Noise Analysis

The noise environment around NAS/JRB Willow Grove is described in the AICUZ report in terms of Day-Night Average Sound Level (DNL), which is the average noise level for a 24 hour period. The DNL value at a given location indicates the cumulative effect of aircraft noise, including a weighting factor for nighttime operations, which are considered more annoying. Three general noise zones are defined in AICUZ studies:

(1) Areas with a DNL of *less than 65 dB*,
(2) Areas with a DNL *between 65 dB and 75 dB*, and
(3) Areas with a DNL of *75 dB or above*.

These three areas are defined as Noise Zones 1, 2, and 3, respectively, with Zone 1 representing moderate or less impact; Zone 2 representing moderate to significant impact; and Zone 3 representing significant to severe impact which requires the greatest degree of control and mitigation.

According to the AICUZ report, there has been a change in the noise environment at NAS/JRB Willow Grove since 1977 due to a fleet mix change to quieter aircraft and a reduction in the number of annual operations. Based fixed-wing aircraft include the Navy's P-3C Orion, C-9B Skytrain and a C-12B, the Air National Guard's A-10A Thunderbolt and C-130E Hercules, and the Army's C-12R. Based rotary-wing aircraft include the Navy's SH-2G and the Marines' CH-53E, AH-1W and UH-1N. Transient aircraft include C-141A aircraft primarily from McGuire Air Force Base (AFB) in New Jersey and the F/A-18 fighter aircraft primarily from Andrews AFB in Maryland. While these transient aircraft are relatively noisy,

they are a small percentage of total operations, and therefore do not significantly increase the size of the noise contours. The annual F/A-18 operations average 222 and C-141 operations average 396. Table 2 is a comparison of the based aircraft mix between the 1977 and 1999 AICUZ studies. As Table 2 shows, 60% of the aircraft operating in 1999 were of a different type than in 1977, representing a considerably less noisy fleet mix.

Table 2. Aircraft Mix at Willow Grove (from AICUZ)

	Aircraft	1977	1999
NAVY	P-3	18	16
	S-2	2	0
	C-9	0	3
	C-12	0	1
	H-3	0	0
	SH-2	0	8
MARINES	TA-4	2	0
	A-4	12	0
	H-1	0	10
	CH-53	7	8
USAF	C-130	8	12
	C-118/131	0	0
	A-10	0	15
	A-37	20	0
ARMY	H-1	11	0
	H-58	9	0
	C-12	0	5
	U-3	3	0
Total		92	78

Source: AICUZ Requirements Update Table C-1 pg. 7, August 1999

(Note: According to NAS/JRB Willow Grove representatives, the Navy SH-2 fleet is now "0" due to disestablishment of HSL-94 in 2001, and the Marine H-1 is now "0" due to relocation of unit to Johnstown, PA in 2000).

The Advisory Board notes that since 1977, the number of operations has decreased from approximately 70,000 annually to the current level of approximately 32,000 annually. Although future events could result in increased operations, the Navy sees none in the foreseeable future. However, during the course of the study effort, fleet mix changes have been noted by the Base Commander (see Table 2 Note). These changes involve further reduction in the fleet stationed at NAS/JRB since the fleet mix data was compiled for the August 1999 AICUZ requirements update.

The Advisory Board accepts the revised fleet mix size as the best available information for purpose of this JLUS.

The AICUZ report states that noise zones on and off base at NAS/JRB Willow Grove (noise above DNL 65) decreased from approximately 4,144 acres in 1977 to less than 351 acres in 1999 (Table 3). This reduction in noise zones is shown graphically in Figure 5 by comparing 1977 contours with those of 1999.

Table 3. Areas and Estimated Populations of Populated Areas Within the Off-station Noise Exposure Contours (From AICUZ)

DNL Contour Zones	Area* (Acres)		Population**	
	1977	1999	1977	1999
65-75 dB	3,958	351	12,087	958
75+ dB	186	0	392	0
Total	4,144	351	12,479	958

Notes: * NAS/JRB Willow Grove and bodies of water are subtracted from the total area.
**** Based on 1990 population.**

These decreases appear to be primarily due to a significant reduction in the number of air operations at the field, as well as the elimination of the Marine Corps' use of the A-4 (Table 2). The Pennsylvania Air National Guard's A-10A is currently the primary aircraft using the Station, and it is approximately 16dB quieter at 1000 feet away than the A-4 aircraft. Appendix D provides comparison data for the A-10A and A-4.

The township of Horsham, on the southeast side of the airfield, experiences most of the aircraft noise impact in the existing and forecast scenarios.

The total number of aircraft operations at NAS/JRB Willow Grove used to generate the current (1999) noise contours is 31,588. The AICUZ Requirements Update predicted aircraft operations and fleet mix to remain constant. Existing fixed-wing and rotary-wing aircraft operations, flight track descriptions and utilization, runway utilization, and noise characteristics of the involved aircraft were collected for input into two computer noise models, NOISEMAP, Version 6.5, and the Rotorcraft Noise Model (RNM). These programs were employed to calculate and plot the Day-Night Average Sound Level (DNL) contours for existing and forecast average daily conditions. The 1977 contours were digitized and entered into a geographic information system to produce the baseline area and population (1990 census data) impacts for comparison to current conditions.

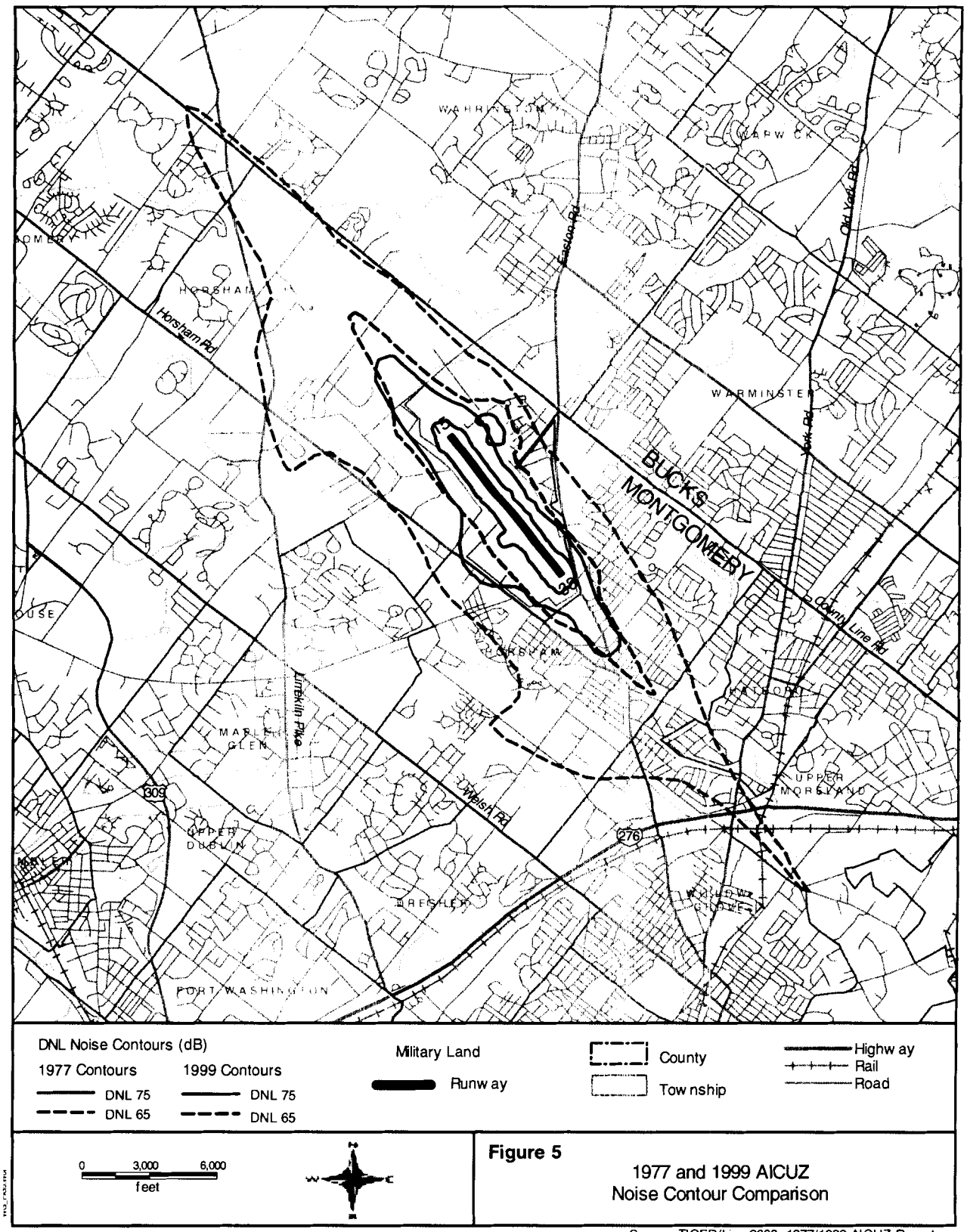


Figure 5

1977 and 1999 AICUZ
Noise Contour Comparison

Source: TIGER/Line 2000, 1977/1999 AICUZ Reports

wyle laboratories

5.3 AICUZ Safety Analysis

Analysis of the potential for accidents in the vicinity of NAS/JRB Willow Grove is the other major consideration in the AICUZ and in this JLUS. The AICUZ report established the geographic Accident Potential Zones (APZ), which define the probable impact area if an accident were to occur, not the probability of an accident happening. The 1999 AICUZ APZs (see Figure 6) reflect the changes in fleet mix and operations since the 1977 AICUZ Study, including additional revised fleet mix estimates provided during the course of this study.

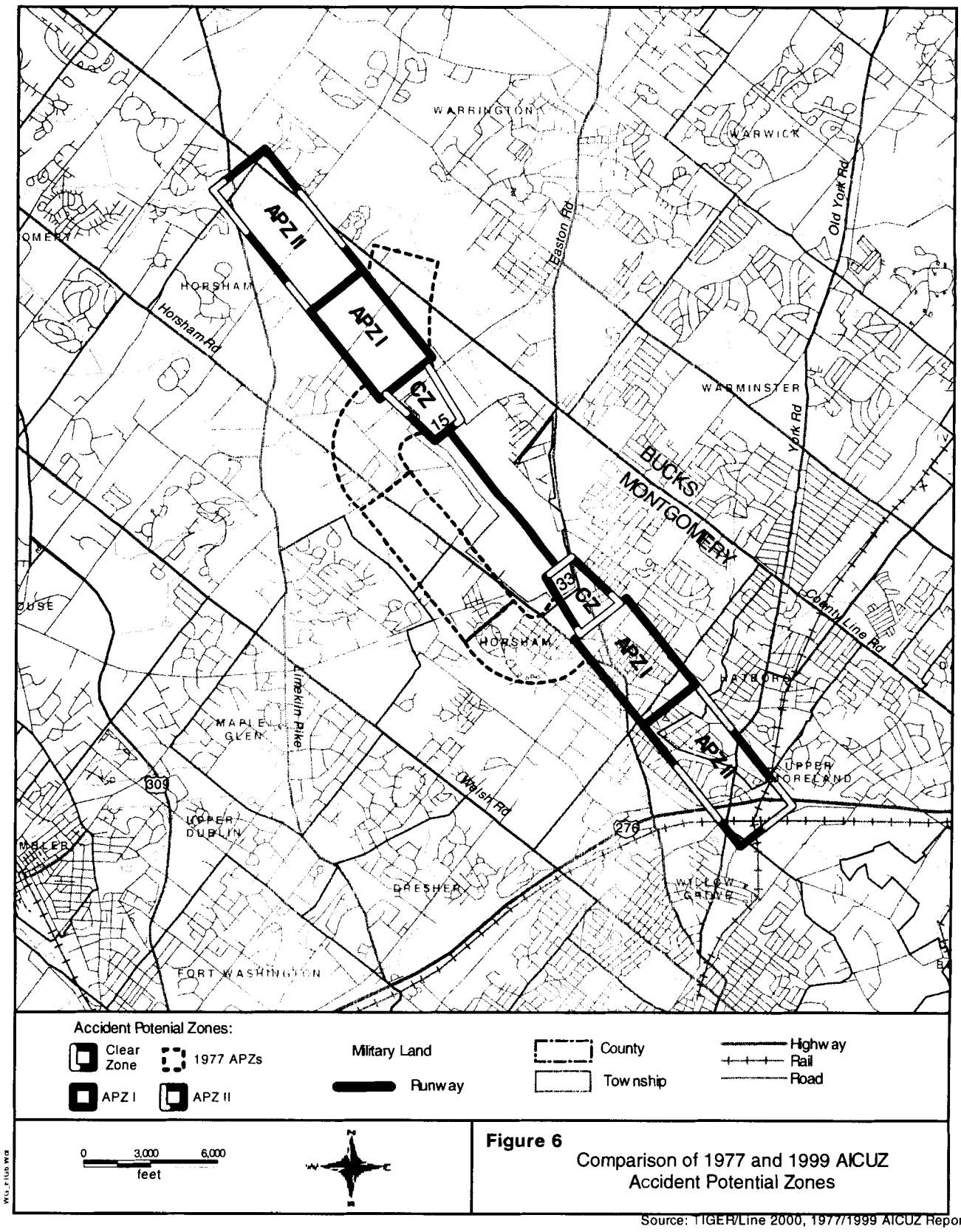


Figure 6
Comparison of 1977 and 1999 AICUZ Accident Potential Zones

Source: TIGER/Line 2000, 1977/1999 AICUZ Report

wyle laboratories

Aircraft operations are constrained by the surrounding natural terrain and man-made features, such as buildings, towers, poles and other potential vertical obstructions to air navigation. Acceptable limitations to heights of man-made or natural growth are dictated through the application of "imaginary surfaces" specified in FAA and Navy criteria. The 1999 AICUZ Report explains that these Zones radiate at variable, increasing heights from an airfield runway so as the distance from the runway increases, the taller structures and trees can be allowed. It further explains that as an aircraft approaches the runway surface along its corresponding flight path, more stringent height limitations are imposed and that in general, no above ground obstacles are permitted in the primary surface and Clear Zone areas.

According to AICUZ guidelines, the height of structures is best regulated by local zoning codes to prevent penetration of the transitional surfaces and approach/departure surfaces. Currently, aircraft related approach/departure surfaces are not contained in the surrounding jurisdiction's zoning ordinances. However, the general building height limitations in the local jurisdiction's zoning codes are sufficient to preclude the construction of structures that could penetrate the imaginary surfaces. Nevertheless, desiring to preclude the possibility that through a waiver or some other variance process construction of a non-compliant structure could occur, the Advisory Board recommends the adoption of local ordinance language that will specifically preclude approval of any structure that would penetrate an imaginary surface around NAS/JRB Willow Grove.

The removal and/or topping of trees in the northern Clear Zone, both on and off base, is recognized in the AICUZ as needed to comply with airfield safety/Clear Zone criteria. The Advisory Board agrees that, as stated in the AICUZ, the Navy should initiate action to bring this area into compliance.

The AICUZ report points out there is a limited Bird-Aircraft Strike Hazard (BASH) potential from resident and migratory birds at NAS/JRB Willow Grove and the vicinity of the airport. Daily and seasonal bird movements can create hazardous conditions. During the years 1981 through 1996, fifty-one bird strike incidents were reported at NAS/JRB Willow Grove. The Atlantic Division, Naval Facilities Engineering Command, is currently preparing a BASH Study for the facility. The AICUZ Requirements Update Table F-4, Suggested Land Use Restrictions in AICUZ Zones, advises that activities that are attractive to birds should be avoided in the CZs and APZs. The Advisory Board concurs with this recommendation.

5.4 AICUZ Impact Analysis

According to the AICUZ report, changes in flight profiles, aircraft mix and reductions in numbers of operations have resulted in changes to the shape of the noise contours and accident potential footprints at NAS/JRB Willow Grove. The AICUZ areas impacted on and off base at NAS/JRB Willow Grove (APZ and noise above DNL 65 dB) decreased from approximately 6,200 acres based on the 1977 AICUZ, to less than 3,000 acres in 1999. As previously noted, these decreases are primarily due to a significant reduction in the number of air operations at the field, as well as the elimination of the Marine Corps' use of the A-4.

The APZs in the 1999 AICUZ Requirements Update were reduced in size from the 1977 AICUZ to reflect updated flight tracks and a reduction in flight operations. The 1999 AICUZ Requirements Update points out that there are development pressures in the areas north of the Station at this time, and that some zoning controls exist to help prevent incompatible development in the future, but they do not cover all of the areas affected by the AICUZ and imaginary surfaces. The AICUZ itself is delineated by a series of Zones representing impact areas and noise exposures. The Advisory Board agrees that the finite placement of these AICUZ boundaries does not mean that negative impacts do not extend beyond those limits; nor do they imply that all impacts within the boundaries are wholly negative or intolerable. The Advisory Board recognizes that AICUZ boundaries are an effective tool for developing compatible zoning, but they are not necessarily the best or only tool available. The AICUZ indicates that there is no known mission increase, which is a relatively short-term view. The Advisory Board is aware that DoD has conducted several rounds of base closures in the past few years, which have resulted in the reassignment of military missions and units to other bases. The bases to which missions and units were transferred were selected, in part, because they had the physical capacity to accommodate the additional missions and units. With the potential for further rounds of base closure and consolidation, the Advisory Board recognizes that the physical capacity exists for NAS/JRB to accommodate a mission at least as large as that which existed when the 1977 AICUZ was prepared. Accordingly, the Advisory Board conducted this JLUS with the view that the mission of NAS/JRB could potentially return to the 1977 or greater level. The Advisory Board believes that the interests of the community and NAS/JRB will be best served by JLUS Report recommendations that, if implemented, will preclude non-compatible development not just in the current actual AICUZ impact area, but in the potential impact area as well. The Advisory Board is concerned that without strong constraints on future non-compatible development, the chances could be considerably increased that NAS/JRB will become a candidate for closure.

5.5 AICUZ Recommendations

The August 1999 AICUZ Requirements Update contained the following recommendations:

1. Seek Airfield Compatible Land Use controls in the areas of Montgomery County and Bucks County surrounding NAS/JRB Willow Grove where they do not exist, particularly in the area of APZ and height restrictions.
2. Seek an update to the existing airfield zoning in the areas surrounding NAS/JRB Willow Grove.
3. Initiate action to remove and/or top trees that violate airfield safety/Clear Zone criteria in the northern Clear Zone.
4. Examine the Final Bird-Aircraft Strike Hazard Plan for NAS/JRB Willow Grove and implement recommendations as appropriate.

The Advisory Board carefully analyzed the AICUZ recommendations and concluded the following:

- While recommendations 1 and 2 seem very similar, 1 focuses on adding controls in areas that currently do not have compatible land use controls (implying controls via zoning ordinances), while 2 acknowledges that there are existing compatible land use zoning ordinances at the north end of NAS/JRB Willow Grove. The Advisory Board comments regarding height restrictions in Recommendation 1 and removal and/or topping of trees in Recommendation 3 are located at the end of Section 5.3, AICUZ Safety Analysis.
- As stated in Section 5.3 above, the Advisory Board agrees that the Navy should initiate action to remove and/or top trees that violate airfield safety/Clear Zone criteria in the northern Clear Zone.
- The results of the BASH Study being conducted by the Atlantic Division, Naval Facilities Engineering Command, were not available for consideration in this JLUS. However, should that study contain any recommendations to local jurisdictions to use their zoning authority to preclude any development that would attract birds in the near vicinity of NAS/JRB, as described in the BASH Study Report, the Advisory Board encourages the local jurisdictions to fully consider adoption of any such recommendations.
- As a general rule, potential for light and/or electrical interference with aircraft operations is addressed in an AICUZ. However, the 1999 AICUZ Requirements Update did not contain any discussion or recommendations regarding existing or potential light or electrical interference with aircraft operations. Nevertheless, the Advisory Board discussed the potential for light or electrical interference and concluded that the existing zoning code provisions are sufficient to preclude such interference with aircraft operations. The Advisory Board found that the Navy also reached the same conclusion in excluding the subject from the AICUZ.

6.0 Findings and Conclusions

The Advisory Board studied the existing and planned land uses in the jurisdictions around NAS/JRB Willow Grove and found that:

- Considerable existing land use to the southeast under the approach end of Runway 33 is not compatible with DoD guidelines,
- Existing and planned low density land uses to the northwest under the approach end of Runway 15 are more consistent with the Federal guidelines, and
- Current Horsham and Warrington Township's zoning codes are designed to limit non-compatible land uses only to the northwest of NAS/JRB Willow Grove.

Horsham Township representatives expressed their goal of preserving the existing low-density character of the area consistent with the comprehensive plan. A secondary benefit of the recommendation is that it is compatible with the objectives of the Navy AICUZ recommendations and the land uses permitted in the Horsham Townships zoning ordinance. Furthermore, both Upper Moreland and Horsham Township representatives expressed goals of updating their jurisdiction's zoning ordinances to minimize further encroachment of incompatible development and to improve future compatibility of land use to the extent practicable in areas surrounding NAS/JRB Willow Grove. The Advisory Board concluded that even though there is some incompatible development to the northwest and southeast sectors, the appropriate recommendation to achieve the JLUS goals is to amend the text of the Horsham Township Zoning Ordinance. Included in this report is the latest status report on the NAS/JRB Willow Grove Environmental Restoration Program (see Appendix F). This restoration status report will help the reader form a more comprehensive picture of the on-going military and civilian land use activity and continuing environmental dialogue.

7.0 Recommendations

The Advisory Board recommends the respective Township elected officials consider the adoption of the following recommendations:

7.1 Proposed Amendment to Horsham Township Zoning Ordinance

The Horsham Township Zoning Ordinance was amended on November 2, 1998 to add, among other things, Ordinance No. 1148, Section 8, Airport Crash and Noise Overlay District. That revision created a noise and accident potential overlay district to the northwest of NAS/JRB Willow Grove under the approach end of Runway 15 only. However, it did not include areas to either side of Runway 15/33 or areas to the southeast of NAS/JRB Willow Grove under the approach end of Runway 33.

The Advisory Board developed a recommended revision to Section 8 of the Zoning Ordinance to address noise, accident potential and height issues in all affected areas around NAS/JRB Willow Grove based on the noise exposure zones, APZs and height limitations, which derive primarily from the 1999 AICUZ Requirements Update. The Clear Zone (CZ), Noise Exposure Zone (NEZ), and Accident Potential Zone (APZ) numbering in the proposed Zoning Ordinance revisions purposely differs from the AICUZ, in order to more clearly define the affected areas within the Horsham Township boundaries and to enable unique uses to be proposed for each zone. Thus the CZs and APZs I and II at each end of Runway 15/33, and NEZ 1,2, and 3 in the 1999 AICUZ Requirements Update are re-designated as CZ 1 and 2, NEZ 1 and 2, and APZ 1,2, and 3, in the proposed revisions to Horsham Township's Zoning Ordinance, with one exception. The area in proposed APZ 1 corresponds to the area in the current zoning ordinance (APZ I in the 1977 AICUZ, rather than the APZ I area in the 1999 AICUZ).

The Advisory Board concluded that since the physical capacity of NAS/JRB Willow Grove will accommodate a fleet even larger than was present when the 1977 AICUZ Report was published (from which the current zoning ordinance APZ I was derived), it is logical and prudent to retain the existing safety protections afforded the community by the current ordinance APZ I area. DoD has announced there will be additional base closures and consolidations in the near future, which the Advisory Board believes could conceivably result in the transfer of additional aircraft squadrons to NAS/JRB Willow Grove. Should this occur, a new AICUZ would likely follow with larger APZs to correspond to the increased mission level. Subsequent update of the Horsham Township Zoning Ordinance would logically follow. Retaining the existing ordinance APZ I area would preclude certain development that might otherwise occur in that area in the interim, which later might become non-compatible. Therefore, the Advisory Board strongly recommends that the APZ I area in the existing zoning ordinance be adopted as the APZ 1 area in the revised ordinance (see Figure 7). Should the future growth scenario transpire, it would be far more difficult to recapture the area in the current APZ-I than to justify retaining it based on the above logic. Figure 8 consolidates on the base map all of the overlay information recommended in this Section 7.1. It shows the underlying zoning districts (available in digital format from Horsham and

Warrington Townships only); the CZs, APZs, and NEZs, which comprise the recommended Military Airport Overlay District; and the recommended NAS/JRB Willow Grove Influence Area Disclosure District.

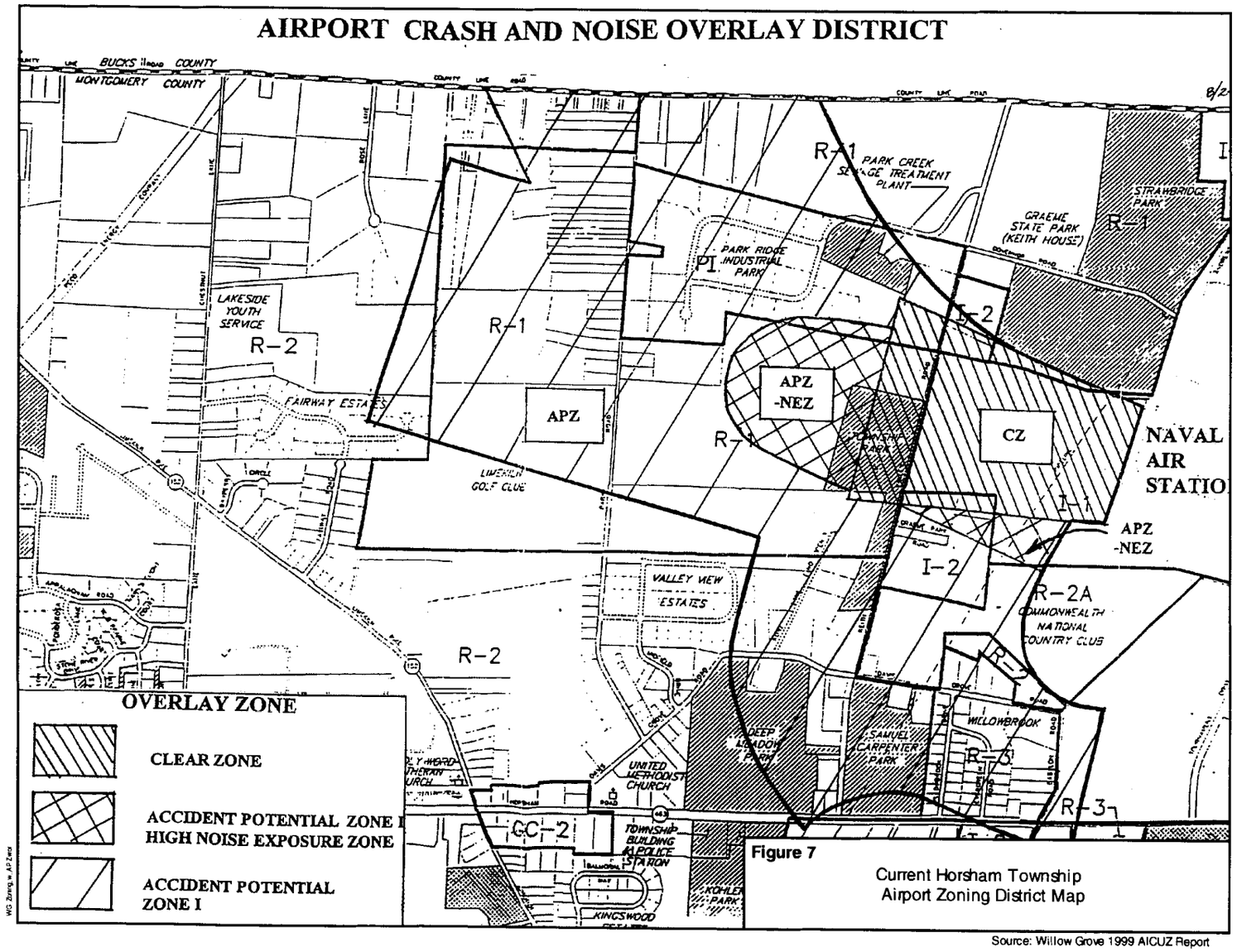


Figure 7

Current Horsham Township Airport Zoning District Map

Source: Willow Grove 1999 AICUZ Report

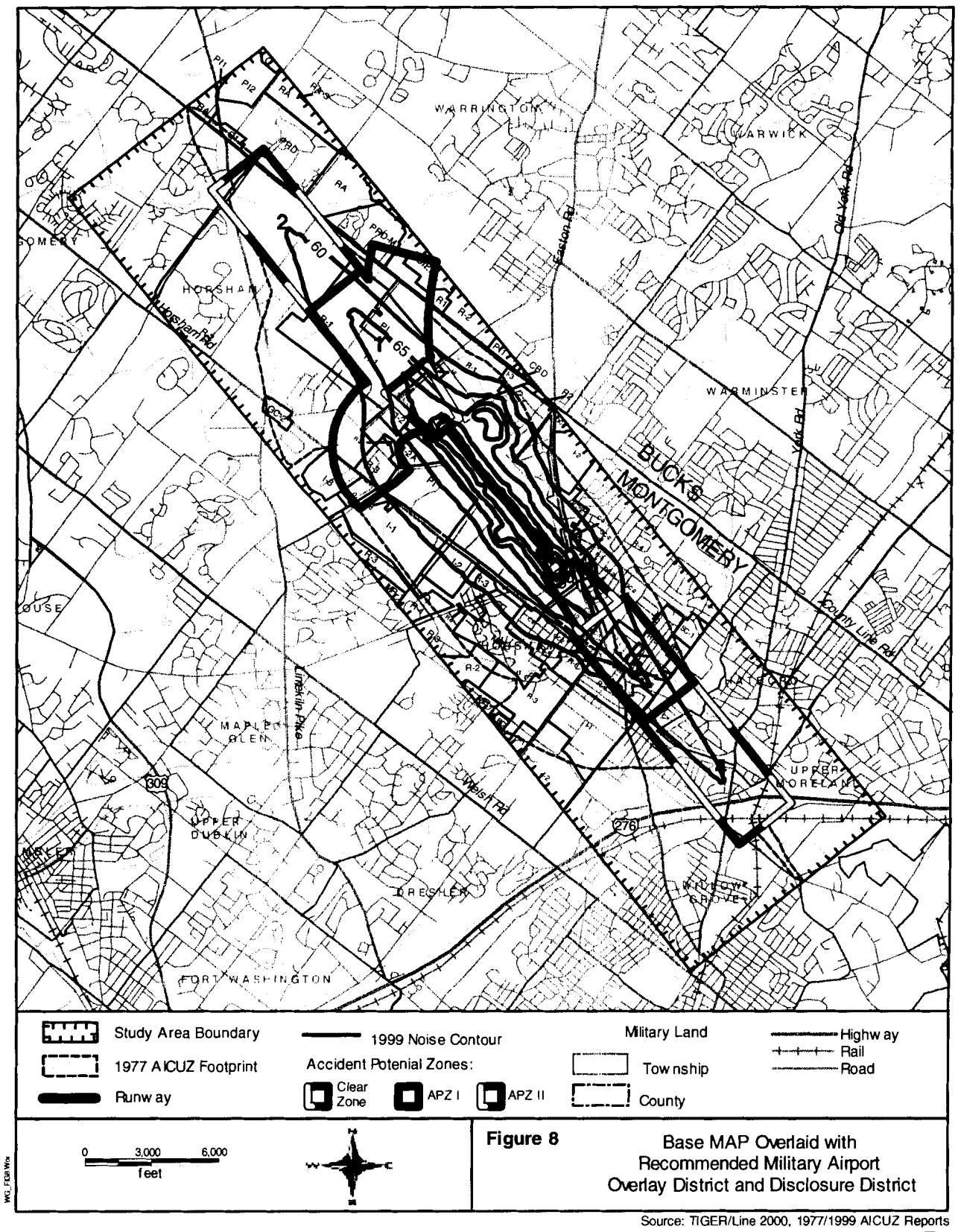


Figure 8 Base MAP Overlaid with Recommended Military Airport Overlay District and Disclosure District

Source: TIGER/Line 2000, 1977/1999 AICUZ Reports

wyle laboratories

The proposed Zoning Ordinance prescribes the amount of Noise Level Reduction (NLR) required for noise sensitive building development within the boundaries of NEZ 1 and 2. If adopted, the Horsham Township Building Code must be revised accordingly. Appendix C contains general building requirements that will achieve the amount of NLR prescribed for each of the NEZs. As recommended in the 1999 AICUZ Report, the proposed Zoning Ordinance includes height limitations in conformance with Federal Aviation Regulations, Part 77.28.

The Advisory Board also recommends a real estate disclosure requirement covering the JLUS Study Area (see Figure 2 or 8). The specific disclosure requirement is contained in the proposed changes to the Zoning Ordinance below within this Section 7.1. The purpose of the proposed disclosure requirement is to educate both residents and prospective purchasers or lessees of property located within the JLUS Study Area that they may be subject to noise, vibration and emissions from low-altitude overflights; occasional special military events, including air shows and military training exercises; or the movement of large numbers of personnel and equipment by land or air.

Considerable precedent exists for this type of disclosure requirement. Orlando, FL recently passed as part of its zoning ordinance the requirement to disclose noise impacts for all real estate transactions within the DNL 55 dB noise contours around its primary and reliever airports. Appendix G presents the Orlando Airport Noise Overlay District Ordinance as an example of what one community did to protect prospective purchasers of property located in a comprehensive airport overlay zoning district. Section 58.383 of the ordinance requires public notification of potential noise impacts via disclosure requirements and methods of implementation similar to those recommended herein.

A second example of effective disclosure involves the Raleigh/Durham Airport. In 1996 North Carolina amended its real estate disclosure law to require that any notification to a property owner by any State or local government entity that might affect the use or value of a property must be subsequently disclosed in all real estate transactions. Using that general requirement, the Raleigh/Durham Airport Authority defined the DNL 55 dB noise contour around the airport as a noise impact area, and formally notified all area Realtors and each owner of property within that area of the requirement to disclose Airport noise impacts to prospective purchasers. Local Realtors now appear to favor the disclosure requirement, because they were previously exposed if they failed to disclose potential Airport operational impacts on transactions within the noise impact area.

Both examples involve large disclosure areas. The Advisory Board endorses an inclusive disclosure area around NAS/JRB Willow Grove for two reasons:

- Half of the aircraft accidents in the vicinity of NAS/JRB Willow Grove (5 of the 12 shown in the 1999 AICUZ, plus 1 in 2000) have occurred outside the updated APZs; and,
- There is unused airport carrying capacity at NAS/JRB Willow Grove, which is available in the future to accommodate military realignments and base closures elsewhere. Use of this potential capacity by DoD could increase the operating tempo and the accident potential outside the APZs, but within the JLUS Study Area.

The Advisory Board views real estate disclosure as the best means to advise prospective purchasers and the general public that NAS/JRB Willow Grove is an active military installation that presents noise impacts, accident potential and other impacts. In the interest of protecting the public health, safety, and welfare of the community, it is the opinion of the Advisory Board that formal disclosure of the present and potential operational impacts of the installation be made more fully known. This is a fundamental objective of the JLUS Program.

The Orlando Airport Noise Disclosure Ordinance (Appendix G) offers a model for consideration and implementation of disclosure requirements that are considered fair and appropriate, given the presence and circumstances surrounding military air operations at NAS/JRB Willow Grove. The Advisory Board recognizes that the issues of 1) extent of the disclosure area; 2) effective implementation planning and enforcement; and 3) public interest to be served must be addressed by elected officials during the zoning amendment process. Therefore, the Advisory Board recommends that the Horsham Township Council implement the JLUS real estate disclosure recommendations in phases as each issue is addressed. The Advisory Board recommends immediate implementation of a requirement for disclosure of NAS/JRB impacts as a condition for approval of residential subdivisions, by requiring that the specific disclosure statement in Section 3008 below be included on each residential plat subsequently recorded within the Disclosure District. In developing the specific zoning code recommendations below, the Advisory Board took into account the 1999 AICUZ Requirements Update recommendations and the supporting guidelines in the Office of the Chief of Naval Operations Instruction (OPNAVINST) 11010.36A for land use compatibility in accident potential zones.

The following are recommended amendments, modifications, and deletions to Section 8 of the Horsham Township Zoning Ordinance and Building Code:

Amend Section 8, Airport Crash and Noise Overlay District as follows:

Revise: Section 8 title to read: Military Airport Overlay District (MAPOD)

Section 3000: Declaration of Legislative Intent.

Add: 7. To preserve the low density residential and non-residential character within the Horsham Township; to assure compatible development consistent with the adopted and approved Horsham Township Comprehensive Land Use Plan; to protect the public health, safety, and welfare of residents living in proximity to NAS/JRB Willow Grove from aircraft noise and accident potential related to Runways 15 and 33; and to guarantee open airspace corridors to and from NAS/JRB Willow Grove.

Section 3001: Definitions

Amend: Clear Zone (CZ) to read: Clear Zone 1 (CZ 1) – The most critical aircraft hazard area is the area immediately beyond the approach end of Runway 15 to the Northwest of NAS/JRB Willow Grove. It is in the shape of a trapezoidal "approach" fan beginning at the end of Runway 15 and extending outward from the runway centerline for 3000 feet. The dimensions are 1500 feet in width at the runway threshold and 2284 feet in width at the outer edge.

Add: Clear Zone 2 (CZ 2) - An aircraft hazard area located at the approach end of Runway 33 to the Southeast of NAS Willow Grove. It is in the shape of a trapezoidal "approach" fan beginning at the end of Runway 33 and extending outward from the runway centerline for 3000 feet. The dimensions are 1500 feet in width at the runway threshold and 2284 feet in width at the outer edge. Notwithstanding the fact that the area south of Runway 33 is substantially committed to urban development, it has been determined that additional safeguards are required to protect the public health and safety from the potential for aircraft accident. For this reason, most uses are prohibited and a Special Exception for certain use activity is required by this ordinance. Land uses in the CZ 2 in existence at the time of the adoption of this amendment shall not be considered non-conforming for purposes of the administration of this zoning ordinance, subject to the provisions of section 2404.

Add: Day Night Average Sound Level (DNL) - The Code of Federal Regulation, Title 14, Part 150, defines DNL as the 24-hour average sound level, in decibels, for the period from midnight to midnight, obtained after the addition of ten decibels to sound levels for the periods between midnight and 7 a.m. and between 10 p.m. and midnight local time. As used in this ordinance, it is the average sound level of aircraft noise events for the average annual day expressed in A-weighted decibels. A-weighting is a filtering system that adjusts low and high frequency sound pressure levels to closely correlate with the frequency range of human hearing.

Amend: High Noise Exposure Zone (NEZ) to read: High Noise Exposure Zone 1 (NEZ 1) - An area with the loudest noise impact on the surrounding community, measured by Day-Night Average Sound Levels of 65 dBA or greater and extending into Clear Zones 1 and 2. Land uses in the NEZ 1 in existence at the time of the adoption of this amendment shall not be considered non-conforming for purposes of the administration of this zoning ordinance, subject to the provisions of section 2404, Discontinued Use.

Add: High Noise Exposure Zone 2 (NEZ 2) - An area of significant noise impact, measured by Day Night Average Sound Levels at or above 60 dBA, but below 65 dBA.

Add: Accident Potential Zone 1 (APZ 1) - The area beyond Clear Zone 1 to the northwest of NAS/JRB Willow Grove which has a measurable potential for aircraft accidents during times of aircraft approach and take-off. APZ 1 is less hazardous than Clear Zone 1, but poses a sufficient level of potential danger to the public health and safety as to require lower density residential zoning, restrictions on places of assembly, and limitations on building and structure height in excess of those that otherwise may be permitted by underlying zoning. Land uses in the APZ 1 in existence at the time of the adoption of this amendment shall not be considered non-conforming for purposes of the administration of the zoning ordinance, subject to the provisions of section 2404, Discontinued Use.

Add: Accident Potential Zone 2 (APZ 2) -- The rectangular area to the northwest of NAS/JRB Willow Grove beyond APZ 1 which poses a lesser degree of hazard than APZ 1, but poses a sufficient level of potential danger to the public health and safety as to require lower density residential zoning, restrictions on places of assembly, and limitations on building and structure height in excess of those that otherwise may be permitted by underlying zoning. Land uses in the APZ 2 in existence at the time of the adoption of this

amendment shall not be considered non-conforming for purposes of the administration of the zoning ordinance, subject to the provisions of section 2404, Discontinued Use.

Add: Accident Potential Zone 3 (APZ 3) - The rectangular area to the southeast of NAS/JRB Willow Grove beyond CZ 2 which has a measurable potential for aircraft accidents during times of aircraft approach and take-off. APZ 3 is less hazardous than Clear Zone 2, but poses a sufficient level of potential danger to the public health and safety as to require restrictions on places of assembly and limitations on building and structure height in excess of those that otherwise may be permitted by underlying zoning. Land uses in the APZ 3 in existence at the time of the adoption of this amendment shall not be considered non-conforming for purposes of the administration of the zoning ordinance, subject to the provisions of section 2404, Discontinued Use.

Add: NAS/JRB Willow Grove Influence Area Disclosure District - All land in Horsham Township within the NAS/JRB Willow Grove Joint Land Use Study (JLUS) "Study Area" as reflected on the Official Zoning Map of Horsham Township as the NAS/JRB Willow Grove Influence Area Disclosure District.

Add: Noise Sensitive Development - A term applicable to all habitable areas in residential development and in all structures used for business or public assembly where there is a reasonable need and expectation for verbal communication to occur without the need to raise voices above normal levels.

Section 3002: Overlay Concept

Amend as follows: The Military Airport Overlay District (MAPOD) shall be deemed an overlay on any zoning district within its boundaries as depicted on the official Horsham Township Zoning Map, and now or hereafter, is applicable to any lot or portion of a lot that lies within the overlay district.

Amend Section 3002 d. as follows: The MAPOD is comprised of seven sub-districts consisting of Clear Zones (CZ) 1 and 2; High Noise Exposure Zones (NEZ) 1 and 2; and Accident Potential Zones (APZ) 1, 2, and 3, which permit uses and area, bulk and height requirements reflective of the relative potential threat to public health and safety associated with high noise levels and potential for aircraft accident within each sub-district.

Sections 3003 through 3006:

Amend as follows: Replace the term "ACNOD" with "MAPOD" in each section.

Section 3004: Permitted Uses

Amend and Add Permitted Use Tables as Follows:

Permitted Uses in the R-1, R-2, R-2A, R-3 Zoning Districts	Clear Zone 1 (CZ 1)	Accident Potential Zone 1 (APZ 1)	Accident Potential Zone 2 (APZ 2)	High Noise Exposure Zone 1 (NEZ 1)	High Noise Exposure Zone 2 (NEZ 2)
Woodland, game preserve or other conservation use	P	P	P	P	P
Agricultural Use – tilling of soil, plant nursery or greenhouse	P	P	P	P	P
Agricultural Use – keeping of livestock and poultry	X	P	P	P	P
Municipal park or recreation area	X	P	P	P	P
Single Family Detached Dwelling	X	P	P	X	P
Utility Line, or any necessary governmental or public utility use, but not including communication or electrical transmission towers	SE	P	P	P	P
Accessory uses on the same lot with and customarily incidental to the permitted uses	P	P	P	P	P
Privately owned low density outdoor recreational area, or 18 hole golf course	X	SE	P	SE	SE
Riding Academy	X	SE	P	X	SE
Stables for horses	X	SE	P	X	SE
Places of Assembly, including Churches, chapels or other places of worship	X	X	X	X	SE
Memorial park type cemetery	X	SE	P	SE	SE
Day care facilities for children or senior citizens	X	X	X	X	SE
Public or private schools, academies, colleges, and universities	X	X	X	X	SE
Uses not expressly stated in this table	X	X	X	X	X

Note: Existing uses are permitted within the MAPOD, subject to the provisions of Section 2404, Discontinued Use. The zoning district descriptions, permitted uses and other limitations are contained in the Horsham Township Zoning Ordinance 1143.

Permitted Uses in the PI, I-1, I-2, and I-3 Zoning Districts	Clear Zone 1 (CZ 1)	Clear Zone 2 (CZ2)	Accident Potential Zone 1 (APZ 1)	Accident Potential Zone 3 (APZ 3)	High Noise Exposure Zone 1 (NEZ 1)	High Noise Exposure Zone 2 (NEZ 2)
Processing, compounding, treatment, packaging and manufacturing of uses permitted in §1801.1 or 1801.A.1	X	X	P	P	P	P
Laundry, dry cleaning or dyeing plant	X	X	P	P	P	P
Laboratory, research, experimental and testing	X	X	X	X	P	P
Printing, publishing, lithographing and similar processes	X	X	P	P	P	P
Office Buildings per §2101	X	X	X	X	P	P
Wholesale, warehouse, storage or distribution center per §1801.6 or 1801.A.6	X	X	P	P	P	P
Accessory uses per §1801.7 or 1801.A.7	X	X	P	P	P	P
Indoor recreational uses per §1801.8 or 1801.A.8	X	X	X	X	P	P
Restaurant	X	X	SE	SE	E	P
Banks	X	X	SE	SE	SE	P
Hotel-motel	X	X	SE	SE	SE	P
Day Care Centers, Public and private schools, academies, colleges, universities	X	X	X	X	X	P
Utility line, or any necessary governmental or public utility use	SE	SE	P	P	P	P
Communications tower, including antenna per §1901.2	X	X	X	X	X	X
Billboard per §2001.2	X	X	SE	SE	SE	SE
Uses not expressly stated in this table	X	X	X	X	X	X

Note: Existing uses are permitted within the MAPOD, subject to the provisions of Section 2404, Discontinued Use. The zoning district descriptions, permitted uses and other limitations are contained in the Horsham Township Zoning Ordinance 1143.

Permitted Uses in the R-4, R-5, R-6, and R-7 Zoning Districts	Clear Zone 2 (CZ 2)	Accident Potential Zone 3 (APZ 3)	High Noise Exposure Zone 1 (NEZ 1)	High Noise Exposure Zone 2 (NEZ 2)
Woodland, game preserve or other conservation use	P	P	P	P
Agricultural Use – tilling of soil, plant nursery or greenhouse	P	P	P	P
Municipal park or recreation area	X	X	P	P
Single Family Detached Dwelling	X	P	X	P
Two Family Dwellings (duplexes)	X	X	X	P
Multiple dwelling or apartment house	X	X	X	P
Professional Offices	X	X	X	P
Places of Assembly, including Churches, , chapels or other places of worship	X	X	X	SE
Convalescent home, nursing home, life care community for the care of the elderly, or medical or surgical hospital	X	X	X	P
Public or private schools, academies, colleges, and universities	X	X	X	SE
Utility Line, or any necessary governmental or public utility use, but not including communication or electrical transmission towers	SE	P	P	P
Accessory uses on the same lot with and customarily incidental to the permitted uses	P	P	P	P
Uses not expressly stated in this table	X	X	X	X

Note: Existing uses are permitted within the MAPOD subject to the provisions of Section 2404, Discontinued Use. The zoning district descriptions, permitted uses and other limitations are contained in the Horsham Township Zoning Ordinance 1143.

Permitted Uses in the C-1, C-2, C-5, SC-1, and GC-2, Zoning Districts	Clear Zone 2 (CZ 2)	Accident Potential Zone 3 (APZ 3	High Noise Exposure Zone 1 (NEZ 1)	High Noise Exposure Zone 2 (NEZ 2)
Retail establishment	X	P	P	P
Restaurant, café or similar food or beverage establishment	X	P	P	P
Personal service shop	X	P	P	P
Assembly hall, community building, indoor recreational establishment, library, day care center, theater (except outdoor),	X	X	P	P
Banks or similar financial institutions	X	P	P	P
Office or studio	X	P	P	P
Post Office	X	P	P	P
Passenger station for public transportation, electric substation, telephone and telegraph offices	X	P	P	P
Self service laundry	X	P	P	P
Automobile parking lots	X	P	P	P
Satellite and Conditional Uses *permitted in §1302-A and* §1303-A	X	P	P	P
General Service or Contractor's shop	X	P	P	P
Hotel-motel	X	P	P	P
Clubs for social, fraternal, civic, cultural, or educational purposes	X	X	P	P
Motor vehicle service station or repair shop, used car lot, public garage, or materials storage yard	X	P	P	P
Accessory uses on the same lot with and customarily incidental to the permitted uses	X	P	P	P
Uses not expressly stated in this table	X	X	X	X

Note: Existing uses are permitted within the MAPOD, subject to the provisions of Section 2404, Discontinued Use. The zoning district descriptions, permitted uses and other limitations are contained in the Horsham Township Zoning Ordinance 1143.

Add a new noise level reduction requirements section as follows:

Section 3005: Noise Level Reduction (NLR) Requirements

All new noise-sensitive development permitted in NEZ 1 and NEZ 2 must meet the following NLR requirements:

- NEZ 1 - NLR 30 dBA
- NEZ 2 - NLR 25 dBA

This requirement is applicable to all building permits issued after the date of this amendment, and is administered via the Horsham Township Building Code which specifies, in detail, the structures and improvements to existing structures that are subject to this provision. The Building Code also specifies appropriate building materials that will achieve the prescribed NLR.

Add a new height limitation section as follows:

Section 3006 - Height Limitations

Height limitations are specified by Federal Aviation Regulation (FAR), Part 77.28, Military Airport Imaginary Surfaces. Throughout the approach, transitional, inner horizontal, outer horizontal, and conical areas in the vicinity of NAS/JRB Willow Grove, no building, structure, or object of natural growth shall be erected, extended, or allowed to grow beyond the maximum height established by the height overlay district applicable to the lot on which the building, structure, or object of natural growth is located.

Notwithstanding the height limitations of the underlying zoning district, the maximum height of a building, structure, or object of natural growth shall be established by the designated height district applicable to the lot on which it is located as shown on the Horsham Township Official Height Zoning Map. The Official Height Zoning Map shall reflect and be consistent with the Federal Aviation Administration FAR Part 77.28, which specifies military airport imaginary surfaces as follows:

(a) *Related to airport reference points.* These surfaces apply to all military airports. For the purposes of this section, a military airport is any airport operated by an armed force of the United States.

(1) *Inner horizontal surface.* A plane that is oval in shape at a height of 150 feet above the established airfield elevation. The plane is constructed by scribing an arc with a radius of 7,500 feet about the centerline at the end of each runway and interconnecting these arcs with tangents.

(2) *Conical surface.* A surface extending from the periphery of the inner horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 7,000 feet to a height of 500 feet above the established airfield elevation.

(3) *Outer horizontal surface.* A plane, located 500 feet above the established airfield elevation, extending outward from the outer periphery of the conical surface for a horizontal distance of 30,000 feet.

(b) *Related to runways.* These surfaces apply to all military airports.

(1) *Primary surface.* A surface located on the ground or water longitudinally centered on each runway with the same length as the runway. The width of the primary surface for runways is 2,000 feet. However, at established bases where

substantial construction has taken place in accordance with a previous lateral clearance criteria, the 2,000-foot width may be reduced to the former criteria. **Note: This caveat applies to NAS/JRB Willow Grove, where the primary surface width is 1500 feet.**

(2) *Clear zone surface.* A surface located on the ground or water at each end of the primary surface with a length of 1,000 feet and the same width as the primary surface.

(3) *Approach clearance surface.* An inclined plane, symmetrical about the runway centerline extended, beginning 200 feet beyond each end of the primary surface at the centerline elevation of the runway end and extending for 50,000 feet. The slope of the approach clearance surface is 50 to 1 along the runway centerline extended until it reaches an elevation of 500 feet above the established airport elevation. It then continues horizontally at this elevation to a point 50,000 feet from the point of beginning. The width of this surface at the runway end is the same as the primary surface; it flares uniformly, and the width at 50,000 is 16,000 feet.

(4) *Transitional surfaces.* These surfaces connect the primary surfaces, the first 200 feet of the clear zone surfaces, and the approach clearance surfaces to the inner horizontal surface, conical surface, outer horizontal surface or other transitional surfaces. The slope of the transitional surface is 7 to 1 outward and upward at right angles to the runway centerline.

(Note: If the recommended Height Ordinance provisions above are adopted, an official Horsham Township Height Zoning Map must be created by a separate action of the Township Council. Also, if the MAPOD is adopted as recommended herein, the official Airport Crash and Noise Overlay District Map (see Figure 7) must be updated accordingly, and all of the area in the current zoning ordinance APZ I in will be included in the new APZ 1.)

Section 3005: Area and Bulk Requirements

Renumber as follows:

Section 3007: Area and Bulk Requirements

Amend the header in the first row, second column of the table and limit the lot area 3-acre requirement in the second row of the table to APZ-1 as follows:

In the R-1, R-2, R-2A, & R-3 Zoning Districts	**MAPOD**
Lot Area	**Three (3) acres in APZ-1**

Amend the Height requirements in the MAPOD column of the table as follows:

Height (This height limit is also applicable in the R-4, R-5, R-6, R-7 & C-2 Zoning Districts)	35', except not more than the aircraft glide slope as set forth in §602.6, or more than the "Military Airport Imaginary Surfaces" defined in Section 3200 as required by Federal Aviation Regulation, Part 77.28

Add the following table after the existing table:

In the C-1, C-5, SC-1, GC-2, I-1, I-2, & I-3 Zoning Districts	**MAPOD**
Height	45' for buildings and structures defined in §518-A and 120' for towers and antennas defined in §1901.2, except not more than the aircraft glide slope as set forth in §602.6, or more than the " Military Airport Imaginary Surfaces" defined in Section 3200 as specified by Federal Aviation Regulation, Part 77.28

Add a new disclosure section as follows:

Section 3008: NAS/JRB Willow Grove Influence Area Disclosure District

No contract for sale or lease, deed, or plat of the property or any portion thereof located within the NAS/JRB Willow Grove Influence Area Disclosure District (Disclosure District), as defined in Section 3001 and reflected on the Official Zoning Map of Horsham Township, shall be drawn, made, executed, used, or recorded unless there is attached to such contract for sale or lease, deed, or plat of said property a statement of disclosure that the subject property, all or part of which, is located within the Disclosure District. Property owners/agents and property purchaser/lessee agents shall formally deliver a copy of the Horsham Township Disclosure District map to affected future purchasers, mortgagees, occupiers and users of real property located within the Disclosure District.

The disclosure document, to be signed by all parties to an affected real property transaction within the Disclosure District, shall include the following language:

> "The property subject to this real estate (**sale**) (**lease**) (**transfer**) transaction between _____ and _____ is located in the Horsham Township NAS/JRB Willow Grove Influence Area Disclosure District. We, the undersigned parties, hereby acknowledge that the property may be subject to noise, vibration and emissions from low-altitude overflights and occasional special military events, including airshows and training exercises that may involve the movement of large numbers of personnel and equipment by land or air. We further acknowledge that the subject property (**is**) (**is not**) located within a runway (**Clear Zone**) (**Accident Potential Zone**) as defined by the Horsham Township Zoning Ordinance and Official Zoning Map, adopted on (insert date ordinance is adopted)."

The disclosure document shall be signed and dated by all parties to the transaction, and in the case of sale transactions, shall be incorporated into the settlement documentation. All parties to the transaction shall receive a copy of the disclosure document and Horsham Township Disclosure District map (copies available at the Horsham Township Government Center).

Section 3006: Applicability

Renumber section as follows:

Section 3009: Applicability

Should the MAPOD be declared inapplicable to any tract by reason of action of (1) the Township Council in amending this Ordinance; or (2) the Zoning Officer, the Zoning Hearing Board, or any court of competent jurisdiction in interpreting the same; or (3) the Zoning Hearing Board or any court of competent jurisdiction in determining a legal effect of the same; the zoning applicable to such lot shall be deemed to be the District in which it is located without consideration of this Article.

Should the underlying zoning of any parcel or any part thereof in which the MAPOD is located be changed through any legislative or administrative actions or judicial discretion, such change shall have no effect on the MAPOD unless such change was specifically included as part of the original application.

7.2 Proposed Horsham Township Building Code Revisions

The Advisory Board recommends that all new noise sensitive development (as defined above in the recommended Horsham Township Zoning Code Revision, Section 3001) and improvements to all existing noise sensitive development be subject to the NLR requirements proposed in the Horsham Township Zoning Code Revision, Section 3004.2. For improvements to existing noise sensitive development, the Advisory Board recommends this requirement apply to all residential improvements when the addition to a residence comprises 100 sq. ft. or more of habitable space. When the addition is to a non-residential noise-sensitive use, such as a school, the Advisory Board recommends the NLR requirement be applicable when the addition comprises 100 sq. ft. or 1/3 or more of the total existing area used for noise sensitive purposes, whichever is smaller. If such addition is clearly intended for non noise-sensitive use in an otherwise noise-sensitive structure, the NLR requirement would not be applicable, provided the applicant can show that subsequent use of the newly constructed space is not appropriate for some future noise sensitive use. The Advisory Board recommends that the existing portion of any structure to which a noise sensitive addition is attached be exempt from the sound insulated requirements.

7.3 Zoning Code Revisions for Other Jurisdictions

The Advisory Board recommends that each jurisdiction in the Study Area, including Upper Moreland, Warrington and Montgomery Townships, and Hatboro Borough, develop appropriate zoning code amendments to address noise, accident potential zones, height requirements, and disclosure of potential impacts, consistent with the recommendations contained in Section 8.1. The Advisory Board also recommends that at the time a jurisdiction in the Study Area amends its zoning code to require disclosure of potential NAS/JRB Willow Grove impacts, that the jurisdiction also amend its Subdivision Regulations to require subdivision plat maps clearly indicate the subject property, or a portion thereof, is located within the defined Disclosure District.

7.4 Actions Proposed for NAS/JRB Willow Grove

The JLUS Advisory Board proposes that NAS/JRB Willow Grove officials take the following actions:

- Include in all future budget submittals, until approved and funded, a request for acquisition of all non-compatible properties in the Clear Zones.
- Minimize nighttime operations and instruct pilots to employ all noise abatement departure and arrival procedures that are deemed practicable.

- Attend Horsham Township Planning Commission meetings to provide appropriate input on all land use planning proposals that may result in non-compatible development in the near vicinity of NAS/JRB Willow Grove.
- Provide written comments on land use planning proposals that are circulated for public comment when the proposed action may affect NAS/JRB Willow Grove.
- Schedule meetings with local elected officials as necessary to discuss NAS/JRB actions that may affect the surrounding communities and to share other information of mutual interest.
- Provide copies of communications with the FAA regarding flight obstructions or other issues to the Planning Commissions of the local jurisdictions.
- Consider applying the Noise Level Reduction recommendations in this report to future noise-sensitive construction within the boundaries of NAS/JRB Willow Grove.

7.5 Implementation Plan

The JLUS Advisory Board recommends that each affected jurisdiction, including Horsham, Upper Moreland, Warrington and Montgomery Townships, and Hatboro Borough, create unique plans for implementing the above recommendations as soon as possible, using the following guidelines:

- Acknowledge acceptance of the JLUS Advisory Board Report and recommendations by general resolution at the next Council meeting. Include general guidelines in the resolution pending revision of Comprehensive Plans, Zoning Ordinances, and Building Codes.
- Initiate action to incorporate the Report recommendations into the Comprehensive Plans.
- As soon as possible after action on the Comprehensive Plans, initiate action to amend the Zoning Codes and Building Codes, including development of the required official zoning district maps.
- Develop a public outreach program to educate current and potential residents regarding the zoning and building code requirements, particularly with respect to the disclosure requirements.
- Reevaluate the MAPOD every 10 years and as soon as possible following a mission change or issuance of an AICUZ update by NAS/JRB Willow Grove.
- Establish an ad hoc Advisory Board when necessary to reevaluate the MAPOD and to develop future recommendations to the Comprehensive Plans, Zoning Codes and Building Codes.

Appendix A.
JLUS Advisory Board

Appendix B.
Full Text of Proposed Revision of Horsham Township Zoning Ordinance

Appendix C.
Building Requirements for a Minimum Sound Level Reduction

Appendix D.
Maximum Noise Level (Lmax) Comparisons

Appendix E.
Discussion of Noise and Its Effect on the Environment

Appendix F.
Environmental Restoration Program

Appendix G.
Orlando, Florida Zoning Code – Aircraft Noise Overlay District

wyle laboratories

APPENDIX A: JLUS Advisory Board

The following jurisdictions and organizations were represented on the Advisory Board:

Horsham Township
- Mike McGee 215-643-3131
- Elizabeth Steele 215-646-0227
- Judy Caesar 215-672-7968

Horsham Planning Commission
- Tim John 215-675-8011
- Bill Hackenyos (Alternate) 215-657-6499

Horsham Environmental Advisory Board
- Rick Paczewski 215-646-1618
- Julia Kollar (Alternate) 215-643-1512

Horsham Chamber of Commerce
- Dan McCaffrey (1/00-5/01) 215-957-1618
- Edgar Ebenbach (6/01 on) 215-323-1211

Horsham Water and Sewer Authority
- Anna Miller 215-672-4106

Upper Moreland Township
- Jim Vandergrift 215-659-4041
- Bill Hunter 215-674-3000
- Judy Muller 215-675-2455
- Carol Macrone 215-657-2227
- Bob Craig 215-675-7067
- Harvey Seligsohn 215-674-0864

Warrington Township
- Joe Bonargo 215-393-9594
- Kenneth Kugel 215-343-9350

Naval Air Station/Joint Reserve Base Willow Grove
- Commander Gil Viera 215-443-6051
- Lieutenant Mark Leemaster ..... 215-443-6051 (Transferred)
- LCDR William Schoen 215 443-6221

Department of Defense, Office of Economic Adjustment
- James (Mike) Davis 703-604-4726

Wyle Laboratories Acoustics Group (Consultant)
- William Albee ..... 703-415-4550 Ext. 48

Parsons Brinckerhoff Quade & Douglas, Inc. (Consultant)
- Peter Denitz 215-790-2307

APPENDIX B: Full Text of Proposed Revision of Horsham Township Zoning Ordinance

(NOTE: The full text of the proposed zoning ordinance is provided so the reader can see the result of incorporating the proposed revisions into the existing Horsham Township Zoning Ordinance).

SECTION 8: Military Airport Overlay District (MAPOD)

The Horsham Township Zoning Ordinance is hereby amended to include a new Section 3000, which shall read as follows:

Section 3000: Declaration of Legislative Intent

In addition to the Legislative Intent of Section 101, and in order to implement the objectives of the Horsham Township Comprehensive Plan, the primary purpose of this section is as follows:

1. To implement Section 604 Zoning Purposes, of the Pennsylvania Municipalities Planning Code, related to the regulation of airports and national defense facilities.

2. To implement the Land Use Objectives regarding the Willow Grove Naval Air Station (NAS) as set forth in the Horsham Township Comprehensive Plan Update of 1989.

3. To promote, protect and facilitate the safety, and general welfare of the community by recognizing certain hazards exist from the operation of the NAS, specifically related to areas within the approach zones for various runways in areas of Horsham Township that are largely undeveloped.

4. To recognize that the Department of the Navy completed an "Air Installation Compatible Use Zone Study" (AICUZ) for the NAS, and that such study makes recommendations regarding what constitutes compatible land uses and densities around the NAS.

5. To recognize observed changes in the operation of the NAS.

6. To recognize that the AICUZ identifies accident hazard zones as being areas where future development should be severely limited.

7. To preserve the low density residential and non-residential character within the Horsham Township; to assure compatible development consistent with the adopted and approved Horsham Township Comprehensive Land Use Plan; to protect the public health, safety, and welfare of residents living in proximity to NAS/JRB Willow Grove from aircraft noise and accident potential related to Runways 15 and 33; and to guarantee open airspace corridors to and from NAS/JRB Willow Grove.

Section 3001: Definitions

Clear Zone 1 (CZ 1) – The most critical aircraft hazard area in the area immediately beyond the approach end of Runway 15 to the Northwest of NAS/JRB Willow Grove. It is in the shape of a trapezoidal "approach" fan beginning at the end of Runway 15 and extending outward from the runway centerline for 3000 feet. The dimensions are 1500 feet in width at the runway threshold and 2284 feet in width at the outer edge.

Clear Zone 2 (CZ 2) – An aircraft hazard area located at the end of Runway 33 to the Southeast of NAS Willow Grove. It is in the shape of a trapezoidal "approach" fan beginning at the end of Runway 33 and extending outward from the runway centerline for 3000 feet. The dimensions are 1500 feet in width at the runway threshold and 2284 feet in width at the outer edge. Notwithstanding the fact that the area south of Runway 33 is substantially committed to urban development, it has been determined that additional safeguards are required to protect the public health and safety from the potential for aircraft accident. For this reason, most uses are prohibited and a Special Exception for certain use activity is required by this ordinance. Land uses in the CZ 2 in existence at the time of the adoption of this amendment shall not be considered non-conforming for purposes of the administration of this zoning ordinance, subject to the provisions of section 2404.

Day Night Average Sound Level (DNL) – The Code of Federal Regulation, Title 14, Part 150 defines DNL as the 24-hour average sound level, in decibels, for the period from midnight to midnight, obtained after the addition of ten decibels to sound levels for the periods between midnight and 7 a.m., and between 10 p.m. and midnight local time. As used in this ordinance, it is the average sound level of aircraft noise events for the average annual day expressed in A-weighted decibels. A-weighting is a filtering system that adjusts low and high frequency sound pressure levels to closely correlate with the frequency range of human hearing.

High Noise Exposure Zone 1 (NEZ 1) - An area with the loudest noise impact on the surrounding community, measured by Day-Night Average Sound Levels of 65 dBA or greater, and extending into Clear Zones 1 and 2. Land uses in the NEZ 1 in existence at the time of the adoption of this amendment shall not be considered non-conforming for purposes of the administration of this zoning ordinance, subject to the provisions of section 2404, Discontinued Use.

High Noise Exposure Zone 2 (NEZ 2) – An area of significant noise impact, measured by Day Night Average Sound Levels at or above 60 dBA, but below 65 dBA.

Accident Potential Zone 1 (APZ 1) – The area beyond Clear Zone 1 to the Northwest of NAS/JRB Willow Grove, which has a measurable potential for aircraft accidents during times of aircraft approach and take-off. APZ 1 is less hazardous than Clear Zone 1, but poses a sufficient level of potential danger to the public health and safety as to require lower density residential zoning, restrictions on places of assembly, and limitations on building and structure height in excess of those that otherwise may be permitted by underlying zoning. Land uses in the APZ 1 in existence at the time of the adoption of this amendment shall not be considered non-conforming for purposes of the administration of the zoning ordinance, subject to the provisions of section 2404, Discontinued Use.

Accident Potential Zone 2 (APZ 2) -- The rectangular area to the Northwest of NAS/JRB Willow Grove beyond APZ 1, which poses a lesser degree of hazard than APZ 1, but poses a sufficient level of potential danger to the public health and safety as to require lower density residential zoning, restrictions on places of assembly, and limitations on building and structure height in excess of those that otherwise may be permitted by underlying zoning. Land uses in the APZ 2 in existence at the time of the adoption of this amendment shall not be considered non-conforming for purposes of the administration of the zoning ordinance, subject to the provisions of section 2404, Discontinued Use.

Accident Potential Zone 3 (APZ 3) – The rectangular area to the Southeast of NAS/JRB Willow Grove beyond CZ 2, which has a measurable potential for aircraft accidents during times of aircraft approach and take-off. APZ 3 is less hazardous than Clear Zone 2, but poses a sufficient level of potential danger to the public health and safety as to require restrictions on places of assembly and limitations on building and structure height in excess of those that otherwise may be permitted by underlying zoning. Land uses in the APZ 3 in existence at the time of the adoption of this amendment shall not be considered non-conforming for purposes of the administration of the zoning ordinance, subject to the provisions of section 2404, Discontinued Use.

NAS/JRB Willow Grove Influence Area Disclosure District - All land in Horsham Township within the NAS/JRB Willow Grove Joint Land-Use Study (JLUS) "Study Area" as reflected on the Official Zoning Map of Horsham Township as the NAS/JRB Willow Grove Influence Area Disclosure District.

Noise Sensitive Development - A term applicable to all habitable areas in residential development and in all structures used for business or public assembly where there is a reasonable need and expectation for verbal communication to occur without the need to raise voices above normal levels.

Section 3002: Overlay Concept

The Military Airport Overlay District (MAPOD) shall be deemed an overlay on any zoning district within it's boundaries as depicted on the official Horsham Township Zoning Map, and now or hereafter is applicable to any lot or portion of a lot that lies within the overlay district.

Section 3003: Definition and Establishment of the MAPOD

1. The MAPOD shall be delineated on the Horsham Township Zoning Map, which is hereby made a part of this Ordinance and is available for inspection at the Township Office.

2. It is recognized that the AICUZ study may be updated from time to time by the Department of the Navy, and the Township specifically reserves the right to update the MAPOD boundaries and regulations to reflect such studies.

3. The MAPOD shall supersede and modify the underlying zoning district and any other conflicting ordinance requirements.

4. The MAPOD is comprised of seven sub-districts consisting of – Clear Zones (CZ) 1 and 2; High Noise Exposure Zones (NEZ) 1 and 2; and Accident Potential Zones (APZ) 1, 2, and 3, which permit uses and area, bulk and height requirements reflective of the relative potential threat to public health and safety associated with high noise levels and potential for aircraft accident within each sub-district.

Section 3004: Permitted Uses

3004.1. A building may be erected, altered or used, or a lot may be used or occupied for one (1) principal use for any of the following purposes in the MAPOD, if permitted in the underlying zoning district classification:

X = Prohibited Use P = Permitted Use SE = Special Exception

Permitted Uses in the R-1, R-2, R-2A, R-3 Zoning Districts	Clear Zone 1 (CZ 1)	Accident Potential Zone 1 (APZ 1)	Accident Potential Zone 2 (APZ 2)	High Noise Exposure Zone 1 (NEZ 1)	High Noise Exposure Zone 2 (NEZ 2)
Woodland, game preserve or other conservation use	P	P	P	P	P
Agricultural Use – tilling of soil, plant nursery or greenhouse	P	P	P	P	P
Agricultural Use – keeping of livestock and poultry	X	P	P	P	P
Municipal park or recreation area	X	P	P	P	P
Single Family Detached Dwelling	X	P	P	X	P
Utility Line, or any necessary governmental or public utility use, but not including communication or electrical transmission towers	SE	P	P	P	P
Accessory uses on the same lot with and customarily incidental to the permitted uses	P	P	P	P	P
Privately owned low density outdoor recreational area, or 18 hole golf course	X	SE	P	SE	SE
Riding Academy	X	SE	P	X	SE
Stables for horses	X	SE	P	X	SE
Places of Assembly, including Churches, chapels or other places of worship	X	X	X	X	SE
Memorial park type cemetery	X	SE	P	SE	SE
Day care facilities for children or senior citizens	X	X	X	X	SE
Public or private schools, academies, colleges, and universities	X	X	X	X	SE
Uses not expressly stated in this table	X	X	X	X	X

Note: Existing uses are permitted within the MAPOD, subject to the provisions of Section 2404, Discontinued Use. The zoning district descriptions, permitted uses and other limitations are contained in the Horsham Township Zoning Ordinance 1143.

Permitted Uses in the PI, I-1, I-2, and I-3 Zoning Districts	Clear Zone 1 (CZ 1)	Clear Zone 2 (CZ2)	Accident Potential Zone 1 (APZ 1)	Accident Potential Zone 3 (APZ 3)	High Noise Exposure Zone 1 (NEZ 1)	High Noise Exposure Zone 2 (NEZ 2)
Processing, compounding, treatment, packaging and manufacturing of uses permitted in §1801.1 or 1801.A.1	X	X	P	P	P	P
Laundry, dry cleaning or dyeing plant	X	X	P	P	P	P
Laboratory, research, experimental and testing	X	X	X	X	P	P
Printing, publishing, lithographing and similar processes	X	X	P	P	P	P
Office Buildings per §2101	X	X	X	X	P	P
Wholesale, warehouse, storage or distribution center per §1801.6 or 1801.A.6	X	X	P	P	P	P
Accessory uses per §1801.7 or 1801.A.7	X	X	P	P	P	P
Indoor recreational uses per §1801.8 or 1801.A.8	X	X	X	X	P	P
Restaurant	X	X	SE	SE	E	P
Banks	X	X	SE	SE	SE	P
Hotel-motel	X	X	SE	SE	SE	P
Day Care Centers, Public and private schools, academies, colleges, universities	X	X	X	X	X	P
Utility line, or any necessary governmental or public utility use	SE	SE	P	P	P	P
Communications tower, including antenna per §1901.2	X	X	X	X	X	X
Billboard per §2001.2	X	X	SE	SE	SE	SE
Uses not expressly stated in this table	X	X	X	X	X	X

Note: Existing uses are permitted within the MAPOD, subject to the provisions of Section 2404, Discontinued Use. . The zoning district descriptions, permitted uses and other limitations are contained in the Horsham Township Zoning Ordinance 1143.

Permitted Uses in the R-4, R-5, R-6, and R-7 Zoning Districts	Clear Zone 2 (CZ 2)	Accident Potential Zone 3 (APZ 3)	High Noise Exposure Zone 1 (NEZ 1)	High Noise Exposure Zone 2 (NEZ 2)
Woodland, game preserve or other conservation use	P	P	P	P
Agricultural Use – tilling of soil, plant nursery or greenhouse	P	P	P	P
Municipal park or recreation area	X	X	P	P
Single Family Detached Dwelling	X	P	X	P
Two Family Dwellings (duplexes)	X	X	X	P
Multiple dwelling or apartment house	X	X	X	P
Professional Offices	X	X	X	P
Places of Assembly, including Churches, , chapels or other places of worship	X	X	X	SE
Convalescent home, nursing home, life care community for the care of the elderly, or medical or surgical hospital	X	X	X	P
Public or private schools, academies, colleges, and universities	X	X	X	SE
Utility Line, or any necessary governmental or public utility use, but not including communication or electrical transmission towers	SE	P	P	P
Accessory uses on the same lot with and customarily incidental to the permitted uses	P	P	P	P
Uses not expressly stated in this table	X	X	X	X

Note: Existing uses are permitted within the MAPOD, subject to the provisions of Section 2404, Discontinued Use. . The zoning district descriptions, permitted uses and other limitations are contained in the Horsham Township Zoning Ordinance 1143.

Permitted Uses in the C-1, C-2, C-5, SC-1, and GC-2, Zoning Districts	Clear Zone 2 (CZ 2)	Accident Potential Zone 3 (APZ 3	High Noise Exposure Zone 1 (NEZ 1)	High Noise Exposure Zone 2 (NEZ 2)
Retail establishment	X	P	P	P
Restaurant, café or similar food or beverage establishment	X	P	P	P
Personal service shop	X	P	P	P
Assembly hall, community building, indoor recreational establishment, library, day care center, theater (except outdoor),	X	X	P	P
Banks or similar financial institutions	X	P	P	P
Office or studio	X	P	P	P
Post Office	X	P	P	P
Passenger station for public transportation, electric substation, telephone and telegraph offices	X	P	P	P
Self service laundry	X	P	P	P
Automobile parking lots	X	P	P	P
Satellite and Conditional Uses permitted in §1302-A and §1303-A	X	P	P	P
General Service or Contractor's shop	X	P	P	P
Hotel-motel	X	P	P	P
Clubs for social, fraternal, civic, cultural, or educational purposes	X	X	P	P
Motor vehicle service station or repair shop, used car lot, public garage, or materials storage yard	X	P	P	P
Accessory uses on the same lot with and customarily incidental to the permitted uses	X	P	P	P
Uses not expressly stated in this table	X	X	X	X

Note: Existing uses are permitted within the MAPOD, subject to the provisions of Section 2404, Discontinued Use. The zoning district descriptions, permitted uses and other limitations are contained in the Horsham Township Zoning Ordinance 1143.

Section 3005: Noise Level Reduction (NLR) Requirements

All new noise-sensitive development permitted in NEZ 1 and NEZ 2 must meet the following NLR requirements:

- NEZ 1 - NLR 30 dBA
- NEZ 2 - NLR 25 dBA

This requirement is applicable to all building permits issued after the date of this amendment and is administered via the Horsham Township Building Code, which specifies in detail the structures and improvements to existing structures that are subject to this provision. The Building Code also specifies appropriate building materials that will achieve the prescribed NLR.

Section 3006: Height Limitations

Height limitations are specified by Federal Aviation Regulation (FAR), Part 77.28, Military Airport Imaginary Surfaces. Throughout the approach, transitional, inner horizontal, outer horizontal, and conical areas in the vicinity of NAS/JRB Willow Grove, no building, structure, or object of natural growth shall be erected, extended, or allowed to grow beyond the maximum height established by the height overlay district applicable to the lot on which the building, structure, or object of natural growth is located.

Notwithstanding the height limitations of the underlying zoning district, the maximum height of a building, structure, or object of natural growth shall be established by the designated height district applicable to the lot on which it is located as shown on the Horsham Township Official Height Zoning Map. The Official Height Zoning Map shall reflect and be consistent with the Federal Aviation Administration FAR Part 77.28, which specifies military airport imaginary surfaces as follows:

(a) *Related to airport reference points.* These surfaces apply to all military airports. For the purposes of this section a military airport is any airport operated by an armed force of the United States.

(1) *Inner horizontal surface.* A plane that is oval in shape at a height of 150 feet above the established airfield elevation. The plane is constructed by scribing an arc with a radius of 7,500 feet about the centerline at the end of each runway and interconnecting these arcs with tangents.
(2) *Conical surface.* A surface extending from the periphery of the inner horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 7,000 feet to a height of 500 feet above the established airfield elevation.
(3) *Outer horizontal surface.* A plane located 500 feet above the established airfield elevation, extending outward from the outer periphery of the conical surface for a horizontal distance of 30,000 feet.

(b) *Related to runways.* These surfaces apply to all military airports.

(1) P*rimary surface.* A surface located on the ground or water longitudinally centered on each runway with the same length as the runway. The width of the primary surface for runways is 2,000 feet. However, at established bases where substantial construction has taken place in accordance with a previous lateral clearance criteria, the 2,000-foot width may be reduced to the former criteria. **Note: This caveat applies to NAS/JRB Willow Grove, where the primary surface width is 1500 feet.**

(2) C*lear zone surface.* A surface located on the ground or water at each end of the primary surface, with a length of 1,000 feet and the same width as the primary surface.

(3) *Approach clearance surface.* An inclined plane, symmetrical about the runway centerline extended, beginning 200 feet beyond each end of the primary surface at the centerline elevation of the runway end and extending for 50,000 feet. The slope of the approach clearance surface is 50 to 1 along the runway centerline extended until it reaches an elevation of 500 feet above the established airport elevation. It then continues horizontally at this elevation to a point 50,000 feet from the point of beginning. The width of this surface at the runway end is the same as the primary surface; it flares uniformly, and the width at 50,000 is 16,000 feet.

(4) *Transitional surfaces.* These surfaces connect the primary surfaces, the first 200 feet of the clear zone surfaces, and the approach clearance surfaces to the inner horizontal surface, conical surface, outer horizontal surface or other transitional surfaces. The slope of the transitional Surface is 7 to 1 outward and upward at right angles to the runway centerline.

(Note: If the recommended Height Ordinance provisions below are adopted, an official Horsham Township Height Zoning Map must be created by a separate action of the Township Council. Also, if the MAPOD is adopted as recommended herein, all of the area in the current zoning ordinance APZ I in will be included in the new APZ 1.

Section 3007: Area and Bulk Requirements

All of the zoning district area and bulk requirements of the underlying zoning district shall apply unless specifically modified herein:

In the R-1, R-2, R-2A, & R-3 Zoning District	**MAPOD**
Lot Area	Three (3) acres in APZ 1
Lot Width	**250 feet at Building Line**
Building Coverage	Not more than 10%
Lot Coverage	Not more than 15%
Front Yard	Not less than 60'
Side Yards	Two, not less than 80' in aggregate width, with neither less than 35' in width
Rear Yard	Not less than 80'
Height (This height limit is also applicable in the R-4, R-5, R-6, R-7 & C-2 Zoning Districts)	35', except not more than the aircraft glide slope as set forth in §602.6, or more than the "Military Airport Imaginary Surfaces" defined in Section 3200 as required by Federal Aviation Regulation, Part 77.28
Density	Per Section 521 B
Contiguous Building Envelope Area	8,000 SF

In the C-1, C-5, SC-1, GC-2, I-1, I-2, & I-3 Zoning Districts	**MAPOD**
Height	45' for buildings and structures defined in §518-A and 120' for towers and antennas defined in §1901.2, except not more than the aircraft glide slope as set forth in §602.6, or more than the " Military Airport Imaginary Surfaces" defined in Section 3200 as specified by Federal Aviation Regulation, Part 77.28

Section 3008: NAS/JRB Willow Grove Influence Area Disclosure District

No contract for sale or lease, deed, or plat of the property or any portion thereof located within the NAS/JRB Willow Grove Influence Area Disclosure District (Disclosure District), as defined in Section 3001 and reflected on the Official Zoning Map of Horsham Township, shall be drawn, made, executed, used, or recorded unless there is noted on such contract for sale or lease, deed, or plat of said property a statement of disclosure that the subject property, all or part of which, is located within the Disclosure District. In addition, the disclosure shall indicate whether or not the property, all or part of which, is located within the DNL 60 decibel (dB) or greater noise contour sub-district, and/or any of the following sub-districts: CZ 1, CZ 2, APZ 1, APZ 2 or APZ 3. Property owners/agents and property purchaser/lessee agents shall formally deliver a copy of the Horsham Township Disclosure District map to affected future purchasers, mortgagees, occupiers and users of property located within the Horsham Township Disclosure District.

A disclosure document, to be signed by all parties to an affected real property transaction within the Disclosure District, shall include the following language:

> "The real property transaction between _____ and _____ is located in the Horsham Township NAS/JRB Willow Grove Influence Area Disclosure District and is subject to noise, vibration and emissions from low-altitude overflights, occasional special military events including airshows and training exercises that may involve movement of large numbers of personnel and equipment by land or air. I/We the undersigned parties to this_transaction hereby acknowledge that the property subject to this transaction is located within the NAS/JRB Willow Grove Influence Area Disclosure District. I/We further acknowledge that the property (is) or (is not) located within the 60 dB or greater Day Night Average Sound Level noise contour, and/or an aircraft clear or accident potential zone as defined by the Horsham Township Zoning Ordinance and Official Zoning Map, adopted ___(date)
> ".

The disclosure document shall be signed and dated by all parties to the transaction, and in the case of sale transactions, shall be incorporated into the settlement documentation. All parties to the transaction shall receive a copy of the disclosure document and Horsham Township Disclosure District map.

Section 3009: Applicability

Should the MAPOD be declared inapplicable to any tract by reason of action of (1) the Township Council in amending this Ordinance; or (2) the Zoning Officer, the Zoning Hearing Board, or any court of competent jurisdiction in interpreting the same; or (3) the Zoning Hearing Board or any court of competent jurisdiction in determining a legal effect of the same; the zoning applicable to such lot shall be deemed to be the District in which it is located without consideration of this Article.

Should the underlying zoning of any parcel or any part thereof which the MAPOD is located be changed through any legislative or administrative actions or judicial discretion, such change shall have no effect on the MAPOD unless such change was specifically included as part of the original application.

SECTION 9. Repealer

All Ordinances or parts of Ordinances which are inconsistent herewith are hereby repealed.

SECTION 10. Severability

If any sentence, clause, section or part of this Ordinance is for any reason found to be unconstitutional, illegal or invalid, such unconstitutionality, illegality or invalidity shall not affect or impair any of the remaining provisions, sentences, clauses, sections or part of this Ordinance. It is hereby declared as the intent of the Board of Supervisors of Horsham Township, that this Ordinance would have been adopted had such unconstitutional, illegal or invalid sentence, clause, section or part thereof not been included therein.

SECTION 11. Effective Date

This Ordinance shall be effective five (5) days after enactment.

ENACTED AND ORDAINED by the Horsham Township Council this __ day of _____2001.

ATTEST

TOWNSHIP COUNCIL
TOWNSHIP OF HORSHAM

_____
Township Secretary

_____
President

APPENDIX C: Building Requirements for a Minimum Sound Level Reduction

SECTION I: 25 dB NOISE LEVEL REDUCTION

A. General

1. Brick veneer, masonry blocks, or stucco exterior walls shall be constructed airtight. All joints shall be grouted or caulked airtight, except weep holes for drainage.

2. At the penetration of exterior walls by pipes, ducts, or conduits, the space between the wall and pipes, ducts, or conduits shall be caulked or filled with mortar. Non-mortar caulking may be used to fill a space no more than one-quarter inch around the pipe, duct, or conduit. Any opening having a gap greater than one-quarter inch around the pipe, duct, or conduit must be reduced to a maximum one-quarter inch by filling with mortar.

3. Window and/or through-the-wall ventilation units shall not be used in habitable rooms or in hallways or spaces that access habitable rooms.

4. Through-the-wall/door mailboxes shall not be used.

B. Exterior Walls

1. Exterior walls other than as described in this section shall have a laboratory sound transmission class rating of at least STC-39.

2. Masonry walls having a surface weight of at least 25 pounds per square foot do not require a furred (stud) interior wall. At least one surface of concrete block walls shall be plastered or painted with heavy "bridging" paint.

3. Stud walls shall be at least 4 inches In nominal depth and shall be finished on the outside with siding-on-sheathing, stucco, or brick veneer:

   a. Interior surface of exterior stud walls shall be of gypsum board or plaster at least 5/8 inch thick, installed on studs.

   b. Continuous composition board, plywood, or gypsum board sheathing at least 5/8 inch thick shall cover the exterior side of the wall studs behind wood, metal, or other siding. Asphalt or wood shake shingles are acceptable forms of siding.

   c. Sheathing panels shall be butted tightly and covered on the exterior with overlapping building paper. The top and bottom edges of the sheathing shall be sealed airtight.

   d. Insulation material at least 2 inches thick shall be installed continuously throughout the cavity space behind the exterior sheathing and between the wall studs. Insulation shall be glass fiber or mineral wool.

C. Windows

1. Windows other than as described in this section shall have a laboratory sound transmission class rating of at least STC-30.

2. Where the window consists of a single pane, the glass shall be at least 3/16 inch thick.

3. Dual-glazed, thermal-pane units may be used provided the thermal-pane assembly consists of two panes of glass, each at least1/8 inch thick, and that the airspace between them is at least 1/4 inch thick (total overall thickness 1/2 inch), and that the entire assembly is sealed airtight.

4. All operable windows shall be weather-stripped and airtight when closed so that air infiltration will not exceed 0.5 cubic foot per minute per foot of crack length in accordance with ASTM E-282-65-T.

5. Glass of fixed sash windows shall be sealed in an airtight manner with a non-hardening sealant, or a soft elastomer gasket, or glazing tape, or equivalent airtight adhesive.

6. The perimeter of window frames shall be sealed airtight to the exterior wall construction with a sealant conforming to one of the following federal specifications: 'IT-S-00227, 'fl'-S-00230, or TT-S001-53.

7. The total area of glass in exterior windows and doors in sleeping spaces shall not exceed 20 percent (20%) of the floor area.

D. Doors

1. Doors, other than as described in this section, shall have a laboratory sound transmission class rating of at least STC-28.

2. All exterior side-hinged doors shall be solid-core wood or insulated hollow metal at least 1¾ inches thick and shall be fully weather-stripped.

3. Exterior sliding doors shall be weather-stripped with an efficient airtight gasket system with performance as specified in Subsection C 4.

4. Glass in doors shall be sealed in an airtight non-hardening sealant or in a soft elastomer gasket, or glazing tape, or equivalent airtight adhesive.

5. The perimeter of doorframes shall be sealed airtight to the exterior wall construction as described in Subsection C-6.

E. Roofs

1. Combined roof and ceiling construction other than as described in this and the following subsection shall have a laboratory sound transmission class rating of at least STC-39.

2. With an attic or rafter space at least 6 inches deep, and with a ceiling below, the roof shall consist of closely butted 1 /2-inch composition board, plywood, or gypsum board sheathing topped by roofing as required.

3. If the underside of the roof is exposed over a habitable room (as with a cathedral ceiling), or if the attic or rafter spacing is less than 6 inches, the roof construction shall have a surface weight of at least 25 pounds per square foot. Rafters, joists, or other framing may not be included in the surface weight calculation.

F. Ceilings

1. Gypsum board or plaster ceilings at least 1/2 inch thick shall be provided where required. Ceilings shall be substantially airtight, with a minimum number of penetrations.

2. Glass fiber or mineral wool insulation at least 2 inches thick shall be provided above the ceiling between joists.

3. Skylights shall have a laboratory sound transmission class rating of at least STC-28.

G. Floors

1. Openings to any crawl spaces below the floor of the lowest occupied rooms shall not exceed two percent (2%) of the floor area of the occupied rooms.

H. Ventilation

1. A mechanical ventilation system shall be installed that will provide the minimum air circulation and fresh air supply requirements for various uses in occupied rooms, as specified in the Ohio Basic Building Code (OBBC/CABO), without the need to open any windows, doors, or other openings to the exterior.

2. Gravity vent openings in attic shall not exceed code minimum in number and size.

3. If a fan is used for forced ventilation, the attic inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20-gauge steel, which shall be lined with one-inch-thick coated glass fiber, and shall be at least 5 feet long with at least one 90-degree bend.

4. All vent ducts connecting the interior space to the outdoors, excepting kitchen range exhaust ducts, shall contain at least a 5-foot length of internal sound-absorbing duct lining. Each duct shall be provided with a bend in the duct such that there is no direct line-of-sight through the duct from the venting cross-section to the room opening cross-section.

5. Duct lining shall be coated glass fiber duct liner at least one inch thick.

6. Domestic range exhaust ducts connecting the interior space to the outdoors shall contain a baffle plate across the exterior termination which allows proper ventilation. The dimensions of the baffle plate should extend at least one diameter beyond the line-of-sight into the vent duct. The baffle plate shall be of the same material and thickness as the vent duct material.

7. Fireplaces shall be provided with well-fitted dampers.

SECTION II: 30 dB NOISE LEVEL REDUCTION

A. General

1. Brick veneer, masonry blocks, or stucco exterior walls shall be constructed airtight. All joints shall be grouted or caulked airtight, except weep holes for drainage.

2. At the penetration of exterior walls by pipes, ducts, or conduits, the space between the wall and pipes, ducts, or conduits shall be caulked or filled with mortar.

3. Window and/or through-the-wall ventilation units shall not be used.

4. Non-vented fireplaces are permitted without restriction. Operational vented fireplaces shall not be used unless the following requirements are met: the fireplace chimney must be fitted with a tight-fitting damper that prohibits airflow when closed; the fireplace opening into the room must be able to be sealed completely and must have glass fireplace doors incorporating 1/4-inch-thick laminated glass; a fresh-air inlet to provide combustion air must be supplied by means of a small vent containing at least one 90-degree bend to prevent line-of-sight to the exterior or adjacent spaces.

5. All sleeping spaces shall be provided with either a sound-absorbing ceiling or a carpeted floor.

6. Through-the-wall/door mailboxes and pet doors shall not be used.

7. Skylights shall not be used unless they meet the following requirements: all skylights must incorporate double glazing if fixed and triple glazing if operable; the skylight glazing shall conform to all requirements stated in Section C, for Windows, plus any supplemental sealing and flashing as required to meet weather exposure conditions.

B. Exterior walls

1. Exterior walls other than as described below shall have a laboratory sound transmission class rating of at least STC 44.

2. Masonry walls having a surface weight of at least 40 pounds per square foot do not require a furred (stud) interior wall. At least one surface of concrete block walls shall be plastered or painted with heavy "bridging" paint.

3. Stud walls shall be at least 4 inches in nominal depth and shall be finished on the outside with siding-on-sheathing, stucco, or brick veneer. For the purposes of this regulation, all forms of siding, whether wood, aluminum, or vinyl, are addressed by the term "siding". For the purposes of this regulation, brick or brick veneer must be at least 4½ inches thick. Otherwise, the guidance for siding structures applies.

   a. Interior surface of the exterior walls shall be of gypsum board or plaster at least 5/8 inch thick, installed on the studs. The gypsum board or plaster may be fastened rigidly to the studs if the exterior is brick veneer or stucco. If the exterior is siding on sheathing, the interior gypsum

board or plaster must be fastened to the studs using resilient channels. An acceptable alternative is to use three (3) layers of gypsum board (instead of one) mounted to the studs without requiring resilient channels.

b. Continuous composition board, plywood, or gypsum board sheathing at least 1/2 inch thick shall cover the exterior side of the wall studs behind wood or metal siding. The sheathing and facing shall weigh at least 4 pounds per square foot. If vinyl siding is used, the sheathing must be at least 3/4 inch thick.

c. Sheathing panels shall be butted tightly and covered on the exterior with overlapping building paper. The building paper can be omitted provided the sheathing panels have tightly fitting tongue-and-groove or lap-and-gap joints. The top and bottom edges of the sheathing shall be sealed.

d. Insulation material at least to provide at least R-11 shall be installed continuously throughout the cavity space behind the exterior sheathing and between wall studs. Insulation shall be glass fiber or mineral wool.

C. Windows

1. Windows other than as described in this section shall have a laboratory sound transmission class rating of at least STC 36 for stucco and brick homes and STC 40 for siding homes.

2. Operable windows shall be triple glazed with an operable sealed insulating glazed sash and an operable or fixed storm sash. The insulated sash shall consist of two panes, at least 1/8 inch thick separated by at least a 3/4-inch air space. The airspace between the insulated unit and the storm unit shall be at least 2 inches. At least one of the three panes shall be tempered or laminated.

3. Fixed sashes shall be double-glazed. Glass of double-glazed windows shall be at least 3/16 inch thick. Panes of glass shall be separated by a minimum 3 inches air space and should not be of equal thickness.

4. Glass of fixed-sash windows shall be sealed in an airtight manner with a non-hardening sealant, or a soft elastomer gasket or glazing tape, or equivalent airtight adhesive. The sash shall be rigid and weather-stripped with material so that air infiltration will not exceed 0.5 cubic foot per minute per foot of crack length in accordance with ASTM E-283-65-T.

5. The perimeter of window frames shall be sealed airtight to the exterior wall construction with a sealant conforming to one of the following Federal Specifications: TT-S-00227, TT-S-00230, or TT-S-001 53.

6. The total area of glass of both windows and exterior doors in sleeping spaces shall not exceed 20 percent of the floor area.

D. Doors

1. Doors, or door and storm composite assemblies, other than as described in this section shall have a laboratory sound transmission class rating of at least STC 35.

2. Double door construction is required for all door openings to the exterior. Openings fitted with side-hinged doors shall have one solid-core wood or insulated hollow metal core door at least 1¾ inch thick separated by an air space of at least 4 inches from another door, which can be a storm door. Both doors shall be tightly fitted and weather-stripped.

3. The glass of double-glazed sliding doors shall be separated by a minimum 4 inches of air space. Each sliding frame shall be provided with an efficiently airtight weather-stripping material as specified in section 4, C-4.

4. Glass of all doors shall be at least 3/16 inch thick. Glass of double sliding doors shall not be equal in thickness.

5. The perimeter of doorframes shall be sealed airtight to the exterior wall construction as indicated in Section 4, C 6.

6. Glass of doors shall be set and sealed in an airtight non-hardening sealant, or a soft elastomer gasket or glazing tape, or equivalent airtight adhesive.

E. Roofs

1. Combined roof and ceiling construction other than described in this section shall have a laboratory sound transmission class rating of at least STC 44.

2. With an attic or rafter space at least 6 inches deep, and with a ceiling below, the roof shall consist of closely butted 1/2-inch composition board, plywood, or gypsum board sheathing topped by rooting as required.

3. If the underside of the roof is exposed, or if the attic or rafter spacing is less than 6 inches, the roof construction shall have a surface weight of at least 40 pounds per square foot. Rafters, joists, or other framing may not be included in the surface weight calculation.

F. Ceilings

1. Gypsum board or plaster ceilings at least 5/8 inch thick shall be provided where required by Section 4, E-2. Ceilings shall be substantially airtight, with a minimum number of penetrations.

2. Glass fiber or mineral wool insulation providing at least R-19 shall be provided above the ceiling between joists.

G. Floors

The floor of the lowest occupied rooms shall be slab on fill, below grade, or over a fully enclosed basement or crawlspace. All door and window openings in the fully enclosed basement shall **be tightly** fitted. If the basement is used as a habitable living area (as a recreation area, study, or additional sleeping area, for example), the doors and windows shall conform to the requirements stated in this regulation.

H. Ventilation

1. A mechanical ventilation system shall be installed that will provide the minimum air circulation and fresh air supply requirements for various uses in occupied rooms as specified in the Ohio Building Code, without the need to open any windows, doors, or other openings to the exterior.

2. Gravity vent openings in attic shall not exceed code minimum in number and size. The openings shall be fitted with transfer ducts at least 3 feet in length containing internal sound-absorbing duct lining. Each duct shall have at least one lined 90-degree bend in the duct such that there is no direct line-of-sight from the exterior through the duct into the attic.

3. If a fan is used for forced ventilation, the attic inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20-gauge steel, which shall be lined with one-inch-thick coated glass fiber, and shall be at least 5 feet long with at least one 90-degree bend.

4. All vent ducts connecting the interior space to the outdoors shall contain at least a 10-foot length of internal sound-absorbing duct lining. Each duct shall have at least one lined 90-degree bend in the duct such that there is no direct line-of-sight through the duct from the venting cross-section to the room opening cross-section.

5. Duct lining shall be coated glass fiber duct liner at least one inch thick.

6. Domestic range exhaust hoods should incorporate a filtered, air re-circulation system rather than ducting to the exterior. Other kitchen exhaust ducts to the exterior shall contain a baffle plate across the exterior termination which allows proper ventilation. The dimensions of the baffle plate should extend at least one diameter beyond the line-of-sight into the vent duct. The baffle plate shall be of the same material and thickness as the vent duct material.

7. Building heating units with flues or combustion air vents shall be located in a closet, attached garage, or other room closed off from the occupied space by doors. There shall be no louvers communicating between the HVAC unit room and occupied spaces.

8. Doors between occupied space and attached garage or mechanical equipment areas shall be solid core wood or 20-gauge steel hollow metal at least 1¾ inches thick and shall be fully weather-stripped.

APPENDIX D: Maximum Noise Level (Lmax) Comparisons

Maximum Noise Levels of A-10, A-4, and F-18 Aircraft –A-Weighted Decibels

DISTANCE	A-10A AIR TO GROUND LMAX	A-4C AIR TO GROUND LMAX	F-18 AIR TO GROUND LMAX
200	110.1	130.1	126.9
250	107.9	127	124.2
315	105.6	123.8	121.5
400	103.3	120.6	118.7
500	100.9	117.5	116
630	98.4	114.5	113.3
800	95.8	111.6	110.7
1000	93.2	108.7	108
1250	90.4	105.8	105.3
1600	87.6	102.8	102.6
2000	84.6	99.8	99.8
2500	81.5	96.6	96.9
3150	78.4	93.2	93.8
4000	75.1	89.7	90.7
5000	71.7	85.9	87.4
6300	68.2	81.7	84
8000	64.5	77.1	80.4
10000	60.7	72.1	76.6
12500	56.7	66.4	72.6
16000	52.4	60.1	68.3
20000	47.9	53	63.8
25000	43.1	45.3	59

APPENDIX E

Discussion of Noise and Its Effect on the Environment

E.1 NOISE

E.1.1 General

Noise, often defined as unwanted sound, is one of the most common environmental issues associated with aircraft operations. Of course, aircraft are not the only sources of noise in an urban or suburban surrounding, where interstate and local roadway traffic, rail, industrial, and neighborhood sources also intrude on the everyday quality of life. Nevertheless, aircraft are readily identifiable to those affected by their noise and are typically singled out for special attention and criticism. Consequently, aircraft noise problems often dominate analyses of environmental impacts.

Sound is a physical phenomenon consisting of minute vibrations which travel through a medium, such as air, and are sensed by the human ear. Whether that sound is interpreted as pleasant (for example, music) or unpleasant (for example, aircraft noise) depends largely on the listener's current activity, past experience, and attitude toward the source of that sound. It is often true that one person's music is another person's noise.

The measurement and human perception of sound involves two basic physical characteristics – intensity and frequency. Intensity is a measure of the acoustic energy of the sound vibrations and is expressed in terms of sound pressure. The higher the sound pressure, the more energy carried by the sound and the louder the perception of that sound. The second important physical characteristic is sound frequency which is the number of times per second the air vibrates or oscillates. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches.

The loudest sounds which can be detected comfortably by the human ear have intensities which are 1,000,000,000,000 times larger than those of sounds which can just be detected. Because of this vast range, any attempt to represent the intensity of sound using a linear scale becomes very unwieldy. As a result, a logarithmic unit known as the decibel (abbreviated dB) is used to represent the intensity of a sound. Such a representation is called a sound level.

A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above about 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

Because of the logarithmic nature of the decibel unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are useful in dealing with sound levels. First, if a sound's

intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example:

60 dB + 60 dB = 63 dB, and

80 dB + 80 dB = 83 dB.

The total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

Because the addition of sound levels behaves differently than that of ordinary numbers, such addition is often referred to as "decibel addition" or "energy addition". The latter term arises from the fact that what we are really doing when we add decibel values is first converting each decibel value to its corresponding acoustic energy, then adding the energies using the normal rules of addition, and finally converting the total energy back to its decibel equivalent.

An important facet of decibel addition arises later when the concept of time-average sound levels is introduced to explain Day-Night Average Sound Level. Because of the logarithmic units, the time-average sound level is dominated by the louder levels which occur during the averaging period. As a simple example, consider a sound level which is 100 dB and lasts for 30 seconds, followed by a sound level of 50 dB which also lasts for 30 seconds. The time-average sound level over the total 60-second period is 97 dB, not 75 dB.

The minimum change in the sound level of individual events which an average human ear can detect is about 3 dB. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, and this relation holds true for loud sounds and for quieter sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound intensity but only a 50 percent decrease in perceived loudness because of the nonlinear response of the human ear (similar to most human senses).

Sound frequency is measured in terms of cycles per second (cps), or hertz (Hz), which is the preferred scientific unit for cps. The normal human ear can detect sounds which range in frequency from about 20 Hz to about 15,000 Hz. All sounds in this wide range of frequencies, however, are not heard equally well by the human ear, which is most sensitive to frequencies in the 1000 to 4000 Hz range. In measuring community noise, this frequency dependence is taken into account by adjusting the very high and very low frequencies to approximate the human ear's lower sensitivity to those frequencies. This is called "A-weighting" and is commonly used in measurements of community environmental noise.

Sound levels measured using A-weighting are most properly called A-weighted sound levels while sound levels measured without any frequency weighting are most properly called sound levels. However, since most environmental impact analysis documents deal only with A-weighted sound levels, the adjective "A-weighted" is often omitted, and A-weighted sound levels are referred to simply as sound levels. In some instances, the author will indicate that the levels have been A-weighted by using the abbreviation dBA or dB(A),

rather than the abbreviation dB, for decibel. As long as the use of A-weighting is understood to be used, there is no difference implied by the terms "sound level" and "A-weighted sound level" or by the units dB, dBA, and dB(A).

In this document all sound levels are A-weighted sound levels and the adjective "A-weighted" has been omitted.

Sound levels do not represent instantaneous measurements but rather averages over short periods of time. Two measurement time periods are most common – one second and one-eighth of a second. A measured sound level averaged over one second is called a slow response sound level; one averaged over one-eighth of a second is called a fast response sound level. Most environmental noise studies use slow response measurements, and the adjective "slow response" is usually omitted. It is easy to understand why the proper descriptor "slow response A-weighted sound level" is usually shortened to "sound level" in environmental impact analysis documents.

A.1.2 Noise Metrics

A "metric" is defined as something "of, involving, or used in measurement." As used in environmental noise analyses, a metric refers to the unit or quantity which quantitatively measures the effect of noise on the environment. Noise studies have typically involved a confusing proliferation of noise metrics as individual researchers have attempted to understand and represent the effects of noise. As a result, past literature describing environmental noise or environmental noise abatement has included many different metrics.

Recently, however, various federal agencies involved in environmental noise mitigation have agreed on common metrics for environmental impact analysis documents, and both the Department of Defense and the Federal Aviation Administration have specified those which should be used for federal aviation noise assessments. These metrics are as follows.

A.1.2.1 Maximum Sound Level

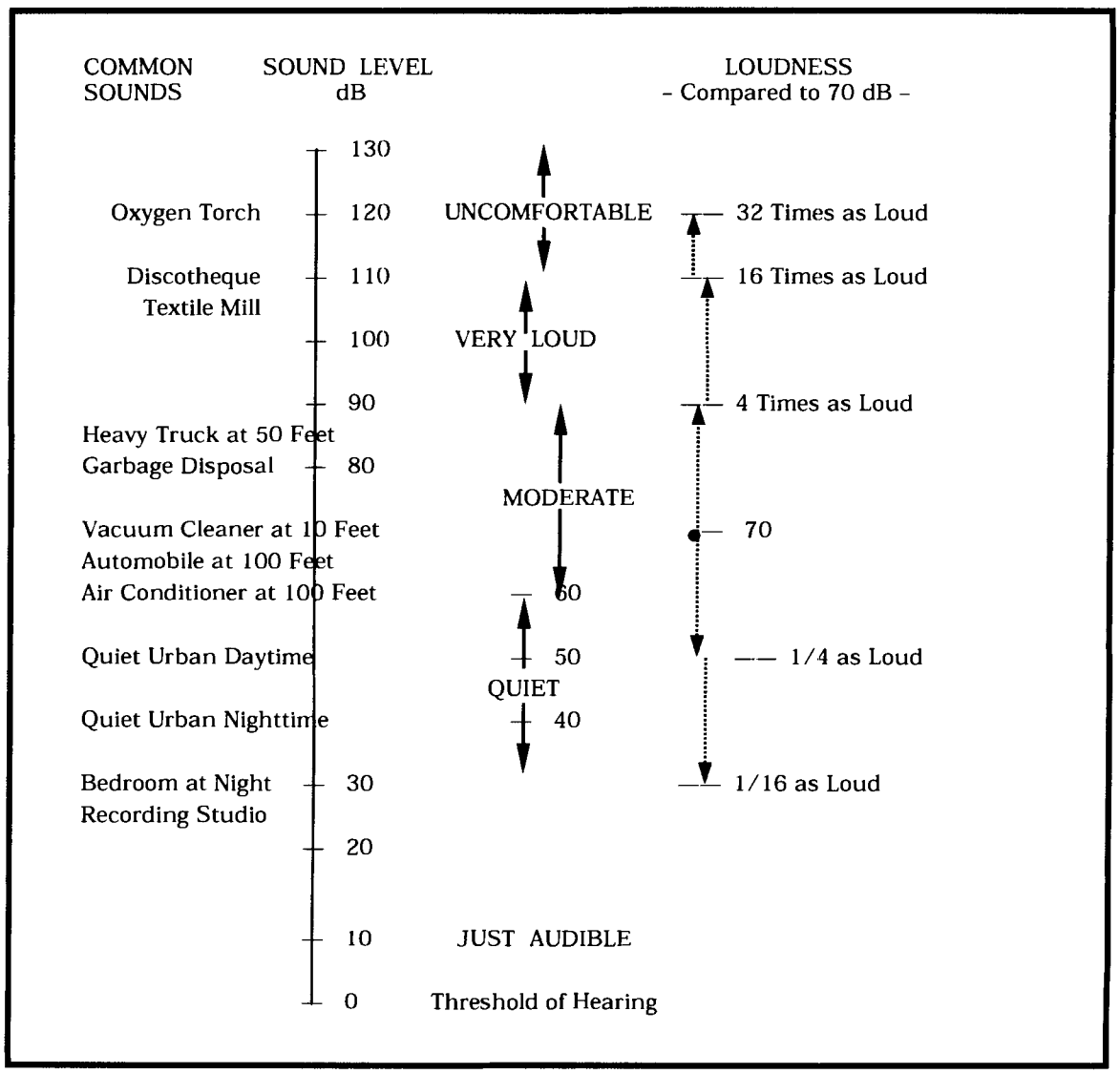
The highest A-weighted sound level measured during a single event in which the sound level changes value as time goes on (e.g., an aircraft overflight) is called the maximum A-weighted sound level or maximum sound level, for short. It is usually abbreviated by ALM, L_{max} or L_{Amax}.

The maximum sound levels of typical events are shown in Figure E-1. The maximum sound level is important in judging the interference caused by a noise event with conversation, TV or radio listening, sleep, or other common activities.

A.1.2.2 Sound Exposure Level

Individual time-varying noise events have two main characteristics – a sound level which changes throughout the event and a period of time during which the event is heard. Although the maximum sound level, described above, provides some measure of the

intrusiveness of the event, it alone does not completely describe the total event. The period of time during which the sound is heard is also significant. The Sound Exposure Level (abbreviated SEL or L_{AE}) combines both of these characteristics into a single metric.



Source: *Handbook of Noise Control*, C.M. Harris, Editor, McGraw-Hill Book Co., 1979, and Ref. E5.

Figure E-1. Typical A-Weighted Sound Levels of Common Sounds.

Sound Exposure Level is a logarithmic measure of the total acoustic energy transmitted to the listener during the event. Mathematically, it represents the sound level of the constant sound that would, in one second, generate the same acoustic energy as did the actual time-varying noise event. Since aircraft overflights usually last longer than one second, the

Sound Exposure Level of an overflight is usually greater than the maximum sound level of the overflight.

Note that sound exposure level is a composite metric which represents both the intensity of a sound and its duration. It does not directly represent the sound level heard at any given time, but rather provides a measure of the net impact of the entire acoustic event. It has been well established in the scientific community that Sound Exposure Level measures this impact much more reliably than just the maximum sound level.

Because the Sound Exposure Level and the maximum sound level are both A-weighted sound levels expressed in decibels, there is sometimes confusion between the two, so the specific metric used should be clearly stated.

A.1.2.3 Day-Night Average Sound Level

Time-average sound levels are measurements of sound levels which are averaged over a specified length of time. These levels provide a measure of the average sound energy during the measurement period.

For the evaluation of community noise effects, and particularly aircraft noise effects, the Day-Night Average Sound Level (abbreviated DNL or L_{dn}) is used. Day-Night Average Sound Level averages aircraft sound levels at a location over a complete 24-hour period, with a 10-decibel adjustment added to those noise events which take place between 10:00 p.m. and 7:00 a.m. (local time) the following morning. This 10-decibel "penalty" represents the added intrusiveness of sounds which occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient sound levels during nighttime are typically about 10 dB lower than during daytime hours.

Ignoring the 10-decibel nighttime adjustment for the moment, Day-Night Average Sound Level may be thought of as the continuous A-weighted Sound Level which would be present if all of the variations in sound level which occur over a 24-hour period were smoothed out so as to contain the same total sound energy.

Day-Night Average Sound Level provides a single measure of overall noise impact, but does not provide specific information on the number of noise events or the individual sound levels which occur during the day. For example, a Day-Night Average Sound Level of 65 dB could result from a very few noisy events, or a large number of quieter events.

As noted earlier for Sound Exposure Level, Day-Night Average Sound Level does not represent the sound level heard at any particular time, but rather represents the total sound exposure. Scientific studies and social surveys which have been conducted to appraise community annoyance to all types of environmental noise have found the Day-Night Average Sound Level to be the best measure of that annoyance. Its use is endorsed by the scientific community (References E1 through E5).

There is, in fact, a remarkable consistency in the results of attitudinal surveys about aircraft noise conducted in different countries to find the percentages of groups of people who express various degrees of annoyance when exposed to different levels of Day-Night Average Sound Level. This is illustrated in Figure E-2, which summarizes the results of a

large number of social surveys relating community responses to various types of noises, measured in Day-Night Average Sound Level.

Reference E6, from which Figure E-2 was taken, was published in 1978. A more recent study has reaffirmed this relationship (Reference E7). In general, correlation coefficients of 0.85 to 0.95 are found between the percentages of groups of people highly annoyed and the level of average noise exposure. The correlation coefficients for the annoyance of individuals are relatively low, however, on the order of 0.5 or less. This is not surprising, considering the varying personal factors which influence the manner in which individuals react to noise. Nevertheless, findings substantiate that community annoyance to aircraft noise is represented quite reliably using Day-Night Average Sound Level.

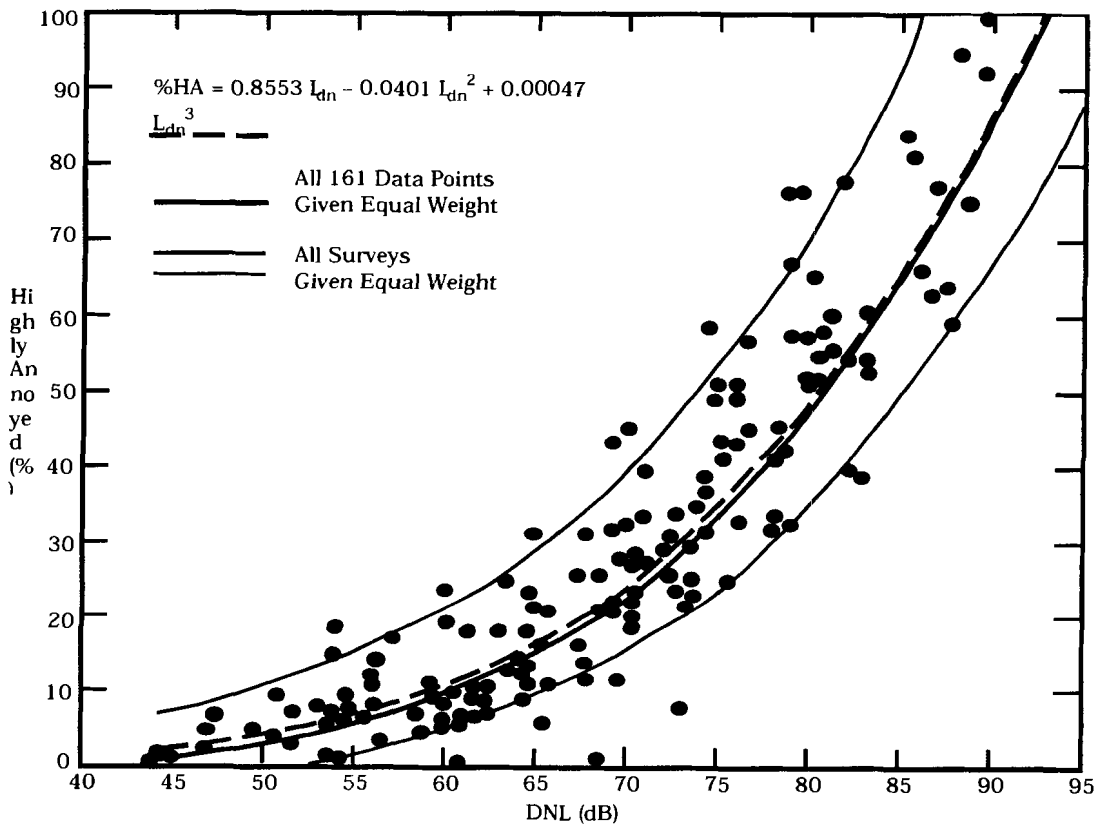


Figure E-2. Community Surveys of Noise Annoyance. (Reference E6.)

This relation between community annoyance and time-average sound level has been confirmed, even for infrequent aircraft noise events. Reference E8 reported the reactions of individuals in a community to daily helicopter overflights, ranging from one to 32 per day. The stated reactions to infrequent helicopter overflights correlated quite well with the daily time-average sound levels over this range of numbers of daily noise events.

The use of Day-Night Average Sound Level has been criticized recently as not accurately representing community annoyance and land-use compatibility with aircraft noise. Much of that criticism stems from a lack of understanding of the basis for the measurement or calculation of L_{dn} . One frequent criticism is based on the inherent feeling that people react more to single noise events and not as much to "meaningless" time-average sound levels.

In fact, a time-average noise metric, such as L_{dn} , takes into account both the noise levels of all individual events which occur during a 24-hour period and the number of times those events occur. As described briefly above, the logarithmic nature of the decibel unit causes the noise levels of the loudest events to control the 24-hour average.

As a simple example of this characteristic, consider a case in which only one aircraft overflight occurs in daytime during a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The Day-Night Average Sound Level for this 24-hour period is 65.5 dB. Assume, as a second example, that ten such 30-second overflights occur in daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The Day-Night Average Sound Level for this 24-hour period is 75.4 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events. This is the basic concept of a time-average sound metric, and specifically the Day-Night Average Sound Level.

E.1.2.4 Onset-Rate Adjusted Day-Night Average Sound Level

Aircraft operations along low-altitude Military Training Routes (MTRs) and in Military Operating Areas (MOAs) and Restricted Areas/Ranges generate a noise environment different from other community noise environments. Overflights can be highly sporadic, ranging from many (e.g., ten per hour) to few (less than one per week). This situation differs from most community noise environments in which noise tends to be continuous or patterned.

Individual military overflight events also differ from typical community noise events, because of the low-altitude and high-airspeed characteristics of military aircraft. These characteristics result in aircraft that exhibit a rate of increase in sound level (onset rate) of up to 30 dB per second. The Day-Night Average Sound Level metric is adjusted to account for the "surprise" effect of the onset rate of aircraft noise on humans with an adjustment ranging up to 11 dB added to the normal Sound Exposure Level (Reference E9). Onset rates between 15 to 150 dB per second require an adjustment of from 0 to 11 dB, while onset rates below 15 dB per second require no adjustment. The adjusted Day-Night Average Sound Level is designated as Onset-Rate Adjusted Day-Night Average Sound Level (abbreviated L_{dnr}). Because of the sporadic occurrences of aircraft overflights along MTRs, in MOAs and Restricted Areas/Ranges, the number of average daily operations is

determined from the calendar month with the highest number of operations in each area. This monthly average is denoted L_{dnmr}.

E.2 NOISE EFFECTS

E.2.1 Hearing Loss

Noise-induced hearing loss is probably the best defined of the potential effects of human exposure to excessive noise. Federal workplace standards for protection from hearing loss allow a time-average level of 90 dB over an 8-hour work period, or 85 dB averaged over a 16-hour period. Even the most protective criterion (no measurable hearing loss for the most sensitive portion of the population at the ear's most sensitive frequency, 4000 Hz, after a 40-year exposure) suggests a time-average sound level of 70 dB over a 24-hour period. Since it is unlikely that airport neighbors will remain outside their homes 24 hours per day for extended periods of time, there is little possibility of hearing loss below a Day-Night Average Sound Level of 75 dB, and this level is extremely conservative.

E.2.2 Nonauditory Health Effects

Nonauditory health effects of long-term noise exposure, where noise may act as a risk factor, have never been found to occur at levels below those protective against noise-induced hearing loss, described above. Most studies attempting to clarify such health effects have found that noise exposure levels established for hearing protection will also protect against any potential nonauditory health effects, at least in workplace conditions. The best scientific summary of these findings is contained in the lead paper at the National Institutes of Health Conference on Noise and Hearing Loss, held on 22–24 January 1990 in Washington, D.C.:

"The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an eight-hour day). As presented at the 1988 International Congress on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss, and even above these criteria, results regarding such health effects were ambiguous. Consequently, one comes to the conclusion that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem but also any potential nonauditory health effects in the work place." (Reference E10; parenthetical wording added for clarification.)

Although these findings were directed specifically at noise effects in the work place, they are equally applicable to aircraft noise effects in the community environment. Research studies regarding the nonauditory health effects of aircraft noise are ambiguous, at best, and often contradictory. Yet, even those studies which purport to find such health effects use time-average noise levels of 75 dB and higher for their research.

For example, in an often-quoted paper, two UCLA researchers apparently found a relation between aircraft noise levels under the approach path to Los Angeles International Airport (LAX) and increased mortality rates among the exposed residents by using an average noise exposure level greater than 75 dB for the "noise-exposed" population (Reference E11). Nevertheless, three other UCLA professors analyzed those same data and found no relation between noise exposure and mortality rates (Reference E12).

As a second example, two other UCLA researchers used this same population near LAX to show a higher rate of birth defects in 1970–1972 when compared with a control group residing away from the airport (Reference E13). Based on this report, a separate group at the U.S. Centers for Disease Control performed a more thorough study of populations near Atlanta's Hartsfield International Airport (ATL) for 1970–1972 and found no relation in their study of 17 identified categories of birth defects to aircraft noise levels above 65 dB (Reference E14).

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft time-average sound levels below 75 dB.

E.2.3 Annoyance

The primary effect of aircraft noise on exposed communities is one of annoyance. Noise annoyance is defined by the U.S. Environmental Protection Agency as any negative subjective reaction on the part of an individual or group (Reference E3). As noted in the discussion of Day-Night Average Sound Level above, community annoyance is best measured by that metric.

It is often suggested that a lower Day-Night Average Sound Level, such as 60 or 55 dB, be adopted as the threshold of community noise annoyance for airport environmental analysis documents. While there is no technical reason why a lower level cannot be measured or calculated for comparison purposes, a Day-Night Average Sound Level of 65 dB:

1. provides a valid basis for comparing and assessing community noise effects,
2. represents a noise exposure level which is normally dominated by aircraft noise and not other community or nearby highway noise sources, and
3. reflects the FAA's threshold for grant-in-aid funding of airport noise mitigation projects.

The U.S. Department of Housing and Urban Development also established a Day-Night Average Sound Level standard of 65 dB for eligibility for federally guaranteed home loans.

For this environmental study, levels of Day-Night Average Sound Level equal to and greater than 65 dB were used for assessing community noise impact.

E.2.4 Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. The disruption of routine activities such as radio or television listening, telephone use, or family conversation gives rise to frustration and agravation. The quality of speech communication is also important in classrooms, offices, and industrial settings and can cause fatigue and vocal strain in those who attempt to communicate over the noise. Research has shown that "whenever intrusive noise exceeds approximately 60 dB indoors, there will be interference with speech communication" (Reference E5).

Indoor speech interference, per Reference E3, can be expressed as a percentage of sentence intelligibility among two people speaking in relaxed conversation approximately 1 meter apart in a typical* living room or bedroom. The percentage of sentence intelligibility is a non-linear function of the (steady) indoor background A-weighted sound level as shown in Figure E-3. This curve was digitized and curve-fitted for the purposes of this appendix. Such a curve-fit yields 100 percent sentence intelligibility for background

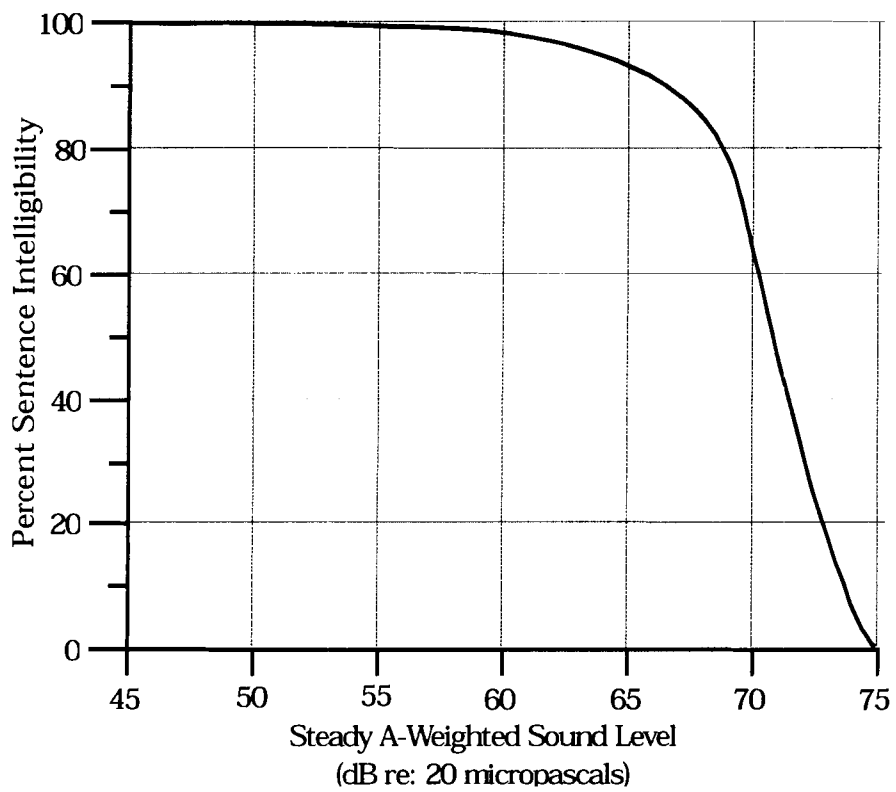


Figure E-3. Percent Sentence Intelligibility (Reference E3)

* "Typical" is defined as a room with about 300 sabins of sound absorption which, according to Reference E3, is representative of living rooms and bedrooms.

levels below 57 dB and yields less than 10 percent intelligibility for background levels above 73 dB. Note that the function is especially sensitive to changes in sound level between 65 dB and 75 dB. As an example of the sensitivity, a 1 dB increase in background sound level from 70 dB to 71 dB yields a 14 percent decrease in sentence intelligibility.

Sleep disturbance is another source of annoyance associated with aircraft noise. This is especially true because of the intermittent nature and content of aircraft noise, which is more disturbing than continuous noise of equal energy and neutral meaning.

Sleep disturbance can be measured in either of two ways. "Arousal" represents awakening from sleep, while a change in "sleep stage" represents a shift from one of four sleep stages to another stage of lighter sleep without awakening. In general, arousal requires a higher noise level than does a change in sleep stage.

In terms of average daily noise levels, some guidance is available to judge sleep disturbance. The U.S. Environmental Protection Agency identified an indoor DNL of 45 dB as necessary to protect against sleep interference (Reference E3). Assuming a conservative structural noise insulation of 20 dB for typical dwellings, 45 dB corresponds to an outdoor DNL of 65 dB as minimizing sleep interference.

In June 1997, the Federal Interagency Committee on Aviation Noise (FICAN) reviewed the sleep disturbance issue and presented a sleep disturbance dose-response prediction curve (Reference E15), which was based on data from field studies in References E16 through E19, as the recommended tool for analysis of potential sleep disturbance for residential areas. Figure E4 shows this curve which, for an indoor Sound Exposure Level of 60 dB, predicts that a maximum of approximately 5 percent of the residential populaton exposed are expected to be behaviourally awakened. FICAN cautions that this curve should only be pplied to long-term adult residents.

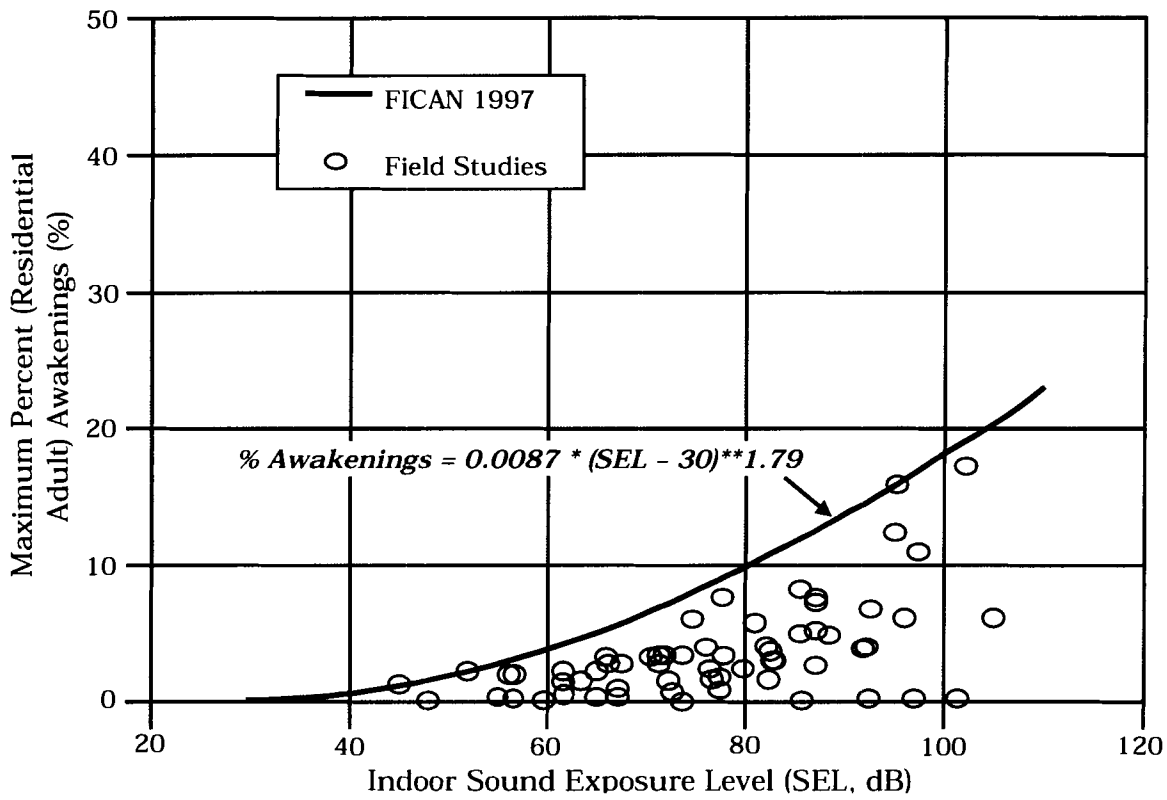


Figure E-4. Sleep-disturbance Dose-response Relationship

E.2.6 Noise Effects on Domestic Animals and Wildlife

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include nonauditory effects similar to those exhibited by humans – stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines.

Many scientific studies regarding the effects of noise on wildlife and some anecdotal reports of wildlife "flight" due to noise are available. Few of these studies or reports include any reliable measures of the actual noise levels involved.

In the absence of definitive data on the effect of noise on animals, the Committee on Hearing, Bioacoustics, and Biomechanics of the National Research Council has proposed that protective noise criteria for animals be taken to be the same as for humans (Reference E16).

E.2.7 Effects on Noise-Induced Vibration Structures and Humans

The sound from an aircraft overflight travels from the exterior to the interior of the house in one of two ways: through the solid structural elements and directly through the air. Figure E-5 illustrates the sound transmission through a wall constructed with a brick exterior, stud framing, interior finish wall, and absorbent material in the cavity. The sound transmission starts with noise impinging on the wall exterior. Some of this sound energy will be reflected away, and some will make the wall vibrate. The vibrating wall radiates sound into the airspace, which in turn sets the interior finish surface vibrating, with some energy lost in the airspace. This surface then radiates sound into the dwelling interior. As the figure shows, vibrational energy also bypasses the air cavity by traveling through the studs and edge connections.

Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally sufficient to determine the possibility of damage. In general, at sound levels above 130 dB, there is the possibility of structural damage. While certain frequencies (such as 30 hertz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (Reference E20).

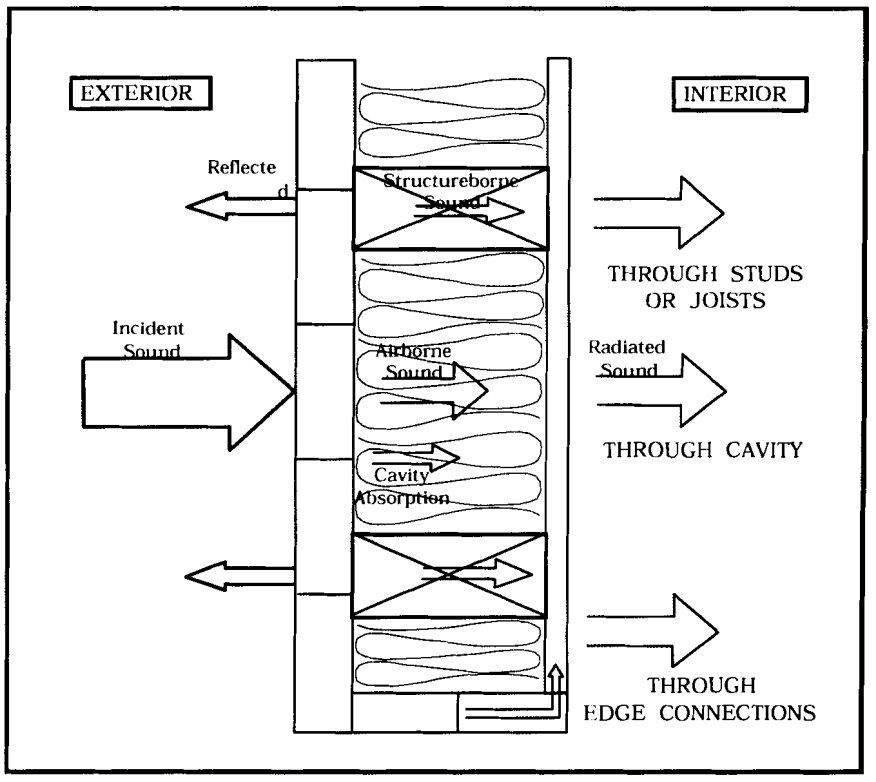


Figure E-5. Pictorial Representation of Sound Through Built Construction.

In terms of average acceleration of wall or ceiling vibration, the thresholds for structural damage (Reference E18) are:

- 0.5 m/s/s – is the threshold of risk of damage to sensitive structures (i.e., ancient monuments, etc.).
- 1.0 m/s/s – is the threshold of risk of damage to normal dwellings (i.e., houses with plaster ceiling and walls).

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or "rattle", of objects within the dwelling – hanging pictures, dishes, plaques, and bric-a-brac. Loose window panes may also vibrate noticeably when exposed to high levels of airborne noise, causing homeowners to fear breakage. In general, such noise-induced vibrations occur at sound levels above those considered normally compatible with residential land use. Thus assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

In the assessment of vibration on humans, the following factors determine if a person will perceive and possibly react to building vibrations:

1. Type of excitation: steady state, intermittent, or impulsive vibration.
2. Frequency of the excitation. ISO 2631-2 (Reference E21) recommends a frequency range of 1 to 80 Hz for the assessment of vibration on humans.
3. Orientation of the body with respect to the vibration.
4. The use of the occupied space (i.e., residential, workshop, hospital).
5. Time of day.

Table E-1 lists the whole-body vibration criteria from Reference E21 for one-third octave frequency bands from 1 to 80 Hz.

Table E-1

Vibration Criteria for the Evaluation of Human Exposure to Whole-Body Vibration

Frequency (Hz)	RMS Acceleration (m/s/s)		
	Combined Criteria Base Curve	Residential Night	Residential Day
1	0.0036	0.0050	0.0072
1.25	0.0036	0.0050	0.0072
1.6	0.0036	0.0050	0.0072
2	0.0036	0.0050	0.0072
2.5	0.0037	0.0052	0.0074
3.15	0.0039	0.0054	0.0077
4	0.0041	0.0057	0.0081
5	0.0043	0.0060	0.0086
6.3	0.0046	0.0064	0.0092
8	0.0050	0.0070	0.0100
10	0.0063	0.0088	0.0126
12.5	0.0078	0.0109	0.0156
16	0.0100	0.0140	0.0200
20	0.0125	0.0175	0.0250
25	0.0156	0.0218	0.0312
31.5	0.0197	0.0276	0.0394
40	0.0250	0.0350	0.0500
50	0.0313	0.0438	0.0626
63	0.0394	0.0552	0.0788
80	0.0500	0.0700	0.1000

Source: Reference E18.

E.2.8 Noise Effects on Terrain

It has been suggested that noise levels associated with low-flying aircraft may affect the terrain under the flight path by disturbing fragile soil or snow structures, especially in mountainous areas, causing landslides or avalanches. There are no known instances of such effects, and it is considered improbable that such effects will result from routine, subsonic aircraft operations.

E.2.9 Noise Effects on Historical and Archaeological Sites

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, aircraft noise may affect such sites more severely than newer, modern structures. Again, there are few scientific studies of such effects to provide guidance for their assessment.

One study involved the measurements of sound levels and structural vibration levels in a superbly restored plantation house, originally built in 1795, and now situated approximately 1,500 feet from the centerline at the departure end of Runway 19L at Washington Dulles International Airport (IAD). These measurements were made in connection with the proposed scheduled operation of the supersonic Concorde airplane at Dulles (Reference E22). There was special concern for the building's windows, since roughly half of the 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning.

As noted above for the noise effects of noise-induced vibrations of normal structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

E.3 REFERENCES

E1. "Sound Level Descriptors for Determination of Compatible Land Use," American National Standards Institute Standard ANSI S3.23-1980.

E2. "Quantities and Procedures for Description and Measurement of Environmental Sound, Part 1," American National Standards Institute Standard ANSI S12.9-1988.

E3. "Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare With an Adequate Margin of Safety," U.S. Environmental Protection Agency Report 550/9-74-004, March 1974.

E4. "Guidelines for Considering Noise in Land-Use Planning and Control," Federal Interagency Committee on Urban Noise, June 1980.

E5. "Federal Agency Review of Selected Airport Noise Analysis Issues," Federal Interagency Committee on Noise, August 1992.

E6. Schultz, T.J., "Synthesis of Social Surveys on Noise Annoyance," *J. Acoust. Soc. Am.*, *64*, 377-405, August 1978.

E7. Fidell, S., Barger, D.S., and Schultz, T.J., "Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise," *J. Acoust. Soc. Am.*, *89*, 221-233, January 1991.

E8. "Community Reactions to Helicopter Noise: Results From an Experimental Study," *J. Acoust. Soc. Am.*, *82*, 479-492, August 1987.

E9. Stusnick, E., and Bradley, K.A., "The Effect of Onset Rate on Aircraft Noise Annoyance. Volume 2: Rented Home Experiment", AL/OE-TR-1993-0170, October 1992.

E10. von Gierke, H.R., "The Noise-Induced Hearing Loss Problem", NIH Consensus Development Conference on Noise and Hearing Loss, Washington, D.C., 22–24 January 1990.

E11. Meacham, W.C., and Shaw, N., "Effects of Jet Noise on Mortality Rates," *British J. Audiology*, 77-80, August 1979.

E12. Frericks, R.R., *et al.*, "Los Angeles Airport Noise and Mortality: Faulty Analysis and Public Policy," *Am. J. Public Health*, 357-362, April 1980.

E13. Jones, F.N., and Tauscher, J., "Residence Under an Airport Landing Pattern as a Factor in Teratism", *Archives of Environmental Health*, 10-12, January/ February 1978.

E14. Edmonds, L.D., *et al.*, "Airport Noise and Teratogenesis," *Archives of Environmental Health*, 243-247, July/August 1979.

E15. "Federal Interagency Committee on Aviation Noise (FICAN) Effects of Aviation Noise on Awakenings From Sleep", June 1997.

E16. Pearsons, K.S., Barber, D.S., and Tabachick, B.G., "Analyses of the Predictability of Noise-Induced Sleep Disturbance," USAF Report HSD-TR-89-029, October 1989.

E17. Ollerhead, J.B., Jones, C.J., Cadous, R.E., Woodley, A., Atkinson, B.J., Horne, J.A., Pankhurst, F., Reyner, L., Hume, K.I., Van, F., Watson, A., Diamond, I.D., Egger, P., Holmes, D., and McKean, J., *Report of a Field Study of Aircraft Noise and Sleep Disturbance*, London: Department of Safety, Environment and Engineering, 1992.

E18. Fidell, S., Pearsons, K., Howe, R., Tabachnick, B., Silvati, L., and Barber, D.S., "Noise-Induced Sleep Disturbance in Residential Settings", AL/OE-TR-1994-0131, Wright Patterson AFB, OH, Armstrong Laboratory, Occupational & Environmental Health Division, 1994.

E19. Fidell, S., Howe, R., Tabachnick, B., Pearsons, K., and Sneddon, M., "Noise-Induced Sleep Disturbance in Residences Near Two Civil Airports", Langley Research Center, 1995.

E20. von Gierke, H.E., and Ward, W.D., "Criteria for Noise and Vibration Exposure", *Handbook of Acoustical Measurements and Noise Control*, Third Edition, 1991.

E21. "Evaluation of Human Exposure to Whole-Body Vibration – Part 2: Continuous and Shock-Induced Vibration in Buildings (1 to 80 Hz)", International Organization for Standardization, Standard 2631-2, February 1989.

E22. Wesler, J.E., "Concorde Operations At Dulles International Airport," NOISEXPO '77, Chicago, IL, March 1977.

APPENDIX F: Environmental Restoration Program

Based on joint guidelines issued by the Department of Defense and the United States Environmental Protection Agency (EPA), a Restoration Advisory Board (RAB) was established in 1996 at Naval Air Station Joint Reserve Base (NASJRB) and Air Force Reserve Station (ARS), Willow Grove, Pennsylvania to promote public involvement in environmental clean-up activities. The RAB replaced the previous Technical Review Committee (TRC), which was a group composed of Navy and Air Force representatives, their consultants, EPA, the Pennsylvania Department of Environmental Protection (PADEP), and representatives of local government who met periodically to discuss facility environmental developments. The RAB includes those agencies, but also encourages participation by community residents, business people, and representatives of civic groups. The RAB's intent is to bring together community members who reflect the diverse interests of the local community to promote direct two-way communication between the local community and the facility.

Since August 1996, the RAB has met quarterly to receive updates on Navy and Air Force IRP activities. Active RAB members receive reminders of upcoming RAB meetings in the mail as well as environmental program documents for review. RAB meetings, which are advertised in local newspapers, are open to the public and community members are encouraged to attend. Since the inception of the RAB, NAS/JRB and ARS, Willow Grove has issued a series of four fact sheets to inform the public and community leaders of its environmental restoration activities. These fact sheets provide information about Navy and Air Force Installation Restoration Program (IRP) activities. The purpose of the IRP is to identify and clean up former waste disposal sites at Department of Defense installations. The status of environmental investigations, clean-up actions, and other IRP developments at NAS/JRB and Air Force Reserve Station, Willow Grove is summarized below.

Environmental Activity

The principal Navy IRP sites include NAS Site I - Privet Road Compound Site 2 – Antenna Field - Landfill, Site 3 - Ninth Street Landfill, Site 5 – Fire Training Area, and Site 10 - Navy Fuel Farm. Figure 1 shows the locations of the Navy IRP sites. Table I summarizes previous investigations and current program status. Principal Air Force sites include ARS Site I - Petroleum, Oil and Lubricants (POL) Area and ARS Site 4 - Aircraft Washrack Area.

Phase II Remedial Investigation (RI)

The Navy conducted Phase II RI field activities in the spring and summer of 1997 at NAS Sites 1, 2, 3, and 5. The goal of the Phase II RI was to fill data gaps identified from previous investigations and collect additional information needed to perform human health and ecological risk assessment for these sites. Field work was completed in August 1997. The Phase II RI Report (draft) was submitted for regulatory review in April 1998. Copies of the Phase II RI report (or the "Executive Summary" of the Phase II RI report) were distributed to RAB members according to their preference. A summary of Phase II RI results was presented to the RAB on September 10, 1998.

Comments from RAB members and partial review comments from EPA have been received. Final disposition of the Phase II RI Report (draft) depends on receipt of final comments from the regulatory community.

Navy Fuel Farm (NAS Site 10)

This site is the location of a fuel spill discovered in 1988. Remedial investigations and pilot clean-up studies were implemented at the site. Since 1997, the Navy has operated a clean-up system consisting of contaminant extraction wells in a network, vacuum pumps to move contaminated liquids and vapor, and a treatment system using liquid-phase activated carbon to capture the contaminants for disposal.

The goal of the cleanup at the Navy Fuel Farm is to remove the spilled fuel from the soil and groundwater in the vicinity of the Navy Fuel Farm Site to reduce potential risks to people and the environment.

Privet Road Compound (NAS Site 1)

Site 1 was formerly used as a waste-handling and transfer station. In response to the findings of the RI, approximately 1,100 tons of soil containing low levels of polychlorinated biphenyls (PCB5) was removed off-station. Soil excavation and removal began on June 2, 1999. Contaminated soil was removed from the excavation area until clean-up confirmation samples taken within the excavation area showed that the remaining soil complied with the strictest clean-up guideline for soil found in residential areas. Clean soil was backfilled into the excavation beginning on August 7, 1999. Final grading and landscaping were

completed in October 1999. The contaminated soil was sent to Clean Earth, of New Castle, Delaware, for thermal treatment and disposal. The Navy plans no further action for PCBs in this area.

Antenna Field Landfill (NAS Site 2)

Site 2 was once used for solid waste disposal. The Phase II RI report concluded that there was no substantial concern from any site conditions to humans, animals or plants residing at the area or passing through. No further action is deemed necessary at Site 2.

Ninth Street Landfill (NAS Site 3)

Site 3 is an area formerly used to dispose of solid waste and conduct salvage yard operations. The Phase II RI report noted concerns with sediments in the pond near this site and with groundwater in the vicinity. The report recommends that further investigation and analysis of options for pond sediments be discussed with the U.S. Government Biological Toxicity Assessment Group (BTAG). For groundwater found to be contaminated with chlorinated solvents, the report recommends additional monitoring well installation, sampling and analysis, and development of a feasibility study (FS) to evaluate remedial options.

Former Fire Training Area (NAS Site 5)

The Site 5 fire training area is a grass-covered and overgrown area where flammable liquids were stored in drums and later burned as part of fire training exercises. The Phase II RI report noted concerns with compounds in surface soils near the former burning area and with groundwater contaminated with chlorinated solvents. The Phase II RI recommended an FS to consider risks from site soils to humans, animals or plants residing at the area or passing through, and to evaluate options for Site 5 groundwater. Informal comments from EPA questioned the extent of the volatile solvent plume in groundwater. EPA also suggested the possibility that chlorinated solvent from the former solvent storage area, located in the northwestern corner of the site, could have moved against the predominant groundwater flow direction to a position up gradient of the main contamination plume.

At the RAB meeting held on June 7, 2000, the Navy described additional monitoring well installation and hydrogeological investigation planned to respond to EPA concerns at Site 5.

Water-Level Studies

At the request of the Navy, the United States Geological Survey (USGS) has performed hydrogeological studies in the general vicinity of NASJRB Willow Grove sites. Water levels facility-wide and in nearby wells were measured to produce a water-level map for the vicinity of the Air Station.

A municipal water supply well owned by Horsham Township [Horsham Township well number 26 (H-26)] is located near NAS Site 5, the (former) Fire Training Area. A temporary shutdown test was performed at H-26 to measure the effects of the shutdown on nearby wells. Measurable impacts on monitoring wells O2MWO1 I at NAS Site 2 and O5MWI 11 at NAS Site 5 were recorded among other less notable effects. The results of this study confirmed the conclusion in the Phase II RI report that contaminated groundwater from Site 5 does not reach off-station water supply wells.

USGS and the Navy also studied water levels, geology, and water quality in the vicinity of two Navy production wells (NW-I and NW-2) located near NAS Site 1. These studies were performed during the replacement of the two Navy water supply pumps in those wells. Both old groundwater supply pumps had been installed over 50 years ago. Replacement of those old pumps enabled the Navy to perform the hydrogeological studies in NW-1 and NW-2 recommended by the Phase II RI report.

Results of the USGS studies were summarized at the June 7, 2000 RAB meeting and were to be documented in a report from USGS autumn of 2000.

Washrack Area Site (ARS Site 4)

The Air Force performed investigations in 1997 at and near the washrack area (an aircraft washing facility where paint stripping has been performed in the past), where residual cleaning solvents such as trichloroethene (TCE) exist in the groundwater. The washrack is part of Site SD-04, which included the washrack, associated structures, an oil/water separator, a trickling filtered, two storage buildings, and a ditch located to the east. Conclusions in the draft source identification report state that:

- Soils at SD-04 are not the source of chlorinated solvents in the groundwater.
- Groundwater flow conditions indicate that Site SD-04 is not the source of chlorinated solvents in the Navy supply wells.
- Site SD-04 is not the source of chlorinated solvents in groundwater.

Final disposition of the draft source identification report depends on the receipt of final comments from the regulatory community.

Air Force POL Area (ARS Site ST-O1)

ARS Site I is the location of leaks and spills of JP-4 and sludge disposal from the POL area, located adjacent to this site prior to 1979. The Air Force is moving ahead with on-base testing and evaluation of methods to remove remaining oil from the fuel spills. A system with a biological treatment approach that utilizes indigenous bacteria, which are enhanced by increasing the available oxygen in the groundwater, was installed on base only in 1998. Pilot-scale tests to evaluate the effectiveness of oxygen release compound (ORC) treatment to promote natural biodegradation were to be completed by the end of the calendar year 2000. Collection and analysis of groundwater samples demonstrate that the plume continues to shrink. A report of findings will follow completion of the pilot test next year. In calendar year 2001, the ORC approach will also be applied to the off-base properties after the new lease/access is obtained for these properties.

Navy Jet Mishap Site

During the Air Show hosted by the Navy in June 2000, there was a mishap involving a Navy F-14 Tomcat off-station near the intersections of Horsham Road and Norristown Road. Sampling and analysis performed by the Navy after the mishap detected fuel-type residues in the soil of the site. Concentrations of fuel compounds found in the surface soil exceeded the most stringent PADEP clean-up criteria for impacts from subsurface soil to groundwater. The Navy proposed a voluntary clean-up and verification program that was accepted by PADEP. Clean up of soils at the site began in July 2000 with Phase I clean-up completed by Fall 2000. Tree planting in the Spring of 2001 completed the Navy response in the area.

UPCOMING ACTIVITIES

- The Navy will prepare and submit a feasibility study (FS) for groundwater at NAS Site 5.
- The Navy will prepare and submit a Preferred Remedial Action Plan (PRAP) recommending no further action (NFA) for soils at NAS Site 1. If approved, then a NFA Record of Decision (ROD) would be pursued.
- The Navy will finalize the RI for NAS Site 2 and initiate discussions with the regulatory community regarding the need for further investigations at NAS Site 3.

- The Navy will continue operation, evaluation and optimization of groundwater remediation at NAS Site 10.
- The Air Force will review the pilot-scale groundwater ORC program results at the POL Area.
- NAS/JRB Willow Grove will perform clean up and verification analysis of fuel in the soil at the F-14 crash site. Landscaping and planting of trees to replace those damaged in the crash will follow cleanup.

Community interest in environmental restoration at NAS/JRB and ARS, Willow Grove continues. The Navy and Air Force consider this interest a positive statement with regards to the role the air station plays in the local community. Through regular meetings of the RAB, it has been possible to engage interested community members in the discussions regarding environmental issues at the air station. In order to inform and thereby involve even more interested community members, periodic fact sheets will be prepared to disseminate the news of IRP activities at NAS/JRB and ARS, Willow Grove.

POINTS OF CONTACT

The Navy point of contact for information regarding the RAB is Mr. Jim Edmond of the NASJRB Willow Grove Environmental Office, at (215) 443-6939. The Navy point of contact for all other environmental issues regarding the NAS/JRB IR program is Mr. Jim Colter, of the Northern Division, Naval Facilities Engineering Command, at (610) 595-0567, extension 163. The Air Force point of contact is Mr. Charanjit Gill, at (215) 443-1105. The Air Force Public Affairs Office contact person is Major Marge McGlinn at (215) 443-1062.

APPENDIX G: ORLANDO, FLORIDA ZONING CODE - AIRCRAFT NOISE OVERLAY DISTRICT

2R. AN AIRCRAFT NOISE OVERLAY DISTRICT

Sec. 58.370. Relationship to the Growth Management Plan.

The AN Aircraft Noise Overlay District implements GMP Transportation Element Objective 1.19 to facilitate proper land use planning and prohibit incompatible land uses in the areas surrounding the Orlando International Airport (OIA) and the Orlando Executive Airport (OEA). GMP Future Land Use Element Policy 2.4.11 also specifies that the City and Greater Orlando Aviation Authority shall work cooperatively to implement the Aircraft Noise and Land Use Control Map concept, which utilizes the AN Overlay district.

(Ord. of 9-16-1991, Doc. #25094; Ord. of 5-20-1996, Doc. #29361; Ord. of 8-23-1999, § 7, Doc. #32283)

Sec. 58.371. Purpose of the District.

The purpose of the Aircraft Noise Overlay District is to protect the health, safety, and welfare of persons and property in the vicinity of the OIA and OEA. Aircraft noise may be considered annoying, objectionable, or unhealthy to residents in the community surrounding the airports. The AN Overlay District is intended to reduce noise and safety hazards associated with aircraft operations, to preserve the operational stability of the airports, and assist in the implementation of policies and recommendations found in the City's Growth Management Plan and in appropriate FAA sponsored Part 150 Studies.

The requirements found in the AN Overlay District are intended to supplement all other zoning districts in which land may be classified, and the various Chapters of the City Code which might impact on aviation and land development, including, but not limited to, safety, fire, building, and health codes. However, to the extent that any provision of this Part conflicts with another code or ordinance, the provisions of this Part shall govern and control.

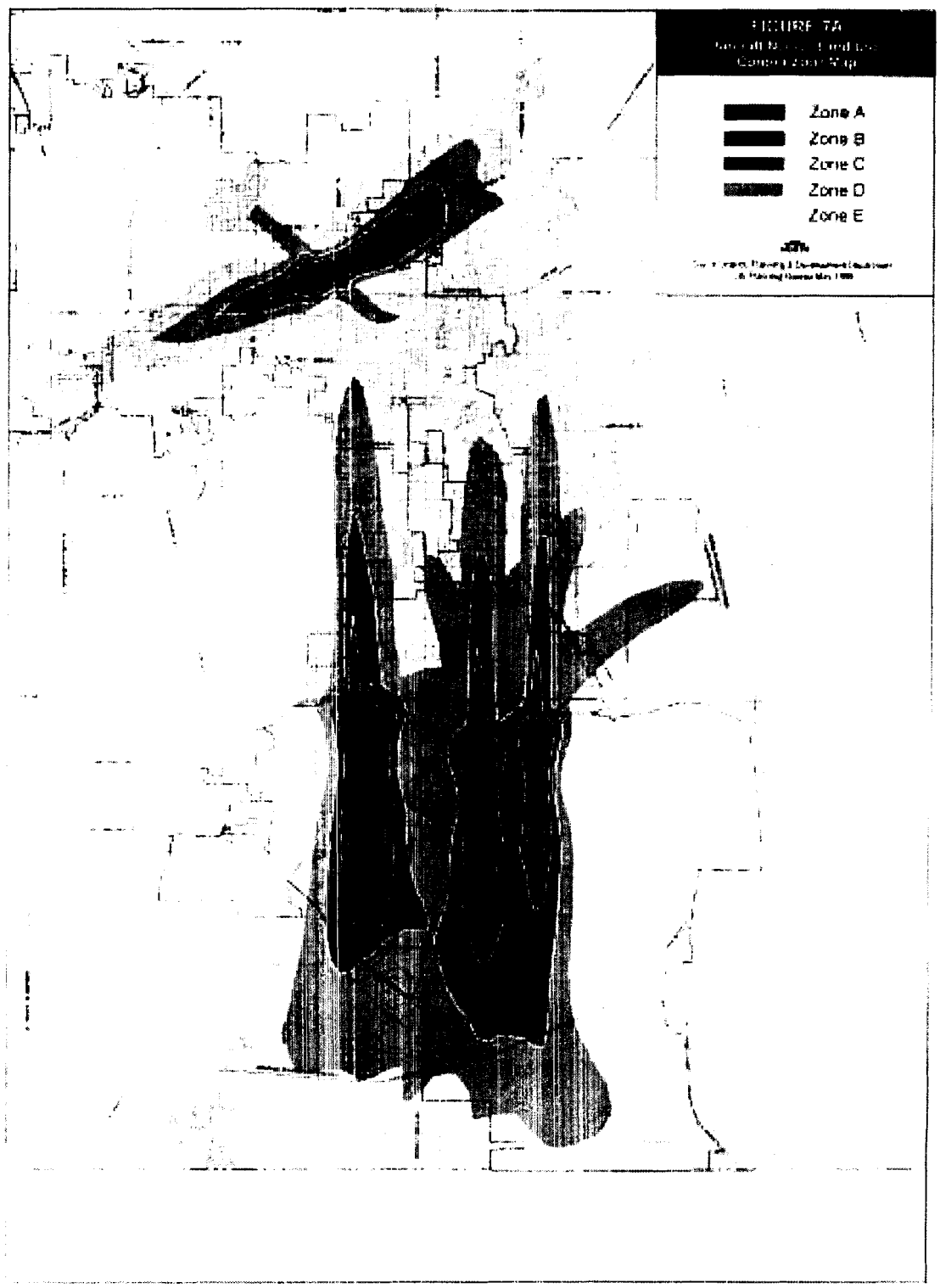


Figure 7a. Aircraft Noise/Land Use Control Zone Map

(Ord. of 9-16-1991, Doc. #25094; Ord. of 5-20-1996, Doc. #29361; Ord. of 8-23-1999, § 9, Doc. #32283)

Sec. 58.372. Establishment of Aircraft Noise/Land Use Control Zones.

Aircraft Noise/Land Use Control Zones - Five separate Aircraft Noise/Land Use Control Zones shall be established as shown on the Aircraft Noise/Land Use Control Zone Map (Figure 7A). The Aircraft Noise/Land Use Control Zones are based on a projection of future noise environments arising from aircraft flight operations at the OIA and OEA, as such environments were defined by FAR Part 150 Studies.

A composite contour was developed to establish the aircraft noise overlay zones. This was accomplished based on land use controls for two noise metrics (DNL and dBA Aircraft Noise Metric). The DNL metric is a day-night sound level used to present cumulative/average long term aircraft noise exposure. The dBA Aircraft Noise Metric is a single event maximum sound level measure used to describe peak noise levels of representative aircraft flyovers as related to speech interference.

Zone A - 75 and greater DNL contour

Zone B - 70 to 75 DNL contour

Zone C - 65 to 70 DNL contour

Zone D - The composite limits of the 60 DNL contour and the 80 dBA Aircraft Noise Metric contour to the 65 DNL contour

Zone E - The composite of the limits of the 55 DNL and the 75 dBA Aircraft Noise Metric contour to the composite limits of the 60 DNL contour and the 80 dBA Aircraft Noise Metric contour.

The boundaries of the AN Overlay District shall be construed as the outer boundary of Zone E, and may be altered by initiation of the City Council or Municipal Planning Board whenever there is a finding that noise impacts have changed, via a FAA Part 150 Study.

Determination of Boundaries. In determining the location of noise zone boundaries on the Aircraft Noise/Land Use Control Zone Map, the following standards shall apply:

1. For platted lots less than one (1) acre in size, where an Aircraft Noise/Land Use Control Zone boundary line enters or crosses said platted parcel, the land use restriction and sound level reduction standards associated with the more stringent Aircraft Noise/Land Use Control Zone shall apply.

2. For platted and unplatted properties greater than 1 acre in size, where an Aircraft Noise/Land Use Control Zone boundary line enters or crosses the parcel, the regulations associated with more than one zone may apply. The City shall utilize the Aircraft Noise/Land Use Control Zone Map over-layed onto a $^{1}/_{8}$th section line map to determine the applicable Aircraft Noise/Land Use Control Zone. The City, in consultation with the Greater Orlando Aviation Authority, shall determine the applicable line of demarcation. If conflicts arise, the City's determination may be appealed to the Municipal Planning Board and City Council.

(Ord. of 9-16-1991, Doc. #25094; Ord. of 8-23-1999, § 11, Doc. #32283)

Secs. 58.373--58.379. Reserved.

Editor's note--Ord. of 8-23-1999, § 12, repealed § 58.373, relative to additional district requirements. Said section was derived from Ord. of 9-16-1991, Doc. #25094.

2S. AIRCRAFT NOISE

Sec. 58.380. Land Use Restrictions.

Applicability of Overlay Zone Controls. Aircraft noise/land use control zone regulations shall not apply to existing residential and non-residential development, noise compatible land uses such as commercial, industrial, and office uses and/or vacant land zoned for such use, or vacant properties zoned for residential use prior to the adoption of this ordinance (unless a proposed modification of the residential zoning would reduce existing noise/land use compatibility).

The regulations prescribed by this Part shall not be construed to require the sound conditioning or other changes or alteration of any pre-existing structure not conforming to this Part as of the effective date of this revision or to otherwise interfere with the continuance of any pre-existing nonconforming use. Nothing in this Part shall require any such change in the construction or alteration of a structure which was begun prior to the effective date of this part and is diligently pursued.

(Ord. of 9-16-1991, Doc. #25094; Ord. of 8-23-1999, § 13, Doc. #32283)

Sec. 58.381. Sound Level Requirements for Structures and Buildings.

The following chart (Figure 7B) summarizes the aircraft noise/land use controls associated with the noise overlay zones:

Figure 7b. Aircraft Noise Land Use Controls

Residential Uses.

Consistent with Future Land Use Element Policy 2.4.11, the following controls shall apply to all residential uses including: single family, multifamily, mobile homes, and hotel/motel/timeshare uses.

REQUIRED CONTROLS						
Control Zone	Avigation Easement	Waiver of Claim	Notification	SLR 25 db	SLR 30 db	SLR 35 db
Zone E			X			
Zone D		X	X	X		
Zone C	X	X	X		X	X
Zone B	X	X	X			X
Zone A (On Airport)	X	X	X		X	

1. Single Family, Multi-Family, and Mobile Home uses prohibited in Zones A and B, except where prior approvals/ agreements grant such use. Hotel/Motel/Timeshare uses are permitted in Zones A and B with appropriate controls as specified above.

2. While Single Family and Multifamily residential uses are permitted in Zone C, they are discouraged. Mobile Homes are specifically prohibited in Zone C. For Single Family uses in Zone C, a 35 SLR shall be applied. For Multifamily uses, a 30 SLR shall be applied.

Non-Residential Uses.

Consistent with Future Land Use Element Policy 2.4.11, the following controls shall apply to all sensitive non-residential land use types, consisting of: hospital/clinic/nursing home, childcare, and school uses. These regulations shall not be applied to commercial, industrial and/or office uses.

REQUIRED CONTROLS						
Control Zone	Avigation Easement	Waiver of Claim	Notification	SLR 25 db	SLR 30 db	SLR 35 db
Zone E			X			
Zone D			X	X		
Zone C		X	X		X	
Zone B	X	X	X			X
Zone A (On Airport)	X	X	X			X

1. Hospital/Clinic/Nursing Homes, Childcare, and School uses prohibited in Zones A and B, except for aviation related training/educational facilities.

2. Childcare facilities in Zone C shall only be permitted as accessory uses. Stand-alone childcare facilities shall be prohibited. Existing childcare facilities shall be permitted to expand so long as new structures meet the SLR standards shown above.

3. Elementary, Middle and High School facilities, whether public or private, shall be prohibited in Zone C. Other school facilities shall be reviewed as a Conditional Use, in which the SLR reduction specified above and additional land use compatibility measures may be applied.

SLR - Sound Level Reduction in Decibels (db) can be achieved through insulation, high-grade windows, etc.

(Ord. of 9-16-1991, Doc. #25094; Ord. of 8-23-1999, § 14, Doc. #32283)

Sec. 58.382. Sound Level Reduction (SLR) Design Requirements

General Requirements. The SLR requirements found in Section 58.381 may be achieved by any suitable combination of building design, choice of building materials and execution of construction details in accordance with established architectural and acoustical principles. The SLR requirements

shall apply to all occupied rooms having one or more exterior walls or ceilings, when furnished in accordance with the intended final usage of the room.

No new building or structure for which an SLR of 25, 30, or 35 is required by Section 58.381 may be constructed unless and until a building permit therefore has been issued by the City. No such permit shall be issued unless and until conformance with the requirements contained in Section 58.381 is indicated by plans and specifications for the building or structure.

Verification Testing Procedures/SLR Design Information. Sound level reductions shall be determined for at least four aircraft fly-over events by a typical air carrier-sized jet aircraft for each room tested. The resulting value assigned to the room shall be the average value of the individual fly-over events. Using the noise signal generated by an individual aircraft fly-over event, outside and inside noise levels may be measured simultaneously. The noise levels measured outside and inside the room being tested may be observed directly by simultaneously reading the maximum noise levels on two sound level meters; or the outside and inside fly-over event may be recorded on magnetic tape, and the required noise level reduction determined by analysis of the recorded signals. In either case, the two measuring systems used for outside and inside noise measurement must satisfy the requirements for a Type II Sound Level Meter according to ANSI S1.4-197. The two systems shall be calibrated prior to and following the fly-over events so that they indicate the same level within one decibel for the same noise, using suitable calibration procedures as specified by the manufacturer. For calculations undertaken for purposes of meeting the requirements of this Part, the City, owner, or qualified acoustical consultant may use the assumed outside spectrum shown in Figure 8.

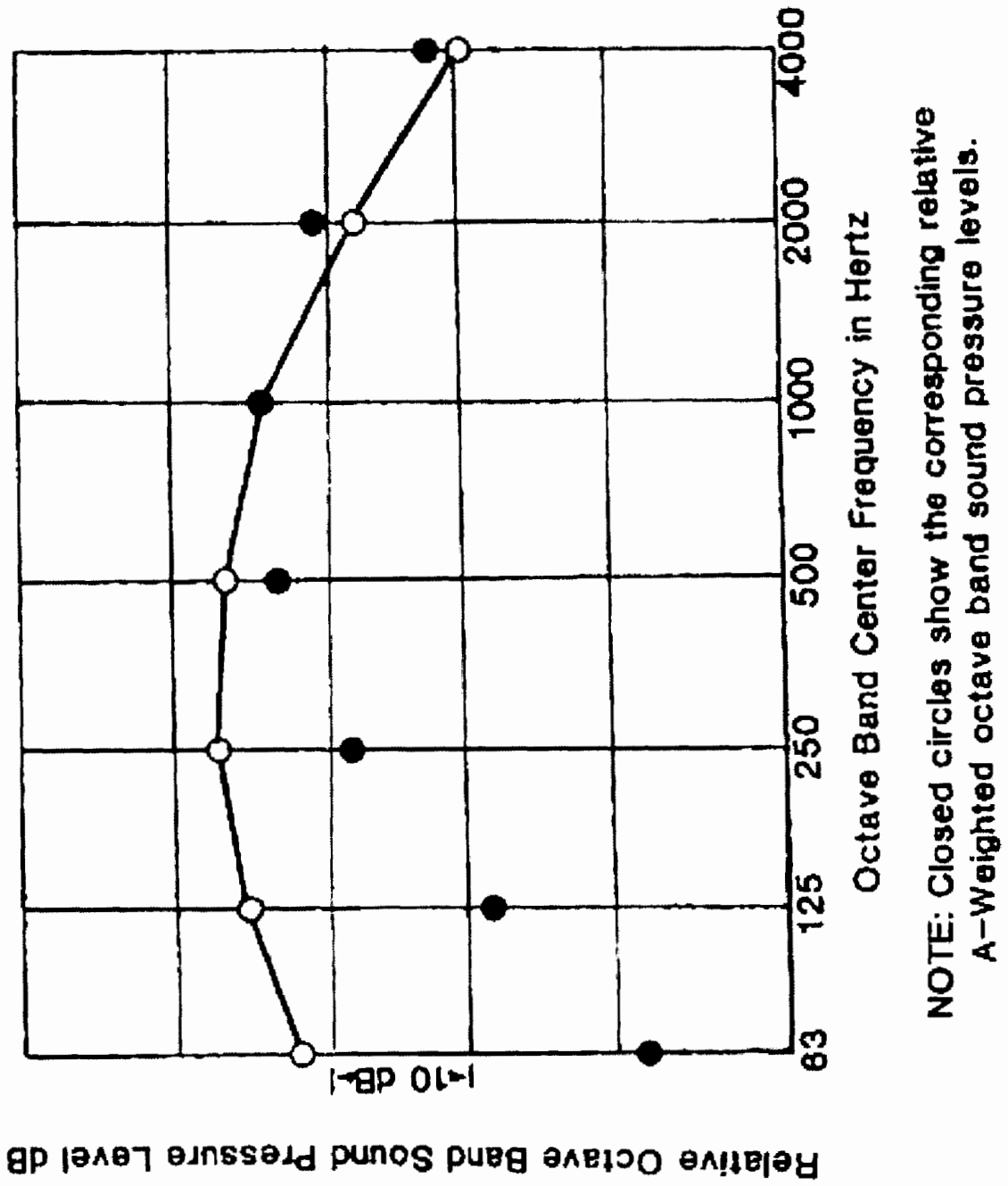


Figure 8. Octave Band Noise Spectrum

This spectrum may be used to make calculations for determining how the standards of this Part are to be met. Such calculations shall take into account the area and sound transmission loss characteristics of exposed room surfaces, and the amount of sound absorption in the room.

In residential structures, the assumed ratio of sound absorption to floor area for each room is as follows (making an allowance of at least two decibels for sound leaks and flanking sound transmission paths):

Octave Frequency Band (H2)	Sound Absorption Floor Area
63	0.30
125	0.50
250	0.75
500+	1.00

Inside Noise Levels. In residential structures, inside noise levels shall be measured with a single microphone, four feet above the floor, near the center of the room. For other structures, inside noise levels shall be measured with a single microphone, five feet above the floor, either near the center of the room, or inside the room eight feet from the exterior wall most directly exposed to the aircraft noise, whichever distance from the most directly exposed wall is less.

For residential structures, it shall generally be sufficient to conduct tests in two rooms. One of the rooms to be tested shall be the bedroom most directly exposed to aircraft noise. The other room to be tested shall be either the living room, dining room, or family room, whichever is most directly exposed to the aircraft noise. The Building Official shall have sole authority in determining the number of rooms and the particular rooms to be tested.

For structures where a number of rooms receive nearly equal exposure to aircraft noise, tests need only be conducted in two of the near identical rooms. For structures in which several rooms are to be evaluated, tests need only be conducted for those rooms whose exterior walls are most directly exposed to the noise source. If noise level reduction requirements are met for these rooms, the tests need not be repeated for rooms of similar construction which are not directly exposed to fly-over events.

Adjustments for Unfurnished Rooms. When the sound level reduction is measured in an unfurnished or partially furnished room, an adjusted sound level reduction shall be computed by adding ten times the logarithm and the base ten of the ratio of the floor area of the room to the sound absorption in the unfurnished or partially furnished room but in any event, such correction shall not exceed two decibels. The adjusted noise level reduction value shall be used in determining compliance with the SLR requirements. If the noise level reduction is measured in a furnished room, no adjustment in the noise level reduction may be made.

Outside Noise Levels. The outside noise level shall be measured in an unobstructed location near the center of the wall most directly exposed to the aircraft noise source, approximately five feet above the level of the floor of the room being tested and eight feet from the wall.

(Ord. of 9-16-1991, Doc. #25094; Ord. of 8-23-1999, § 15, Doc. #32283)

Sec. 58.383. Public Notification of Potential Noise Impacts.

Public disclosure of aircraft noise impacts shall be made to all future purchasers, mortgagees, occupiers and users of residential property located in all of the Aircraft Noise/Land Use Control Zones shown on the Aircraft Noise/Land Use Control Zone map, consistent with Figure 7A. Public notification shall consist of the following:

1. Public notice of the existence of maps depicting noise impacted areas shall be published by the Greater Orlando Aviation Authority at least three (3) times in a newspaper of general circulation in Orange County, as provided in Public Law 96-193; and

2. Aircraft Noise/Land Use Control Zone Maps depicting noise impacted areas shall be available for public inspection at the Planning and Development Department, the Orlando Public Library and other public places; and

3. The Greater Orlando Aviation Authority shall ensure that Aircraft Noise information is publicized and available to the public and other interested parties such as local Realtors/brokers/title companies and professional organizations; and

4. The City shall attach a zoning suffix of AN-Aircraft Noise Overlay District to all areas where residential and/or sensitive non-residential uses are allowed within Aircraft Noise/Land Use Control Zones A through E; and

5. Residential plats recorded within Noise Zones C, D, and E shall note the potential for objectionable aircraft noise on the plat. Specifically, the plat shall note the following in a minimum 12 point type: "The properties delineated on this plat are subject to aircraft noise that may be objectionable." This requirement shall be made a condition of approval for all residential subdivisions approved by the City of Orlando.

(Ord. of 8-23-1999, § 16, Doc. # 32283)

Sec. 58.384. Avigation Easement and Waiver of Claims.

An avigation easement and/or waiver of claim, consistent with Section 58.381, shall be required as a condition of development approval for certain lot-splits, short form and long form subdivisions in Aircraft Noise Zones A, B, C, and D. The avigation easement and/or waiver of claim shall be executed between the applicant and the Greater Orlando Aviation Authority and delivered to the Planning and Development Department before a building permit may be issued for a building or structure located, or to be located, within Aircraft Noise Zones A, B, C, or D.

The Board of Zoning Adjustment or Municipal Planning Board may require the execution and delivery of an avigation easement and/or waiver of claim as a condition of granting variances for nonconforming construction or land uses within any of the Aircraft Noise Zones. The land use controls, avigation easement, waiver of claim, and sound level reduction requirements specified in this Part shall be consistent with agreements reached between the property owner and the Greater Orlando Aviation Authority established prior to the effective date of this ordinance revision. Adoption of this ordinance shall in no way invalidate or modify such recorded avigation easements, or noise damage waivers of claim.

(Ord. of 8-23-1999, § 17, Doc. #32283)

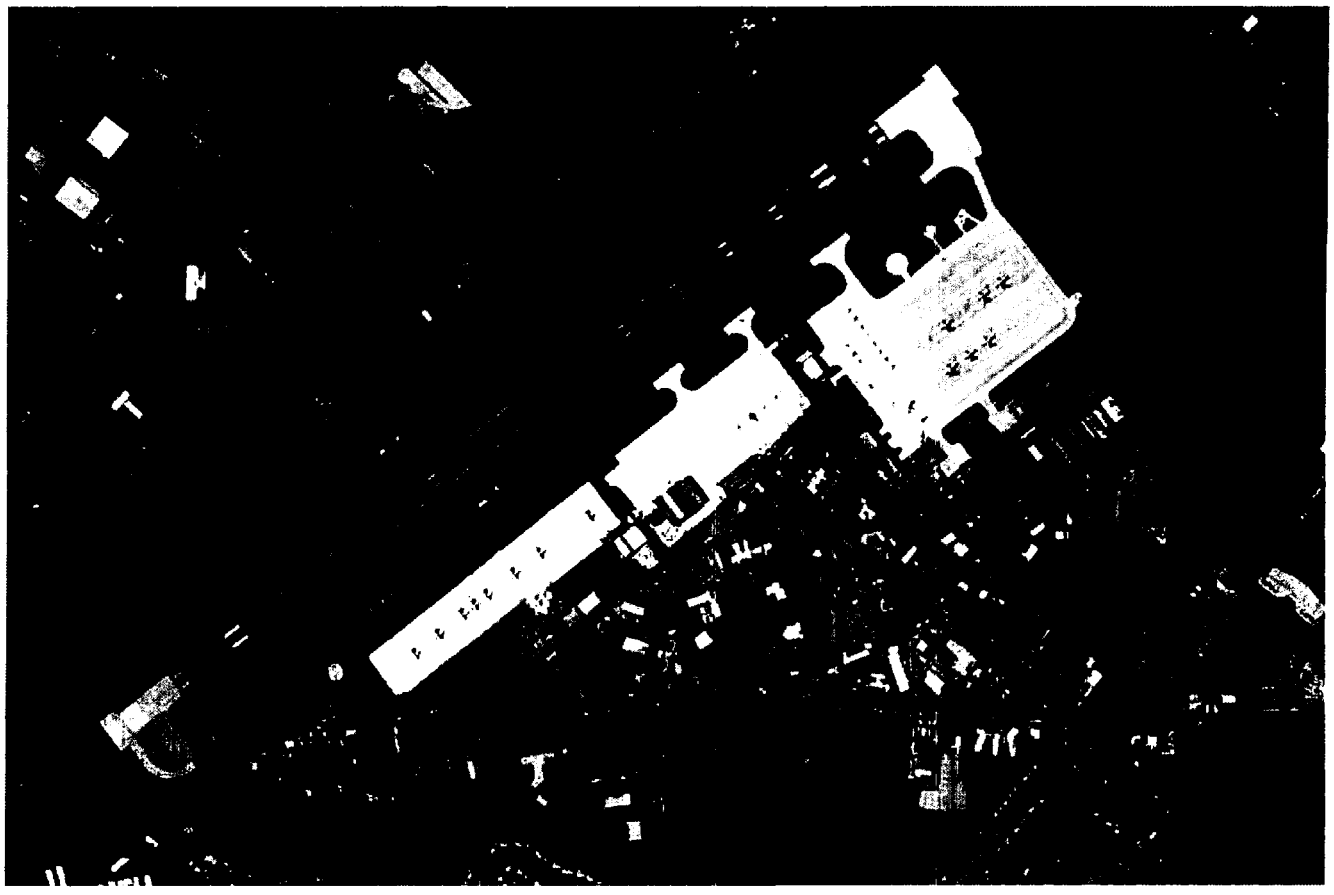
Secs. 58.385--58.389. Reserved.

G

NAS JRB Willow Grove

TAB G

17 August 2005



Updated Point Paper
Costs and Savings Resulting from Closing NAS JRB Willow Grove

- The DoD's own COBRA analysis for Willow Grove shows one-time closing costs of <u>$126 million.</u>
    - Most of these costs ($66 million) are for new military construction at McGuire AFB to accommodate Navy units moving there.
        - Copies of the military construction (MCI) pages from the COBRA analysis are attached.
    - $44 million are moving costs
- The DoD estimated costs for military construction at McGuire are too low because they failed to take into account retention of the KC-135s there.
- Planned military construction costs at Willow Grove over the next five years are about $15 million (for a new commissary, etc.) and DoD claims a credit for avoiding these costs.
- We believe Willow Grove could maintain flying operations with no additional military construction costs.
    - Repairs to runway are already programmed and will start soon.
- DoD claims the $126 million in costs for closing Willow Grove are offset by net savings in personnel, overhead and other costs.
    - $178 million of the claimed cost savings are personnel
    - ***<u>BUT</u>*** as the GAO observed, about 50% these supposed personnel cost savings are illusory because the personnel don't go away – they are moved. Military end strength remains constant.
- The Navy took cost saving credit for 52 more personnel than was consistent with the Navy's own strength figures. Even the Navy's COBRA analysis shows these errors.
- We ran a quick COBRA analysis using conservative assumptions and correcting the Navy errors. The results are:

Scenario	Payback Period (Years)	Costs/Savings ($K) negative numbers are savings				
		20 - Year NPV	1-Time	Personnel (2006 2011)	Total (2006 2011)	Annual Total Recurring
DON 0084	2	-710,503	126,256	-177,725	-134,726	-60,645
Add Back 52 and delete 40% of 468 remaining eliminations	**4**	**-327,347**	**118,257**	**-62,464**	**-15,456**	**-32,604**

- This analysis shows that recurring savings are cut about in half by a more realistic analysis, and the payback period in years is about doubled.
- What's more, no one, not the Navy and not the Air Force, ever analyzed costs for closing the entire installation and deactivating the 111th Fighter Wing and 913th Airlift Wing.
    - Training costs for new pilots are about $2 million each.
    - Training cost for aircraft maintainers and other aircrew members are similarly quite high and rising.

- It is not clear that the Air Force or Navy will have training capacity to retrain these personnel.
- Bottom Line: It is possible that training and retraining costs, which were not accounted for in the COBRA analysis, will consume most, if not all, the purported savings. For example, if as few as 50% of Willow Grove's reservists decide not to move and are therefore replaced, those 2,378 replacement reservists will consume all of the projected $327 million in 20-year savings if their training costs exceed $138K each, an unrealistically low figure for training.

- **Conclusion:** The purported cost savings from DoD's recommendations for Willow Grove are unsupportable and may be non-existent.

H

NAS JRB Willow Grove

TAB H

17 August 2005

ECONSULT CORPORATION®

Sixth Floor
3600 Market Street
Philadelphia, PA 19104

Voice (215) 382-1894
Fax (215) 382-1895
e-mail: econsult@ econsult.com
Web: www.econsult.com

August 10, 2005

TO WHOM IT MAY CONCERN:

I understand that a summary of the Econsult Corporation report entitled, "Economic Impacts of Willow Grove NAS-JRB," dated April 2005, was submitted to the Defense Base Closure and Realignment Commission regional hearing in Washington, DC on July 7, 2005. I hereby certify that the data contained in the report are true and correct to the best of my knowledge, information and belief.

Sincerely,

Stephen P. Mullin
Econsult Corporation
Senior Vice President & Principal