SUBTERRANEAN TERMITE INTEGRATED PEST MANAGEMENT

by

GLEN CARLTON RAMSEY

(Under the Direction of Brian T. Forschler)

ABSTRACT

Modern pest control has relied primarily on chemicals to rid structures of invaders. Urban Integrated Pest Management is an environmentally conscious philosophy of managing pest populations by combining treatment measures in an attempt to manage pests in a lasting manner. The concept of Integrated Pest Management (IPM) for subterranean termites has been discussed, under various guises, in the entomological literature for at least 80 years. In 2001, a program was initiated on the University of Georgia campus to manage subterranean termites following the philosophy of IPM. This is the first attempt since 1934 to quantify subterranean termite infestation entry points and treatment success toward identifying items relevant to developing an IPM program for termites.

INDEX WORDS: Termite, Isoptera, Subterranean, Integrated, Pest, Management, IPM, Bioassay

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DEDICATION

This thesis is dedicated to my family, whose patience and encouragement has finally been rewarded.

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CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

INTRODUCTION

Insects have inhabited our planet for approximately 400 million years (Grimaldi and Engel 2005) as opposed to the earliest humans (genus *Homo*) who occupied earth about 1.9 million years ago (Wood and Collard 1999). For reasons of shelter or safety, humans found themselves habiting caves or manmade structures and started thinking of these areas as possessions that needed protection. Robinson (1996) deemed these areas "sacred space", a term fitting to describe how humans feel about their home and possessions. History has shown us that from the time that habitable structures were being occupied, man has been attempting to protect these spaces buy constructing an entry or door that must be crossed by other people to enter this "sacred space"(Hartnack 1943, Robinson 1996). There is no doubt that early man suffered the effects of pest arthropods in his daily life due to close habitation or infestations (Robinson 1996). Since that time, humans have been taking measures to either manage or eradicate pests from their surroundings. Beginning with prayer and mechanical control, the practice of pest management was born (Robinson 1996). This mostly intuitive process arose while humans and pests struggled to protect what they each considered their own. The basic concepts of pest management are simple. When pests are discovered the first instinct, for most people, is to rid the structure of the pest and find out how and why the pest came inside. This is to prevent a recurring problem. Through time, pest management has come to include specialized cultural techniques, chemicals, baits, and theories on integrating control options (Wickham 1995, Wang and Bennett 2006).

HISTORY OF URBAN IPM

During the late 1930's and early 1940's Hartnack (1943) concluded that chemical application was a temporary fix to structural pest problems, and stated that chemicals should only be used when the cost of more permanent management strategies were unreasonable. Hartnack was not alone in this thinking. Snyder (1935) suggested that soil applied chemicals were still experimental and should only be used when the property owner determined the cost of structural changes to be impractical. In addition, Snyder made an interesting point about the chemicals of the time. He mentioned cautions for human contact. Compounds such as orthodichlorobenzene and mixtures of coal tar creosote and kerosene oil posed respiratory risks to the applicator. Many of the chemicals that were in use have either been banned or would not be considered for use today.

The idea of integrated control originated during the late 1950's by researchers focused on pest management by the preservation of biological control factors in association with the economic aspects of crop plant pest injury (Stern et al. 1959). The "Integrated Control Concept" or Integrated Pest Management (IPM), as it later became known, has been defined many times in both agricultural and urban literature over the years (Hedges 2000, Bajwa and Kogan 2002), but at the core of most definitions was the suppression of pest populations based upon economic boundaries with action thresholds (Robinson 1996).

The effects of fewer pesticide applications and the importance of economics in the decision making process garnered the attention of the urban forestry and landscaping market (Potter 1986, Robinson 1996, 1999). This peridomestic habitat, while not a monoculture, retained many of the plant-insect characteristics of the agricultural setting and the agricultural IPM model could easily be adapted to meet the needs of the industry (Hellman et al. 1982, Ball 1987, Robinson 1999). These early attempts were successful in obtaining results equal to that of the agricultural model with regard to reductions in pest numbers, pesticide applications, and total cost (Smith and Raupp 1986). The successes seen in the tree, ornamental, and turf sectors gave promise that the agricultural IPM model was adaptable to other habitats (Robinson 1999).

Urban IPM has roots in the early models of agricultural IPM, but with little consideration of the many differences between the two. Ebeling (1975) described an urban pest situation as "flies in poultry ranches on the outskirts of cities". This concept of an urban environment is more agricultural than what we consider an urban landscape today, and is not a representative model for modern Urban IPM. The National Research Council (NRC) Committee on Urban Pest Management (NRC 1980) suggested that there might "be an economic, aesthetic, or public health threshold" at which action must be taken. In addition the NRC (1980) concluded that, in some situations, IPM in the urban setting could not be implemented if eradication was the goal. Owens (1986) described a 5 step urban IPM process. However, one of the five steps is a determination of the action threshold for treatment. Robinson (1996) included an injury level into his Urban Entomology IPM model following the shared beliefs of earlier IPM writings (Stern et al. 1959, Anonymous 1992, Robinson and Zungoli 1995). Current entomology texts often include sections on IPM, but most have economic or asthetic injury levels built into their discussion (Kennedy and Sutton 1999, Gullan and Cranston 2005, Pedigo and Rice 2009).

In the urban setting, fear, aesthetic, or health reasons, instead of economics are more likely the trigger, or threshold, for pest management actions, however these "injury levels" or "action thresholds" are either difficult or impossible to standardize (Boyden and Millar 1978, Wood et al. 1981, Sawyer and Casagrande 1982/1983, Byrne et al. 1984, Zungoli and Robinson 1984). Economics are still an issue in urban IPM, but usually refer to repair and replacement costs after damage has occurred. Termites alone are responsible for between $1 and $11 billion in damage and repair costs annually across the United States (Thorne 1998, Su 2002).

URBAN IPM TODAY

The urban arena is vastly different from the large monocultures of modern agriculture (Sawyer and Casagrande 1982/1983, Flanders 1986). Pest control in agriculture deals with management of pests for a specific cropping system with little regard to the setting because many target pests are crop specific (Robinson 1996). In contrast, the domestic setting is a polyculture. When one habitat is affected the results may cause important changes to the surrounding habitats (Sawyer and Casagrande 1982/1983). For example, Kramer et al. (2000) showed that German cockroach management in multi-unit public housing required a building-wide as opposed to a unit by unit approach. This was due to shared plumbing connections that facilitated cockroach movement between units. Unless a building-wide approach was taken, untreated foci for cockroaches would exist and provide a source for rapid re-infestation.

In more recent literature, there is a debate over the focus or measure of success in urban IPM. Methodologists believe that the success of a program should be based on the reduction of pest population numbers (Greene and Breisch 2002, Drees and Gold 2003, Rust et al. 2003, Wang and Bennett 2006). This approach usually has a secondary goal of a reduction in pesticide use or preferred choice of control techniques (eg. a choice for baits instead of residual sprays), but this is not used to determine success of the program (Greene and Breisch 2002). In contrast, ideologues believe that success should be based on a reduction in pesticide use, or even customer satisfaction (Sawyer and Casagrande 1982/1983, Gouge et al. 2006), and that a reduction in a pest population is either not measurable or not important if the customer is satisfied (Greene and Breisch 2002). Robinson (1996) stated that success might need to include short-term goals such as reduction in pest numbers and reduced pesticide use while still focusing on the long-term goal of customer satisfaction. The achievement of either goal alone may not indicate success in an IPM program.

DEFINITION

Many definitions were reviewed and combined during the synthesis of the definition and ideas presented (Pedigo 1999, Bajwa and Kogan 2002). Urban Integrated Pest Management is an environmentally conscious philosophy of managing pest populations at appropriate points in the life cycle to achieve economic, long term control by incorporating education, communication, investigation, intervention, documentation, and evaluation into a program that prevents pests and disease vectors from causing unacceptable damage to operations, people, property, material, or the environment.

These components of Urban Integrated Pest Management all work in conjunction to help resolve and prevent pest injury. However, four of the six components will be discussed in further detail: education, investigation, intervention, and evaluation.

One of the tenets of any IPM program, either agricultural or urban, is proper pest identification (Owens 1986, Robinson 1996, Pedigo 1999). This in conjunction with a proper investigation must be completed in the initial stages of an Urban IPM program. After the pest has been properly identified, education on the life history or biology of the target pest will ensure that an intervention, focused on a susceptible pest life stage, becomes part of the action plan (Robinson 1996). This education or gained knowledge of pest life history may or may not be formal in nature, but it must be factual to ensure that the intervention is well planned and appropriate. There are many resources for factual information including local Cooperative Extension Offices and libraries, in addition to state and national pest control associations (Frankie et al. 1986).

The *investigation* into a pest infestation can be challenging (Forschler 1998). Pests by nature are typically cryptic and/or nocturnal (Story 1986, Robinson 1996). If obvious signs of pest activity are not apparent, but evidence has been noted, multiple inspections might be necessary. The initial investigation might include the placement of traps or other means of collecting specimens so the pest can be properly identified and researched (Owens 1986, Story 1986, Wang and Bennett 2006). The follow up investigation should include the findings from the initial investigation with the habitat descriptions of the pests to determine the true extent of the infestation. If the pest can be properly identified and the extent of the infestation can be determined from prior knowledge, a single investigation might be all that is required for intervention planning.

The *intervention* is the application of measures to prevent further pest impact. Well planned interventions will often include moisture management, habitat modification, general sanitation, and sometimes an insecticide (Owens 1986, Pedigo 1999). These measures are meant to specifically target one or more key aspects of the pest's biology and will therefore make the surroundings unsatisfactory for habitation. A "do nothing" approach is sometimes appropriate (Owens 1986, Pedigo 1999). These instances might be the result of a window left open or the chance entry when a door is opened. In these situations, the simple removal of the intruder will usually solve the problem (Appel 2003).

Evaluation of the intervention will help determine if the plan was well formulated and if the initial inspection was thorough enough. The evaluation is not a one-time operation and must be conducted regularly to ensure that the preventative measures set up during the intervention are continuing to remain functional (Owens 1986, 1995, Robinson 1996). If there is a breach in their ability for pest prevention, a new intervention must be planned and executed.

The plasticity of an Urban IPM program is essential to the continued successful prevention of pest problems in and around urban structures. Traditional pest control programs could be categorized as either too rigid or too loose in practice. Quarterly pest management is a prime example of a too rigid situation. With proper sanitation and exclusion, it might be possible to eliminate the application of pesticides completely (Marsh and Bertholf 1986, Rust 1986, Wood 1986). If the complete elimination of pesticide application is not possible, reduction in the frequency of application is also a possibility. Quarterly pesticide application does not take into account the presence of pests that might require an application. It also does not account for the types of pests present. This type of application has the potential to shift populations toward resistance, eventually preventing the insecticides from being effective (Potter 1986, Robinson 1996, Pedigo 1999, Robinson 1999). In contrast, a homeowner who sprays an insecticide every time a pest or occasional invader is seen is being too loose with application. This, just like the previous example, does not take into consideration the identification of the pest or its life history.

CALL FOR ACTION

With the publishing of *Silent Spring* in 1962, awareness of the risks of pesticide overuse was now more obvious to the public. One thing that became known was that not all pesticides that are applied to kill pests can be considered safe. Any substance in the appropriate quantity can become unsafe; this principle is true with many products or medications we use on a daily basis. The dose dependant nature of any substance is a main reason that habitat modification should be considered as a primary control option before any application of pesticide (Byrne and Carpenter 1986, McEwen and Madder 1986). It must be clear that IPM does not exclude the use of pesticides. While not always a requirement, the use of a pesticide might be necessary to allow the physical manipulations of the habitat to become effective. Integrating forms of control can not only help to rid the structure of an insect problem; it also provides an area that will likely not have a future problem if the improved conditions remain and are maintained (Brown et al. 1934, USDA 1942, Su and Scheffrahn 1998). This lasting effect is a key component of the IPM action plan.

Modern pest control has relied primarily on chemicals to rid structures of invaders (Su and Scheffrahn 1998). Either by building owner application, or a professional pest control technician, these chemicals were applied to both kill pests and to give the occupant a sense that their structure is safe and clean. With the recent “Green” movement there has been a push to perform Urban IPM (Robinson and Tucker 1995, Clinton 2000, Nagro 2007). Many companies are providing IPM services to their customers, but are they really practicing the core concepts of IPM? This period of heightened awareness should be an opportunity to revise our definition of IPM and how it applies to Urban Entomology and Pest Management and what it means for the future of the industry.

CHAPTER 2

DEMONSTRATING A SUBTERRANEAN TERMITE INTEGRATED PEST MANAGEMENT PROGRAM

INTRODUCTION

The concept of Integrated Pest Management (IPM) for subterranean termites has been discussed, under various guises, in the entomological literature for at least 80 years (Snyder 1927, Brown et al. 1934, Kofoid and Chase 1934, Snyder 1935, USDA 1942, Hartnack 1943, USDA 1948, Johnston 1960, St. George et al. 1960, Su and Scheffrahn 1998, Su 2002, Kard 2003). An example would be Farmers Bulletin 1911 (1942) published by the US Department of Agriculture that devoted 23 pages to proper construction techniques and cultural control methods while four pages discussed application of soil- and wood-borne insecticide treatments (USDA 1942). The 5X disparity in pages-per-topic illustrates the impact that construction and maintenance have toward maintaining structures free of subterranean termite infestation. Entomologists have long understood and published on the need to include construction and landscaping practices in the process of subterranean termite management (Randall and Doody 1934) but that message was lost by the 1950's with the use of long-residual insecticides as soil termiticides (St. George 1944, Kowal and St. George 1948, Hetrick 1950, 1952, 1957, Ebeling and Pence 1958, Johnston 1960, Bess et al. 1966). The last Approved Reference Procedures (ARP) published by the National Pest Control Association in 1991 had 10 pages on construction and cultural control while termiticide application covered 131 pages (Rambo 1991). Termite management today can best be described as an industry-formalized practice based on soil poisoning.

The application of soil insecticides for termite management was standard practice for over 50 years in the United States (Moore 1986, Lewis et al. 1996, Robinson 1996). The termite management industry accepted their role as palliatives for bad construction and landscape management because they had ‘effective’ soil insecticides. The termiticides used during that era (1940-1989) provided a long residual that could mitigate infestations if the soil was properly treated and, over time, not moved or replaced (Hetrick 1957, Bess et al. 1966). Training for technicians in this service industry involved education on proper placement of correct volumes aimed at attaining a “continuous and uniform barrier” of insecticide (Randall and Doody 1934, Rambo 1991, Mallis 1997). Regulatory standards in several states, such as Georgia, dictated inspection and treatment specifications further codifying the soil barrier concept (GSPCC 2007). The importance of implementing IPM based on knowledge of the insects life history and behavior was relegated to a distant memory because the construction and landscape practitioners abrogated any culpability for subterranean termite infestation in light of the pest management industry’s willingness to accept responsibility for keeping termites out of structures. Termite biology-conscious design, construction and landscape management is unlikely to be a feature of new construction anytime in the near future because that education component of IPM, although attempted for decades, appears to be falling on ‘deaf ears’ (Ebeling 1968, Langston et al. 1995, Suiter and Forschler 2004). The termite management professional is, today, saddled with the legacy of their industry's genesis during the heady days of long-lived soil poisoning for subterranean termite control.

The pest management industry suffered the consequences of their overreliance on soil termitcides when in the early 1990's chlorinated hydrocarbon insecticides were removed from registration (Su and Scheffrahn 1990, Lewis et al. 1996, Kramer 2005). The pesticide manufacturers responded to the increase in reports of subterranean termite infestations by funding research on termite biology and management (Reay-Jones and Mascari 2007). That influx of investment in investigation has rewritten our understanding of termite biology and provides the impetus for revisiting IPM for subterranean termite management.

The peer-reviewed literature has little information on the field efficacy of termite management practices because the heterogeneous urban habitat prevents meaningful replication and the liability of using valuable property for experimentation has been used as a justification to forgo designation of untreated controls. The data available on subterranean infestation rates and field experiments on treatment efficacy are therefore most frequently found in pest management trade publications (PCT 1995, Kramer and Kaukeinen 1997, Potter et al. 2001, Rambo 2002, Hickman 2006, Austin and Gold 2009). The commercialization of termite baiting in the late 1990's produced a wealth of information on bait product efficacy (without controls) yet that efficacy is assumed to apply to structural infestation because experiments have not been conducted on infested structures. Su and Scheffrahn (1998) discussed IPM for subterranean termites from an economic perspective and implied that the use of baits constituted IPM. Termite baiting programs have been designed around a "monitoring" procedure that assumes a zero tolerance action threshold and records only the presence or absence of termites at bait stations (Su 1994, Su and Scheffrahn 1996). The dearth of population information provided by a presence/absence data set precludes implementation of meaningful action thresholds because false positive data (abandonment of a bait station cannot be related to treatment impacts) remain unresolved (Thorne and Forschler 2000).

The foundation of IPM is knowledge of a pest's biology that is used to identify vulnerable attributes as targets for intervention. Termites - in the literature - have evolved from "white ants" to a unique order of social insects to social cockroaches over the last one hundred years (Maeterlinck 1939, Gold and Jones 2000, Triplehorn and Johnson 2005, Inward et al. 2007). Native subterranean termites occur in relatively small populations, follow structural guidelines while foraging for food, and most importantly require moisture to survive (Forschler 1998, Thorne 1998). Termite biology is also designed for a prodigious increase in population once adequate food and moisture are located (Lenz et al. 2009). Applying these lessons to the design of a subterranean termite IPM program highlights the need to first address foraging behavior. Moisture provides conditions required for survival and increases the probability of prolonged foraging, food resources allow for population increase while guidelines invite investigation. The combination of these three features intuitively increases the probability of structural infestation (Brown et al. 1934). Therefore, structures should provide a minimum of structural guidelines (when present, they should be accessible to visual inspection), reduce termite food resources in 'close' proximity of the foundation and keep the soil around the foundation dry (Brown et al. 1934, Hartnack 1939, Ebeling 1968).

Subterranean termite IPM interventions should be aimed at limiting access to infestation by addressing site conditions and insecticide use restricted to areas of high risk.

This manuscript details 57 case histories from a program initiated in 2001 when the Household and Structural Entomology Research Program (HSERP) at the University of Georgia negotiated with the Physical Plant Division to respond to all notifications of termite infestations on the main campus in Athens, Georgia. The data includes infestation rates, termite species identification, flight times, infestation-site specifics (construction and landscape features), inspection methods, and treatments (type and success) that are reported and discussed as a guideline for developing a meaningful subterranean termite IPM program.

MATERIALS & METHODS

The University of Georgia main campus, 380 buildings situated on 2.5 km^2, is located in Athens, Georgia approximately 96.5 km (60 miles) northeast of Atlanta, Georgia. There are 145 "primary structures" while the remainder are classified as outbuildings or sheds. There were no reports of infestations in any of the secondary structures during the years of the study and therefore all data are discussed relative to 145 buildings. Data were collected as part of a cooperative agreement between the HSERP and the University of Georgia Physical Plant Division (UGA PPD) involving their work order reporting process. Reports of termite infestation from swarm activity or discovered during routine repairs as reported to UGA PPD were relayed to HSERP with location and building contact-person information. The HSERP Termite Response Team (HSERP-TRT) performed an inspection and collected termites, when possible, and stored them in 90% EtOH. Inspections were aimed at determining the route of entry and extent of infestation. Inspection tools included a moisture meter (TRAMEX Ltd, Littleton, CO), acoustic emissions detector (proprietary device for amplification of unfiltered sound), microwave motion detector (Termatrac, Coopers Plains Qld-4108, Australia), Infrared Camera (MIKRON, Oakland, New Jersey), and Resistograph drill (Instrument Mechanic Lab, Inc., Kennesaw, GA) in addition to visual inspection using a flashlight and probe. The affected area was measured, mapped, and photographed for future record and action plan formulation. Termite samples were collected, when available, for identification to species (Scheffrahn and Su 1994). Inspection reports aimed at communication, education, and maintaining cooperation contained descriptions of site conditions and photographs that were transferred to the UGAPPD via email in ADOBE Portable Document Format (PDF) (Appendix 1). Report documentation included building name, notification and/or swarm date, site personal contact information, inspection findings, and location maps. Inspection reports also included an action plan detailing recommended interventions. Reports were amended following implementation of interventions to include details of any action taken for each infestation site.

Action plans were developed for each infestation based on inspection findings. Site conditions were considered first and landscape modification or construction alterations constituted the first line of recommended interventions. Insecticide applications were scheduled with UGA PPD and building occupants and applied using a targeted or “spot treatment” approach.

Liquid termiticide applications were made using one of two pieces of equipment. Treatments conducted between 2001-2007 were made with a B&G Wood Treatment System (B&G Equipment Company, Jackson, Georgia) and thereafter a JackPlus Pest and Termite Mobile Treatment System (NPD Products Ltd., Midhurst ON, Canada). Both systems allow application of foam or liquid solutions. Infested wood or other appropriate structural elements were injected with insecticide solutions by drilling a 3-mm hole or inserting the applicator tip into existing holes. Exterior elements of construction were treated using insecticides applied using a trenching or rodding technique. Trenches (15 cm wide x 15 cm deep) were excavated approximately 3 meters in opposite directions from the suspected termite entry point. Insecticide was mixed in a ~19L (5-Gallon) plastic bucket and half of the labeled volume poured directly into the trench and the remaining solution was used to treat the backfill soil. Soil rodding was accomplished by the use of a 0.5-m metal application rod with a uni-directional tip that was pushed into the ground with the tip directed toward the structure allowing for sub-surface application.

One insecticide, Termidor SC (BASF, Florham Park, New Jersey) was used for termiticide treatments. Wood injection treatments employed concentrations ranging from 0.00006% to 0.125% (Table 2.1). Wood injections were performed at six different rates; 0.125% (N=4), 0.03% (N=3), 0.06% (N=3), 0.006% (N=1), 0.0006% (N=4), and 0.00006% (N=6). Void applications were performed at five concentrations 0.125% (N=1), 0.03% (N=1), 0.06% (N=9), 0.0006% (N=2), and 0.00006% (N=5). The 17 soil applications were conducted using one concentration - 0.06% (Table 2.1).

Volume of insecticide used for each treatment ranged from 500mL to 7.6L for wood injection and from 3.8L to 94.6L for soil trench and treat (Table 2.1). Termite baits containing 0.5% hexaflumuron (Dow Agrosciences, Indianapolis, IN) or 0.25% diflubenzuron (Whitmire Micro-Gen / BASF, St. Louis, MO) were placed around four structures. Bait stations were spaced 1-6 m between placements and within15-m of the suspected termite entry point.

Fifty-seven interventions were conducted between February 2001 and June 2009 from reports of termite infestations in 43 separate structures. Treatment success was measured using two definitions based on the classification of Green and Breisch (2002). The first measure considered a methodological approach and was defined by elimination of signs of termite activity from the immediate vicinity involved in an intervention. A success was therefore verified if termite activity was not detected upon follow-up inspection in the immediate area where insecticide was applied or landscape/building alterations were made to the site. The second method considered an ideological approach and defined success if termites did not return to the any part of a structure that was involved in an intervention. Verification was determined by two methods. First, ideological, was "call backs" where a post-intervention swarm or other evidence of continued infestation was reported to HSERP. The second, methodological, involved site re-inspection using visual inspection and at least one of the alternative inspection devices previously described.

Conducive conditions were categorized into 3 groups: Wood to Ground Contact (WGC), Exterior Landscape Grade (Grade), and Moisture (M). WGC was indicated when structural lumber was found in contact with the ground. Grade referred to any situation where the ground level was higher than the original foundation of the structure. Moisture was used to describe any indication of leaks, flooding, or drainage problems associated with an infestation.

Entry points were placed into 3 groups: Expansion and Cold Joints (EJ), Gaps in Stone Foundations (GSF), and Wood to Ground Contact (WGC). EJ's are described as the space or gap between two elements of a concrete foundation. GSF describe the presences of cracks between mortared stones or bricks that compose the foundation of a structure. WGC is described as above but this conducive condition also served as the entry point for infestation.

Insecticidal treatments were conducted using 3 different methods: Wood Injection (WI), Soil application (Soil), and Void application (Void). WI treatments were performed by injecting insecticidal solutions, as foam, directly into termite galleries or voids in elements of construction. Void describes application of insecticide to any element of construction as a liquid solution. Soil describes any application of termiticide liquid to the soil using either trenching and rodding methods.

Construction elements were recorded as brick veneer (BV), wood frame (WF), slab (S), stone foundation (SF), crawlspace (CS), multiple-wythe brick (MWB), hollow block (HB), metal frame (MF), cast stone (CAS), hard-coat stucco (HCS), concrete walls (C), basement (B), and stucco veneer over Styrofoam insulation (SV) (Table 2.1).

Structures were measured and reported in linear feet due to whole house treatment standards required by some states (GSPCC 2007). Projected treatment volumes were calculated using the ground floor linear feet measurements of infested structures and 4 Gallons per 10 linear feet soil treatment standards (Rambo 1991).

RESULTS

Infestation of Structures

There were 43 buildings identified as having a subterranean termite infestation while 57 reports of infestation were relayed to HSERP during the 9 years of this study. Two events were used to identify infested structures. The first was routine repairs and remodeling that provided 4 reports of infestation. The majority of infestations were identified (92.98%, N=53) by building occupants following alate flights (swarm calls).

Alate Flights or Swarms

Springtime was the most active season for reports of swarms with the month of March having the highest number (N=27) representing 53% of all swarms reported over 9 years. There were 6 other months when swarms were reported. In order of most to least they were April (N=9, 18%), February (N=6, 12%), May (N=5, 10%), January (N=2, 4%) whereas August and November provided 1 swarm call apiece.

All swarm data are not included in the campus-wide building infestation rate (Table 2.2) because a 'repeat' swarm (in the same building following an intervention) did not constitute a 'new' report of infestation. The swarm data examined by species indicate that *Reticulitermes flavipes* (Kollar) provided the longest span of time when flights occurred. We identified *R. flavipes* flights in every month between November (11-7-2003) and May (5-4-2005) excluding December. *R. flavipes* accounted for 88.57% of all swarms (N=62) reported by building occupants. Two other species were identified as infesting buildings on campus and both were recorded from a single month – *R. virginicus* were involved in 6 swarms, all in the month of May and *R. hageni* from one swarm in August (Table 2.3). Species identification was not possible at one site (42) because custodians had ‘cleaned up’ by the time of HSERP inspection and only wings remained making species identification problematic while the early May flight date is a time frame when both *R. flavipes* and *R. virginicus* swarm.

The distribution of swarm calls by year indicate that there was an annual average of 7.77 swarms with a range from 14 (2008) to 3 (2002). Interestingly, swarms from 2001-2006 averaged 5/y (N=30) while from 2007-2009 they averaged 13/y (N=39). Deviation from normal weather may account for this disparity. The years 2001 to 2006 averaged 4.4-cm less rainfall and temperatures 1.08 ºC above normal area averages. The years 2007 to 2009 averaged 24.6-cm less rainfall than usual and temperatures 4 ºC above normal area averages (Georgia 2009). Increased activity in the later years could be a result of termite populations seeking habitats that could provide increased moisture.

Building Infestation by Termite Species

The infestation of buildings as reported by swarms or repairs indicated that *R. flavipes* was the most common subterranean termite species found in structures on campus. *R. flavipes* was identified in 50 of the 57 verified infestations (87.7%). *R. virginicus* was responsible for 4 infestations (7%) and *R. hageni* was identified from 1 building (2%). Two infestations could not be identified to species - #42 as described above and #12 because only workers were found at the time repairs identified the infestation.

Building Infestation by Age of Structure

Structures were grouped into 10-y age categories for comparison of infestation by building age (Table 2.4). There was no significant relationship between building age and infestation $r(9) = .177$, $p = 0.603$ (SPSS 2008).

The infestation rate of all buildings on campus was 4.66% a year with a 9-y total of 29.65% (Table 2.5).

Entry Points and Conducive Conditions

Three structural features were identified as termite entry points in all infestations. EJ's provided termite access to structures in 85.96% (N=49) of infestations. Four entry points were described as GSF and 4 others attributed to WGC (Table 2.1).

There were 17 EJ entry points (34.69%) that were not obviously associated with a conducive condition (Table 2.1). Sixteen EJ entry points were associated with Grade conducive conditions (32.65%) and 11 (22.45%) implicated with M. Moisture (M) and EJ, together, were found 4 four times (8.16%). One EJ entry point (2.04%) was attributed to WGC because of stucco with foam insulation below grade (Table 2.1).

Three sites were infested through GSF and all involved different conducive conditions. One had evidence of M, one WGC, and the final showed no obvious conducive condition.

Three locations involved entry through WGC. Two involved concrete form boards left in place after construction. The third had wooden support piers that extended through the concrete foundation to ground contact.

Interventions

The 57 interventions employed in this program were classified into 6 categories; WI (N=22), Soil (N=17), Void (N=18), landscape alteration (N=2) and no treatment (N=6). Termite baits were used at 5 sites (Table 2.1).

Forty sites involved only one type of intervention with the approximately one third of these receiving void application (15) followed, in descending order, by WI (13), Soil (9), and baits (3). Six sites involved a combination of WI and Soil application. One site received a combination of WI and baits. Two sites employed a combination of three methods, Soil / Void / bait and WI / Void / Soil application. Eight sites had no insecticide treatment and are described in further detail below (Table 2.1).

Site 1: Termites were identified in a windowsill during routine repairs to water-damaged drywall. The building is wooden framed brick veneer on slab that was cosnstructed in 1983. The rain gutter system was installed to divert water into an underground drainage system with a downspout located within 0.5-m of the infested windowsill. Inspection indicated a problem with the rainwater management system as evidenced by the water-damaged drywall and sunken patio bricks around the downspout. Repair of the drainage problem was recommended in the action plan, physical plant accomplished this task and no infestation has been identified in the area or that building since repairs were completed 2 years ago.

Site 2: The building, constructed in 1847, is multiple-wythe brick on a stone foundation over a crawlspace. Termites were found infesting a joist header, several floor joists, and a portion of the subfloor at a loading dock on 7-25-08. Infrared photography indicated excess moisture in the walls one and two floors above the infestation site. Visual inspection and interviews with building occupants verified that the gutter above the loading dock, because of damage sustained from a falling tree limb, poured water on the exterior wall above the loading dock whenever it rained. Gutter repair was recommended in the action plan, affected by Physical Plant, within one month. The high moisture in the wall was greatly reduced within 2 months and has remained termite-free for 1 year.

Site 37: The structure, built in 1938 is multiple-wythe brick on concrete slab foundation. Termites swarmed in a cinderblock addition to the structure in 2001. The addition extended into a hill and exterior landscape grade covered 2.5 m of that wall. No recommendations were made or action taken. This structure has remained termite free for 8 years.

Site 45: The structure is an all-metal storage warehouse built in 2001 on a concrete slab foundation. Termites swarmed in 2002 from an interior EJ in one of the records storage rooms. No action was recommended or taken and no activity has been reported in the 7 years since the swarm was reported.

Site 47: The structure built in 1940 is a multiple-wythe brick on a concrete slab foundation that is 2-m below grade. A cinderblock interior wall inside this structure experienced a swarm event in 2008. Termites swarmed from a drill hole in the cinderblock about 3-m above the poured concrete floor. The only wooden structural elements were a window frame that was not affected. No landscape modifications were recommended and no actions taken. No termite activity has been reported in the past year.

Site 53: The building was constructed in 1831 as a multiple-wythe brick on a stone foundation with a crawlspace. Termites were observed swarming in 2009 from a crawlspace entry doorframe of an addition to the original structure (construction date unknown). The wooden portions of this entry were replaced with treated lumber. No additional actions were taken and no termite activity noted in the past 6 months.

Site 54: A metal frame structure on concrete slab foundation built in 2006. The swarm at this location emerged, 2009, from the EJ between the brick base of a decorative wood-veneer column on the patio. No evidence of termite feeding was observed in the wooden elements. No actions were recommended or taken at this site and no termite activity has been reported in the last 6 months.

Site 56: The structure was built in 1972 and is a wood frame brick veneer on hollow block raised foundation. Termites at this location swarmed in 2009 from an interior hollow block wall located on the 4th floor. No wooden structural elements were visible during inspection and no actions were recommended or taken. No termite activity has been noted in the past 6 months.

Concentrations of Termiticide

A range of concentrations was employed in the wood injection and void applications in an attempt to identify one that would provide evidence of transfer of the toxicant beyond the point of application. All wood injections and void treatments provided evidence that these applications eliminated termite activity in the area(s) where termiticide was applied while 13 showed an indication of transfer. It was assumed that evidence of transfer would be provided by removal of infestation at a structure that received a wood injection or void application.

Proposed Volumes vs. Actual Applied Volumes

Structures where termiticide interventions were conducted ranged in ground floor linear meter measurement from 45.7 to 980.8. The volume of termiticide dictated by Georgia State Standards (GSPCC 2007) for these structures ranged from 227.1 to 4,872.6 liters. Actual applied volumes ranged from 0.05 liters to 94.6 liters. The difference between the projected and actual volumes ranged from 221.4 to 4,857.4 liters (Table 2.1). The volume of termiticide used in all treatments applying a targeted, 'spot-treatment' approach versus the whole-house method codified by Georgia State Standards reduced insecticide use by 99.36%.

Measures of Success for Interventions

A successful intervention was determined using two measures. The methodological metric provided 100% success because termites were never (N=57) again found in the same area they were initially found prior to intervention. The ideological measure of identifying infestation in a structure following intervention provided a 86.1% (37 of 43 structures) success rate.

Six sites required revisions to the original action plan. Each of these case histories are detailed below as an example of the difficulty in determining success or failure of a termite IPM intervention.

- Site 7: A swarm was reported in 2002 emerging from a windowsill in Room 124 of a structure built in 1921 using brick multiple-wythe construction with a basement that had a poured-concrete floor. Visual inspection of the basement area under Room 124 provided no indication of an entry point. A spot treatment was conducted by applying 0.5 L of Termidor® at 0.06% as a void application into the windowsill that had evidence of a flight castle. No activity was recorded until 2006 when live termites were discovered during baseboard repairs (within 1 m of the treatment) along the same wall as the treated windowsill. No evidence of an entry point was observed by visual inspection. The action plan was modified to include a soil treatment along the exterior wall beneath the window up to a gutter drain that extended into the ground (Soil trench, 5.7 L, 0.06%). The brick multiple wythe construction was believed to offer access because of the lack of evidence of activity in the basement below Room 124. In 2007, termites swarmed, again, from an undetermined location in Room 124. A visual inspection of the crawlspace adjacent to the basement below Room 124 was conducted. This inspection found heavily infested wooden form boards that were left after adding a separate wing to the building in the 1950's. The action plan was changed to request that Physical Plant remove the form boards. Difficulties surrounding implementation of that removal prevented any follow-through on that request. Termites swarmed again in 2009 and a wood injection using a foam application (0.5 L, 0.00006%) to the baseboards in room 124 and 122 (above the crawlspace) were conducted. The concrete form boards have yet to be removed and the infestation at site 7 has not been remediated.

- Site 11: A swarm was reported in 2002 from an office in a concrete block structure built on slab constructed in 1984. The flight originated from a built-in bookshelf that covered an entire wall in the office. Visual inspection of the area provided no evidence of an entry point because the interior wall cladding prevented examination for EJ's that were suspect. A liquid wood injection treatment was conducted (0.5L, 0.125%) by drilling holes in the plywood back of the bookshelf. No activity was reported until a remodel 6 years after the original treatment (2008). Live termites were discovered in the structural members of the wall behind the original bookshelf. The bookshelf was constructed by placing untreated lumber on the block wall as support for the plywood back of the shelf.

An expansion joint was directly under this wood frame and provided the entry point for infestation. The EJ was treated (Void, 1.2 L, 0.0006%) prior to the wall being repaired with treated lumber framing for a drywall interior finish. No further activity was noted upon re-inspection in 2009.

- Site 20: A swarm was reported in 2002 originating from a windowsill in a stairwell of a wood frame structure covered in hard-coat stucco built in 1824, on a stone foundation. A spot treatment was conducted using 0.5 L of a 0.06% liquid solution of Termidor® injected into the windowsill after a visual inspection could find no evidence of the entry point from the crawlspace. No activity was noted until 2005 when termites swarmed from a doorframe over to an expansion joint for the brick step-porch 2-m from the previously treated windowsill. The expansion joint of the rear door was treated (Liquid, 5.7 L, 0.03%) and no activity was reported until 2009 when termites swarmed from a stone fireplace 5-m from the other treatment locations. Visual inspection of the crawlspace was unable to locate the entry point although the brick foundation of the fireplace is suspected as the most probable culprit. Inspection with IR and AED provided no indication of infestation although the MMD indicated activity in a windowsill between the fireplace and previous swarm sites. The revised action plan calls for a whole-house soil treatment and reduction of the landscape mulch surrounding this structure. No treatment has been conducted at this site at the time of this report and the infestation at site 20 is considered active. This site has multiple conducive conditions including mulch (> 10-cm deep) up to the hard-coat stucco that extends over the stone foundation.

- Site 43: A swarm was reported in 2004 in a structure built in 1938 of multiple-wythe brick on a slab foundation. Visual inspection provided no indication of an entry point and a treatment was conducted in the baseboards of two rooms (Wood Injection liquid, 0.6 L, 0.06%). The following year termites swarmed again from the same location and the action plan was revised to include a soil treatment along the exterior wall (Soil rod, 15.1 L, 0.06%). No evidence of continued activity has been noted at the site using visual inspection, MMD, AED, and moisture meter. This structure has been termite-free for the past 4 years.
- Site 8: A swarm was reported in 2006 from a brick multiple wythe structure constructed in 1882 that had a combination of basement, crawlspace and adjoining slabs. Visual inspection found no evidence of an entry point but the grade was over the slab foundation of the multiple-wythe brick construction at the corner produced by the foyer where the swarm occurred. The action plan called for reducing the grade to expose the foundation/slab interface, extending the gutters that dropped water into the area and included a wood injection of foam (0.5 L, 0.06%) to an exterior doorframe in an entry foyer above the attached slab foundation. Two years later (2008), termites swarmed from the adjoining wall opposite the treated door. The grade had not been reduced and the gutters not attended as recommended. No termite activity was noted at the previous treatment location. The action plan was revised and a wood injection using a void treatment was performed (1.25 L, 0.00006%) to an interior wall in the foyer next to the previously treated door, void treatment was also conducted to the EJ along the sidewalk by the front door entry to the foyer (0.3 L, 0.06%), and a soil treatment

along the exterior wall opposite the interior wall previously mentioned (15.1 L, 0.06%). The grade was lowered at the time of the exterior wall treatment. No swarm was reported in 2009 yet during re-inspection termite activity was discovered using a microwave motion detector in an interior doorframe and wall 1-m behind the foyer areas previously treated. The action plan was revised, once again, to include a soil treatment along an adjoining exterior wall (Soil trench, 37.9 L, 0.06%). Exterior landscape grade and multiple-wythe construction at this location provide numerous possible entry points.

- Site 39: A swarm was reported in 2007 from the hardwood floor in the hallway and adjacent room in a multiple-wythe brick structure built in 1847 on a stone foundation with a crawlspace. An inspection of the crawlspace indicated termite activity in the form of shelter tubes in the stone foundation extending to the wooden beam joist header and floor joists. A treatment was conducted in 2007 (Wood injection, 7.6 L, 0.0006%) in the joist header and floor joists along the stone foundation where shelter tubes were observed. A swarm occurred in 2008 and inspection of the crawlspace indicated no termite activity at the treated beams but had extended shelter tubes down piers and a hollow block foundation wall 10-m distance from the treatments. An 'above-ground' baiting was attempted on floor joists that showed termite activity as indicated by visual inspection of shelter tubes and a resistograph examination for voids in the beams. Termites did not feed on the baits, and the swarmed again in 2009. The infestation at site 39 has not been remediated. The third revision includes soil treatment around all piers that exhibited termite activity and the hollow block wall in an attempt to eliminate contact with soil and the presumed source of moisture for this infestation.

Inspection and treatment duration

Times for inspection and treatment were recorded for 2009 actions plans (N=11). Inspection times ranged from 20 to 90 minutes with an average of 42.3 minutes. Treatment times ranged from 15 minutes to 120 minutes with an average of 42.5 minutes (Table 2.1).

DISCUSSION

This study illuminated some important biological information about subterranean termites: their swarming activity, species infestation, rates of infestation, and routes of entry to name a few. This information will add to the body of knowledge in an attempt to help manage these structural pests.

March was the heaviest swarm month during my study period. This corresponds with the flight time of the dominant species, *R. flavipes* (Kollar), during our study (Miller 1949, 1964, Weesner 1965, Scheffrahn and Su 1994, Suiter et al. 2009). *R. flavipes* accounted for 93% of the infestations reported in campus structures. Swarm activity on the university campus increased over the last three years of the study. During the first six years (2001-2006) there was an average of 5 swarms per year. This increased to an average of 13 annually during the years 2007, 2008, and 2009.

One aim of this project was to determine the termite entry point during the inspection. In 8 instances, entry was able to be remediated by landscape modification or doing nothing. Five of the 8 sites have not showed signs of re-infestation for a year or more. Three of the eight sites were established in the past year, but have not had reports of continued activity. The reduction of conducive conditions was sufficient enough to deter continued foraging activity.

The most common entry point observed was through an expansion joint. In almost 60% of expansion joint entries, the joint entry was found to be aided by exterior landscape grade and/or a moisture problem. Repairing the conditions that are vital to termite biology in association with structural elements that provide means of entry, the chance of infestation is lowered.

The University of Georgia campus has structures ranging in age from new construction to over 200 years old. Building age did not correlate with infestation indicating that structure age does not relate to the chance of infestation.

The termite literature is lacking actual numbers on infestation rates for subterranean termites. Most references to the topic label areas on a risk scale map from slight to heavy infestation (Hafner and Hites 2003, Suiter and Forschler 2004). The southeastern portion of the United States extending from southern portions of North Carolina west to portions of Texas are considered high risk areas for termite infestation. Granovsky and Sadberry (1983) indicated a subterranean termite infestation rate of 33.1% when 251 homes were inspected across three Texas cities. Initial infestation rates in the New Orleans French Quarter were reported between 12.8 and 30.2% (Guillot Personal Communication). Infestation rates during our study of 4.66% annually and a 9-year total of 29.65% are similar to reports from these other high risk areas.

Varying concentrations of fipronil were used over the 9 year study period on substrates other than soil in an attempt to get transfer to occur. The high toxicity of fipronil at label rate appears to cause rapid mortality on non-soil substrates. This rapid mortality caused an apparent chasing of termites to close non-treated areas in the same structure.

A common thematic goal of most IPM programs is a reduction in applied insecticide (Stern et al. 1959, Greene and Breisch 2002). During the 9 years that this study encompassed there was a total reduction in insecticide application of 88,005.8 liters (99.457%) not including the 8 sites where no treatment was performed. If these 8 sites are included, the reduction increases to 88,979.4 liters (99.463%).

The average times for inspection and treatment were similar with both around 42 minutes for inspections and treatments conducted in 2009. Typical Termidor® treatment times for a home usually take less than a day (BASF 2009). Using a spot treatment strategy focused on locating the entry point treatment time was reduced dramatically.

Treatment success can be evaluated by two definitions described earlier. The first method, the methodological, provided a 100% success rate for treatments. Termites were not re-discovered in the location where termiticide was applied in any if the 49 sites. In 3 cases, the entry point was not accurately identified and the termites re-swarmed from the general location of the treatment. Method 2, the ideological approach, provided a success rate of 72.1%. While this may seem low, it must be considered that most of the buildings are much larger than a typical home and provide a much greater chance of re-infestation strictly based on size. It is the author's belief that the first measure, the methodological approach, of success is a more accurate measure than the ideological. If the definition of methodological success were not bound to the specific location of treatment, but within a localized site, the treatment success rate would be the most accurate. Using this measure, a blend of the two described, the program provided an initial success rate of 89.5% (51 of

57 sites were remediated on the first treatment) and an overall success rate of 94.7% (54 of 57 sites have been remediated).

This is the first attempt since 1934 (Brown et al. 1934, Kofoid and Chase 1934) to quantify subterranean termite infestation entry points and treatment success toward identifying items relevant to developing an IPM program for termites. Termite IPM is different than traditional termite control. The treatment is never complete. It is a cooperation between the property owners and pest control technicians to maintain inhospitable conditions for termite re-infestation. It is a costly (Su and Scheffrahn 1998), yet simple fix to have a traditional liquid structure treatment for termites. This alone may not be a final solution. Breaks in soil treatments, altered construction due to remodeling, landscape grade changes, or improper drainage can cause failures to these traditional treatments. These steps show why an integrated approach is necessary. An integrated methodology can limit the gaps in these treatments by assisting with another action to reduce the chances of termite activity.

Inspection is the most important step in the termite treatment process. Considering only the construction of a structure is not enough. The surrounding landscape of the structure is also extremely important and will ultimately determine how the termites are gaining access. When completing the inspection, the landscape and building construction must be taken hand-in-hand if a proper action plan is to be determined and implemented. In addition to landscape and construction, other factors might complicate an inspection or treatment. Accessibility, tools available, or regulations might play into the process. It is the job of the pest control technician to be aware of all of the constraints when formulating an action plan and communicating that plan to the property owner.

A total IPM program, sold as a complete service, could be the solution. This IPM service must be a cooperation between builders, architects, landscapers, and pest control companies to complete a balanced action plan and provide the maintenance to ensure sustainability. Chemicals alone can't solve every termite infestation.

Table 2.1: Comparison of treatment type, concentration, building size, projected volume, actual amount used, linear feet treated, and difference between projected and actual applied volumes for the 57 sites of termite activity.

ID Number	Building Number	Construction Type	Entry Point	Conducive Conditions	Notification Date	Swarm	Species	Det Method	Treatment Type	Concentration	Linear ft	Linear Meters	Projected Liters	Projected Gallons	Liters Used	Gallons Used	Linear Meters Treated	Linear feet treated	Inspection tools	re-inspection date	2009 inspection time	2009 treatment time
1	0072	BV, WF, S	EJ	Moisture	4/4/2008	Y	F	FT	Landscape Mod		1775	541.0	2687.6	710.0					MM, MMD, AED	1/23/2009		
					5/11/2004	Y	V	A														
2	0101	SF, CS	GSF	Moisture	7/25/2008	N			Landscape Mod		3218	980.8	4872.6	1287.2					MM, MMD, AED, IR	1/21/2009		
3	0042	MWB, S	EJ	Moisture & Grade	4/9/2008	Y	F	A	Bait		444	135.3	672.3	177.6					MM, MMD, AED	3/4/2009		
4	1656	SF, WF, CS, HB	GSF	WGC	5/11/2007	N	F	S	Bait		222	67.7	336.1	88.8						6/3/2008		
					3/18/2008	Y	F	A	Wood Injection	0.00006%												
5	2685	BV, MF, S	EJ	Grade	4/11/2008	Y	F	A	Bait		398	121.3	602.6	159.2	0.4	0.1			MM, MMD, AED	1/21/2009		
					3/10/2008	Y	F	FT	Soil Trench	0.06000%					37.9	10.0	7.62	25				
					3/13/2008	Y	F	A	Liquid	0.06000%					0.1	0.03						
6	1693	CAS, MF, S	EJ	Grade	3/17/2008	Y	F	FT	Bait		873	266.1	1321.9	349.2					MM, MMD, AED	12/9/2008		
					2/26/2001	Y	F	A														
					2/27/2002	Y	F	FT														
					8/28/2006	N			Wood Injection	0.06000%					0.5	0.1						
					3/28/2007	Y	F	A	Soil Trench	0.06000%					5.7	1.5	0.1524	0.5				
7	0271	SF, MWB, CS	WGC	WGC	3/17/2009	Y	F	A	Wood Injection	0.00006%	662	201.8	1002.4	264.8	0.5	0.1			MM, MMD, AED	3/31/2009	50	15
					3/29/2006	Y	F	A														
					3/19/2008	Y	F	FT	Wood Injection	0.00006%					1.3	0.3						
					4/2/2008	Y	F	A	Liquid	0.06000%					0.3	0.1						
8	2617	MWB, MF, S	EJ	Moisture & Grade	4/9/2008	Y	F	A	Soil Trench	0.06000%	323	98.5	489.1	129.2	15	4.0	3.048	10	MM, MMD, AED, IR	6/1/2009	30	120
9	1690	CAS, HB, S	EJ	Grade	3/27/2008	Y	F	A	Liquid	0.00006%	2930	893.1	4436.5	1172.0	1.9	0.5			MM, MMD, AED	12/9/2008		
10	1701	BV, S	EJ	Moisture	3/28/2007	Y	F	FT	Soil Rod	0.06000%	703	214.3	1064.5	281.2	3.8	1.0	1.8288	6	MM, MMD, AED	4/10/2009		
					3/1/2001	Y																
11	2685	CAS, WF, S	EJ	NO	2/11/2008	N	F	FT	Liquid	0.00060%	398	121.3	602.6	159.2	1.2	0.3			MM, MMD, AED	1/21/2009		
12	0060	MWB, S	EJ	Grade	10/8/2008	N			Wood Injection	0.00006%	1036	315.8	1568.7	414.4	11.4	3.0			MM, MMD, AED	4/10/2009		
					1/23/2007	Y	F	FT														
13	2300	CAS, MF, S	EJ	Moisture	2/29/2008	Y	F	A	Wood Injection	0.00006%	824	251.2	1247.7	329.6	0.3	0.1			MM, MMD, AED	2/12/2009		
14	2835	HCS, MF, S	EJ	Moisture & Grade	3/28/2007	Y	F	A	Soil Trench	0.06000%	1424	434.0	2156.2	569.6	15.1	4.0	3.048	10	MM, MMD, AED, IR	2/4/2008		
15	2335	C, CAS, S	EJ	Grade	1/6/2003	Y	F	FT	Wood Injection	0.12500%	853	260.0	1291.6	341.2	0.9	0.2			MMD, IR	12/19/2008		
16	0290	MWB, S, B	EJ	NO	3/11/2002	Y	F	FT	Soil Trench	0.06000%	827	252.1	1252.2	330.8	94.6	25.0	19.05	62.5	MM, AED	4/10/2009		
17	1030	MWB, S	EJ	Moisture	3/11/2003	Y	F	S	Liquid	0.06000%	1462	445.6	2213.7	584.8	0.9	0.2			MM, MMD, AED	4/10/2009		
18	1010	MWB, S	EJ	NO	10/1/2002	N	F	S	Liquid	0.06000%	1310	399.3	1983.6	524.0	0.5	0.1			MM, MMD, AED	3/18/2009		
19	1010	MWB, S	EJ	Grade	3/28/2003	Y	F	A	Soil Trench	0.06000%	1310	399.3	1983.6	524.0	15.1	4.0	3.048	10	MM, MMD, AED	3/18/2009		
					3/27/2002	Y	F	A														
					5/4/2005	Y	F	A														
20	0021	SF, HCS, CS	EJ	GSF	4/3/2009	Y	F	FT	Liquid	0.03000%	150	45.7	227.1	60.0	5.7	1.5			MM, MMD, AED	1/29/2009		
21	1024	BV, HB, S	EJ	NO	3/9/2004	Y	F	A	Wood Injection	0.12500%	340	103.6	514.8	136.0	0.9	0.2			MM, MMD, AED	3/4/2009		
22	1058	BV, HB, S	EJ	Grade	4/20/2005	Y	F	FT	Wood Injection		303	92.4	458.8	121.2					MM, MMD, AED	4/10/2009		
23	1058	BV, HB, S	EJ	Grade	11/7/2003	Y	F	S	Liquid	0.06000%	303	92.4	458.8	121.2	0.9	0.2			MM, MMD, AED	4/10/2009		
24	0060	MWB, S	EJ	NO	8/14/2003	Y	H	A	Liquid	0.06000%	1036	315.8	1568.7	414.4	0.9	0.2			MM, MMD, AED	4/10/2009		
25	1002	BV, HB, S	EJ	NO	3/19/2004	Y	F	A	Liquid	0.06000%	695	211.8	1052.3	278.0	0.9	0.2			MM, MMD, AED	2/11/2009		
26	1693	CAS, S	EJ	Moisture	4/3/2007	Y	F	FT	Soil Trench	0.06000%	873	266.1	1321.9	349.2	30.3	8.0	6.096	20	MM, MMD, AED	12/9/2008		
27	0024	MWB, S, CS	EJ	NO	2/26/2001	Y	F	A	Wood Injection	0.12500%	283	86.3	428.5	113.2					MM, MMD	1/29/2009		
28	2495	MWB, S	EJ	Grade	3/2/2005	Y	F	S	Soil Rod	0.06000%	742	226.2	1123.5	296.8	22.7	6.0	53.9496	177		2/25/2009		
29	0056	MWB, S	EJ	Moisture	3/8/2005	Y	F	A	Wood Injection	0.03000%	936	285.3	1417.3	374.4	0.6	0.2			MM, MMD, AED	3/18/2009		
30	2300	BV, WF, MF, S	EJ	NO	4/5/2005	Y	F	A	Soil Trench	0.06000%	824	251.2	1247.7	329.6	22.7	6.0	3.048	10	MM, MMD, AED	2/12/2009		
31	2412	MF, S	EJ	Moisture	2/23/2007	Y	F	A	Soil Trench	0.06000%	301	91.7	455.8	120.4	30.3	8.0	6.096	20	MM, MMD	6/3/2009		
32	0064	HB, S	EJ	NO	3/22/2006	Y	F	FT	Liquid	0.12500%	1026	312.7	1553.5	410.4					MM, MMD, AED	4/7/2009		
33	2600	SV, MWB, S	EJ	NO	2/22/2005	Y	F	A	Liquid	0.00060%	1205	367.3	1824.6	482.0	3.8	1.0			MM, MMD, AED	1/28/2009		
34	2600	SV, MWB, S	EJ	WGC	2/28/2007	Y	F	A	Wood Injection	0.00060%	1205	367.3	1824.6	482.0	3.8	1.0			MM, MMD, AED	1/28/2009		
35	0059	BV, WF, S	EJ	Moisture	3/29/2007	Y	F	FT	Wood Injection	0.00060%	210	64.0	318.0	84.0	3.8	1.0			MM, MMD, AED	4/10/2009		
36	1079	BV, S	EJ	Moisture	3/20/2008	Y	F	A	Wood Injection	0.03000%	3203	976.3	4849.9	1281.2	1.9	0.5			MM, MMD, AED	3/4/2009		
37	0050	BV, HB, S	EJ	Grade	3/26/2001	Y	F	FT	None		1047	319.1	1585.3	418.8					MM, MMD, AED	4/7/2009		
38	1000	BV, WF, S, CS	EJ	NO	3/23/2006	Y	F	FT	Wood Injection		2361	719.6	3574.9	944.4	0.5	0.1			MM, MMD, AED	12/19/2008		
					5/3/2007	Y	V	FT														
					5/5/2008	Y	V	A														
39	0101	SF, MWB, CS	GSF	NO	5/6/2009	Y	V	FT	Wood Injection	0.00060%	3218	980.8	4872.6	1287.2	7.6	2.0			MM, MMD, AED	1/23/2009	35	0
									Wood Injection	0.00060%					7.6	2.0						
40	0101	SF, MWB, CS	EJ	Moisture	3/27/2007	Y	F	FT	Soil Rod	0.06000%	3218	980.8	4872.6	1287.2	7.6	2.0	0.9144	3	MM, AED	1/21/2009		
									Wood Injection	0.00006%					7.6	2.0						
41	0102	SF, MWB, CS	WGC	WGC	3/23/2007	Y	F	FT	Soil Rod	0.06000%	988	301.1	1496.0	395.2	53	14.0	17.0688	56	MM, MMD, AED	1/21/2009		
									Wood Injection	0.00600%					3.8	1.0						
42	1010	MWB, S	EJ	Grade	5/6/2005	Y			Soil Trench	0.06000%	1310	399.3	1983.6	524.0	7.6	2.0	0.4572	1.5	MM, MMD, AED	3/18/2009		
					3/14/2003	Y	F	A														
					3/22/2004	Y	F	A	Wood Injection	0.06000%					0.6	0.2						
43	0053	MWB, S	EJ	Grade	3/2/2005	Y	F	FT	Soil Rod	0.06000%	539	164.3	816.1	215.6	15.1	4.0	4.2672	14	MM, MMD, AED	1/21/2009		
									Wood Injection	0.03000%					3.8	1.0						
44	0042	MWB, S	EJ	Grade	10/6/2005	N	F	S	Soil Trench	0.06000%	444	135.3	672.3	177.6	3.8	1.0	0.762	2.5	MM, MMD, AED	3/4/2009		
45	2037	MF, S	EJ	NO	2002	Y	F	FT	None		1120	341.4	1695.9	448.0								
46	1021	MWB, S	WGC	WGC	5/8/2001	Y	V	FT	Wood Injection	0.06000%	1135	345.9	1718.6	454.0						3/3/2008		
47	1042	MWB, S	EJ	Moisture & Grade	2/11/2008	Y	F	FT	None		562	171.3	851.0	224.8								
48	1033	BV, HB, S	EJ	Moisture	3/12/2009	Y	F	A	Liquid	0.00006%	1315	400.8	1991.1	526.0	0.05	0.01					35	20
49	0120	SF, HCS, CS	EJ	WGC	3/13/2009	Y	F	A	Liquid	0.00006%	538	164.0	814.6	215.2	0.15	0.04					90	15
50	0053	MWB, S	EJ	NO	3/20/2009	Y	F	A	Liquid	0.00006%	539	164.3	816.1	215.6	0.475	0.1					35	25
51	1692	BV, HB, S	EJ	NO	3/27/2009	Y	F	A	Liquid	0.00006%	826	251.8	1250.7	330.4	3.8	1.0					20	35
					4/1/2009	Y	F	A	Liquid	0.06000%					1.9	0.5						
52	0045	BV, HB, S	EJ	NO	4/14/2009	Y	F	FT	Liquid	0.06000%	626	190.8	947.9	250.4	3.8	1.0					40	50
53	0120	SF, HCS, CS	EJ	Grade	4/13/2009	Y	F	A	None		538	164.0	814.6	215.2								
54	2692	BV, HB, S	EJ	NO	4/13/2009	Y	F	FT	None		182	55.5	275.6	72.8							25	0
55	1652	BV, HB, B	EJ	Grade	4/13/2009	Y	F	FT	Soil Trench	0.06000%	687	209.4	1040.2	274.8	15.1	4.0	3.048	10	MM, MMD, AED	4/16/2009	45	60
56	2639	BV, HB, B, S	EJ	Grade	5/18/2009	Y	V	A	None		901	274.6	1364.3	360.4							60	0
57	1000	BV, WF, S, CS	EJ	NO	3/15/2007	Y	F	FT	Bait		2361	719.6	3574.9	944.4						12/19/2008		

Table 2.2: Annual accounting of initial swarms at each site as a determination of site infestation.

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
January			1				1		
February	2				1		2	1	
March	2	2	3	2	2	4	5	3	4
April					2		1	2	4
May	1			1	1		1		1
June									
July									
August			1						
September									
October									
November			1						
December									
Totals	5	2	6	3	6	4	10	6	9

Table 2.3: Annual and monthly accounting of all swarms, by species, at each site as an indicator of species swarm biology. F indicates *R. flavipes*, V indicates *R. virginicus*, and H indicates *R. hageni*.

	2001			2002			2003			2004			2005			2006			2007			2008			2009			Totals		
	F	V	H	F	V	H	F	V	H	F	V	H	F	V	H	F	V	H	F	V	H	F	V	H	F	V	H	R. f.	R. v.	R. h.
January							1												1									2	0	0
February	2			1									1						2			2						8	0	0
March	2			2			3			3			3			4			7			6			5			35	0	0
April													2						1			5			6			14	0	0
May		1									1		1	1						1			1			2		1	7	0
June																												0	0	0
July																												0	0	0
August									1																			0	0	1
September																												0	0	0
October																												0	0	0
November							1																					1	0	0
December																												0	0	0
Totals	4	1	0	3	0	0	5	0	1	3	1	0	7	1	0	4	0	0	11	1	0	13	1	0	11	2	0	61	7	1

Table 2.4: Number of infested and total campus buildings split into 10 year age categories.

Age in Years	# Infested	# of Campus Buildings	% infested by category
0 - 9	3	12	0.25
10 - 19	6	18	0.33
20 - 29	4	10	0.40
30 - 39	2	11	0.18
40 - 49	5	19	0.26
50 - 59	1	8	0.13
60 - 69	3	13	0.23
70 - 79	6	16	0.38
80 - 89	2	5	0.40
90 - 99	2	6	0.33
100+	9	27	0.33

Table 2.5: Times required for inspection and treatment for 2009 action plans in minutes.

Site ID	Bldg #	Inspection	Treatment
48	1033	35	20
49, 53	120	90	15
7	271	50	15
50	53	35	25
51	1692	20	35
52	45	40	50
54	2692	25	0
55	1652	45	60
8	2617	30	120
39	101	35	0
56	2639	60	0

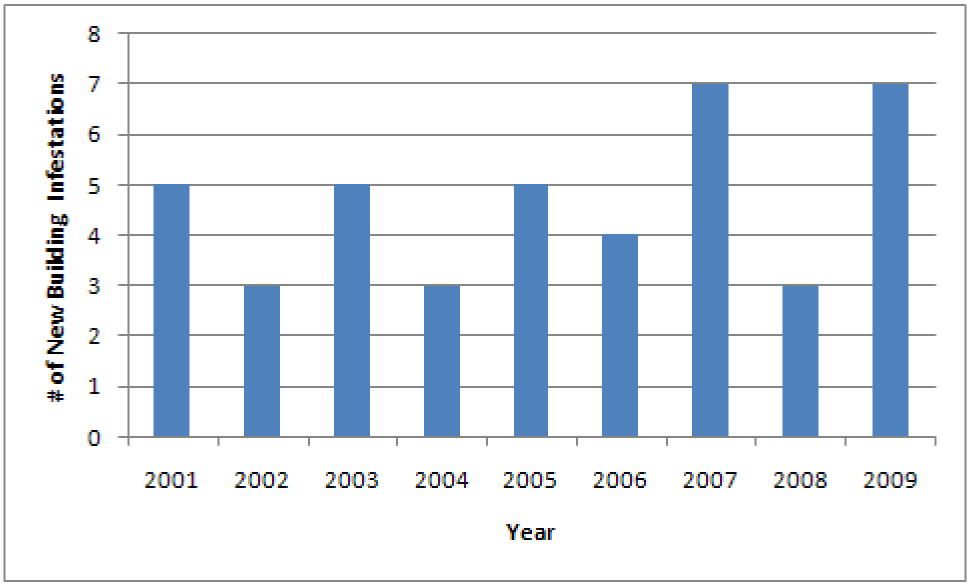

Figure 2.1: Graph of termite infestation rate by number of buildings identified from 2001 to 2009 on the University of Georgia campus.

CHAPTER 3

COMPARISON OF MORTALITY BETWEEN TWO DIFFERENT SOIL TYPES USING A MULTI-CHOICE BIOASSAY ARENA

INTRODUCTION

Termites have been damaging structures built by man for hundreds of years (Snyder 1935). Prior to the 1930's, discussion on termite management was restricted to treatment of lumber, modification of construction, and protection of valuable documents in tight fitting containers (Harris 1849, Snyder 1927). In the mid 1930's literature began to describe the use of soil applied chemicals as an attempt to control structural infestations in conjunction with proper building techniques (Randall and Doody 1934, Snyder 1935).

Subterranean termite workers, being blind, tunnel through the soil following either chemical signals or structural guidelines in an attempt to find food resources (Forschler 1998, Thorne 1998). These food resources can be in many forms ranging from dead trees and wood piles to wood in structures such as homes and businesses. When a food resource is located by foraging termites, chemical cues are deposited to assist members of the colony in navigating to that location. For a termite treatment to be successful, these lines of communication, or chemical signals, must be broken (Forschler 1998).

Early efforts at termite management involved attempting to make the structure impenetrable to termites so that no food resources could be found. These methods sometimes included the use of metal plates, chemically treated lumber, and increased maintenance schedules to repair possible entry points (Snyder 1927, Brown et al. 1934, Horner et al. 1934). As soil application of chemicals became more widely accepted as a management technique in the 1930's, a shift to this type of technique occurred. Literature began to report the effectiveness of long lasting termiticides without any mention of building construction modification (St. George 1944, Hetrick 1950, Heal 1957). The goal in soil treatments is the application of a continuous and uniform insecticide barrier around the perimeter of a structure to discourage entry by termites (Randall and Doody 1934, Rambo 1991). These treatments may either repel or kill the termites that contact it. This has been the most common method of treatment for the past 50 years (Potter 1997).

Long-term efficacy of soil termiticides has aided in the acceptance and success of this treatment type (Johnston 1960). Attempts to measure the long term potential of soil applied chemicals began in the 1940's when St. George applied different concentrations of DDT to moistened containers of soil and exposed termites to the containers after they were given time to dry. These tests were also performed in a field setting under infested logs (St. George 1944). In field studies it was noticed that effectiveness was determined based on the completeness of the treatment. Gaps in treatments allowed infestations in chemicals previously shown effective in lab experiments (Kowal and St. George 1948).

The first multiple chemical termiticide laboratory experiment was conducted by Ebeling and Pence (1958). This work quantified a testing method that allowed termites to tunnel, but did not allow them to get out of sight. This allowed the effects of the chemicals to be measured without destruction of the testing chambers. The amount of time for 50% immobility and mortality was measured between 7 potential termiticides. Similar constant exposure bioassays were used to measure termiticide efficacy in lab trials for almost 15 years. Beal and Smith (1971) first included termite behavior in the design and adapted the construction of the bioassay system to allow the termites to tunnel through treated soil. Their design had some inherent flaws that didn't allow the termites to be observed while in the bioassay, and didn't prevent the treated soil from being spread. In 1982, Su et al. further modified Beal and Smith's design to fix the flaws that had become apparent from their design. The changes that Su et al. included in the design were more slender tube chambers that allowed termite viewing and agar plugs to retain moisture and contain treated soil. These minor changes to the design made it a successful system to measure termiticide effectiveness (Su et al. 1995, Gold et al. 1996). The ability to visually inspect the trials allowed Su et al. (1982) to document the termites' behavioral reaction to the termiticides. This is the origin of termiticide classification as repellent, not repellent, or slow-acting stomach poison.

This manuscript reports data from a multiple-choice bioassay. The design allows termites to forage in a more natural environment where choices between treated soil and non-treated soil are presented. Six termiticide formulations were tested at label rate concentrations with two soil types to demonstrate the varied bio-availability and entry into treatments.

MATERIALS & METHODS

Termites

Eastern subterranean termites, *Reticulitermes flavipes* (Kollar), were collected from infested logs at the University of Georgia Whitehall Forest in Athens, GA using extraction methods described by La Fage et al. (1983) and modified by Forschler and Townsend (1996). Termites were identified using soldier characteristics (Scheffrahn and Su 1994). Termites collected from logs were placed in clear plastic boxes (26cm x 19cm x 9cm) containing moistened 9-cm No. 1 Whatman filter papers and several thin pieces of pine (11.25 x 3.75cm and 1mm thick). Boxes were maintained in an environmental chamber at 24°C for no more than one month prior to beginning a bioassay. Only undifferentiated *R. flavipes* workers, fourth instar and older, were used in bioassay. Soldiers were added to equal 1% of the included workers.

Termiticides

The six insecticides tested in this experiment were fipronil (Termidor SC, BASF, Research Triangle, NC), imidacloprid (Premise 2, Bayer, Kansas City, MO), bifenthrin (Talstar One, FMC, Philadelphia, PA), chlorfenapyr (Phantom TM, BASF, Research Triangle, NC), chlorantraniliprole (DPX E2Y45-130, DuPont, Wilmington, DE) and indoxacarb (DPX MP062, DuPont, Wilmington, DE).

Choice Bioassay

Nine cylindrical plastic containers (5-cm ID, 3.5-cm H) were connected using a 7-cm length of Nalgene tubing (3.175-mm ID, Nalge Nunc International Corporation, Rochester, NY). The central container was filled to a depth of 2.5-cm with a sand and vermiculite mixture (14:12 ratio) to provide a moist tunneling substrate. It also served as the introduction chamber with the tubing entering the chamber at a height equivalent to the top of the sand/vermiculite mixture. The introduction chamber was connected to the base of four chambers, termed substrate chambers, containing substrate that was treated in the following ‘Sand’ or ‘Soil’ manner.

Only one of the four substrate chambers, within any replicate, contained a treatment such that the termites introduced into each arena had a choice of three untreated and one treated substrate chamber. The four substrate chambers were connected by a 7-cm length of Nalgene tubing (placed on the opposite side from the tube leading into that chamber) to the base of another chamber, termed the food chamber, containing two blocks (2-cm^3 each) of pine wood.

The arrangement of chambers resembled a wheel with the introduction chamber at the center with four spokes (tube-defined paths) each leading to a separate substrate chamber with access to a final food chamber (Figure 3.1). Each bioassay arrangement of nine chambers was considered one run. Three hundred termites were placed into the introduction chamber at the start of the bioassay and confined in that chamber for 24-h using small (1.9-cm width) binder clips (ACCO Brands Inc., Lincolnshire, IL). The binder clips were positioned on the tubes leading from the introduction chamber near the point of attachment to the introduction chamber to provide a period of acclimatization prior to release into the choice arena. Seven runs, one run for each termiticide tested and one completely untreated control, comprised one replicate. Termites from a single laboratory culture were used for each replicate. Three different termite colonies (laboratory cultures) were used in the 13 replicates (7 Sand, 6 Soil) that composed this series of tests.

Chambers were destructively sampled at 21 days after binder clip removal to determine the number of surviving workers and soldiers. The amount of termite entry into the treated substrate chamber was also measured.

Sand

Termiticide concentrations were determined by calculating the amount of active ingredient needed to reach the labeled rate parts per million (ppm, w of AI/w of sand) when 8ml of solution were added to 100g of sand. Termiticides were tested in Play Sand purchased commercially.

Termiticide solutions, prepared as previously described to obtain the desired concentration, were added to 50g of substrate to reach 8% sand moisture and the appropriate solution slowly added to the substrate in a zip top plastic bag (Ziploc Sandwich, SC Johnson, Racine, WI). The solution/substrate was thoroughly mixed by hand, through the bag, until all of the substrate was evenly moistened. Untreated control substrates were brought to 8% moisture using distilled water only. The treated substrate was then added to one of the four substrate chambers and compressed (1.01 g/cm^3) to form a continuous layer on the bottom using a homemade sand press. Untreated control sand was divided equally (≈50-g) into the remaining three substrate chambers.

Soil

Termiticide concentrations were determined by calculating the amount of active ingredient needed to reach the labeled rate parts per million (ppm, w of AI/w of soil) when 18ml of solution were added to 100g of soil. Termiticides were tested in a Cecil series sandy loam (71% sand, 21% silt, 8% clay) typical of A horizon soils (top soil) from the Piedmont region in Georgia.

Termiticide solutions, prepared as previously described to obtain the desired concentration, were added to 40g of substrate to reach 18% soil moisture and the appropriate solution slowly added to the substrate in a zip top plastic bag (Ziploc Sandwich, SC Johnson, Racine, WI). The solution/substrate was thoroughly mixed by hand, through the bag, until all of the substrate was evenly moistened. Untreated control substrates were brought to 18% moisture using distilled water only. The treated substrate was then added to one of the four substrate chambers and tapped on the table top to achieve a uniform soil density (0.81 g/cm^3) and form a continuous layer on the bottom. Untreated control soil was divided equally (≈40-g) into the remaining three substrate chambers.

RESULTS

<u>Sand Bioassay</u>

Seven replicates were run using a sand substrate for termite tunneling. An average of 291.86 (97.29%) termites survived in the controls (Table 3.1).

Highest average survivorship in the treatments was seen with bifenthrin (187.14, 62.38%). The remaining treatments in order of highest to lowest survivorship were: imidacloprid (111.57, 37.19%), indoxacarb (91.43, 30.48%), chlorfenapyr (53, 17.67%), chlorantraniliprole (2.43, 0.81%), and fipronil (0, 0%)(Table 3.1).

Average entry into the treated substrate chamber was measured. Average entry for untreated controls was measured on the same respective chamber (substrate chamber 1) as in the treated arrangement. A fully breached substrate chamber was averaged at 5.5cm, the outer diameter of the chamber. Average entries from highest to lowest were: Control

(4.68cm), chlorfenapyr (3.29cm), indoxacarb (2.36cm), chlorantraniliprole (2.21cm), imidacloprid (1.64cm), bifenthrin (1.07cm), and fipronil (0.79cm).

The number of successful times the termites reached each food chamber was recorded. Each chamber had an opportunity to be reached 7 times (7 replicates, 6 treatments and 1 control each replicate). Food chamber 1 (Figure 3.1) was reached 5 times in the control. In the treatments, food chamber one was reached 1 time for bifenthrin, 2 times for imidacloprid, chlorfenapyr, chlorantraniliprole, indoxicarb, and not reached in the fipronil treatment. Food chamber 2 was reached 4 times in the control. In the treatments, food chamber one was reached 6 times for bifenthrin, 3 times for imidacloprid, 5 times for chlorfenapyr, 4 times for chlorantraniliprole, 3 times for indoxicarb, and 1 time in the fipronil treatment. Food chamber 3 was reached 6 times in the control. In the treatments, food chamber one was reached 4 times for bifenthrin, 5 times for imidacloprid, 3 times for chlorfenapyr, 4 times for chlorantraniliprole, 3 times for indoxicarb, and not reached in the fipronil treatment. Food chamber 4 was reached 6 times in the control. In the treatments, food chamber one was reached 4 times for bifenthrin, 6 times for imidacloprid, 2 times for chlorfenapyr, 3 times for chlorantraniliprole, 4 times for indoxicarb, and 1 time in the fipronil treatment (Table 3.2).

Soil Bioassay

Six replicates were run using a soil substrate for termite tunneling. An average of 287.5 (95.83%) termites survived in the controls (Table 3.3).

Highest average survivorship in the treatments was seen with bifenthrin (242.17, 80.72%). The remaining treatments in order of highest to lowest survivorship were:

imidacloprid (194.5, 64.83%), chlorfenapyr (100.83, 33.61%), indoxacarb (87.33, 29.11%), chlorantraniliprole (31.83, 10.61%), and fipronil (0, 0%)(Table 3.3).

The number of successful times the termites reached each food chamber was recorded. Each chamber had an opportunity to be reached 6 times (6 replicates, 6 treatments and 1 control each replicate). Food chamber 1 (Figure 3.1) was reached all 6 times in the control. In the treatments, food chamber one was not reached for bifenthrin, 5 times for imidacloprid, 3 times for chlorfenapyr, 4 times for chlorantraniliprole, 5 times for indoxicarb, and 5 times in the fipronil treatment. Food chamber 2 was reached all 6 times in the control. In the treatments, food chamber one was reached 6 times for bifenthrin, 6 times for imidacloprid, 6 times for chlorfenapyr, 4 times for chlorantraniliprole, 5 times for indoxicarb, and 6 times in the fipronil treatment. Food chamber 3 was reached all 6 times in the control. In the treatments, food chamber one was reached 6 times for bifenthrin, 6 times for imidacloprid, 4 times for chlorfenapyr, 4 times for chlorantraniliprole, 6 times for indoxicarb, and 5 times in the fipronil treatment. Food chamber 4 was reached 5 times in the control. In the treatments, food chamber one was reached 6 times for bifenthrin, 4 times for imidacloprid, 5 times for chlorfenapyr, 4 times for chlorantraniliprole, 5 times for indoxicarb, and 4 times in the fipronil treatment (Table 3.4).

Sand-Soil Comparison

The average sand survivorship was lower in four of the six chemistries. Indoxacarb survivorship was almost equal between sand and soil (difference of 1.37%) and Fipronil which killed all individuals in both substrates. The four chemistries with lower sand survivorship were imidacloprid (difference of 27.64%), bifenthrin (difference of 18.34%), chlorfenapyr (difference of 15.94), and chlorantraniliprole (9.8%).

Average entry into the treated substrate chamber was higher for soil in all but one chemistry, bifenthrin (difference of 0.99cm). Fipronil had the largest difference between average sand and soil entry (4.38cm). The differences in the remaining four chemistries were imidacloprid (2.94cm), chlorantraniliprole (2.29cm), indoxacarb (2.22cm), and chlorfenapyr (0.21cm). The controls in the soil trials for substrate chamber 1 were all completely breached and account for a difference from the average sand control entry of 0.82cm.

DISCUSSION

Differences in soil composition have been shown to affect the availability of insecticide (Harris 1972, Smith and Rust 1993, Forschler and Townsend 1996). Our study was designed to highlight this phenomenon in a multi-choice bioassay arena. The multi-choice setup provided the termites options to forage in a more 'natural' manner.

Bifenthrin produced the lowest mortality in both substrate types. It also recorded the second lowest entry into the treated substrate chamber (substrate chamber 1) for the sand substrate and the lowest entry for the soil substrate. Bifenthrin is labeled as a type I 'repellent' termiticide and the low mortality combined with the limited entry in bioassay appears to fit with the designation. Chlorantraniliprole in both substrates provided high mortality over the 21 day span having only 0.81% survivorship in sand and 10.61% in soil. Tunneling was observed averaging 2.21cm in sand and 4.5cm in soil. Chlorfenapyr showed differences in sand-soil survivorship of 17.67 and 33.61% respectively. Termite entry into the treated chamber was similar averaging 3.29cm in sand and 3.5cm in soil.

Fipronil was toxic to all termites in the bioassay in both substrates over the course of the 21 days. Entry into the treated chamber varied greatly between sand and soil. Termites averaged 0.79cm of entry into the sand while averaging 5.17cm in the treated soil substrate. Mortality occurred extremely quickly in the sand substrate (3 days to one week) and could be an explanation for the limited tunneling and low successful reaches observed. Imidacloprid treatments averaged 37.19% survivorship in sand and 64.83 in soil. The average entry into the treated chamber was 1.64cm in sand and 4.58cm in soil. Indoxacarb survivorship was 30.48% in sand and 29.11% in soil. Average entry into the treated chamber was recorded at 2.36cm in sand and 4.58cm in soil.

When comparing reach data in the sand substrate (Table 3.2), the control food source in chamber 1 was reached 71% of the time (5 of 7). Treatment successful reaches ranged from not reaching (0 of 7) to 29% (2 of 7) for the food chamber 1. This shows some level of protection provided by the treatments, but not complete protection for any of the termiticides. In the soil substrate (Table 3.4), the control food source in chamber 1 was reached 100% of the time (6 of 6). Treatment successful reaches ranged from not reaching (0 of 7) to 83% (5 of 6) for the food chamber 1. The fipronil treatment in sand could easily be confused with a 'repellent' type termiticide. The lack of successful food source reaches and limited tunneling activity give the appearance that termites were repelled from the treatments. This was not observed. The rapid mortality of the termites in the sand substrate treated with fipronil could be an explanation of this phenomenon. The termiticides in the soil trials showed little protection of the food source in food chamber 1, but did show mortality over the course of the 21 days in bioassay. The slow acting nature of the termiticides is critical if the termites are expected to provide exposure to other members of their colonies. Limited mortality and lack of successful reaches to the food chamber in the bifenthrin treatment provide support for its designation as ‘repellent’.

The sand substrate had both higher mortality and reduced tunneling overall. Sand provides the termites an added set of challenges in a bioassay. The non absorbent nature of sand requires termites to maintain moisture levels via tube formation as they tunnel through. The absorbent abilities of soil, by contrast, provide a moisture rich environment that does not require tube formation. Particle size differences between sand and soil must also be considered. These can explain the overall increased tunneling in the soil substrate.

The reduced mortality and increased tunneling in the soil substrates also suggests lower bio-availability of termiticides when compared to sand. This availability can also be attributed to the non-absorbent properties of sand. The termiticide solution is left to fill the gaps between the sand particles causing increased contact with the termites as they tunnel.

Bioassays will continue to be used to measure the efficacy of candidate termiticides. However, substrate and termite biology affect the efficacy results and must be considered when designing a bioassay arena. The bioassay arena presented here provides a better representation of the reactions and interactions of termites in the field than the traditional no-choice bioassay arrangements.

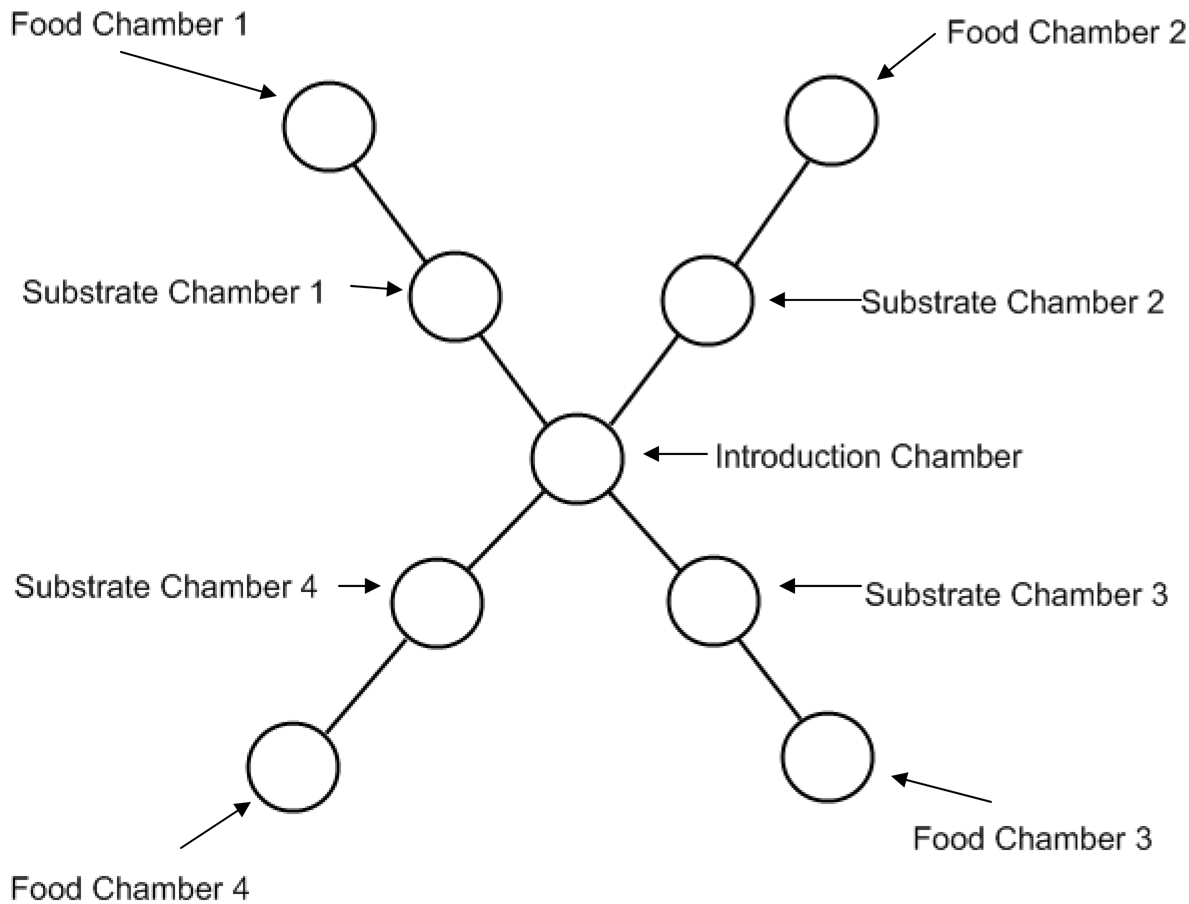

Figure 3.1: The multi-choice bioassay arena arrangement indicating chamber designations.

Table 3.1: Average termite survivorship and entry into treated substrate chamber 1 by chemistry in sand.

	avg survivorship	avg % survivorship	avg entry (cm)
Control	291.86	97.29	4.68
Chlorfenapyr	53.00	17.67	3.29
Bifenthrin	187.14	62.38	1.07
Imidacloprid	111.57	37.19	1.64
Chlorantraniliprole	2.43	0.81	2.21
Indoxacarb	91.43	30.48	2.36
Fipronil	0.00	0.00	0.79

Table 3.2: Number of successful food resource reaches by food chamber and chemistry in sand.

	Food Chamber 1	Food Chamber 2	Food Chamber 3	Food Chamber 4
Control	5	4	6	6
Chlorfenapyr	2	5	3	2
Bifenthrin	1	6	4	4
Imidacloprid	2	3	5	6
Chlorantraniliprole	2	4	4	3
Indoxacarb	2	3	3	4
Fipronil	0	1	0	1

Table 3.3: Average termite survivorship and entry into treated substrate chamber 1 by chemistry in soil.

	avg survivorship	avg % survivorship	avg entry (cm)
Control	287.50	95.83	5.50
Chlorfenapyr	100.83	33.61	3.50
Bifenthrin	242.17	80.72	0.08
Imidacloprid	194.50	64.83	4.58
Chlorantraniliprole	31.83	10.61	4.50
Indoxacarb	87.33	29.11	4.58
Fipronil	0.00	0.00	5.17

Table 3.4: Number of successful food resource reaches by food chamber and chemistry in soil.

	Food Chamber 1	Food Chamber 2	Food Chamber 3	Food Chamber 4
Control	6	6	6	5
Chlorfenapyr	3	6	4	5
Bifenthrin	0	6	6	6
Imidacloprid	5	6	6	4
Chlorantraniliprole	4	4	4	4
Indoxacarb	5	5	6	5
Fipronil	5	6	5	4

CHAPTER 4

CONCLUSION

The work contained in this Thesis shows the history and potential future of an Integrated Pest Management program for subterranean termites. The updated definition presented in chapter 1 highlights the important aspects of IPM, urban integrated pest management must include a combination of steps: inspection, proper identification, action plan formulation, intervention, and continued re-evaluation.

For the first time in recent history a plan to manage subterranean termites using a truly integrated approach was attempted. The program provided positive results in many areas. Overall, the reduction in pesticide application described in chapter 2 was dramatic. This reduction alone indicates the value not only for the cost of application and labor, but to the environment. We live in an era of increased awareness to the potential effects of the non-judicious use of chemicals. This heightened awareness has made this the perfect time to re-establish what Urban Integrated Pest Management and subterranean termite management mean and how they can fit into the current pest management scheme. If the methods do not fit into the current scheme we must consider a revision to how pests are currently managed.

Finally, the multi-choice bioassay arena described in chapter 3 illustrates the need to constantly re-design how we evaluate potential termiticides for the marketplace. Differences between substrates, moisture contents, and opportunity for choice all affect termite behavior when exposed to bioassay. It should be an attempt to simulate the environment termites would encounter in everyday foraging activities to provide results that can be interpreted and considered accurate. The arena presented here is an attempt to provide the most natural environment possible providing multiple choices to the termites contained inside. In addition, differences observed between substrate types indicate the need to consider alternate testing substrates besides sand.

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APPENDIX 1

Report for Inspection Conducted at Building 0102 on July 25, 2007
HOUSEHOLD AND STRUCTURAL ENTOMOLOGY RESEARCH PROGRAM (HSERP)
UNIVERSITY OF GEORGIA

Contact Information:
Contact Person – H. Moore (Phone or email (removed))
Person(s) Responding – BT Forschler, G Ramsey

Inspection Note: A visual inspection of the crawlspace located at Building 0102, two centers of termite activity were observed. These are termed the north and west sites (Map 1).

The north infestation site originated from a plywood form used in the construction of the front ramp that was not removed. The plywood allowed termite access to the joist header where shelter tubes were noticed (Photograph 1). Shelter tubes were also found east and west from the plywood form along the joist header (Photograph 2). Drop tubes (Photograph 3) and shelter tubes were noted extending 3 piers south from the plywood form. Evidence of termite activity ended at the floor joist above the third pier south of the plywood form (Photograph 4).

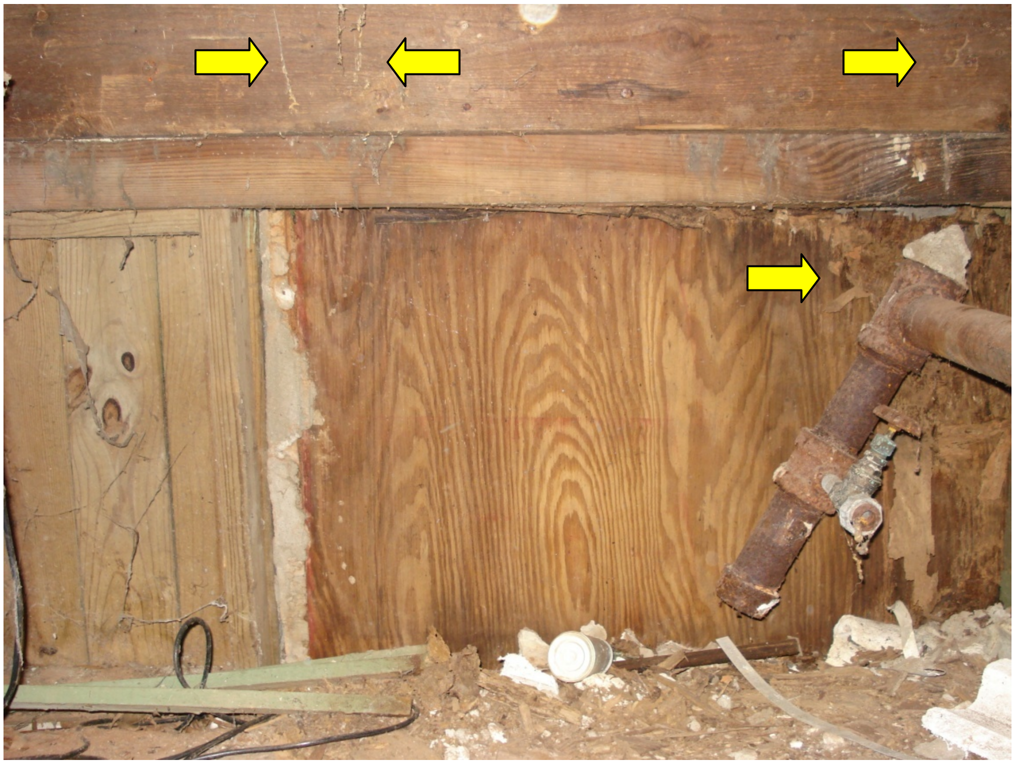
Various pieces of lumber were noted on the ground in the crawlspace (Photograph 5). This wood showed evidence of termite activity, but no evidence was found that the termites had moved to the surrounding piers in any location.

The west infestation site extended north from the crawlspace entrance on the west side of the building. Shelter tubes extended toward the east along the floor joists (Photograph 6).

8-8-2007: Resistograph measurements were taken to determine extent of damage and to develop treatment options. Measurements were taken in 22 locations at the north site (Photographs 7-18) and 6 locations at the west site (Photographs 19-23). Measurement holes were circled, numbered, and charted on a diagram (Map 1) for reference. Data collected from the resistograph readings indicated that the damage coincided with the expected damage from the previous visual inspection. Termite damage was recorded in measurements 11-19 at the North site (Resistograph 1) and 2.2-4.2 at the west site (Resistograph 2). Measurements taken at the other locations along the North site joist header did not show evidence of termite damage (Resistograph 3) and termite activity extending along the subfloor from the north site seemed exploratory with no evidence of damage being recorded (Resistograph 4). The resistograph did not record damage at locations 1.2, 5.2, and 6.2 (Resistograph 5).

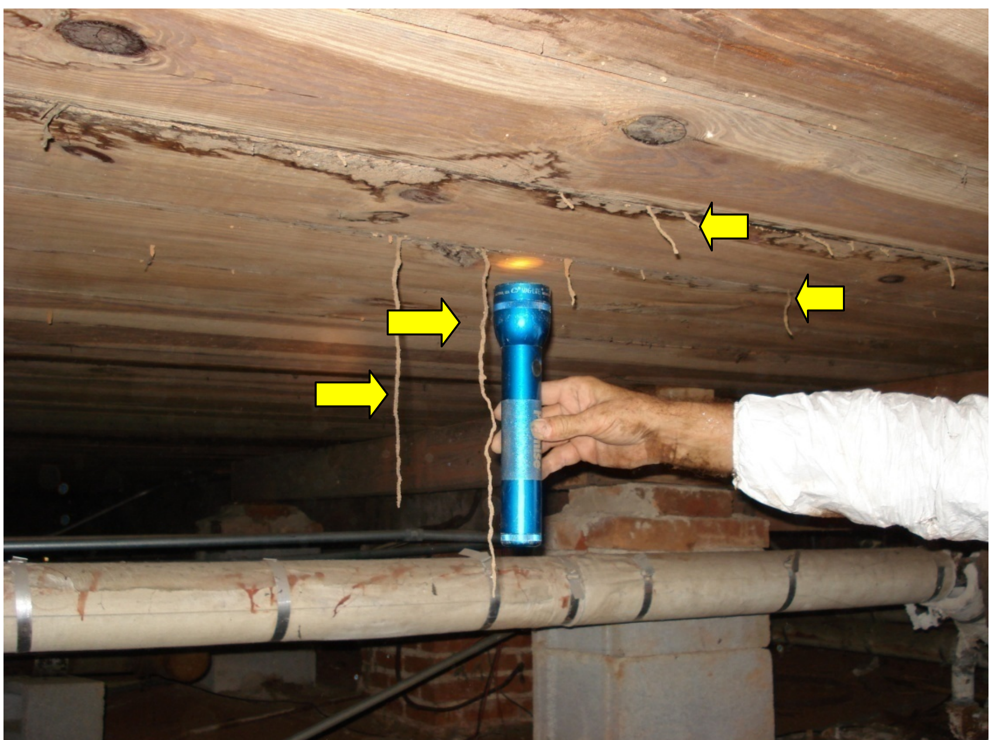
Treatment: 8-9-2007: The joist header at the north site was drilled a total of 12 drill sites to coincide with the damage recorded by the resistograph. A total of two gallons of a 0.0006% concentration of an EC formulation of fipronil was applied as foam into the drill sites (Photograph 24). Brick piers in the affected areas were treated with 2 gallons each of a 0.06% concentration of an EC formulation of fipronil for a total of 14 gallons applied using a rod applicator.

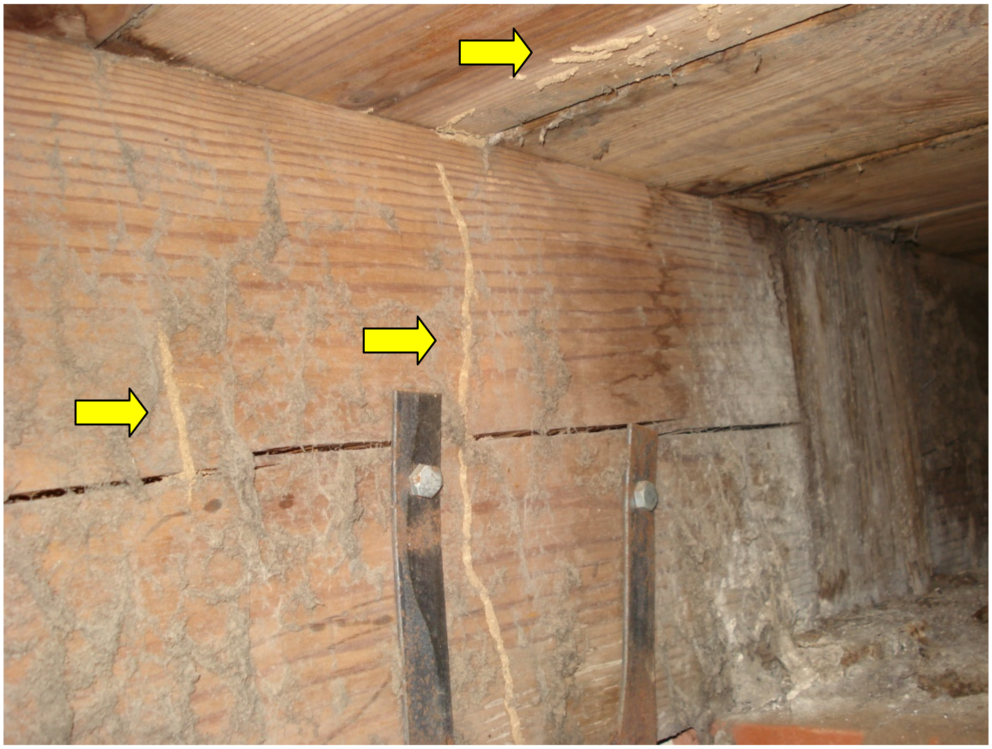
Action Plan: Annual Inspection. Remove excess wood on the ground in the crawlspace.



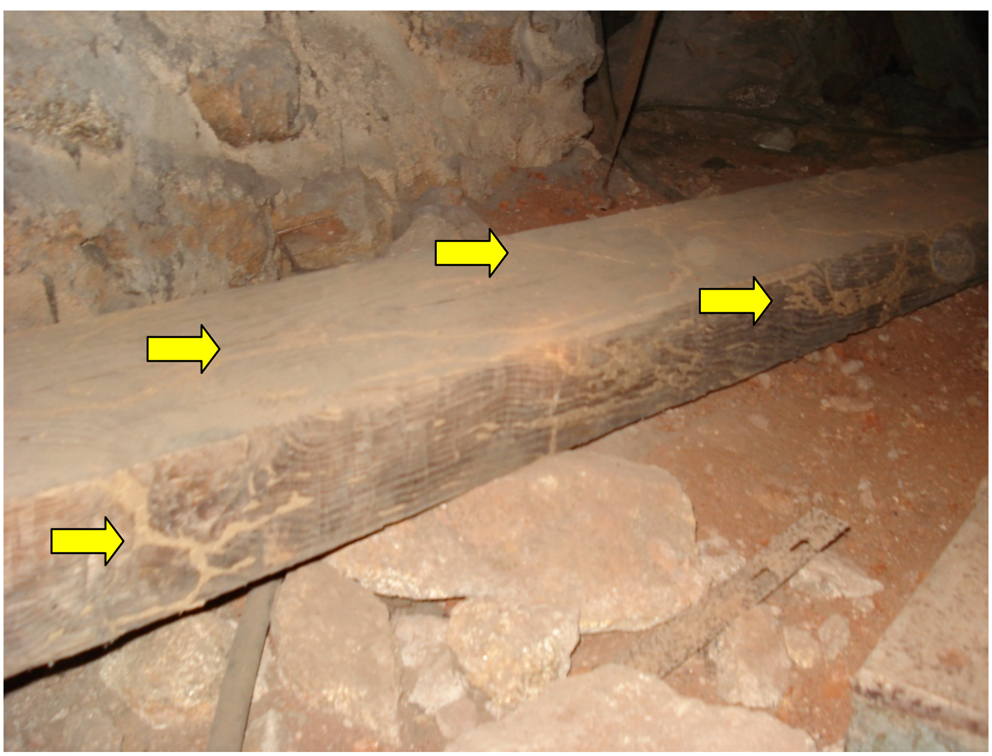
Photograph 1. Plywood form left from the construction of the front ramp that was not removed allowing termite access to the joist header. Arrows indicate evidence of termite activity or damage.


Photograph 2. North site joist header showing shelter tubes.


Photograph 3. Drop tubes on the subfloor between the 2^{nd} and 3^{rd} pier south of the plywood form.



Photograph 4. Shelter tubes on the third floor joist and subfloor south of the plywood form.



Photograph 5. Lumber in the crawlspace with shelter tubes indicative of wood to ground contact in the crawlspace.

Photograph 6. Shelter tubes on the floor joist around the crawlspace entry at the west site.

Photograph 7. Resistograph measurement site 1.

Photograph 8. Resistograph measurement sites 2 and 3.

Photograph 9. Resistograph measurement site 4.

Photograph 10. Resistograph measurement site 5.

Photograph 11. Resistograph measurement site 6.

Photograph 12. Resistograph measurement sites 7 and 8.

Photograph 13. Resistograph measurement sites 9 and 10.

Photograph 14. Resistograph measurement sites 11, 12, 13, and 14.

Photograph 15. Resistograph measurement sites 15, 16, 17, and 18.

Photograph 16. Resistograph measurement site 19.

Photograph 17. Resistograph measurement site 20.

Photograph 18. Resistograph measurement sites 21 and 22.


Photograph 19. Resistograph measurement site 1.2.

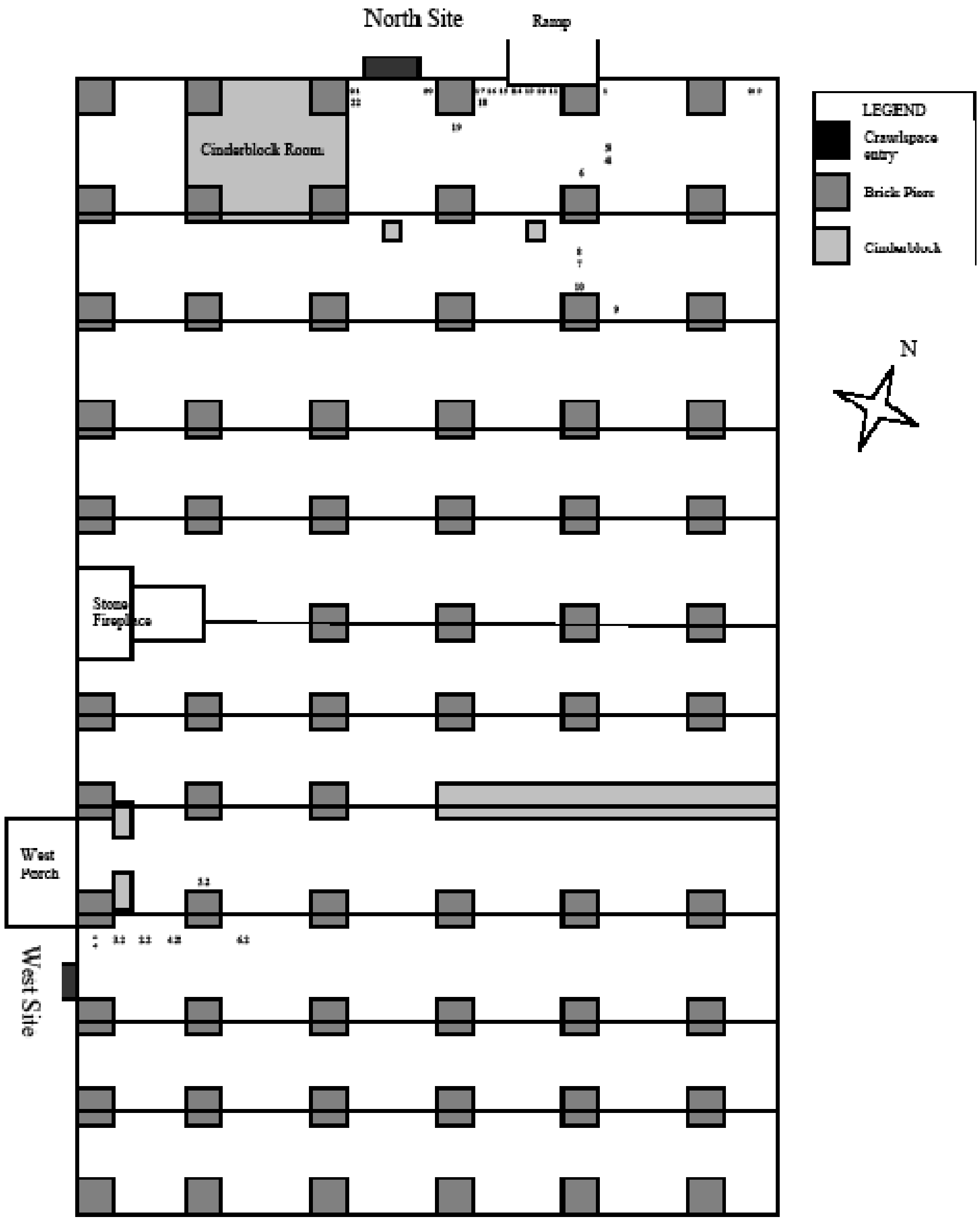
Photograph 20. Resistograph measurement sites 2.3 and 3.2.

Photograph 21. Resistograph measurement site 4.2.

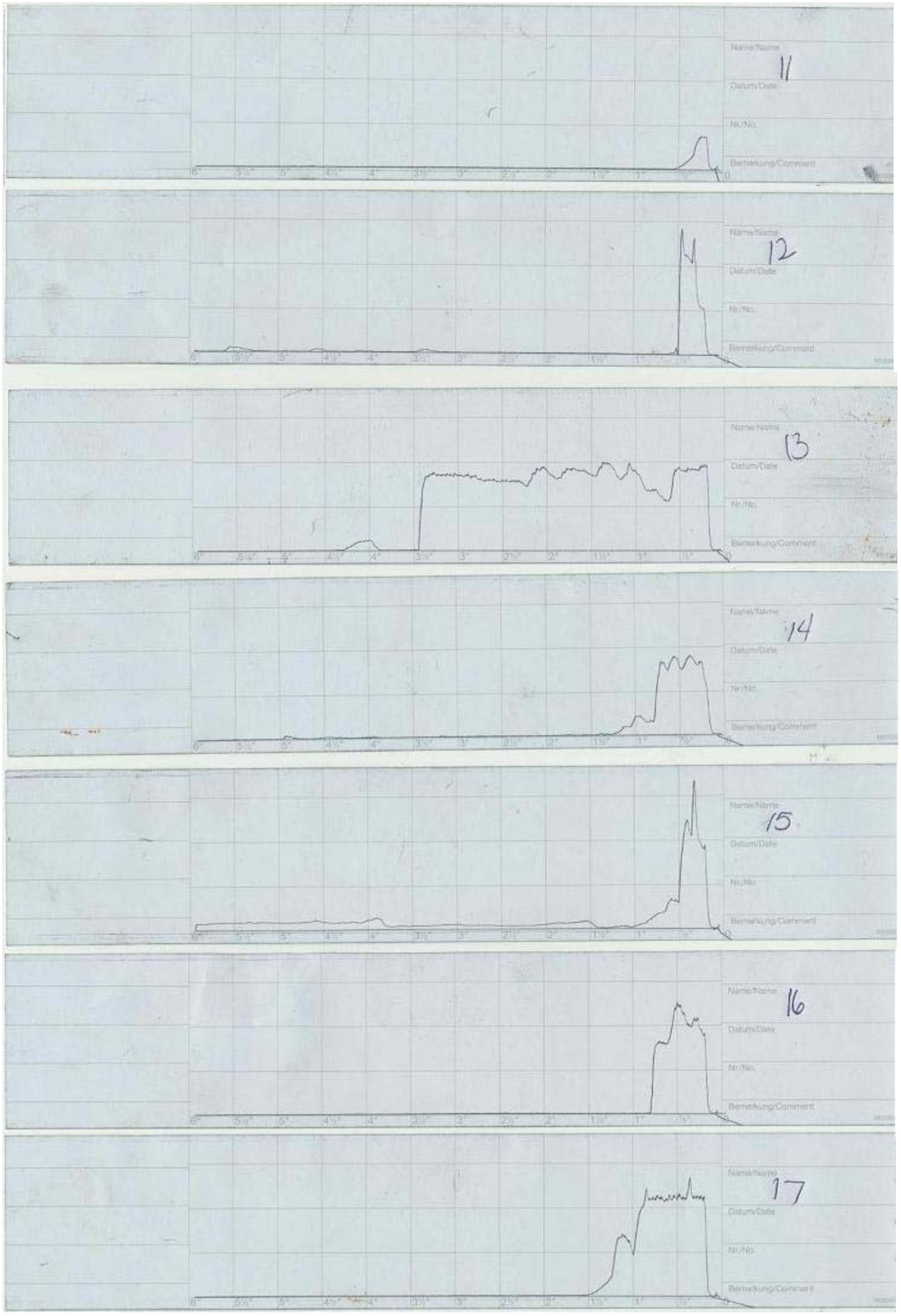
Photograph 22. Resistograph measurement site 5.2.

Photograph 23. Resistograph measurement site 6.2.

Photograph 24. Foam injection application on the north site. Visable foam is from saturation of the joist header.



Map 1. Diagram of the crawlspace noting important structures and resistograph measurement locations.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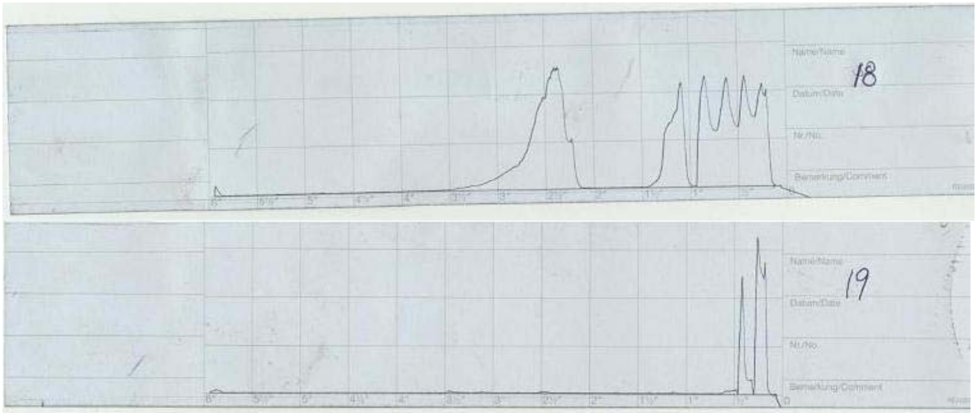
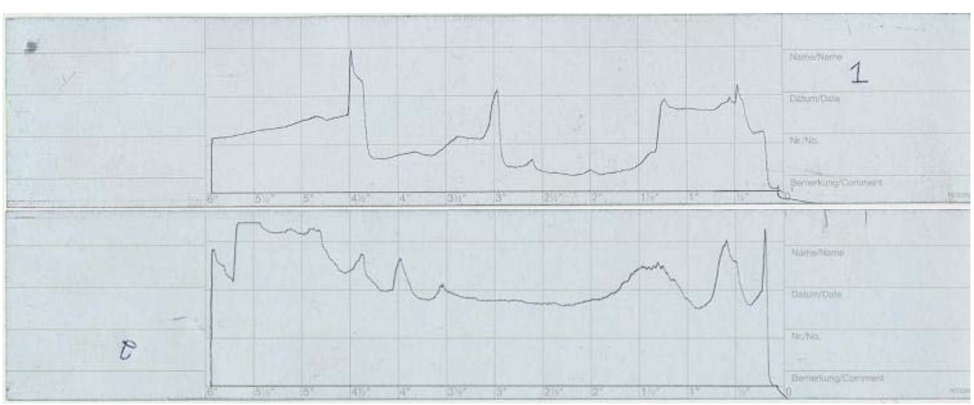
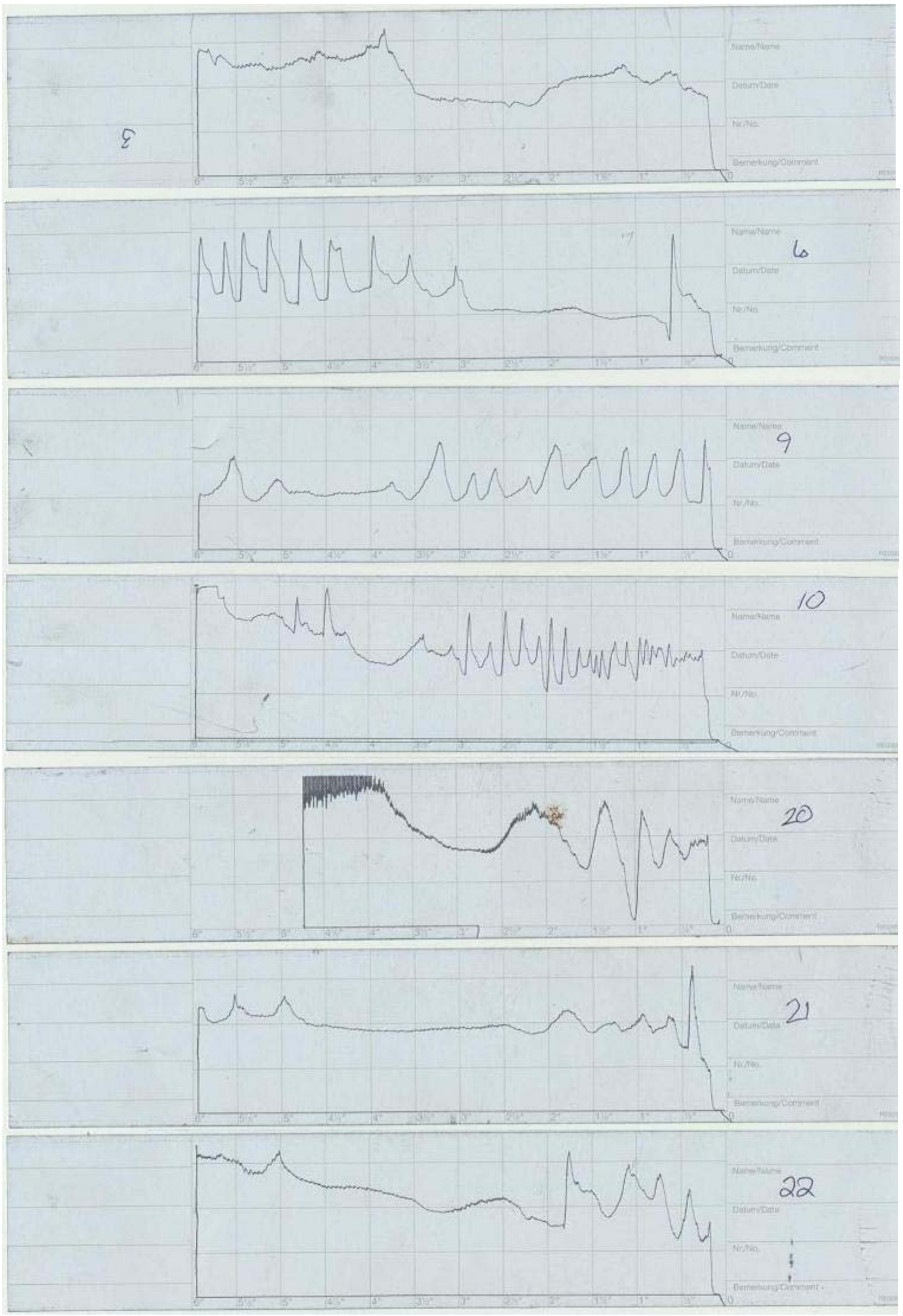


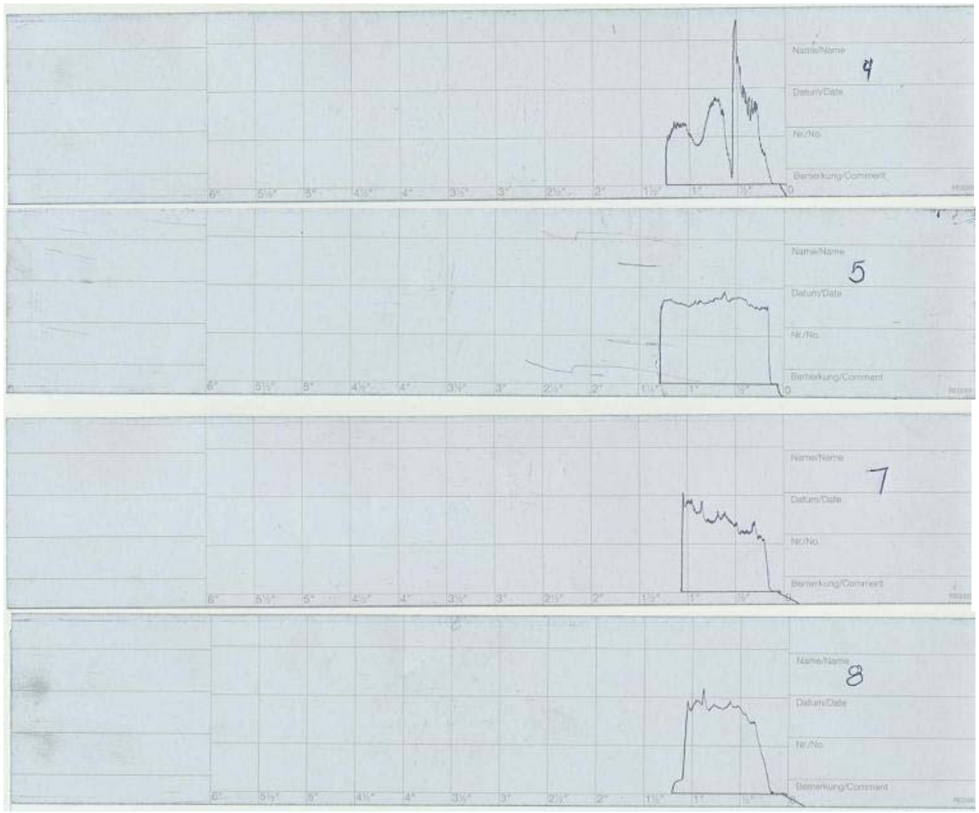
Resistograph 1. Resistograph measurements (11-19) from north joist header showing termite damage.

Resistograph 2. Resistograph measurements (3.2, 2.2, 4.2) showing termite damage in the west site floor joist.

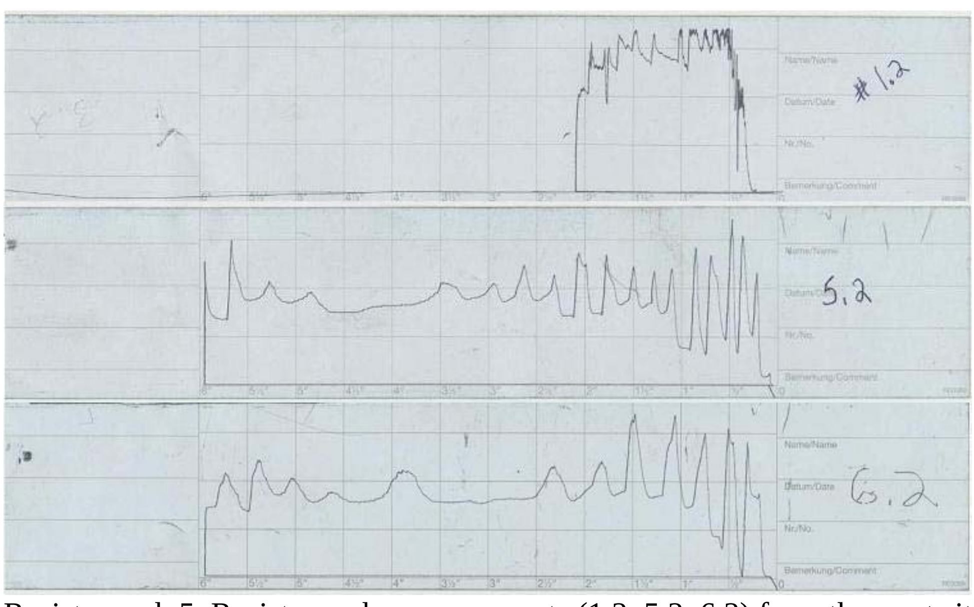




Resistograph 3. Resistograph measurements (1, 2, 3, 6, 9, 10, 20, 21, 22) from the north site that do not show termite damage.



Resistograph 4. Resistograph measurements (4, 5, 7, 8) from the subfloor at the north site.



Resistograph 5. Resistograph measurements (1.2, 5.2, 6.2) from the west site that do not show termite damage.

Report for Re-Inspection Conducted at Building 0102 on March 10, 2009.

HOUSEHOLD AND STRUCTURAL ENTOMOLOGY RESEARCH PROGRAM (HSERP)

UNIVERSITY OF GEORGIA

Contact Information:

Contact Person – H. Moore (Phone or email (removed))

Person(s) Responding – BT Forschler, G Ramsey

Re-Inspection Note: Building 0102 was visually inspected in addition to the use of a Moisture Meter, Acoustic Emissions Detector (AED), and Microwave Motion Detector (MMD) for the presence of termite activity. No evidence of continued activity was noted at either prior site or detectable at any other location in the structure.

APPENDIX 2

Final
Integrated Pest Management Plan

165th Airlift Wing, Georgia Air National Guard
Savannah, GA

Prepared by: Glen C. Ramsey, University of Georgia

Approval and Technical Review

Title	Name	Signature	Date
Installation Pest Management Coordinator	**Mr. Brad Lawson**		
Pest Management Quality Assurance Evaluator	**MSG Jacqueline Terry**		
Installation Bioenvironmental Engineer	**MSG Randy Dart**		
Public Health Officer	**MSG Amy Freeman**		
Fire Department	**SMS Timothy Horton**		
Safety Officer	**SMS Reginal McPherson**		
Hazmat Pharmacy	**MSG William Grimes**		
Unit Training Manager	**MSG Eva White**		
Natural Resource Program Manager	**Lt Col D. Lawrence Eaddy**		
Installation Environmental Manager	**Lt Col D. Lawrence Eaddy**		
Public Affairs Officer	**Lt Col David Simons**		

Base Civil Engineer	**Lt Col Salvador Sancheztroche**		
Pest Management Consultant (NGB/A7A)	**Mr. Steven Covell**		
Mission Support Commander	**Lt Col Todd Freesemann**		
Installation Commander	**Col. Henry Smart**		

Note: This cover page complies with DoD Instruction 4150.07 (May 29, 2008), Enclosure 5, E5.1.1.

After all local installation signatures are entered, except for Mission Support/Installation Commander signatures, forward copy to NGB/A7A Pest Management Consultant for approval via the Cultural Natural Resources (CNR) Database. After requisite NGB/A7A signature is obtained, send IPM Plan to Mission Support/Installation Commander for signatures on cover sheet and on Installation Instruction (enclosed). After all approval signatures have been affixed, record distribution of copies, and send electronic copy of entire plan with signatures to NGB/A7A via CNR.

Record of Annual IPM Plan Review and Approval of Pesticide Use Proposal

Annual Review and Approval of Pesticide Use Proposal	Date	Annual Review and Approval of Pesticide Use Proposal Completed*
1		
2		
3		
4		
5	**Full coordination and approval must be completed every 5 years.**	

*This column will be signed by the IPM Coordinator following annual updates to the IPM Plan and approval from the NGB/A7A Pest Management Consultant on annual Pesticide Use Proposal.

Any routine IPM Plan updates resulting from the Annual Review should be recorded in errata sheets and included with this Plan. For any non-routine updates, confer with the NGB/A7A Pest Management Consultant prior to execution.

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Annexes

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#Annex_2	**Annex 2 – Pest Management Consultant Annual Pesticide Use Proposal**
#Annex_3	**Annex 3 – Points of Contact**
#Annex_4	**Annex 4 – Certificates of Training/Competency**
#Annex_5	**Annex 5 – Installation Map(s)**
#Annex_6	**Annex 6 –Projected Annual Pesticide Requirements**
#Annex_7	**Annex 7 – Statements of Work for Pest Monitoring/Surveillance and Control Services**
#Annex_8	**Annex 8 – DD Form 1532-1 Pest Management Maintenance Record and USDA PPQ Form 523 Emergency Action Notification**
#Annex_9	**Annex 9 – Cost Comparison Analysis Tool**

Authority – Installation Instruction

Date: February 1, 2009

From: Installation Commander

Subject: Integrated Pest Management Plan (IPMP) Implementation Authority

Title: Integrated Pest Management Plan, 165th Airlift Wing, Georgia Air National Guard; Savannah, GA.

Purpose: To implement an Integrated Pest Management Plan for 165th Airlift Wing, Georgia Air National Guard; Savannah, GA.

Regulatory References:

- U.S. Department of Defense (DoD) Directive 4150.07 (May 29, 2008).
- U.S. Air Force Pest Management Program, Air Force Instruction (AFI) 32-1053.
- 40 Code of Federal Regulations (CFR) Part 158, Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Federal Insecticide Fungicide and Rodenticide Act (FIFRA), 7 U.S.C. 136, et seq.

Summary: The IPM plan has been prepared in accordance with DoD Instruction 4150.07 (May 29, 2008). The subject IPM Plan is a comprehensive document that will be used by all personnel working at the 165th Airlift Wing, Georgia Air National Guard. It has been designed to ensure installation compliance with federal, state, and US Territory regulations governing pest management.

Security Classification: The title and document are unclassified. The document does not fall within the scope of directives governing the protection of information affecting national security. This IPM Plan will be designated "For Official Use Only."

Applicability: In accordance with DoD Instruction 4150.07 (May 29, 2008), all ANG installations are required to prepare and maintain a pest management plan. All installation personnel and organizations will review the IPM Plan and ensure full compliance. Through implementation and cooperation, a safe, healthy, and clean environment for current and future generations can be ensured. No in-house or contract pest control operations, including pesticide (ex. herbicide, insecticide, rodenticide, etc.) applications, may be conducted on base without prior coordination and approval from installation designated IPM Coordinator.

Action: The IPM Plan is effective as of February 1, 2009, the date of approval by the 165th Airlift Wing, Georgia Air National Guard Environmental, Safety and Occupational Health Council (ESOHC), chaired by the Installation Commander.

Responsibilities: Civil Engineering is the office of primary responsibility for implementation of this IPM Plan. Tasked organizations are authorized to extract and reproduce those portions of the IPM Plan that are essential to accomplish necessary planning and to prepare supporting documents and reports.

Integrated Pest Management Coordinator should ensure necessary coordination among installation personnel for necessary updates to this plan. Mr. Brad Lawson is hereby designated installation Integrated Pest Management Coordinator for implementation of this plan.

Distribution: Distribution will be in accordance with established U.S. Air Force (USAF) procedures for unclassified documents. The IPM Plan will be distributed to the titled individuals listed below (indicate how many of each hardcopy/electronic copy has been distributed):

Title	Hard Copies	Electronic Copies
Installation Pest Management Coordinator	**1**	**1**
Installation Environmental Manager	**1**	**1**
Installation Bioenvironmental Engineer	**1**	
Fire Department		**1**
Base Civil Engineer	**1**	
NGB Pest Management Consultant		**1**
Pest Management QAE	**1**	**1**

Management Approval: Full approval is extended by management at a level with authority to commit the necessary resources.

Signature: ______________________

Name: **Col. Henry Smart**

Title: **Installation Commander**

Preface

The Integrated Pest Management Plan for the 165th Airlift Wing, Georgia Air National Guard follows. See the table below for a crosswalk between this Integrated Pest Management Plan and Enclosure 5 (E5) “CONTENT OF INSTALLATION PEST MANAGEMENT PLANS, SUGGESTED FORMAT” of U.S. Department of Defense (DoD) Instruction 4150.07 (May 29, 2008).

The following table provides a cross reference to each section of the plan with Enclosure 5 requirements of the latest draft version of DODI 4150.07 (May 29, 2008).

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List of Abbreviations and Acronyms

ACC	Air Combat Command
ACES	Automated Civil Engineering System
ADC	Animal Damage Control
AFCESA	Air Force Civil Engineer Support Agency
AFI	Air Force Instruction
AFOSH	Air Force Occupational Safety and Health
AFP	Air Force Pamphlet
AFPD	Air Force Policy Directive
AFPMB	Armed Forces Pest Management Board
AFSC	Air Force Specialty Code
AGE	Aerospace Ground Equipment
AGR	Active Guard Reserve
ANGI	Air National Guard Instruction
ANGS	Air National Guard Station
APHIS	Animal and Plant Health Inspection Service
BASH	Bird Aircraft Strike Hazard
BCE	Base Civil Engineer
BEE	Bioenvironmental Engineering
BHWG	Bird Hazard Working Group
BX	Base Exchange
CDC	Career Development Course
CE	Civil Engineering
CFETP	Career Field Education and Training Plan
CNR	Cultural/Natural Resource
COP	Community of Practice
DD	Department of Defense
DENIX	Defense Environmental Network & Information Exchange
DFAR	Defense Federal Acquisition Regulation
DoD	Department of Defense
DODI	Department of Defense Instruction

EIS	**Engineering Installation Squadron**
EMIS	**Environmental Management Information System**
EPA	**Environmental Protection Agency**
ESA	**Endangered Species Act**
ESOH	**Environment, Safety, and Occupational Health**
ESOHC	**Environmental, Safety and Occupational Health Council**
ESOHCAMP	**Environmental, Safety, & Occupational Health Compliance Assessment and Management Program**
ESPP	**Endangered Species Protection Program**
F	**Degrees Fahrenheit**
FAA	**Federal Aviation Administration**
FAR	**Federal Acquisition Regulation**
FIFRA	**Federal Insecticide, Fungicide, and Rodenticide Act**
FOMA	**Facility Operations & Maintenance Activities**
FTE	**Full Time Equivalent**
FY	**Fiscal Year**
GaANG	**Georgia Air National Guard**
GPM	**gallons per minute**
GSU	**Geographically Separate Unit**
HAZCOM	**Hazard Communication**
IAW	**In Accordance With**
IMPAC	**International Merchant Purchase Authorization Card**
IPM	**Integrated Pest Management**
IPMT	**Integrated Pest Management Techniques**
ISSA	**Inter-Service Support Agreements**
KO	**Contracting Officer**
MC	**Minor Construction**
MCP	**Military Construction Project**
MH	**Military Housing**
MoM	**Measures of Merit**
MRE	**Meals Ready to Eat**
MSDS	**Material Safety Data Sheet**
MSL	**Mean Sea Level**
NEPA	**National Environmental Policy Act**

NGB	**National Guard Bureau**
OCONUS	**Outside Continental US**
OJT	**On-the-Job Training**
OPR	**Office of Primary Responsibility**
OSHA	**Occupational Health and Safety Administration [or Act]**
PAI	**Pounds of Active Ingredient**
PH	**Public Health**
PMC	**Pest Management Consultant**
PMQAE	**Pest Management Quality Assurance Evaluator**
PPE	**Personal Protective Equipment**
PPQ	**Plant Protection and Quarantine**
PWS	**Performance Work Statement**
RCRA	**Resource Conservation and Recovery Act**
RUTA	**Rescheduled Unit Training Assembly**
QAE	**Quality Assurance Evaluator**
QC	**Quality Control**
QCP	**Quality Control Program**
SABER	**Simplified Acquisition of Base Engineering Requirements**
SPRP	**Spill Prevention and Response Plan**
SRM	**Sustainment, Restoration, and Modernization**
TDD	**Telecommunications Devices for the Deaf**
TES	**Threatened or Endangered Species**
TG	**Technical Guide**
TIM	**Technical Information Memorandum**
UFC	**Unified Facilities Criteria**
USAF	**United States Air Force**
USC	**U.S. Code**
USDA	**U.S. Department of Agriculture**
USD - AT&L	**Under Secretary for Defense - Acquisition, Technology and Logistics**
USFWS	**US Fish and Wildlife Service**
UTA	**Unit Training Assembly**
UTC	**Unit Training Code**
WRRB	**Work Request Review Board**

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1.0 Executive Summary

This Integrated Pest Management Plan (IPM Plan) describes how the 165th Airlift Wing, Georgia Air National Guard will comply with the requirements of DoD Instruction 4150.07, "DoD Pest Management Program," dated May 29, 2008.

An integrated pest management plan is required for the 165th Airlift Wing, Georgia Air National Guard IAW DODI 4150.07 (May 29, 2008).

This IPM Plan follows the requirements and elements defined in Enclosure 5 of DoD Instruction 4150.07 (May 29, 2008), dated 2006, and in the presentation order specified in Enclosure 5. The IPM Plan addresses each element defined in Enclosure 5 whether the element applies or not. Any revision to the format of this plan, or addition of pesticides, requires advance approval from the NGB/A7A Pest Management Consultant.

The Office of Primary Responsibility (OPR) for the IPM Plan is Civil Engineering (AFI 32-1053). The Base Civil Engineer (BCE) has primary responsibility, unless responsibilities have been assigned in writing to another office(s).

Salient requirements of this plan include:

- Under AFI 32-1053, Installation Pest Management Coordinator (a.k.a. "Pest Control Supervisor") works in civil engineering and is responsible for installation's pest management program.

- Only those pesticides pre-authorized by the NGB/A7A Pest Management Consultant may be applied on installation. The "ARMED FORCES PEST MANAGEMENT BOARD (AFPMB) STANDARD PESTICIDES LIST AVAILABLE TO DOD COMPONENTS AND AGENCIES" itemizes pesticides recommended for use at DoD installations; however, the Installation Pest Management Coordinator is responsible for nominating specific pesticides to the NGB/A7A Pest Management Consultant for approval. Each pesticide nominated for use must be tied to a corresponding pest-specific control strategy (see Annex_1).

- Authorized pesticides may only be applied on installation by appropriately certified (DoD or State) pesticide applicators; unless, the applicator is under supervision by a certified applicator under initial training within career field AFSC 3E4X3, or the applicator is a properly trained/instructed participant within the installation self-help program or within a USDA-prescribed quarantine program. Personnel may apply repellents to skin, clothing, or netting for personal protection without pesticide-applicator certification. All pesticide treatments must in strict accordance with label directions. "The label is the law." Personnel who are in "Federal" status (e.g. AGR, Federal Technician, Title 5 Civil Service employee, or Traditional Guardsman who is currently on UTA/RUTA) may apply pesticides on installation under this IPM Plan if they are appropriately DoD or State certified. However, State employees and Traditional Guardsmen (not in "Federal" status) must be appropriately State - certified in order to apply pesticides under this plan, unless otherwise determined in consultation with NGB-JA (POC: Mr. Randy Chambers, Attorney-Advisor, DSN: 327-2729). This means that DoD pesticide applicator certification generally does not cover personnel who are not in "Federal" status.

- Reporting must be done according to Section 8.5 of this IPM Plan or ESOHCAMP, State or DoD findings could result.

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2.0 Background

2.1 Purpose

The purpose of this IPM Plan is to meet DoD policy requirements as defined in DoD Directive 4715.1, “Environmental Security,” Chapter 4; including responsibility of installations to:

- Establish and maintain safe, effective, and environmentally sound IPM programs to prevent or control pests and disease vectors that may adversely impact readiness or military operations by affecting the health of personnel or damaging structures, materiel, or property.
- Ensure that DoD pest management programs achieve, maintain, and monitor compliance with all applicable Executive Orders and applicable federal, state, and local statutory and regulatory requirements.
- Incorporate sustainable IPM philosophy, strategies, and techniques in all aspects of DoD and Component vector control and pest management planning, training, and operations, including installation pest management plans and other written guidance to reduce pesticide risk and prevent pollution.

2.2 Plan Maintenance

Reviews of the Integrated Pest Management Plan and any resulting amendments or changes to the plan will be recorded and kept on file as part of the plan by Civil Engineering. This plan will be reviewed and updated annually by the installation and the installation shall plan the funding for the initial and 5-year revisions to the plan. The NGB/A7A Pest Management Consultant shall review the IPM programs on-site every 3 years either in person or through an on-site external environmental compliance review and the NGB/A7A Pest Management Consultant will annually review and technically approve this IPM plan. This plan should be reviewed sooner if a major revision is proposed.

The IPM Plan is subject to change:

- If any applicable laws, regulations, or requirements are altered;
- When any changes occur that increase potential health or environmental impacts from the management of pesticides; or
- At the request of the NGB/A7A Pest Management Consultant.

Components of the IPM Plan should be reviewed and updated as needed to ensure that all information is as current as possible. Any amendments to the IPM Plan shall be implemented as soon as possible, but no later than 6 months after changes are made (unless legal requirements compel implementation sooner).

2.3 Integrated Pest Management Plan Objectives

The objectives of this Integrated Pest Management Plan (IPM Plan) are to:

- Provide guidance for operating and maintaining an effective integrated pest management program at the 165th Airlift Wing, Georgia Air National Guard.
- Ensure that pest management issues do not adversely impact military readiness and mission.
- Comply with pertinent laws and regulations.
- Meet or exceed DoD pest management measures of merit.
- Identify and implement strategies for managing specific pests on the installation.
- Implement judicious use of both non-chemical and chemical control techniques to achieve effective pest management that minimizes economic, health, and environmental risks. Emphasize the use of mechanical, biological, and cultural control techniques, using chemical techniques sparingly with caution. Use chemical controls only after careful consideration of alternative controls.
- Emphasize use of pest monitoring to determine if and when treatments are needed rather than by a predetermined schedule.
- Document coordination with other organizations and agencies.

2.4 Installation/GSU Description and Mission

2.4.1 165th Airlift Wing, Georgia Air National Guard Description and Mission

Description

The Georgia Air National Guard's (ANG) 165th Airlift Wing (AW) is located at Savannah/Hilton Head International Airport (IAP), approximately 7 miles northwest of Savannah. The 165 AW shares facilities at the airport with the ANG Combat Readiness Training Center (CRTC). Together, they occupy 232 acres of leased land in the southeast and northeast quadrants of the airport. The 165 AW is north of State Route 80 and east of Interstate 95. Access to the installation is from SR 307, east of the airfield. I-95 provides access directly to the northwest half of the airfield.

Three geographically separate units (GSUs) are associated with the 165 AW. The 224th Joint Communication Support Squadron (JCSS) and 165th Air Support Operations Squadron (ASOS) located on the Atlantic Coast in Brunswick, Georgia, and the 117th Air Control Squadron (ACS) located at nearby Hunter Army Airfield just south of Savannah. In addition, the Savannah CRTC is co-located with the 165 AW at the Savannah/Hilton Head IAP. Townsend Bombing Range, located south of Savannah in the city of Townsend, Georgia, is a GSU of the Savannah CRTC. Townsend Range is operated by unit members of the CRTC and is on property owned by the Department of the Navy. In accordance with agreement with Navy, to be documented in ISSA, the 165th AW is responsible for integrated pest management on their exclusive-use property, and the Department of the Navy (USMC) is responsible for pest management on the remainder of Townsend Range property.

History

Savannah/Hilton Head International Airport was established in June 1930. By 1937 the City of Savannah began making plans to build a second airport. The city purchased an additional 590 acres and began construction of the second airport, Chatham Field, in 1941. All runway surfaces at both airports were presumed to have been constructed by 1943. World War II promoted the lease of 1,100 additional acres in 1942. In 1946, Chatham Field was declared surplus by the War Department except for areas used by the National Guard and Air Reserve units. All military activity except the Air National Guard (ANG) was moved to Hunter Army Airfield in 1950 and all property previously leased by the Federal government was transferred to the City of Savannah. Management was transferred to the Savannah Airport Commission in 1955. Chatham Field was then referred to as the Savannah Municipal Airport by city officials. The area was occupied by units including the 158th Fighter Squadron during the Korean conflict and the 165th Airlift Group in the Vietnam Era. A portion of the area was used as the Field Training Site for the military branches designated by the Chief of the National Guard Bureau and was redesignated as a Combat Readiness Training Center in 1990. Both the 165 AW and CRTC currently operate on the property leased from the Savannah Airport Commission. The property is divided into a northern tract and a southern tract which are separated by an east-west runway. An additional tract is located across a public road south of the airport.

The mission of the 165 AW is to provide tactical air transport support for airborne forces, their equipment, and supplies. The 165 AW traces its origin to the 158th Fighter Squadron, which was assigned to Chatham Air Force Base in 1946. The 158th was redesignated in 1958 and assigned a strategic airlift mission flying the Boeing C-97 aircraft in 1962. The unit regularly upgraded its aircraft until 1974, when it was redesignated the 165th Tactical Airlift Group and converted to Lockheed C-130E Hercules aircraft. The 165th Tactical Airlift Group was redesignated the 165 AW in October 1995. The unit currently flies the Lockheed C-130H Hercules.

Climate

The climate in Chatham County is defined as subtropical and is influenced by the coastal location. Summers tend to be warm and humid while winters are short and mild. The average daily high temperature in July is 90.4°F. The highest afternoon temperatures occur from May through September and range between the high 80s and mid-90s with temperatures above 100°F occasionally occurring. The average daily low temperature of 39.3°F occurs in December. The average annual precipitation is between 45 and 50 inches per year, with approximately half the annual rainfall occurring from June through September. Including evapotranspiration, the average net precipitation is 5.22 inches per year. Most warm season precipitation occurs in afternoon thunderstorms of short duration, which are most frequent in midsummer. The heaviest fall/winter precipitation occurs in conjunction with tropical low pressure systems (including hurricanes and tropical storms) that move northeasterly through the area. A rainfall event of 4.70 inches over a 24-hour period can be expected once in a 2-year period.

Geology

The site is located in the Coastal Plain Province, approximately 21 miles west of the Atlantic Ocean. The topography of the area is generally flat to gently sloping. Coastal Plain geology consists of igneous and metamorphic bedrock underlying a thick accumulation of sediments. These sediments, composed of sand and clay, were deposited during the Pliocene to Recent Age and vary in depth from 40 to 80 feet below the surface. Below these sediments is a layer of impermeable clays and sandy-clays of the Hawthorn Formation, 125 to 178 feet thick. The Floridian aquifer, which serves as the major source of potable water for the area, is located under the clay layer within several hundred feet of highly permeable limestone. The ANG property is located in an area that, in the Pleistocene era, was influenced by the movement of glaciers and the fluctuation of sea level. The rising and falling sea level resulted in a terraced effect on the landscape. Due to its slightly increased elevation, the site is located on the remnant of a barrier island or beach.

Surface Water and Groundwater

The top layer sediments of the Coastal Plain region contain a water table aquifer that is located near the surface. The surficial aquifer is concentrated from 2 to 10 feet below the surface by the Hawthorn clays. Surface water on the ANG property is drained via the drainage ditch system to the Pipemakers Canal, which flows eastward and discharges into the Savannah River. More specifically, the airport is located on a groundwater mound which corresponds to a topographic high. It therefore appears that both groundwater and surface water flow radially away in all directions from this mound.

Soils

According to the USDA Soil Survey, the ANG property is located in the Chipley-Urban land complex. Soils of the Chipley Series are classified as moderately well drained, sandy uplands. The surface layer is very dark grayish brown to gray fine sand to about 7 inches. The subsurface layer extends to 65 inches and is an olive brown to light yellowish brown fine sand with gray mottles occurring to about 40 inches in depth. The subsoil is a fine sand of olive brown in color with mottles of light olive brown, light yellowish brown and light gray that reaches 6 feet or more in depth. Permeability is rapid.

2.4.2 GLYNCO ANGS

Description

The 224 Joint Communication Support Squadron (JCSS) and 165th Air Support Operations Squadron (ASOS) are located on the Atlantic Coast of Georgia in the City of Brunswick in Glynn County. The 224 JCSS and 165 ASOS are GSUs of the 165th Airlift Wing located at the Savannah/Hilton Head International Airport. The 224 JCSS and 165 ASOS installation is commonly known as the Glynco ANG Station.

The 224 JCSS and 165 ASOS are supported by the 165 AW at Savannah, Georgia. The site, 13.966 acres in size, is owned by the State of Georgia and leased to the Georgia ANG. The main building on the site was built in the late 1980s. Operations conducted at this facility include vehicle, radio, and aerospace ground equipment (AGE) maintenance. The peacetime mission of the 224 JCSS is to provide equipment and personnel augmentation in support of the United States Central Command/Joint Communications Support Element (USCENTCOM/JCSE) as required to support joint task forces during military operations and disaster relief activities, and to augment or provide contingency emergency communication support to meet the needs of the Joint Chiefs of Staff, military services, and unified and specified commands and defense agencies. These tasks include meeting state requirements as directed by the Governor in support of natural disasters and other state requirements.

History

Built in 1942 as Navy antisubmarine blimp base, Glynco Naval Air Field was fully operational by 1943, with two 960 foot long wooden blimp hangars, two mooring circles, an operational complement of 12 blimps, and a helium plant. The number of buildings constructed during WW II was approximately 500. The number of circular blimp mooring pads was eventually expanded to a large number. In 1945, the station was reduced to an air facility, and it became a storage and salvage yard for some 800 Navy aircraft. In 1952, Glynco underwent a significant expansion, and the current 8,000 foot runway was built for jet aircraft operations. The base eventually totaled over 4,434 acres. At one time, the base could boast of being the only air station operating every type of aircraft: blimps, propeller aircraft, jets, and helicopters. Newer aircraft were added to support advanced pilot training and the Naval Air Technical Training Command (NATTC). NATTC provided advanced and specialized training for the Combat Information Center, air traffic control and associated equipment maintenance. In 1977, the US conveyed the northern half of the base (the runway area, consisting of a total of over 2,300 acres) to the County of Glynn to establish a civil airport. The southern part of the base (the former blimp operating area, a total of over 1,524 acres) became the Federal Law Enforcement Training Center, with driver training tracks being built over many of the former blimp mooring pads.

Climate

The climate of the Brunswick area is characterized by mild temperatures and abundant rainfall. Winters are usually short and mild with occasional cold periods of short duration. Average daily winter temperatures range from 46 to 65° Fahrenheit (F) and average 55°F. Summers are long and hot and typically very wet. Average daily summer temperatures range from 75 to 91°F and average 83°F. Average annual precipitation is approximately 50 inches. The average rainfall intensity from 1988 to 1997 was 4.28 inches. Maximum rainfall generally occurs in August.

Geology

Glynco ANG Station is in the Coastal Plain province, approximately 5 miles west of the Atlantic Ocean. The Coastal Plain province consists of gently seaward-dipping sedimentary rocks of the Cretaceous and Cenozoic Ages. The topography is a flat plain, rising from sea level inland to approximately 500 feet. Gentle cuestas are present. The inner margins are dissected and mature. The outer portions of the Coastal Plain are flat and youthful. The geology of Glynn County in general was greatly influenced by the rising and lowering of the ocean during the Pleistocene and Holocene epochs of the Quaternary Period. This ocean influence from melted glaciers caused several shoreline complexes, consisting of sands and clays, to be deposited. These deposits are remnants of ancient barrier islands and lagoons. At the Station, the surficial layer consists of Pliocene to Recent Age fine-grained sands with a thickness of approximately 40 feet. Underlying the surficial sands is the Hawthorne Formation. This formation is approximately 450 feet of sandy, micaceous clay of the middle Miocene Age. Below the Hawthorne clays are several hundred feet of limestone (approximately 550 feet thick), which is highly permeable and include the Floridian Aquifer, the primary source of potable water in the area.

Surface Water and Groundwater

Glynco ANG Station is located within the Turtle River drainage basin. Surface drainage from the Station is collected by a series of pipes and ditches that outfall into the Brunswick-Altamaha Canal (to the east). This canal subsequently discharges into the Altamaha and Turtle Rivers prior to reaching St. Simons's Sound.

The Stormwater Pollution Prevention Plan for the Station groups the industrial activities of the 165 ASOS and 224 JCSS (e.g., maintenance shops, fuel storage, and wash racks) within Basin 010. This basin generally slopes from west to east. Surface and subsurface drainage structures at Glynco ANG Station direct drainage to industrial stormwater discharge outfall SDO-010. A nonindustrial stormwater discharge outfall collects drainage from the employee parking area south of the 224 JCSS building.

According to Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for the region, the Station is not within the 100-year floodplain. However, the Station is within the 500-year floodplain of the Brunswick-Altamaha Canal.

According to the most current available National Wetlands Inventory (NWI) Map for the region, approximately 6 acres of the Station's property lies within a Palustrine (Forested) Evergreen wetland. However, it is highly likely that this wetland area existed when the property was surveyed for wetlands prior to the construction of the ANG Station in 1988. Presently, no hydric soils or vegetation are known to be located within the boundaries of the Station as depicted on the NWI map.

Surficial groundwater movement is normally controlled by factors such as topographic features, creeks, ditches and pumping wells. The surficial groundwater flow beneath the Station is controlled primarily by local topography, generally in a southeasterly direction consistent with surface water drainage patterns south and east toward the Brunswick-Altamaha Canal, which is approximately 260 feet to the east of the property at its closest point. The surficial (i.e., water table) aquifer occupies the surficial sediments of the Coastal Plain region. In the Station area, the surficial aquifer is unconfined and is approximately 160 feet thick. The aquifer is underlain by clays of the Hawthorne Formation, which is approximately 350 feet thick. Groundwater in the surficial aquifer occurs at 2 to 10 feet below land surface (BLS). Although this aquifer is not currently being used for public water supply, it has been reported that some residents in the area may withdraw drinking water from wells installed into the surficial aquifer. Locally, there are private wells installed into the permeable zones of the Hawthorne Formation. Underlying the Hawthorne Formation is the Floridian Aquifer at approximately 500 feet BLS. Water in this aquifer is under artesian pressure and serves as the primary source of public water supply. The Floridian Aquifer is approximately 550 feet thick.

Soils

United States Geological Survey (USGS) soil maps identify elevation on the site ranging from 15 to 20 feet above mean sea level (MSL). The Station is mostly paved and relatively flat across its entire expanse. An unknown quantity of soil was backfilled into the area during site construction.

According to the Soil Survey of Camden and Glynn Counties by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), the Station includes two primary soil types, as described below:

•Mandarin Fine Sand—Poorly drained soil with rapid permeability and low available water capacity. The water table is commonly at depths from 18 to 40 inches below land surface (BLS).

•Pelham Loamy Sand—Poorly drained soil that may be flooded for brief periods during the winter months. Permeability is moderate, and the available water capacity is low to medium. The seasonal high water table is commonly at a depth of 6 inches BLS for several months of the year.

2.4.3 HUNTER AAF

Description

The 117 Air Control Squadron (ACS), is located at Hunter Army Airfield (AAF). Hunter AAF is located on the southwest edge of Savannah and situated on 5,370 acres and maintains the Army's longest runway (11,375 feet by 200 feet). The airfield is considered a subinstallation of Fort Stewart, which is located 10 miles to the southwest; however, Hunter AAF has its own cantonment area. Land use on the installation includes administrative, housing, maintenance and supply facilities, in addition to the airfield. The majority of development is concentrated along the northeastern boundary of the facility.

The 117 ACS at Hunter AAF occupies approximately 20 acres in the northwest section of Hunter AAF. The 117 ACS is considered a geographically separate unit (GSU) of the 165 Airlift Wing (AW) which is located at Savannah/Hilton Head International Airport. The 117 ACS is a tenant of Hunter AAF.

History

The 117th Air Control Squadron (Air Combat Command), which is now a part of the 152nd Air Control Group, was activated on May 17, 1948, at Chatham Field Savannah, Georgia, with a complement of 23 airmen, four officers, and a small amount of obsolete equipment. Over the years the 117 ACS has undergone several significant changes but still retains its original mission of aircraft surveillance and control. The 117th Aircraft Control and Warning Flight, as it was called then, remained at Travis (previously Chatham) Field until September, 1957: at which time it moved to its new armory at 1117 Eisenhower Drive. The new armory was considered to be one of the finest installations in the State of Georgia at that time. The facility was shared with the 155th Tactical Control Group, the 155th Air Traffic Control Center Squadron and the 226th Air Traffic Regulation Center Flight. In the mid-1960s, the Aircraft Control and Warning Flight became the 117th Tactical Control Squadron. In June 1992, the Tactical Control Squadron fell under the new Air Combat Command and the name changed once again to the 117th Air Control Squadron.

In January 1974, the unit moved to Saber Hall on Hunter Army Airfield. After approximately two years, the 117th relocated to the Hunter Flight Line where it lived and worked under field conditions for more than three years. On 3 November, 1979, the unit relocated to its present 20 acre site on Hunter, formerly the 702nd Radar Squadron. In the early 1970s, the unit received its new AN/TPS-43E Radar and the AN\TSQ-91 (The Bubble). In 1984, after returning from their first deployment to Norway the Maintenance Building was renovated. The Headquarters Building, Building 8593, was completed and dedicated in December 1985. A few other old buildings were removed later. The Ground Radio and Wideband/Satellite Communications Shop was renovated in 1994. The new Modular Control Equipment which replaced "the Bubble" was received in January 1994. The 117 ACS completed the extensive major equipment conversion to the state of the art Modular Control System and the AN/TPS-75 radar in July 1996. This system represents the most advanced Air Control System in the Air Force inventory. In November 1997, the unit received an Excellent rating from the 8th Air Force on their Standard Evaluation Inspection validating crew performance.

During the 50 years since the unit was activated, the 117 ACS has participated in a total of 59 field training exercises and deployments - 50 stateside and 9 overseas. Operationally, perhaps the most significant unit event occurred on January 8, 1951 when the 117 ACS was called to active duty for 21 months during the Korean conflict. Upon returning to Air National Guard status, the unit was assigned to the 152nd Tactical Control Group, with Headquarters in White Plains, New York. While assigned to this Group, the 117 ACS participated in Field Training Exercises in the states of New Jersey, New York and Massachusetts. In December 1958, the unit was reassigned to the 157th Tactical Control Group with Headquarters in Saint Louis, Missouri. The unit has deployed four times to Norway. The 1984 sealift deployment to Norway established the 117th as the first 'Tactical Air Control System (TACS) Squadron to be sealifted. It was also the first TACS to Norway and the first time TACS and the Norwegian Air Defense Ground Environment (NADGE) System were integrated.

The 117 ACS began to support the National Guard Bureau drug interdiction mission with a unit deployment to Great Inagua, Bahamas in 1988. Since that time the unit has deployed to Providenciales (Turks and Caicos Island), Honduras and in 1992 was the first of two radar units to deploy and set up a fully operational site in the jungles of Colombia, South America. The unit became a key player in both United States Southern Command's and United States Atlantic Command's drug interdiction operations. In the summer of 1994, the 117 ACS was also extensively involved (40% of the Unit) in supporting the flood relief efforts in southern Georgia called "Crested River". In January 1998, the 117 ACS deployed 80 guardsmen to NATO's "Operation Joint Guard". In this operation, 117 ACS personnel controlled aerial refuelings, managed multiple datalinks and provided 24 hour maintenance support.

The 117 ACS has passed three Operational Readiness Inspections (ORIs) and has been recognized with numerous awards. Most recently at "Combat Challenge 96", the' Air Force's Premier Worldwide Command, Control, Communications and Intelligence Competition, the 117 ACS won First Place in the Air Control event. An impressive first for the Air National Guard. Also, the unit is the proud recipient of three Air Force Outstanding Unit Awards since 1993. From above the frozen Arctic Circle in Andoya Flystation, Andenes, Norway to the steaming equatorial jungles of Colombia, South America, and on the homefront, the 117 ACS continues to aggressively meet and exceed every challenge with "Pride, Professionalism and People".

Climate

The climate in Chatham County is defined as subtropical and is influenced by the coastal location. Summers tend to be warm and humid while winters are short and mild. The average daily high temperature in July is 90.4°F. The highest afternoon temperatures occur from May through September and range between the high 80s and mid-90s with temperatures above 100°F occasionally occurring. The average daily low temperature of 39.3°F occurs in December. The average annual precipitation is between 45 and 50 inches per year, with approximately half the annual rainfall occurring from June through September. Including evapotranspiration, the average net precipitation is 5.22 inches per year. Most warm season precipitation occurs in afternoon thunderstorms of short duration, which are most frequent in midsummer. The heaviest fall/winter precipitation occurs in conjunction with tropical low pressure systems (including hurricanes and tropical storms) that move northeasterly through the area. A rainfall event of 4.70 inches over a 24-hour period can be expected once in a 2-year period.

Geology

Hunter AAF is located within the Atlantic Coastal Plain physiographic province, which stretches along the southeast coast of the United States from Georgia to Virginia. The highest elevation on the installation is approximately 42 feet above sea level. Geology underlying Hunter AAF was formed in great part during rising and falling of sea levels during the Pleistocene and Holocene Epochs of the Quaternary Period. Ocean levels were influenced by glacial meltwater from the advance and retreat of icesheets in the northern hemisphere. Fluctuations in sea level generated a series of eight marine terraces known as the Shoreline Complex. The resulting elevation (as well as age) of the eight shoreline complexes increase with distance from the coast. The youngest, and therefore the furthest seaward, is the Holocene; it is believed that this terrace was formed during the past 4,000 to 5,000 years.

According to the U.S. Geological Survey topographic maps, the topography of the site generally slopes from the northern Eisenhower Drive border to the south. Surface elevations range from 20 feet above mean sea level (MSL) in the northern part of the property to 10 feet above MSL in the southern part the Station.

The property is located within the eastern Coastal Plain physiographic province of southeastern Georgia. The Coastal Plain sediments consist of a southeastward thickening wedge of poorly consolidated sand, clay, and limestone of Late Cretaceous (approximately 100 million to 65 million years ago) to Holocene (approximately 10,000 years ago to present) age. The older sediments outcrop at the surface along the western margin of the Coastal Plain. The younger sediments of the Coastal Plain are present at the surface along the eastern margin. The surficial formations in the area of the Station are composed of Pleistocene aged sediments (from 11,000 years to approximately 1.8 million years old) resulting from the progression and regression of the shoreline caused by variations in sea level occurring in conjunction with the advance and retreat of continental glaciers. The Station is underlain by the Princess Anne Shoreline Complex, which consists of unconsolidated Pleistocene-aged sands of approximately 20 feet thickness. The Princess Anne Shoreline Complex overlays the Miocene aged sands and clays of the Hawthorn Group. These deposits are the result of the progression and regression of the shoreline caused by variations in sea level, which occurred in conjunction with the advance and retreat of the continental glaciers. The subsurface geology at the Station is documented in Georgia Geological Survey bulletins, which contain detailed subsurface data for the Station, including logs for two supply wells drilled within 6 miles of the Station. These wells are Chatham #1 (GGS-1164), drilled 4 miles east of the site, and Chatham #14 (GGS-3139), drilled 6 miles northwest of the site. The Cypresshead Formation is present at the site below the Princess Anne Shoreline Complex to a depth of approximately 50 feet BGS (below ground surface). The Cypresshead Formation is a coastal beach-type deposit. Below the Cypresshead Formation is the Coosawhatchie Formation, which consists of clay and sand. Clay appears to be the dominant and characteristic lithic component. In the area of the Station, the Coosawhatchie Formation varies in thickness from 100 to 125 feet and exists at a depth of approximately 70 feet. The Suwannee Limestone intersects the basal formation in the two wells near the Station. The Suwannee underlies the Lazaretto Creek Formation at approximately 310 feet BGS. The Suwannee Limestone consists of very pale orange, even-textured, and mealy (medium- to coarse-grained) limestone consisting of rounded calcareous pellets.

Surface Water and Groundwater

The major surface water resources on the Hunter AAF installation include the Little Ogeechee river and associated floodplains, as well as a large area of swamps and marshes. The principal airfield and cantonment area drainage is westerly and then southward via the Lamar Canal, into the Little Ogeechee River. Drainage channels are the only structures within the cantonment area which are located in the river's floodplain. Standing water in the form of swamps and marshes is estimated to cover 33 percent of the installation. At Hunter AAF, water is drawn from two deep water wells located in the cantonment area. The source of the water for these wells is the Florida Principal Artesian Aquifer, which yields high quality water. Depth to groundwater within this aquifer is approximately 400 feet BGS.

At the ANG installation, surface water flow within the Station is controlled by manmade ditches and storm drains. Several naturally formed gullies, which drain to the southern boundary of the Station, are also present. The local storm drain system receives stormwater from the entire area surrounding the Station. Generally, stormwater runoff flows toward the south and drains to a concrete outfall at the southern boundary of the Station. The outfall empties into a drainageway that traverses the marshy area south of the Station and discharges into the Casey Canal. The Casey Canal is approximately 0.3 mile south of the Station and flows for approximately ½ mile prior to emptying into Haney's Creek. Haney's Creek then meanders in a southwesterly direction for approximately 7 miles before eventually emptying into the Atlantic Ocean. Groundwater in the vicinity of the Station exists at shallow depths ranging from 2 to 10 feet BGS and is recharged through downward percolation of rainwater. The surficial groundwater is generally under unconfined conditions, but existing clay strata can form highly localized semi-confined pockets of water. It has been interpreted from the potentiometric maps that the groundwater flow follows the topography of the land surface in a southerly direction. The Station is underlain by a surficial aquifer, which is approximately 50 feet thick. The surficial aquifer sits atop the Coosawhatchie Formation, a 115-foot thick clay and sand layer within the Hawthorne Group. The Upper Brunswick aquifer is present at approximately 180 feet BGS. Underlying the Hawthorne Group are the limestones containing the Floridian aquifer. Water in this aquifer is under artesian pressure. In the vicinity of the Savannah Air National Guard Communications Station, the top of the Floridian aquifer is approximately 310 feet BGS.

Soils

The predominant soil types on the installation are Cape Fear, Chipley-Urban Land Complex, Ellabelle, Lakeland Sand, and Pelham. Most of the soils at the installation are affected by a seasonally high water table due to the generally flat terrain and low elevation. Soils in the low lying areas tend to be poorly drained. Water may stand at the surface for as long as eight months. Poorly draining soils include Cape Fear, Ellabelle, and Pelham. Areas with these types of soils are associated with wetlands and present insurmountable building constraints.

Three main soil types exist in the vicinity of the Station. These soil types include the Lakeland Sand, the Ellabelle Loamy Sand, and the Albany Fine Sand. The Lakeland Sand is found on the northern portion of the Station and is an excessively drained sandy soil extending to a depth of approximately 6 feet BGS. The Albany Fine Sand is found along the southern portion of the Station and is a poorly drained soil extending to 9 feet BGS. The Ellabelle Loamy Sand is found in a limited section south of the Station. It is a very poorly drained soil occurring in depressions and drainage areas in the vicinity of the Station. The seasonal high water table is near the surface and the soil is subject to flooding and ponding for extended periods.

2.4.4 TOWNSEND ANGS-BOMBING RANGE

Description

The Townsend Bombing Range is located primarily in McIntosh County, Georgia. The northwestern boundary of the range area overlaps slightly into Long County. The range is located 40 miles south of Savannah, Georgia, and inland 20 miles from the Atlantic coast. The topography of the range is flat and low with a maximum elevation of 26 feet above mean sea level (MSL). Ground cover is primarily pine forest but is also interspersed with swamps and marshes. The regional area has a temperate climate with a seasonal low temperature of 51 degrees during winter months and 80 degrees during summer months. The range property consists of approximately 5,183.23 acres, of which 2,410.23 acres is a buffer area surrounding the 2,773 acre impact area. The Townsend Bombing Range is a geographically separate unit (GSU) of the Combat Readiness Training Center (CRTC)-Savannah located at the Savannah/Hilton Head International Airport.

History

In the early 1940s, Townsend Range was opened as a gunnery range by the US Navy under the title "GlynCo Bombing Range". Range operations continued until the facility was closed in 1972, in conjunction with the closure of Naval Air Station GlynCo. In 1981, the original 3,882-acre training site was re-opened as Townsend Air-to-Ground Gunnery Range. A 1991 land acquisition expanded the range to its current size by adding an additional buffer area. Currently, Townsend Range is owned by the U.S. Navy and is operated by the Georgia Air National Guard (GAANG) CRTC-Savannah. U.S. military fighter units from the U.S. Air Force (USAF), ANG, U.S. Marine Corps, and U.S. Navy use the bombing range regularly in order to meet mission training requirements. Predominant aircraft types flown on Townsend Range include the F-16, A-10/OA-10, F-18, and A-6.

Townsend Range is a Class A controlled range that has scorable targets for bombs, rockets, and strafing. Class A ranges include restricted airspace that is controllable from the ground and requires aircrews to receive clearance from the Range Control Officer (RCO) prior to expending ordnance. Townsend Range has the capability to support a myriad of aircraft performing air-to-ground training and has an array of targets and threat simulators.

Climate

Southeast Georgia has a temperate climate, with seasonal low temperatures ranging from 51 degrees in the winter to 80 degrees in the summer. Overall, temperatures in the range of influence (ROI) range from below 10 degrees to approximately 100 degrees. Based on the period from 1951 to 1980, the average first occurrence of 32 degrees Fahrenheit in the fall is November 15 and the average last occurrence in the spring is March 10. The normal annual rainfall in the ROI is approximately 49 inches, roughly half of which falls during the thunderstorm season of June 15 through September 15. The remainder, produced principally by squall-line and frontal showers, is spread over the remaining nine months with a minor peak in March. Severe tropical storms affect this region about once in ten years, and the rainfall from these storms constitutes the heaviest sustained precipitation. Considerable periods of fair, mild weather are expected in October, November, April, and to a lesser extent, in May. Snow is a rarity, and the heaviest snowfalls generate less than five inches of snow.

Geology

McIntosh County is one of six Georgia counties bordering the Atlantic Ocean. Similar to other southern Atlantic states, Georgia is characterized by low coastal elevations, interlaced with thousands of tidal creeks and rivers that stretch through vast marshlands toward the ocean. The topography of the area surrounding the range consists of broad depressed flats, with no predominant slope; elevation varies from 20 to 30 feet above MSL. The area is highly susceptible to inundation due to poor natural drainage; however, a series of manufactured canals prevent excessive flooding at the range.

McIntosh county lies within the lower Georgia Coastal Plain. Theoretically, the Georgia Coastal Plain is a stable (i.e., graben-fault) basin that was formed during the Lower Cretaceous period or earlier. These Lower Cretaceous rocks were most likely deformed by uplift of the Peninsular Arch in southern Georgia. Subsequently, the upper Cretaceous seas overlapped the deformed Lower Cretaceous rocks and flowed onto the continent. This transgression continued into the Oligocene and Eocene periods. The Oligocene and Eocene rocks are largely carbonate, suggesting an extensive overlap onto the main landform of the continent. In recent geologic time, uplift occurred again, removing the Oligocene rocks from the Ocala Uplift and Orange Island area, and leading to extensive erosion in the region.

Surface Water and Groundwater

McIntosh County contains a variety of surface water resources, including salt- and freshwater marshes, swamps, flats, depressions, and ponds, as well as rivers and streams. According to an environmental inventory conducted by the US. Army Corps of Engineers, there are no large freshwater lakes or other impoundments in the County. Townsend Range is located in the Altamaha River Basin. The basin, measuring 260 miles in length and averaging 55 miles in width, has a total drainage area of approximately 10,600 square miles. The drainage pattern at the range tends toward a southeasterly direction with rainfall in the area generally ranging from 40 to 60 inches per year.

The aquifer system in southeastern Georgia consists of a sequence of carbonate (limestone and dolomite) rocks that include units of high permeability (aquifers) as well as units of low permeability (confining beds). McIntosh County draws fresh water primarily from the Ocala artesian aquifer. The top of the aquifer is in excess of 500 feet below ground surface (BGS) at the range. The water from this aquifer is of good quality, containing low concentrations of silica, iron, and dissolved solids; however, traces of sulfate exist, giving the water a distinctive odor and taste. Hardness in the water measures as high as 120 parts per million (ppm). Due to the low elevation of the area, proximity to the Atlantic Ocean, and intensified withdrawal directly from the principal artesian aquifer, low and negative pressure has resulted in some saltwater intrusion. Certain restrictions on withdrawing water from the Ocala aquifer have been established; however, in the Townsend Range area, these restrictions do not apply due to the fact that the range and the surrounding land use represent a minimal amount of water demand from the aquifer.

Soils

The soils encountered in the area of the range strongly reflect the existing environment. Primarily found on broad and depressed flats, the Weston, Bayboro, Bladen-Coxville soil association is poorly drained to very poorly drained soils (0.2 to 0.8 inches of water infiltration per hour) with a very acidic pH range (from 4.0 to 6.0). The Bladen-Coxville soil complex, which comprises 75 percent of the Bayboro-Bladen-Coxville association, consists of a gray to black surface layer over a mottled, structure-less clay layer. Bladen-Coxville soils have slow to very slow permeability and can generally be found to a depth of 57 inches below surface. Weston and Bayboro soils are very poorly drained and consist of a black, murky surface layer over a gray, plastic-like clay that is mottled in places; these soils account for approximately 15 percent of the association. These soils are highly acidic and occur primarily where the level of groundwater fluctuates but is generally very high. The Bayboro soils are classified as inorganic silts and inorganic clays. The remaining ten percent of this association is a clayey subsoil. According to1974 data for Long County, the predominant soil type adjacent to Townsend Range is Bladen.

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3.0 Responsibilities – Overview

3.1 Installation Commander

- Assume overall responsibility of the IPM program.
- Ensure that the installation meets DoD policy requirements as defined in DoD Directive 4715.1, “Environmental Security,” Chapter 4.
- Provide implementation authority and necessary resources to carry out the objectives of the IPM program.
- Officially designate, within installation IPM Plan Implementing Instruction, an Integrated Pest Management Coordinator in Civil Engineering to implement the installation IPM program and to maintain the installation IPM Plan.
- Approve and sign the IPM Plan cover page and Implementing Instruction.
- Implement any formal agreements with federal or state regulatory agencies regarding pesticide use on the installation, such as for USDA/APHIS pest quarantine, in coordination with NGB/A7A Pest Management Consultant.
- Installation commanders initiate formal review of suspected violations of the Federal Insecticide, Fungicide, and Rodenticide Act of 1976 (FIFRA), as amended. Suspected violations, such as pesticide misuse or recorded falsification, shall be reported through appropriate command channels to the office of the certifying official (i.e. NGB/A7A). [per DoD 4150.07-P (May 29, 2008)].

3.2 Base Civil Engineer (BCE)

- Ensure overall implementation and management of the IPM Plan (see AFI 32-1053) ..\3 Resource Toolbox\4.1.3 AFI\AFI_32-1053.pdf.
- Identify a qualified individual in CE, for written designation by the installation commander within the IPM Plan Implementing Instruction, to serve as installation IPM Coordinator for implementation of this plan.
- Ensure that the designated installation IPM Coordinator has the appropriate authority, educational background, and management skills to implement the IPM Plan.
- Plan and budget for the development and maintenance of the IPM Plan.
- Provide IPM status to the installation Environmental, Safety and Occupational Health Council (ESOHC).
- Ensure coordination of IPM program among all installation organizations.
- Ensures that all installation landscaping projects/contracts preferentially use native species and do not plant invasive species.

- Ensures that facility designs incorporate cost-effective pest-resistant features and pre-construction termiticide specifications, as appropriate.

- As applicable to the installation, ensure pesticide applicators maintain certification as specified in the Armed Forces Pest Management Board document, DoD Plan for Certification of Pesticide Applicators (DoD 4150.07-P (May 29, 2008)).

- Ensure that qualified personnel develop and update the IPM Plan annually. Annually update the IPM plan, coordinate the review and approval of annually updated IPM plans, and plan the funding for initial and 5-year revisions of IPM plans as necessary.

- Ensure that the IPM Coordinator forwards the IPM Plan to the NGB/A7A Pest Management Consultant for review, technical approval, and signature on the cover sheet.

- Provide review and approval of pesticide monitoring and application contracts consistent with the pest management strategies of this plan using only pesticides pre-approved by NGB/A7A Pest Management Consultant.

- Review and approve use of Federal and State purchase cards for procurement of pest-control services and pesticides that are on the HAZMAT authorized-use list on a case-by-case basis. Pesticides use must strictly conform to pest-specific strategies described within Annex 1 of this IPM Plan.

3.2.1 Installation Integrated Pest Management Coordinator

- Ensure that all pest management operations performed on the installation, except those for personal relief, are recorded, and ensure that all records are properly maintained.

- Ensure that data are reported to the Pest Management Consultant/Certifying Official, Civil Engineer Environmental Division (NGB/A7A Pest Management Consultant) via the Cultural and Natural Resources Database (https://cnr.ang.af.mil/). See section 8.5.1 – Reports, for procedures on reporting through the CNR database.

- Monitor training requirements and certifications of all non-military pesticide applicators on installation.

- Report monthly pesticide applications, using DD Form 1532, Pesticide Management Report, or an electronic equivalent, to NGB/A7A via CNR Database (https://cnr.ang.af.mil/). See section 8.5.1 – Reports, for procedures on reporting through the CNR database.

- Submit annually to the NGB/A7A, via CNR Database, request for renewed approval of installation's Authorized Pesticide Use List, as well as any additionally required pesticides.

- Review and implement requirements defined in "Air Force Self-Help Pest Management Program for Military Housing (MH) Occupants and Building Managers."

- Ensure that personnel participating in installation pest management self-help program are provided with written instructions and appropriate precautions, beyond those on pesticide labels, to ensure proper pesticide application and safety. Maintain current documentation of participant acknowledgment of self-help program instructions.

- Provide technical implementation of the IPM Plan. Review AFPMB TG-1: AFPMB Publications "Tech Guide".

- Formally coordinate appropriate portions of the IPM Plan with the installation Environmental Manager, Bioenvironmental Engineer, Fire Department, Public Health Officer, Safety Officer, Public Affairs Officer, Hazmat Pharmacy Manager, Building Managers, and Aircraft Maintenance personnel.
- Provide Quality Assurance Evaluator (QAE) oversight of pesticide monitoring and application contractors if the installation does not have a separately designated PMQAE.
- Ensure that all State or DoD certified pesticide applicators, and PMQAE personnel, maintain required training and certificates, as appropriate. All DoD personnel who apply or supervise the application of pesticides shall be trained and certified within 2 years of employment in accordance with DoD 4150.07-P (May 29, 2008).
- Provide pest management education and information to installation-level personnel through building managers.
- Provide monitoring and coordination with base organizations to identify new and recurring pests.
- Provide consultation to the BCE on requests to use IMPAC cards to purchase pesticides.
- Provide notification to the Public Health (PH) Officer of pesticide applications. Notify and coordinate with base organizations, including building managers of pesticide applications; ensure that areas treated with pesticides are properly posted.
- Ensure that the appropriate individuals sign the cover sheet of the IPM Plan.
- Forward the IPM Plan to the NGB/A7A Pest Management Consultant for review, technical approval, and signature on the cover sheet, after review and signature by base departments including installation IPM Coordinator and BCE. After signature obtained from NGB/A7A Pest Management Consultant, installation IPM Coordinator forwards plan to mission support commander, wing commander, and installation commander for their signature(s). IPM Plan must be updated and re-signed every five years.
- Institute procedures to prevent terrorists from acquiring DoD pesticide dispersal equipment or pesticides, notify the FBI of any suspicious theft of pest control equipment, and ensure that the identity of personnel and pesticide formulations provided by contractors is known and approved by trained pest management QAEs or DoD certified pesticide applicators.

The responsibilities below are for the Installation Integrated Pest Management Coordinator but they may be delegated to aircraft maintenance personnel for quarantine operations:

- Implement the U.S. Department of Agriculture (USDA) Plant Protection Program (ex. Japanese Beetle Quarantine Program).
- Provide recordkeeping and reporting to BCE and USDA.

3.2.2 Pest Management Quality Assurance Evaluator

Provide PMQAE oversight of pest monitoring and pesticide application contractors.

Maintain required PMQAE certification, or DoD pesticide applicator certification, through DoD training at least every three years.

Ensure pre-approval, from NGB/A7A Pest Management Consultant, of all contract statements of work for installation pest control services.

Ensure that contract statements of work specify only those pesticides that have been pre-approved by NGB/A7A Pest Management Consultant within installation IPM Plan.

3.2.3 Environmental Management

- Ensure that installation IPM programs are managed to minimize the amount of pesticides that become hazardous wastes.
- Ensure that the IPM Plan identifies areas within the installation that contain threatened or endangered species (TES) or associated habitat and that personnel using pesticides on the installation know the potential impact that pesticide applications could have on TES. The Environmental Manager is responsible, in coordination with installation Natural Resources Manager (if applicable), to initiate consultation with regional USFWS office under Section 7 of the Endangered Species Act for any pest management actions potentially affecting TES. Any “formal” Section 7 consultations must include NGB/A7A Natural Resources Program Manager.
- Provide review and approval of pesticide monitoring and application contracts.
- Provide environmental advisory support to the IPM Coordinator.
- Coordinate with installation IPM Coordinator to ensure IPM Plan and pest applications comply with all applicable environmental regulations and directives.
- Review Environmental, Safety, & Occupational Health Compliance Assessment and Management Program (ESOHCAMP) protocols with installation Pest Management Coordinator to ensure requirements are being met.

3.2.4 Public Health Officer

- Provide consultation on HAZCOM training and technical matters to supervisors when requested per AFI 90-821, paragraph 1.6.2.1.
- Determine the type, source, and prevalence of vectors, which affect health and efficiency of personnel.
- Recommend preventative and control measures for pests and monitor the effectiveness of installation pest management efforts.
- Conduct appropriate medical surveillance of pest management personnel. With the Occupational Health Working Group, determine the scope of occupational physicals and provide the Flight Medicine Office with a current roster for scheduling occupational physical exams, including baseline exams before pesticide exposure, for all applicable base personnel who apply pesticides.
- Conduct sanitary inspections of facilities to determine need for pesticide application.
- Ensure that pest management personnel receive initial and refresher cholinesterase testing when required.

3.2.5 Bioenvironmental Engineering

- Evaluate potential occupational exposures and the adequacy of exposure control through periodic shop visits.

- Provide review of pesticide authorization requests.
- Set local standards for obtaining and using personal protective equipment for pest management personnel.
- Provide recommendations on personal protective equipment for all installation pesticide applicators.
- Implement respiratory protection program. Ensure pest management personnel receive initial and refresher respiratory protection training IAW Air Force Occupational Safety and Health Standard (AFOSHSTD) 48-137, section 3.3.
- At direction of the Medical Treatment Facility commander, make sure that medical treatment facilities personnel neither store nor use EPA-classified pesticides, with the exception of disinfectants, and germicide; and insect repellents and permethrin-treated clothing for protection of deploying personnel against insect vectors.
- Develop and publish installation HAZCOM guidance and assist commanders and supervisors with program implementation per AFI 90-821, paragraph 1.6.2.2.

3.2.6 Public Affairs Officer

- Provide coordination of public notices, if needed, of pesticide applications.
- Provide news releases, if needed, to off-site public agencies related to the installation IPM program.

3.2.7 Fire Department

- Maintain information of location of chemical storage sites, including pesticides.
- Provide periodic inspection of pesticide storage sites.

3.2.8 Hazmat Pharmacy

- Implement review process for chemical use authorizations, including pesticides.
- Purchase, issue, and track chemical usage, including self-help pesticide use.
- Ensure that all pesticides on HAZMAT authorized-use list are pre-approved in writing by NGB/A7A Pest Management Consultant within this IPM Plan, updated as appropriate.

3.2.9 Installation Facility/Building Managers

- Manage the self-help program in their facilities, including training to building occupants.
- Initiate requests for chemical/pesticide authorizations through the Hazmat Pharmacy, in coordination with Installation IPM Coordinator.
- Conduct periodic inspections of their buildings and notify installation IPM Coordinator of potential pest issues.
- Review and implement requirements defined in “Air Force Self-Help Pest Management Program for Military Housing (MH) Occupants and Building Managers.”

3.2.10 Safety Officer

- Provide support to ensure pesticide operations comply with OSHA and AFOSH standards.
- Provide review and approval of chemical/pesticide authorizations.
- Provide review and approval of pesticide monitoring and application contracts.

3.2.11 Geographically Separate Unit (GSU) QAE POC

- Provide coordination and communication between GSU and Host BCE on IPM program.

3.2.12 Unit Training Manager

- Support requirements for pest management training.
- Notifies NGB/A7A Pest Management Consultant when ANG members complete initial training requirements (on-the-job training and correspondence training), in order to be issued initial certification.
- Coordinate with installation Pest Management Coordinator to ensure that certifications and re-certifications do not expire. Schedules re-training of installation personnel to keep certifications (pesticide applicator and PM QAE) current.

3.2.13 NGB/A7A Pest Management Consultant

- Implement pest management policies and programs for the NGB installations.
- Reviews installation IPM programs on-site every three years; the substitution of environmental compliance on-site external reviews for on-site reviews by a pest management consultant is permitted to meet DoD program requirements.
- Annually reviews and technically approves installation IPM plans, including the installation’s pesticide-use proposal for the upcoming year.
- Approve 5-year revisions of installation IPM Plans.
- Certify ANG pest management personnel, when DoD certification requirements are met.

4.0 Integrated Pest Management

4.1 Legal Mandate

There are many sources of information to obtain regulations for the management of pesticides. Many government personnel have access to DENIX, where ESOHCAMP checklists are available for Federal, State, and ANG regulatory and procedural requirements.

4.1.1 Federal Legislation

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). This act, as last amended in December 1991, 7 U.S. Code (USC) 136-136y, deals with the sale, distribution, and use of pesticides. FIFRA provides the EPA with the authority to oversee, among other things, the registration, distribution, sale and use of pesticides. The Act applies to all types of pesticides, including insecticides, herbicides, fungicides, rodenticides, and antimicrobials. Civil penalties for any commercial applicator who violates any provision of this regulation may be assessed not more than $5,000 for each offense, and any private applicator may be assessed a civil penalty of not more than $1,000 for each offense. Criminal penalties for any commercial applicator who knowingly violates any provision of this act shall be fined not more than $25,000 or imprisoned for not more than 1 year, or both. Criminal penalties for any private applicator who knowingly violates any provision of this act shall be guilty of a misdemeanor and shall on conviction be fined not more than $1,000, or imprisoned for not more than 30 days, or both.

The full text of the *Federal Insecticide, Fungicide, and Rodenticide Act* (FIFRA) can be found at the following:

http://agriculture.senate.gov/Legislation/Compilations/Fifra/FIFRA.pdf

The Hazardous Materials Transportation Act of 1975. This act, as last amended in November 1990, 49 USC 1801-1819, et al., is the federal legislation that governs the transportation of hazardous materials, including pesticides, in the nation. The policy of Congress is to improve the regulatory and enforcement authority of the Secretary of Transportation to protect the nation adequately against the risks to life and property that are inherent in the transportation of hazardous materials in commerce (49 USC 1801). Any person that knowingly violates this regulation is liable to the U.S. Government for a civil penalty of at least $250 but not more than $25,000 for each violation.

The US Department of Transportation hazardous materials regulations can be found at the following:

http://www.osha.gov/SLTC/trucking_industry/transportinghazardousmaterials.html

The Endangered Species Act (ESA) of 1973. The purpose of this act, (16 USC 1531-1547, et al., last amended in October, 1988), is to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions for protection of endangered species (16 USC 1531(b)). Under ESA, the policy of Congress is that all Federal departments and agencies must seek to conserve endangered species and threatened species and must use their authorities in furtherance of the purposes of this act. Further, Federal agencies must cooperate with state and local agencies to resolve water resource issues in concert with conservation of endangered species (16 USC 1531(c)). Any person who knowingly violates this regulation may be assessed a civil penalty by the Secretary of up to $25,000 for each violation. Criminal violations for any person who knowingly violates any provision of this chapter, upon conviction, may be fined not more than $50,000 or imprisoned for not more than one year, or both.

The full text of *The Endangered Species Act (ESA) of 1973* can be found at the following:

http://www.fws.gov/laws/lawsdigest/esact.html

The Occupational Safety and Health Act (OSHA). This act, last amended in November 1990, 29 USC 651-678, is a Federal statute that governs the issues related to occupational safety and health. The purpose and policy of this act are to assure every working man and woman in the nation safe and healthful working condition and to preserve our human resources by, among other things, providing for the development and publication of occupational safety and health standards, providing for an effective enforcement program, and providing for appropriate reporting procedures with respect to occupational safety and health which procedures will help achieve the objectives of this act and accurately describe the nature of the occupational safety and health (29 USC 651(b)(9)(10)(12)). Any employer who willfully or repeatedly violates the requirements this regulation may be assessed a civil penalty of $5,000 but not more than $70,000 for each violation. Any employer who has received a citation for a violation of the regulation may be assessed a civil penalty of up to $7,000 for each violation. Any employer who fails to correct a violation for which a citation has been issued may be assessed a civil penalty of not more than $7,000 for each day during which such failure or violation continues. Any employer who willfully violates any standard, and that violation caused death to any employee, shall, upon conviction, be punished by a fine of not more than $10,000 or by imprisonment for not more than six months, or by both; except that if the conviction is for a violation committed after a first conviction of such person, punishment shall be by a fine of not more than $20,000 or by imprisonment for nor more than one year, or both.

Access to all of the OSHA regulations can be found at the following:

http://www.osha.gov/comp-links.html

4.1.2 Department of Defense (DoD) Directives, Instructions and Guides

DoD Instruction 4150.07 (May 29, 2008), DoD Pest Management Program. This DoD Instruction, dated 26 April 1996 (now under review for revision), sets forth the policy, responsibilities, and procedures for pest management programs and provides the basis for development of base-specific pest management plans. This instruction establishes the DoD policy of maintaining safe, efficient, and environmentally sound integrated pest management programs to prevent or control pests that may adversely affect health or damage structures, material, or property. The DoD Plan for the Certification of Pesticide Applicators stipulates the certification of U.S. Air Force military and civilian pest managers. Requires pesticide application on DoD installations to be performed by appropriately certified personnel.

To access the DoD Instruction 4150.07 (May 29, 2008), click on the following hyperlink: ..\3 Resource Toolbox\4.1.2 DODI\dod4150.7-i.pdf

- DoD 4150.7-P, Installation commanders shall initiate a formal review if violations of the Federal Insecticide, Fungicide, and Rodenticide Act of 1976 (FIFRA), as amended, are suspected. Any certified applicator who violates any provision of FIFRA, as amended, or the

implementing regulations will have his or her certificate reviewed for possible suspension or revocation. Suspected violations, such as pesticide misuse or record falsification, shall be reported through appropriate command channels to the office of the certifying official (i.e. NGB/A7A). The certifying official shall review the suspected violation and determine if further action is required. If no action is warranted, the installation commander shall be notified in writing that a review of the suspected violation has been conducted and that it has been determined that a violation of FIFRA has not occurred. If the certifying official determines that a violation may have occurred, he or she shall initiate action to temporarily suspend the certificate of the applicator(s) and forward the matter to the lead agency, Under Secretary for Defense - Acquisition, Technology and Logistics (USD - AT&L) for review and final action. If the lead agency determines that a violation of FIFRA has occurred, that agency shall report information on the case and action taken by the Department of Defense to the EPA Administrator.
To access the DoD 4150.7-P, click on the following hyperlink:..\3 Resource Toolbox\4.1.2 DODI\dod4150.7-p.pdf

- DOD 4150.7-M outlines the DoD Pest Management Training and Certification Program. The Manual is not intended to conflict with, be used instead of, or supersede other DoD training Directives or Office of Personnel Management Qualification Standards. The purpose of the manual is to establish training goals, provide a uniform training process, training standards, and procedures to prepare DoD pest management personnel to meet DoD pest management policy objectives, as stated in DoD Instruction 4150.07 (May 29, 2008) (reference (a)). The Manual supports DoD policy to maintain safe, efficient, and environmentally sound integrated pest management programs. It promotes prevention and control of pests that may adversely impact readiness or military operations by affecting the health of personnel or damaging structures, materiel, and/or property as established under DoD Instruction 4150.07 (May 29, 2008), reference (a).
  To access the DoD 4150.7-M, click on the following hyperlink: ..\3 Resource Toolbox\4.1.2 DODI\p41507m.pdf

Technical Guides (TG). DoD Instruction 4150.07 (May 29, 2008) is supplemented by TGs that provide specific criteria and procedures for the operation of a pest management program. The TGs are guidance only and nonregulatory. The following TGs are appropriate to have on hand. TG 1 “Armed Forces Pest Management Board Publications” provides a comprehensive list of all Armed Forces Pest Management Board publications and the following website provides a link to all of the Technical Guides available online: http://www.afpmb.org/pubs/tims/tims.htm

DoD Directive 4715.1E, Environment, Safety, and Occupational Health (ESOH). This directive, dated 19 March 2005, establishes policies on Environment, Safety, and Occupational Health (ESOH) to sustain and improve the DoD mission. The directive also continues to authorize the Armed Forces Pest Management Board (AFPMB) [Added July 2005].
To access the DoD Directive 4715.1E, click on the following hyperlink: ..\3 Resource Toolbox\4.1.2 DODI\4715_1e.pdf

Quarantine Regulations of the Armed Forces, Headquarters Departments of the Army, the Navy, and the Air Force, 24 January 1992. The regulations are intended to prevent the introduction and dissemination, domestically or elsewhere, of diseases of humans, plants and animals, prohibited or illegally taken wildlife, arthropod vectors and pests of health and agricultural importance. To access these regulations, click on the following web link:

http://www.army.mil/usapa/epubs/pdf/r40_12.pdf

4.1.3 U.S. Air Force Instructions (AFIs) and Policies

AFI 32-1053, Pest Management Program. This AFI, dated 1 April 1999, provides guidance for pest management at Air Force installations. The instruction provides guidance for pest management programs at Air Force installations and it implements Air Force Policy Directive (AFPD) 32-10, Installations and Facilities, 27 Mar 95. Hyperlink:..\3 Resource Toolbox\4.1.3 AFI\AFI_32-1053.pdf

Air Force Self-Help Pest Management Program. This USAF HQ AFCESA/CES memo, dated 13 September 2006, provides guidance on the AF self-help pest management program and gives military housing occupants and building managers the opportunity to obtain specific pest control materials and guidelines. See Hyperlinks:
..\3 Resource Toolbox\8.1.4 Self-Help\AF Memo Self-Help Sep 06.pdf

..\3 Resource Toolbox\4.1.3 AFI\AFCESA Self Help IPM_Brochure.pdf

AFI 32-1074, Aerial Application of Pesticides. This AFI, dated 1 May 1998, provides guidance for in-service and contract aerial application of pesticides projects at Air Force installations. It also provides guidance for the use of Air Force resources on other Federal properties, non-Federal properties, and in foreign countries. See Hyperlink:..\3 Resource Toolbox\4.1.3 AFI\AFI_32-1074.pdf

4.1.4 State/Territory Regulations

See weblink:

http://agr.georgia.gov/00/channel_title/0,2094,38902732_81337440,00.html

Although Federal agencies maintain sovereignty under section 136 of title 7, United States Code, the Department of Defense voluntarily complies with the substantive portions of State pesticide/pest management laws and regulations when such compliance does not adversely impact DoD missions. The AFPMB has signed certain memoranda of agreement with some states and territories. The legal applicability of State or territory pest management requirements to ANG installation property, personnel, and operations must be determined in consultation with NGB-JA (POC: Mr. Randy Chambers, Attorney-Advisor, DSN: 327-2729, e-mail: randy.chambers@ngb.af.mil).

There are no restrictions of biocides and/or disinfectants that have an EPA registration number in the state of Georgia.

4.1.5 Local Regulations

The legal applicability of any local pest management requirements to ANG installation property, personnel, and operations must be determined in consultation with NGB-JA (POC: Mr. Randy Chambers, Attorney-Advisor, DSN: 327-2729, e-mail: randy.chambers@ngb.af.mil).

There are no restrictions of biocides and/or disinfectants that have an EPA registration number in the state of Georgia.

4.2 Integrated Pest Management Operations

The cornerstone of the IPM planning effort is development of pest management strategies for each pest and disease vector category present or anticipated at the 165th Airlift Wing, Georgia Air National Guard. This IPM Plan adheres to the outline in DoD Instruction 4150.07 (May 29, 2008), Enclosure 5, entitled “SUGGESTED FORMAT FOR IPM OUTLINES” for specific pest management strategies. These strategies will be followed to ensure that pests do not interfere with the military mission, damage real property, increase maintenance costs, or expose installation personnel to diseases.

It is DoD policy (DoDD 4715.1) to establish and maintain safe, effective, and environmentally sound integrated pest management (IPM) programs to prevent or control pests and disease vectors that may adversely impact readiness or military operations by affecting the health of personnel or damaging structures, materiel, or property.

Integrated pest management (IPM) is a planned program, incorporating continuous monitoring, education, record-keeping, and communication to prevent pests and disease vectors from causing unacceptable damage to operations, people, property, materiel, or the environment. IPM uses targeted, sustainable (effective, economical, environmentally sound) methods including education, habitat modification, biological control, genetic control, cultural control, mechanical control, physical control, regulatory control, and where necessary, the judicious use of least-hazardous pesticides.

A pest management plan is a long-range, comprehensive installation planning and operational document that establishes the strategy and methods for conducting a safe, effective, and environmentally sound integrated pest management program. Written pest management plans are required as a means of establishing and implementing an installation pest management program.

IPM is the method of choice for DoD pest management and disease vector control. IPM is a sustainable approach to managing pests and controlling disease vectors by combining applicable pest management tools in a way that minimizes economic, health, and environmental risks. IPM uses regular or scheduled monitoring to determine if and when treatments are needed and employs physical, mechanical, cultural, biological, genetic, regulatory, chemical, and educational tactics to keep pest numbers low enough to prevent unacceptable damage or impacts. Treatments are not made according to a predetermined schedule; they are made only when and where monitoring has indicated that the pest will cause unacceptable economic, medical, or aesthetic damage. Treatments are chosen and timed to be most effective and least disruptive to natural controls of pests. Least hazardous, but effective, pesticides are used as a last resort.

DoD Instruction 4150.07 (May 29, 2008), DoD Pest Management Program, also requires that pesticide use during deployed military operations be recorded and archived. Pesticide applicators must record applications of all pesticides, except skin and clothing repellents, performed during military operations, using DD Form 1532-1, Pest Management Maintenance Record, or a computer generated equivalent. If this is not possible, the same information will be recorded in the unit logbook, staff journal or in a similar expedient manner. Required information includes: 1) Date applied; 2) Area/Site/Building and country where the pesticide was used; 3) Target pest; 4) Pesticide name and EPA Registration Number (EPA Reg. No.); 5) Percent final concentration used; 6) Method of application; 7) Amount used; and 8) Who (name and rank) applied the pesticide. Different rules concerning the application of pesticides may apply in areas outside the jurisdiction of the Environmental Protection Agency (EPA). Follow the Final Governing Standards (FGSs) for installations in each host country. These standards, which include pesticide applications, were developed by comparing an overseas environmental baseline (based on U.S. laws and regulations) with the host nation's standards. For countries without FGSs, or for operations outside a military installation, you should adhere to EPA requirements or the Overseas Environmental Baseline Guidance Document (OEBGD), whichever is more restrictive. For NATO operations, STANAG 2048, Chemical Methods of Insect and Rodent Control, provides a list of pesticides approved for use by member nations. For further information on contingency operations see: AFPMB Technical Guide #24, at:

http://www.afpmb.org/pubs/tims/TG24/TG24.pdf, and the current DoD Contingency Pesticides list, at: http://www.afpmb.org/pubs/standardlists/dod%20contingency%20pesticides%20list.pdf.

Finally, the contingency pest management Community of Practice website can be found at:

https://wwwd.my.af.mil/afknprod/ASPs/docman/DOCMain.asp?Tab=0&FolderID=OO-EN-CE-23-10&Filter=OO-EN-CE-23

5.0 Priority of Pest Management Work

Installation-specific pests have been identified at the 165th Airlift Wing, Georgia Air National Guard. Table 5.1 represents pests that are or could be present at the installations. For each of the applicable pest/disease vector categories where pests exist or could exist at the installations, IPM strategies are presented. Integrated pest management outlines can be found in #Annex_1.

TABLE 5.1

Priority of Pest Management Work – 165th Airlift Wing, Georgia Air National Guard

Category	***165th Airlift Wing, Georgia Air National Guard***	*Note and References*
1. Public Health-Related Pests	• *Rats and Mice* • *Various Cockroaches* • *Ticks* • *Mosquitoes* • *Bees, Hornets and Wasps* • *Spiders; venomous and non-venomous* • *Ants* • *Filth Flies* • *Fleas* • *Chiggers* • *Bed Bugs* • *Kissing Bugs* • *Biting Flies* • *Scorpions*	
2. Pests Found In and Around Buildings	• *Stored Product Pests*	
3. Structural Pests	• *Subterranean Termites* • *Drywood Termites* • *Wood-Boring Beetle* • *Wood-Decaying Fungi*	*The following link presents guide specifications for termiticide treatment measures for subterranean termite control.* ***..\3 Resource Toolbox\5.0 Priority of Pest Management Work\UFGS 02360 Soil Treatment for Subterranean Termite Control A.pdf*** *The following link provides a termite and wood decay inspection form for field use. ..\3 Resource Toolbox\5.0 Priority of Pest Management Work\Termite Inspection Checklist DD Form 1070.pdf*

TABLE 5.1

Priority of Pest Management Work – 165th Airlift Wing, Georgia Air National Guard

Category	***165th Airlift Wing, Georgia Air National Guard***	*Note and References*
4. Noxious or Invasive Plants and Animals	• *Red Imported Fire Ants* • *Brown-headed cowbirds* • *European starlings* • *House sparrows* • *Canada goose* • *Feral cats and dogs* • *White-tailed deer* • *Lawn and Landscaping Pests* • *Southern Pine Beetle*	*The following link is a table of commonly used turfgrass fungicides and the diseases they control. ..\3 Resource Toolbox\5.0 Priority of Pest Management Work\Fungicide Chart.pdf*
5. Undesirable Vegetation	• *Vegetative Overgrowth* • *Broadleaf Weeds*	*The following link provides lists of state and federal noxious weeds:* ***http://plants.usda.gov/java/noxiousDriver***
6. Quarantine and Regulated Pests	• *Japanese Beetles*	
7. Vertebrate Pests	• *Birds* • *Mammalian Feral Animals and Wildlife Pests* • *Bats* • *Snakes*	

The Integrated Pest Management Strategies for Annex 1 are located at: Annex Files\Annex 1 - IPM Strategies.pdf

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6.0 Health and Safety

6.1 Medical Surveillance of Pest Management Personnel

The 165th Airlift Wing, Georgia Air National Guard uses pest management contractors for application of pesticides. The installation IPM Coordinator is responsible for ensuring that the contractors comply with the contract requirements as defined by the statement of work. All contractor pest management personnel need to be certified as pesticide applicators by the State of Georgia and all applicable Federal laws and regulations.

Air Force Instruction 32-1053, Pest Management Program, dated 1 April 1999, DoD Instruction 6055.5, Medical Surveillance, and AFOSHSTD 48-137 define specific requirements for physical exams, testing, and surveillance. The Public Health Officer at the 165th Airlift Wing, Georgia Air National Guard implements the following steps for workers involved with pesticide application. The steps are:

1. Schedule occupational health exam
2. Develop scope-of-work duties
3. Complete OSHA respiratory questionnaire
4. Perform physical exam
5. Conduct respiratory fit testing
6. Establish baseline cholinesterase
7. Conduct annual follow-up
8. Develop a written respiratory protection plan.

The following staff completes this process:

- Civil Engineering entomologists
- Aircraft Maintenance Personnel involved with the USDA Quarantine Program
- Outside Continental US (OCONUS) deployment personnel
- Others as identified by the IPM, the Bioenvironmental Engineer or Public Health.

Other procedures to protect IPM personnel and the environment from pesticide spills are included in the 165th Airlift Wing, Georgia Air National Guard Oil and Hazardous Substances Spill Prevention and Response Plan.

The following link provides a sample letter to the installation public health officer or healthcare POC. ..\3 Resource Toolbox\6.1 Medical Surveillance\Sample PM letter to Installation Medical Authority.pdf

6.2 Hazard Communication

The hazard communication program provides the initial approach to reducing potential hazards to workers at the 165th Airlift Wing, Georgia Air National Guard. At the 165th Airlift Wing, Georgia Air National Guard, all IPM personnel receive HAZCOM training through the Public Health Officer or the Integrated Pest Management Coordinator, if applicable. A written worker HAZCOM program is in place that contains the following:

- Training to inform employees of issues such as Material Safety Data Sheets (MSDS) and hazardous materials labels and other warning signs
- A list of the hazardous chemicals known to be present
- Directions for requesting self-help pesticide products
- Methods used to inform employees of the hazards associated with non-routine tasks.
- Access to MSDSs for each hazardous chemical that employees may be exposed to while working.

Storage areas at this installation consist of flammable safe cabinets in two locations, Bldg 908, CE mobility warehouse and Bldg 906, grounds maintenance shop.

MSDSs are maintained in the CE grounds maintenance shop and the CE supply office, both in Bldg 906.

Pesticides will never be transferred into a drinking container, such as a water bottle or milk jug. All pesticide products should have a legible EPA registered product label identifying the product name, registration number, active ingredients, application directions, health and safety information, and other pertinent information. Wet and dry products should be stored separately with wet products on spill containment shelves.

6.3 Personal Protective Equipment

All Personal Protective Equipment (PPE) and safety equipment is specific to each individual pesticide product used on base. Confirmation of appropriate PPE is coordinated through the Chemical/Hazardous Material Request Authorization process. The appropriate PPE is approved for each individual product requested through the Environmental Management Information System (EMIS). The correct PPE is reviewed and approved by the Bioenvironmental Engineering and Safety. All information is captured and maintained electronically in the EMIS with AF Form 3952.

TABLE 6.1
Personal Protective Equipment

Building #	Building Name	PPE Description	Number	Unit of Measure	NSN
850	**POWER PRO**	**FACE SHIELD**	**5**	**EACH**	**OBE126-AFR**
906	**CE**	**GLOVES, NEOPRENE**	**10**	**PAIR**	**4137**
850	**POWER PRO**	**99% EYE WARE PROTECTION**	**3**	**EACH**	**0000-884-0307A**
850	**POWER PRO**	**RUBBER GLOVES**	**1**	**PAIR**	**16-312**
850	**POWER PRO**	**RUBBER APRON**	**1**	**EACH**	**N/A**
906	**CE**	**DUSTMASK**	**245**	**EACH**	**4VT68**
906	**CE**	**TYVEK SUIT**	**4**	**EACH**	**5HH51**
850	**POWER PRO**	**RUBBER BOOTS**	**3**	**PAIR**	**N/A**

6.4 Fire Protection

The base fire department maintains information of location of chemical storage sites, including pesticides stored on the 165th Airlift Wing, Georgia Air National Guard. The fire department also conducts periodic inspection of the pesticide storage sites. The following web-site provides a summary of fire protection planning for pesticide fires: www.afpmb.org/pubs/tims/tim16.htm.

The following link provides a sample letter to the installation fire department addressing storage of pesticides on the installation. *..\3 Resource Toolbox\6.4 Fire Protection\Sample PM letter to Installation Fire Chief.pdf*

6.5 Pest Management Vehicles

TABLE 6.2
Pest Management Vehicles

Vehicle Real Property Number	Quantity	Pest Management Vehicle Description
08B46	**1**	**F-350 FORD SUPER DUTY**
00B76	**1**	**CHEVY 6-PACK**
93D144	**1**	**JOHN DEERE 25555 TRACTOR**
Equipment Property Number	Quantity	Pest Management Equipment Description
6140	**2**	**Sprayer, Back Pack 4 Gal (Mfg - CHAPIN)**
2279	**3**	**Hand Sprayer, 3 Gal (Mfg - CHAPIN)**
4265	**1**	**Spray Tank, 100 Gal (Mfg - BURROUGHS)**
475	**3**	**Sprayer, Back Pack (Mfg - SOLO)**

Vehicles dedicated for pesticide transport and application should be securely stored when not in use. Pest control vehicles should only be operated by authorized personnel. Park vehicles containing pesticides over a spill-containment impermeable area.

6.6 Protection of the Public

Pesticide applications at the 165th Airlift Wing, Georgia Air National Guard do not impact off-site locations or adjacent land. Should there be a potential for on-site pesticide applications to affect off-site locations, the installation IPM Coordinator will coordinate with the Public Affairs Officer to perform any notifications to local government agencies.

6.7 Pesticide Inventory

Only pesticides that have been pre-approved by the NGB/A7CVN Pest Management Consultant may be used on ANG property. Stocks of pesticides identified in Table 6.3, Pesticide Product Inventory, that are not on the current AFPMB Standard List (but are EPA and State registered) must be either exhausted, through lawful use, within one year of initial adoption of this IPM Plan, or sent for disposal, or use, off installation [possibly through DRMO]. Non-authorized pesticides shall not be procured for use on installation.

Minimizing the need for pesticide disposal begins with careful planning and identification of an installation's pesticide requirements. USERS SHOULD STOCK ONLY THOSE PESTICIDE QUANTITIES THEY WILL USE IN A REASONABLE PERIOD OF TIME, USUALLY THROUGH ONE PEST CONTROL SEASON. While pesticides used for indoor pests can be applied year round, most of these pesticides should not be stored for more than two years. The AFPMB strongly recommends that an installation's strategic and operational environmental plans incorporate and utilize Integrated Pest Management Techniques (IPMT) when establishing short-term (yearly) and long-term pesticide requirements.

Table 6.3 provides a summary of the pesticide product inventory obtained from the Hazmat Pharmacy program via the Environmental Management Information System (EMIS).

Annex 6 [Annex_6] contains a table showing the projected annual pesticide requirements.

The Contingency Pesticide List at: http://www.afpmb.org/pubs/standardlists/dod%20contingency%20pesticides%20list.pdf provides basic information on pesticides approved by the AFPMB Contingency Advisory Group for control of disease vectors and pests during field operations worldwide. Pesticides should be used only as a part of an integrated pest management program (IPM). The Contingency Pesticide List does not constitute procurement authority for pesticides listed therein.

Installation should periodically check any pesticides and associated materiel stored for deployment against current list posted on the Air Force Portal UTC Community of Practice. See: https://www.my.af.mil/faf/FAF/fafHome.jsp

TABLE 6.3

Pesticide Product Inventory

Integrated Pest Management Plan

165th Airlift Wing, Georgia Air National Guard - Savannah, GA

TABLE 6.4

Trade Name	Description Name	EPA Registration #	Manufacturer	Unit of Issue	Approximate Quantity (count)	Active Ingredient	CAS #	% Concentration	Formulation	Maximum Quantity Authorized	National Stock Number	Authorization Expiration Date	Current State Registration (Y/N)
ROUND UP PRO	HERBICIDE	524-475	MANSANTO	2.5 GAL	19	GLYPHOSATE	NA	41%	LIQUID	25	6840-01-108-9578	NA	Y
CIDE KICK	SURFACTANT	067690-IN-001	SePRO	2.5 GAL	2	D'LIMONENE	NA	100%	LIQUID	2	6840-01-356-8897	NA	Y
QUIK PRO	HERBICIDE	524-535	MANSANTO	6.8 LBS	5	GLYPHOSATE/DIQUAT	NA	73.3%/2.9%	LIQUID	5	6840-01-545-4540	NA	Y
TRACKER	DYE		LESCO	2.5 GAL	1		NA			1		NA	Y
RODEO AQUATIC	HERBICIDE	228-385	RIVERDALE	2.5 GAL	2	GLYPHOSATE	NA	53.80%	LIQUID	2	6840-01-356-8893	NA	Y
REWARD	HERBICIDE	100-1091	SYNGENTA	1 GAL	2	DIQUAT	NA	37.30%	LIQUID	3	6840-01-005-7523	NA	Y
SURFLAN	PRE-EMERGE	70506-44-10404	LESCO	1 GAL	1	ORYZALIN	NA	40.40%	LIQUID	2	6840-01-318-7417	NA	Y
AMDRO	INSECTICIDE	733421-1	AMBRANDS			HYDRAMETHYLNON		0.73%	GRANULES		6840-01-287-3913	N/A	Y
MAXFORCE FC	INSECTICIDE	432-1256	BAYER	3/4 OZ BAIT	100	FIPRONIL	NA	0.01%	BAIT TRAPS	300	6840-01-298-1122	NA	Y
FINAL BLOX	RODENTICIDE	12455-89	BELL LAB	9 LB TUB	2	BRODIFACOUM	NA	0.01%	SOLID BAIT	3	6840-01-503-5348	NA	Y
STATE CONTRACTOR USAGE - NOT ON HAND INVENTORY													
PHANTOM	INSECTICIDE	241-392	BASF			CHLORFENAPYR		21.45%	LIQUID		6840-01-525-7139	N/A	Y
DEMAND CS	INSECTICIDE	100-1066	SYNGENTA			LAMBD-CYHALOTRIN		9.70%	LIQUID		6840-01-428-6646	N/A	Y
TEMPO SC ULTRA	INSECTICIDE	432-1363	BAYER			CYFLUTRIN		11.80%	LIQUID		6840-01-313-7359	N/A	Y
NON-AFPMB APPROVED													
**INVADER HPX	INSECTICIDE	9444-186	CB RESIDUAL	14 OZ CAN	24	PHENYL METHYLCARBONATE	NA	1%	SPRAY CAN	50	6840-01-338-2486	NA	Y
**ZERO IN ANT & ROACH	INSECTICIDE	1021-1601-70799	STATE	12.5 OZ CAN	0	ESFENVLERATE/2METHYL/NOCTY	NA	03%/0.05%/.25%	SPRAY CAN	0		NA	Y
**ZERO IN WASP SPRAY	INSECTICIDE				0					40			

Highlighted and asterick (**) products shown above must adhere to the instruction listed below.

current AFPMB Standard List (but are EPA and State registered) must be either exhausted, through lawful use, within one year of initial adoption of this IPM Plan, or sent for disposal, or use, off installation [possibly through DRMO]. "

Data maintained by Environmental Manager via Environmental Management Information System (EMIS)

Trade Name	Common name of product (example: RoundUp)
Description Name	Generalized identifier from EMIS database (example: Insecticide, house and garden)
EPA Registration #	Self explanatory (can be found on every EPA and state registered product)
Manufacturer	Self explanatory
Unit of Issue	Amount of individual units (example: gallons, pounds-lbs., ounces-oz.)
Approximate Quantity	Estimate of the actual quantity of product on hand
Active Ingredient	Chemical name (listed on product label)
% Concentration	Percent volume of active and inert ingredients listed on product label
Formulation	Form of product (example: powder-P, concentrated liquid-CL, emulsifiable concentrate-EC)
Maximum Quantity Authorized	This amount is to be determined by estimating the amount of pesticide needed and obtaining approval from the ANG PM Consultant
National Stock Number	NSN identifier from EMIS database
Authorization Expiration Date	Date authorization of product use expires
Current State Registration (Y/N)	Yes or No that the product is currently state registered

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6.8 Pesticide Authorization Procedure

Table 6.4 provides a summary of the requirements and procedure to obtain base authorization for pesticide acquisition through the base Hazardous Material Pharmacy using the AF-EMIS tracking database. In accordance with AFI 32-7086, Hazardous Materials Management, pesticide use must be tracked using the approved Hazardous Materials tracking database (either AF-EMIS or EESOH-MIS). This includes government, contractor, and any use of pesticides by a tenant on the installation.

As the Air Force transitions from the use of AF-EMIS to the web-based EESOH-MIS hazardous materials tracking database, the NGB/A7A Pest Management Consultant approval will be integrated with the base authorization process. Until then, however, the Installation Pest Management Coordinator must obtain NGB/A7A Pest Management Consultant approval separately through the CNR Database. Section 8.10 contains a summary of the current steps to obtain approval from the NGB/A7A Pest Management Consultant.

TABLE 6.4
Summary of EMIS Chemical/Hazardous Material Request Authorization Process for Pesticides

1. User Electronic Request via AF Form 3952	**Includes product, purpose, exposure potential, application location, PPE, waste and disposal. Pesticide is identified by EPA Reg. #.**
2. Requesting Unit Supervisor	**Certifies request. Submits initial request Form 3952.**
3. Hazardous Materials Pharmacy	**Ensures completeness, match MSDS, compile paperwork, constituents, manufacturer, etc.**
4. Bio-Environmental Engineering	**Evaluates constituent hazard and exposure potential.**
5. Safety	**Ensures compliance with OSHA and AFOSH standards.**
6. Fire Department	**Reviews for location of hazardous materials locations and storage.**
7. Environmental Manager	**Review for compliance with environmental regulations and potential impacts to base environmental aspects.**
8. Installation Pest Management Coordinator	**Determines if pesticide is listed by Armed Forces Pest Management Board. Confirms state registration of pesticide. Drafts revision to affected pest-specific control strategy in IPM Plan Annex 1, in coordination with installation ESOH Council; and, incorporates revised strategy into IPM Plan after approval by ANG Pest Management Consultant. Obtains pre-approval from NGB/A7A Pest Management Consultant (see #Annex_2). Executes order through Hazmat Pharmacy**
9. NGB/A7A Pest Management Consultant	**Review and approval. (Currently conducted through CNR Database. See Section 8.10)**
10. Hazardous Materials Pharmacy	**Order is executed. Pesticide is added to installation authorized-use list.**

6.9 Pesticide Storage Methods and Facilities

Pesticides can be stored in warehouses, flammable-safe cabinets or in specially-designed storage facilities. At the 165th Airlift Wing, Georgia Air National Guard, pesticides are stored in flammable-safe cabinets.

Figure 6.1 presents a typical structure designed specifically for pesticides storage. As pesticide use has diminished due to implementation of integrated pest management strategies, many of these structures have been used for non-pesticide storage as they provide an effective, regulatory-compliant storage system for other hazardous materials. These structures exhibit appropriate design features that provide built-in secondary containment, ventilation systems, security, weatherproofing, and appropriate signage for pesticides storage when in effect ("Danger Pesticides - Keep Out").

All faucets and spigots used by pest control operations must be appropriately fitted with properly operating backflow prevention devices.

The design of pesticide storage facilities shall comply with the standards described in AFPMB Technical Guide 17, "Military Handbook, Design of Pest Management Facilities." Click on the following link to access this Technical Guide: http://www.afpmb.org/pubs/tims/tim17.htm. Also, the following link will provide access to the entire list of Technical Guides: http://www.afpmb.org/pubs/tims/tims.htm.

FIGURE 6.1
Typical style of a flammable storage cabinet used by the GaANG to store chemicals.

FIGURE 6.2
Typical structure designed specifically for pesticides storage that can also be used for other hazardous material storage.

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7.0 Environmental Considerations

7.1 Sensitive Areas

A wetland area is present inside the fence lines of the 165th Airlift Wing, Georgia Air National Guard.

See Annex_5 for a map showing location of any wetland areas. Pesticide applications in the vicinity of wetlands and open water bodies should strictly follow label instructions. See also 40 CFR 122.3 for NPDES permit exclusions.

7.2 Endangered/Protected Species and Critical Habitats

The EPA identifies pesticides with potential to affect federally listed threatened and endangered species or their critical habitat. The EPA, Endangered Species Protection Program (ESPP), requires pesticide applicators to, when directed by the label, visit the EPA website or call the indicated toll free number to see if a local county Bulletin contains relevant information. Even if the information contained in the county Bulletin is not relevant to the intended use of the pesticide, applicators must still copy or download the county Bulletin. Bulletins will be good for six months, at which time applicators will need to revisit the website (or call the toll free number) to again obtain the county Bulletin. EPA has stated that pesticides bearing label directions only for use indoors, and where the applied product remains indoors, will not be subject to ESPP.

Applicators who ignore label language directing them to obtain a county Bulletin from the EPA website, or toll free number, run the risk of violating labeling directions. Applications that adversely impact a federally listed threatened or endangered species could constitute an Endangered Species Act violation, in addition to an enforceable label violation. Pesticide applicators are encouraged to visit the ESPP Web site at http://www.epa.gov/espp and familiarize themselves with the county Bulletins.

To comply with the ESPP regulations, follow these steps:

1. Review the label of every product you use to determine whether it contains endangered species prohibitions.

2. If the label does contain endangered species language, check the EPA website: http://www.epa.gov/espp/how-to.htm , or call EPA's toll-free number: 1-800-447-3813, before using the product.

3. Review Endangered Species Protection Program U.S. State maps at: http://www.epa.gov/espp/bulletins.htm

4. Do not use the product in a manner inconsistent with the county Bulletin (which is an extension of the product's label).

5. Maintain a copy of the county Bulletin in your files.

6. Recheck the labels of products you use at least once every six months for the generic label statement about county Bulletins.

If proposed application of pesticide has potential to affect any threatened, endangered, or otherwise protected species, the base EM must contact the local USFWS office for an informal consultation under Section 7 of the Endangered Species Act (ESA) or for coordination under the Migratory Bird Treaty Act (MBTA) and other applicable regulation. If the USFWS requests a formal consultation, and preparation of a biological assessment, Unit must contact NGB/A7A Natural Resources Manager for coordination.

Although no threatened and protected species are known to exist at Savannah IAP or Glynco Air National Guard Station, the threatened species Flatwoods Salamander (*Ambystoma cingulatum*) has been confirmed at Townsend Bombing Range. The habitat of the Flatwoods Salamander is on the range proper and not on or near the 50 acres permitted to the ANG by the Marine Corps. Since there are no threatened or endangered species of concern within the geographical area of coverage for this IPM plan, no consultation with USFWS is required.

7.3 Environmental Documentation

There are no National Environmental Policy Act (NEPA) requirements for the implementation of this IPM plan. Documentation for aerial application projects shall be in accordance with DoD, USAF, and ANG environmental requirements including compliance with the requirements of the NEPA. A designated pest management consultant at the major command level or higher, who is certified in the aerial application pest control category, and the NGB/A7A Natural Resources Manager must pre-approve all proposed pest management projects that involve the aerial application of pesticides. Any pesticides to be used must be pre-approved by NGB/A7A Pest Management Consultant specifically for use in aerial application. For routine pest management operations, FIFRA's substantive and procedural provisions for the protection of the environment satisfy the objectives of NEPA [Merrell v. Thomas, 608 F. Supp. 644 (D. Or. 1985), aff'd, 807 F.2d 776 (9th Cir. 1986), cert. denied, 108 S. Ct. 145, 98 L.Ed.2d 101 (1987).].

DODI 4150.07 (May 29, 2008), section E4.8.1. states:

"Pesticide Applications in the Range of Endangered Species. The Military Services and their facilities shall comply with section 1531 et seq. of Reference (an) (the Endangered Species Act (ESA)) and appropriate sections of Service regulations. This includes the requirement to consult or confer with Fish and Wildlife Service (FWS) or National Marine Fisheries Service (NMFS) on any activities that may affect species that are proposed for listing or listed as threatened or endangered (ESA Section 7(a)(2)). Examples of activities on a military facility that would require consultation with FWS or NMFS are development of installation pest management plans and the application of pesticides in listed species
habitat. Label restrictions designed to protect listed species (e.g., regarding application of pesticides adjacent to aquatic habitats) shall be followed. PMPs will coordinate all activities that may affect
listed species with the facilities' natural resource management professionals. Installation commanders shall ensure that their installation pest management plans identify areas within their installations that
contain ETS, and that personnel using pesticides on the installation understand the potential impact that pesticide applications could have on ETS. OCONUS installations shall comply with paragraph 2.6 of this

Instruction."

If (informal) Section 7 ESA consultation between USFWS and GA ANG is required in the future, documentation will be appended within Annex 10 of this plan. If "formal" Section 7 ESA consultation is requested by USFWS, GA ANG will promptly notify NGB/A7A Pest Management Consultant.

7.4 Pesticide Spills and Remediation

Should there be a spill of pesticides; the Oil and Hazardous Substances Spill Prevention and Response Plan will be followed.

Pesticides are addressed in Table B-4, Facility Oil, Hazardous Substances and Potential Pollutant Source Inventory, Oil Drum and Hazardous Substances Storage Areas, and Table 17-7, Spill Cleanup Procedures for Pesticides.

The base will avoid use of household disposal route for disposal of empty pesticides containers as this is not a household use; the “household waste exemption” is not applicable to any pesticides disposed.

7.5 Disposal Procedures and Methods

Residue rinseate from pesticide containers may be utilized as part of normal pesticide applications. All pesticide waste will be properly disposed of following established base procedures in coordination with installation environmental manager. Waste from pesticide operations must be carefully characterized. Care must be taken to distinguish between hazardous waste and acute hazardous waste because their residues and containers must be handled differently. Under the Resource Conservation and Recovery Act (RCRA), a container that has held an acute hazardous waste can be considered “empty” if it has been appropriately triple rinsed (see 40 CFR 261.7(b)(3)), but State regulations might be more restrictive. Empty containers should be made un-reusable by cutting a hole in the bottom of the container, unless contrary to label directions (ex. “do not puncture” for some aerosol cans). Empty containers (see 40 CFR 261.7) can generally be disposed of through the solid waste disposal path. Likewise, other equipment and supplies should be decontaminated, as appropriate, and either processed for reutilization or disposed. Any contaminated equipment or supplies must be evaluated for disposal as hazardous waste. Any de-registered or surplus pesticides will be inventoried through the base hazardous materials pharmacy and reutilized through normal base procedures; this is typically through the Defense Reutilization and Marketing Office (DRMO).

The following link presents Frequently Asked Questions regarding Household Hazardous Waste. http://www.epa.gov/region09/waste/solid/house.html

The following link provide access to the Federal Register dated Wednesday August 16, 2006 and provides the final rule on Pesticide Management and Disposal; Standards for Pesticides Containers and Containment. http://www.epa.gov/EPA-PEST/2006/August/Day-16/p6856a.htm

For further guidance on disposal procedures and methods refer to AFPMB TG-21 ‘Pesticide Disposal Guide for Pest Control Shops. http://www.afpmb.org/pubs/tims/tims.htm].

7.6 Operations Involving Aerial Application

Aerial pesticide applications are not performed at this installation.

7.7 Golf Course Pest Management Operations

No golf course areas are maintained by this installation.

8.0 Program Administration

8.1 Pest Management Operations

8.1.1 Pest Management Organization Structure

Figure 8.1 provides a summary of the organization structure and team members supporting the pest management program at the 165th Airlift Wing, Georgia Air National Guard.

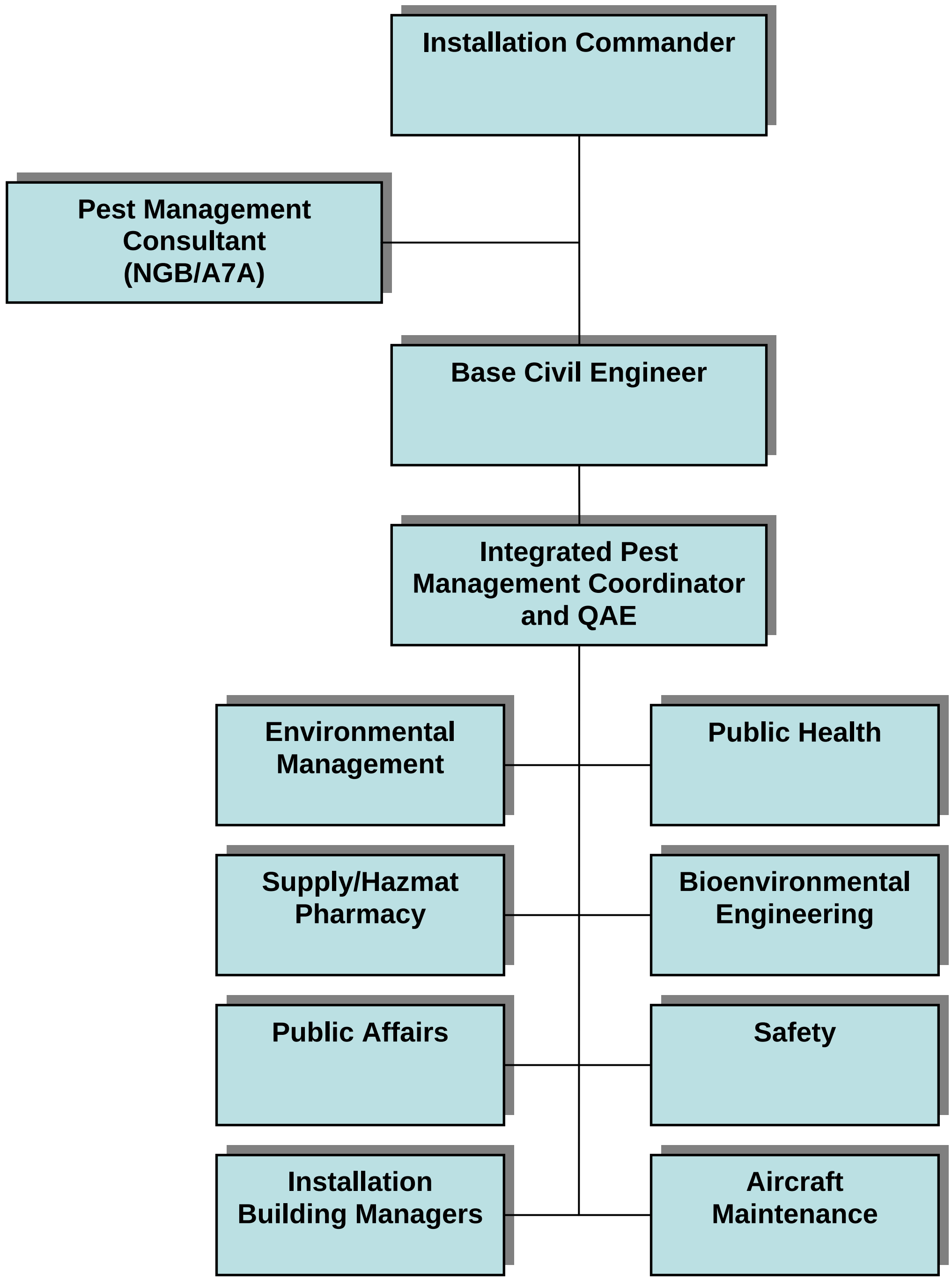

FIGURE 8.1
Pest Management Organization Structure

8.1.2 Work Order Process

Air Force Pamphlet 32-1004, Volume 3, dated 1 September 1998,(..\3 Resource Toolbox\8.1.2 Work Order Process\Work Order Process AFPAM32-1004v3.pdf) describes the activities required to operate, maintain, repair, and construct real property using an in-house military and civilian work force and recurring and non-recurring service contracts. The pamphlet provides detailed guidance on the work (job) order process, including the review process, evaluation of work orders, management of work orders, and tracking requests. Figure 8.2 provides a summary flow of a typical work order program.

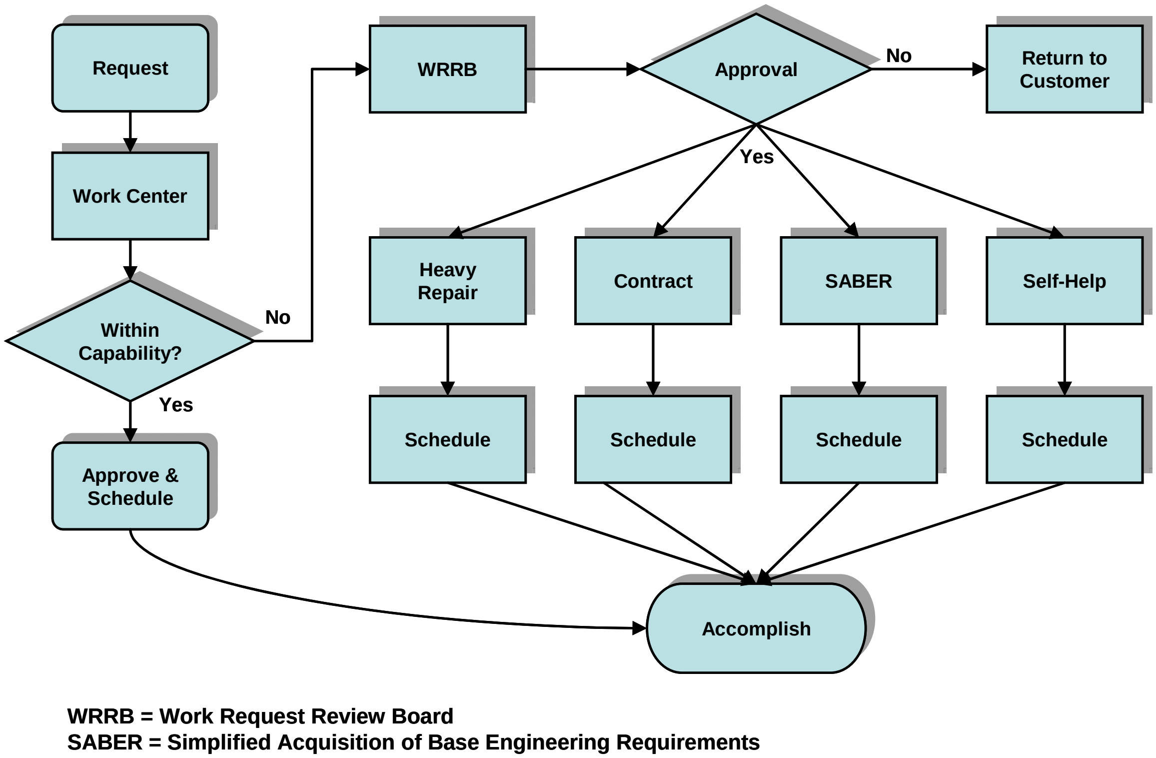

FIGURE 8.2
Work Order Process

8.1.3 Funding

Air National Guard Instruction (ANGI) 32-1023, dated 2 October 1998, prescribes the procedures and reports necessary to implement Military Construction Projects (MCP), Minor Construction (MC) projects, and Sustainment, Restoration, and Modernization (SRM) projects needed to support the pest management program at the 165th Airlift Wing, Georgia Air National Guard.

The Environmental, Safety, Occupational Health Compliance Assessment, and Management Program (ESOHCAMP) is a tool to identify potential opportunities to obtain funding to address pest management non-compliance findings. External assessments are conducted every 3 years and internal assessments are conducted every year. For the 165th Airlift Wing, Georgia Air National Guard, 3 external ESOHCAMPs have been conducted – 6 Dec 1999, 2 Dec 2002, and 9 Sep 2005. The next assessment will likely occur in August 2008.

Currently there are no pending projects associated with pest management at the 165th Airlift Wing, Georgia Air National Guard.

Normally pesticides are to be purchased through the installation hazardous materials pharmacy. However, installations are authorized to make local purchases, of pesticide on the installation's Authorized Pesticide Use List, using IMPAC cards where the amount being acquired is so small that it should not be purchased through the authorization and supply system.

The Automated Civil Engineering System (ACES) website https://aces.csd.disa.mil/ provides project programming documentation and associated training. Any funds expended for PMP materials through Facility Operations & Maintenance Activities (FOMA) must be approved by the BCE.

8.1.4 Self-Help and Poison Control

Self Help

The Air Force has published self-help program guidance document entitled "AIR FORCE SELF-HELP PEST MANAGEMENT PROGRAM FOR MILITARY HOUSING (MH) OCCUPANTS AND BUILDING MANAGERS." This document can be found on the following web-site and Resources Toolbox:

http://www.afcesa.af.mil/shared/media/document/AFD-070613-048.pdf
..\3 Resource Toolbox\8.1.4 Self-Help\AF Memo Self-Help Sep 06.pdf

Under the "Search" feature type in "Pesticides" and hit the "Go" button; a link to the document will appear. The guidance document provides frequently asked questions and responses addressing the directive driving the program, facilities impacted, typical pests found, BCE assistance, available pesticides, and program responsibilities. The document also includes an attachment with an example "Acknowledgment of Understanding" to be signed by the facility occupant stating that the instruction has been read and understood.

The installation has established a self-help program. Users contact the IPM Coordinator, who assesses and validates the need and then briefs personnel on proper use of the authorized pesticide(s). The user is required to sign an acknowledgement that he or she has been briefed. The IPM Coordinator maintains a log of all users authorized to purchase self-help pesticides.

Poison Control

Until recently, each of the 65 poison-control centers in the country had a different phone number. Now, a single toll-free number will provide help no matter where: 1-800-222-1222. Dialing the new hotline will connect to the nearest poison-control center. The number is not just for emergencies, it is available for information and professional advice on poison prevention, pesticide use, drug interactions, and related topics.

POISON Help 1-800-222-1222

Other local poison control contacts include:

Georgia Poison Control Center

(800) 282-5846

8.2 Contracts/Quality Assurance

8.2.1 Contracts

Major pesticide applications are performed under contracts at the 165th Airlift Wing, Georgia Air National Guard. Table 8.1 provides a summary of the current contracts at the installation.

TABLE 8.1

Summary of 165th Airlift Wing, Georgia Air National Guard Pesticide Contracts

Installation	Contract # or Service Provider	SOW Title	Period of Performance	Frequency	Locations
165th Airlift Wing, GaANG	**Cox Termite & Pest Control**	**Performance Work Statement for Pest Control Services**	**June to July**	**Assess monthly, treat as needed**	**Installation Wide**
117th ACS Hunter AAF	**Younce Terminix**	**Performance Work Statement for Pest Control Services**	**June to July**	**Assess monthly, treat as needed**	**Installation Wide**
224th JCSS / 165th ASOS	**Younce Terminix**	**Performance Work Statement for Pest Control Services**	**June to July**	**Assess monthly, treat as needed**	**Installation Wide**
Townsend Bombing Range	**Younce Terminix**	**Performance Work Statement for Pest Control Services**	**June to July**	**Assess monthly, treat as needed**	**Installation Wide**

The DoD will use pest management contracts when cost-effective or when advantageous for non-routine, large-scale, or emergency services, especially when specialized equipment or expertise is needed. Contracts for installation pest management must be monitored by persons either certified as a State or DoD pesticide applicator, or as a Pest Management Quality Assurance Evaluator (PMQAE).

#Annex_9 provides a tool to conduct cost comparison analysis between using base personnel versus contractors for pest management services.

When supported by Annex # 9 economic analysis comparing base personnel versus contractors for pest management services, contracts are appended within Annex # 7; samples of contract SOW language for monitoring and pesticide application contract services are available through this link. To avoid conflict of interest issues, it is highly recommended that pest monitoring/surveillance services contractor be separate (by either base personnel or contractor) from pesticide application contractor. The U.S. Navy offers a 3-day course for quality assurance evaluators, environmental and natural resources personnel, contract administrators and writers, and other personnel who are involved with or provide oversight of pesticide operations or who inspect or will inspect contracts where pesticides are applied. This and other courses can be accessed on the web at:

http://www.afpmb.org/pubs/courses/courses.htm

https://www.netc.navy.mil/centers/csfe/cecos/default.cfm?fa=courses.custom&pg=courseschedules

Mesh Termite Barrier Specifications

..\3 Resource Toolbox\6.9 Pesticide Storage Methods and Facilities\UFGS Mesh Termite Barrier 31 31 16.21.pdf

8.2.2 Quality Assurance

MSG Jacqueline Terry is designated as the Pest Management Quality Assurance Evaluator (PMQAE) for the 165th AW, GA ANG.

8.3 Outleases – Agricultural and Housing

Agricultural and housing outleasing or outgranting is defined as the use of DoD lands under a lease, license, or permit to an agency, organization, or person for growing crops, grazing animals or leasing property. The following link to the Integrated Natural Resource Management Planning AFI provides guidance and requirements for outleasing and related pest management activities...\3 Resource Toolbox\8.3 Outleases\AFI 32-7064 Nat Resources.pdf.

This installation does not lease lands.

8.4 Inter-Service Support Agreements

Table 8.2 provides a summary of the Inter-Service Support Agreements (ISSA) that address support provided by the 165th Airlift Wing, Georgia Air National Guard related to pest management. See the specific ISSAs for details regarding support provided.

TABLE 8.2
Summary of ISSAs Provided by 165th Airlift Wing, Georgia Air National Guard

Receiving Entity	Agreement #	Effective Date	Expiration Date	ISSA Reference to Pest Management
Marine Corps (Marine Corps Air Station Beaufort)	**Annex Files\Townsend MOU.pdf**	**9 September 2004**	**9 September 2029**	**4.b.(6)**

8.5 Reports and Records

8.5.1 Reports

Below are the primary environmental documentation requirements for the IPM program.

Monthly Pesticide Use Reporting Through Cultural/Natural Resource (CNR) Database

CNR online reporting is structured as a series of questionnaires organized by topical area (Base Info, Cultural Resources, Natural Resources, Pest Management). The following ANG procedures must be followed for submitting monthly pesticide use reports through the CNR Database.

- In accordance with DoDI 4150.07 (May 29, 2008), DoD Pest Management Program, installation must record all pesticide applications using DD Form 1532 or an equivalent computer product.
- The Air National Guard requires that copies of the pesticide use reports (1532 or equivalent) be submitted to the NGB/A7A Pest Management Consultant on a monthly basis.
- Submission of monthly reports to ANG is required to be done using the CNR Database: https://cnr.ang.af.mil/. The installation Pest Management Coordinator is responsible for submitting the reports or delegating the responsibility.
- If the individual responsible for uploading monthly reports does not have an active CNR account, they should either request a new user account using the link provided on the homepage, or contact the NGB/A7A Pest Management Consultant.
- Within the CNR, the user should choose "Questions", then "Pest Management", then "Pesticide Use Reporting" questionnaire. They select the month and year being reported, and either manually enter pounds of active ingredient (PAI) if no electronic copies are available or upload the electronic version of the report. Installations may also choose to upload a pesticide inventory if available.
- If there are any questions about using the CNR, installation should consult the CNR User's Manual or contact the NGB/A7A Pest Management Consultant.

Annual Reporting of Measures of Merit

DoD's strategic plan for environmental security, drafted in 1993, mandates a reduction in the environmental risk from pesticides used in DoD programs and provides three Measures of Merit for Pest Management.

Measure of Merit 1 – Installation Pest Management Plans. Through the end of FY 2010, 100% of DoD installations will have pest management plans prepared, reviewed, and updated annually by pest management professionals.

Measure of Merit 2 – Pesticide Use Reduction. Through the end of FY 2010, DoD will maintain the achieved reduction in annual pesticide use on DoD installations. This reduction is set at an average of the FY 2002 and 2003 usage, which is 389,000 pounds of active ingredient (45% of the original 1993 baseline – a 55% reduction). Pesticide applications by contractors shall be included.

Measure of Merit 3 – Installation Pesticide Applicator Certification. Through the end of FY 2010, 100% of DoD's installation pesticide applicators will be properly certified (either by DoD or the appropriate State). Direct-hire DoD employees have a maximum of 2 years to become certified after initial employment. Contract employees should have appropriate State certification when the contract is let.

The following ANG procedures must be adhered to for reporting on Measures of Merit (MoM) through the CNR Database.

- In October of each year, the DoD, and subsequently the ANG, will issue a datacall for annual pest management MoM. These responses must be submitted through the CNR Database.
- Installation Pest Management Coordinators or their designee should enter responses to the five MoM questions by choosing “Questions”, then “Pest Management”, then the “Measures of Merit” questionnaire.
- Installations need to submit this MoM information only once per year, between 1 October and 1 November.
- If there are any questions about MoM requirements or the CNR, installations should contact the NGB/A7A Pest Management Consultant.

Annual Review of Installation IPM Program and Technical Approval of Pesticide Use Proposal

The NGB/A7A Pest Management Consultant reviews installation IPM programs on-site every three years and annually reviews and technically approves installation IPM plans, including the installation’s pesticide use proposal for the upcoming year. During the annual installation review of this IPM Plan, submit the updated “Annual Pesticide Use Proposal” (see Annex_2) for approval by the NGB/A7A Pest Management Consultant. The substitution of environmental compliance on-site external reviews for on-site reviews by a pest management consultant is permitted to meet DoD program requirements.

Hazardous Materials Transactional Issue Reports

All pesticide use must be tracked using the AF-EMIS or EESOH-MIS hazardous materials tracking database, including in-house applications, contractor applications, and application of pesticides by a tenant on the installation. The AF-EMIS or EESOH-MIS will generate a transactional issue report for all installation authorized pesticides.

8.5.2 Records

The following links provide access to the Air Force AFIs on record disposition.

..\3 Resource Toolbox\8.05 Reports and Records\AFI 37-138 Records Disposition .pdf
..\3 Resource Toolbox\8.05 Reports and Records\AFI 37-139 Records Disposition Schedule .pdf

The following records will be maintained to document pesticide applications at the 165th Airlift Wing, Georgia Air National Guard. The 165th Airlift Wing, Georgia Air National Guard BCE will maintain and dispose of records IAW AFI 37-138, Information Management, Records Disposition – Procedures and Responsibilities, dated 31 March 1994, and Air Force Manual 37-139 Information Management – Records Disposition Schedule, dated 1 March 1996, Table 32-33.

The following records will be maintained by the 165th Airlift Wing, Georgia Air National Guard BCE:

- Pesticide-Use Reports - DD Form 1532-1 “Pest Management Maintenance Report”
- USDA Animal and Plant Health Inspection Service (APHIS) Emergency Action Notification PPQ Form 523
- DoD IPM/QAE Training Certification

Copies of DD Form 1532-1 and associated instructions on the use of the form, and USDA Form 523 are included in #Annex_8.

8.6 Training and Certification

All pertinent certificates of training/competency can be found in #Annex_4.

8.6.1 Training

The following training items and actions may be necessary for an effective IPM program at the 165th Airlift Wing, Georgia Air National Guard.

- Base IPM Coordinator/QAE Training. The U.S. Navy and U.S. Army offer a 3-day course for quality assurance evaluators, environmental and natural resources personnel, contract administrators and writers, and other personnel who are involved with or provide oversight of pesticide operations or who inspect or will inspect contracts where pesticides are applied. This and other courses can be accessed on the web at:

  http://www.afpmb.org/pubs/courses/courses.htm

  OR

  https://www.netc.navy.mil/centers/csfe/cecos/default.cfm?fa=courses.custom&pg=courseschedules

- USDA Quarantine Program Training (e.g., Japanese beetle program). The following web link and link to the Resource Toolbox provides access to "The Japanese Beetle Program for Airports":

  http://www.aphis.usda.gov/ppq/manuals/domestic/pdf_files/Japanese_Beetle.pdf
  or
  ..\3 Resource Toolbox\8.06 Training and Certification\USDA APHIS Japanese_Beetle.pdf

  http://www.aphis.usda.gov/publications/plant_health/content/printable_version/jb_poster8-03.pdf

  http://www.aphis.usda.gov/publications/plant_health/content/printable_version/jbidcard5-07.pdf

- Termite Inspection Training to meet USDA annual, biannual, or triennial inspection requirement.

- Base Self-Help. See Section 8.1.4

- Implementation of the installations' HAZCOM program in accordance with OSHA requirements, including training on Material Safety Data Sheets (MSDSs). See Section 6.2.

- The DoD Career Field Education and Training Plan (CFETP) for IPM professionals can be found at:

  ..\3 Resource Toolbox\8.06 Training and Certification\Career Field Progression IPM 3E4X3.pdf

- The AFCESA 3E4X3 webpage can found at:

  https://wwwmil.afcesa.af.mil/Directorate/CEO/Training/QTPs/ceof_3e4x3.htm

- A web link to the AFSC "Community of Practice" can be found at:

  https://afkm.wpafb.af.mil/ASPs/Users/login.asp?Filter=OO-EN-CE-46

- The US Army Medical Zoology Branch, Department of Preventive Health services provides training materials for 3 pest management courses (MD0141, MD0142, and MD0143) at:

  http://139.161.100.20/dphs/MedZoo/study.htm

- The POC information for the Air Force Career Field Manager for AFSC 3E4X3 is:

  MSgt Kevin "RED" Delaney, USAF
  HQ AFCESA/CEOF
  DSN 523-6381
  COMM 850-283-6381
  kevin.delaney@tyndall.af.mil.

8.6.2 DoD Certification

The following ANG Procedures address obtaining DoD certification for pesticide applicators. Note that:

- ANG members in Air Force Specialty Code (AFSC) 3E4X3 who do not hold a valid DoD Pesticide Applicator Certificate (DD 1826) are NOT AUTHORIZED to apply pesticides to DoD property without supervision of a certified applicator or a valid state certification in that specialty.
- ANG members in AFSC 3E4X3 who do not hold a valid DD 1826 are not eligible for deployment.
- Traditional Guardsmen who are DoD pesticide applicator certified, but are not currently in "Federal" status (e.g. AGR, Federal Technician, or UTA/RUTA), must also be State certified in order to apply pesticides on installation [unless otherwise determined by NGB-JA].

Initial Certification

All ANG members assigned to AFSC 3E4X3, Pest Management, are required to attend Apprentice Training (Technical School) at Sheppard AFB, course number J3ABR3E453-00AA. Schedules are available through either the Armed Forces Pest Management Board http://www.afpmb.org or the Air Education and Training Center's Education and Training Course Announcements https://etca.randolph.af.mil/. The duration of the Technical School is 6 weeks. Upon successful completion of the Technical School, notification is sent from Sheppard AFB to the CE Unit Training Manager and the NGB/A7A Pest Management Consultant. The NGB/A7A Pest Management Consultant adds the member's information, including scores and completion date, to the ANG DoD Certified Applicator Database.

IAW the AFSC 3E4X3 Career Field Education and Training Plan (CFETP) and the DoD 4150.07-P (May 29, 2008) DoD Plan for Certification of Pesticide Applicators, the member must complete two additional training requirements, one year of on-the-job training (OJT) and the correspondence Career Development Courses (CDCs). The Unit Training Manager is responsible for ensuring that the member completes the OJT and CDCs within two years of Technical School graduation.

Once the OJT and CDC training requirements are met, the Unit Training Manager must provide the completion dates to the NGB/A7A Pest Management Consultant via e-mail or memorandum. Initial certification is issued for a period of up to three years. The NGB/A7A Pest Management Consultant will then issue an initial DoD Pesticide Applicator Certificate (DD 1826) and wallet card (DD 1826-1). The certificate will be mailed to the unit's BCE for their signature and presentation to the member. The expiration date on the certificate will be three years from the date of completion of the final training requirement.

Recertification

Prior to the expiration date on the DD 1826, the member must attend a 1-week recertification course. Initial certification is issued for a period of up to three years. The member may take the Air Force recertification course, J3ARR3E453-002 or J3AWR3E453-01AA or J7ART3E453-00AA, or another military service's equivalent. The complete course list for all services is available through the Armed Forces Pest Management Board website. http://www.afpmb.org

If the member attends a recertification course through the Air Force, the scores will be sent by the instructors to NGB/A7A Pest Management Consultant, and a new certificate, valid for three years, will be issued. If the member attends another service's course, either the member or the Unit Training Manager should ensure that notification of the scores and completion date are sent to the NGB/A7A Pest Management Consultant so a new certificate can be issued.

Certification Extension

If a DoD-certified pesticide applicator is unable to complete recertification prior to the expiration date of their certificate, that individual, or the cognizant Unit Training Manager, may apply to the NGB/A7A Pest Management Consultant/Certifying Official for a certification extension.

DoD-Certified applicators must attend a DoD pest management recertification training course and take and pass proctored written and performance-based category tests to maintain DoD certification. The certifying official may extend an individual's certification for cause (e.g., illness, family emergency, unscheduled military deployment). For civilian personnel, certification may be extended for a period of not more than six months. For military personnel, certification may be extended for a period of not more than twelve months. Only one extension may be approved for an individual during each certification period. Recertification training is conducted to meet the requirements of changing technology and to assure a continuing level of competency and ability to use pesticides safely and properly.

Members who are approved for a certification extension will be issued a new wallet card (DD 1826-1) with the revised expiration date.

Extension of the two-year training period prior to initial DoD-certification is not authorized.

Certification After Initial/Recertification Period has Lapsed

Members that 1) exceed the two-year training period for initial certification or 2) allow certification to expire and are not eligible for an extension, must attend a four-week Air Force certification course, J3AZR3E453-003 or J3AZR3E453-02AA, or another service's equivalent.

Points of Contact

For information on any courses listed above, members or Unit Training Managers should contact the Air Force Career Field Manager or the Air National Guard Readiness Division (NGB/A7CX). Point of contact information is available on the AFCESA website:

https://wwwmil.afcesa.af.mil/Directorate/CEO/Training/QTPs/ceof_3e4x3.htm or on the AF Portal webpage for NGB/A7CX.

For questions about certification, members or Unit Training Managers should contact the NGB/A7A Pest Management Consultant.

8.6.3 State Certification

In order to obtain a commercial applicator license, you must pass the commercial applicator examination provided by the Georgia Technical Colleges. This computerized exam is administered at several locations around the state numerous times during the course of a given year. Please visit www.gapestexam.com to learn more about our commercial examination. You can select a location and date that is convenient for you. Simply follow the instructions at the site to register for the exam. Please note that you will need to obtain study materials form the University of Georgia (material pricing varies). Ordering information is also located on the www.gapestexam.com web site. A $45 exam fee will be charged by the Technical Colleges. Most colleges accept checks, credit cards or money orders. Once you pass the exam, you will need to mail in a check or money order in the amount of $25.00 made payable to the Georgia Department of Agriculture. Individuals who wish to obtain a commercial applicator license must pass the general standards examination, as well as at least one major category examination with a score of 70%. The general standards exam is designed to test for general knowledge on the use of pesticides, while the category examinations are more specific to particular types of pesticide application. Please review the Rules of the Georgia Department of Agriculture, Pesticide Use and Application, Chapter 40-21-2, Categories for Certified Applicators, to determine the appropriate category for the type of pesticide applications you will be making. http://agr.georgia.gov/vgn/images/portal/cit_1210/49/62/41563801PIPD_Rules_of_Georgia_Pesticide_Use_and_Application_Act_of_1976.pdf

After you take the commercial examination, your license will be mailed to you within three to four weeks if you pass the exam. A failure notice will be mailed to those individuals who do not pass the exam.

The following link can be used to access the specific Georgia requirements, procedures, and fees for pesticide applicator certification.

http://agr.georgia.gov/00/article/0,2086,38902732_0_41426524,00.html

8.7 Pesticide Security

All pesticides stored on the 165th Airlift Wing, Georgia Air National Guard are within the secure fence line of the base. See TG 7, Installation Pesticide Security (August 2003) http://www.afpmb.org/pubs/tims/tims.htm. The Installation IPM Coordinator shall institute procedures to prevent terrorists from acquiring DoD pesticide dispersal equipment or pesticides, notify the FBI of any suspicious theft of pest control equipment, and ensure that the identity of personnel and pesticide formulations provided by contractors is known and approved by trained pest management QAEs or DoD certified pesticide applicators.

8.8 Emergency Disease Vector Surveillance and Control

Certain pests are known to transmit human diseases (ex. malaria, rabies, etc). Efficient communication and coordination with community public health and pest control officials can arrest epidemics and even prevent disease outbreak. The installation public health office should research, in advance, any local/state/regional plans and cooperative agreements for the control of disease vectors. The installation public health office should also have current contact information for key local officials with epidemiological responsibilities for vector control.

To report an animal pest or disease, contact:

U S Government Animal Health Veterinary Services Aphis Gen Info
Area Veterinarian In Charge
1498 Klondike Rd, Suite 200
Conyers, GA 30094
Phone: (770) 922-7860 Fax: (770) 483-9000

Additionally, the public health office should be familiar with ANG roles within established state and local disease response plans. AFI 48-102 Medical Entomology Program, dated 1 July 2004, assigns responsibilities for prevention of vector-borne disease and control of medical pests using an integrated pest management approach.

The unclassified version of the USAF Guide to Operational Surveillance of Medically Important Vectors and Pests is available on the AFPMB's web page at:

http://www.afpmb.org/coweb/guidance_targets/vector_and_pestcontrol/Operational_Surveillance_Guide.pdf

8.9 Coordination – DoD, Other Federal, State, and Local

The 165th Airlift Wing, Georgia Air National Guard provide coordination with off-base organizations and agencies for pest-related activities. Several Memoranda of Understandings have been set up with various organizations and agencies.

- Memorandum of Understanding between the U.S. Environmental Protection Agency and the U.S. Department of Defense with Respect to Integrated Pest Management, dated 20 March 1996. ..\3 Resource Toolbox\8.09 Coordination-DoD Federal State Local\IPM MOU EPA DOD 1996.doc

- Memorandum of Understanding between the U.S. Department of Defense and U.S. Department of Agriculture Animal and Plant Health Inspection Service on Animal Damage Control (ADC), dated 28 August 1990. ..\3 Resource Toolbox\8.09 Coordination-DoD Federal State Local\Animal Damage Assessment and ControlUSDA.pdf

- Memorandum of Agreement between the Federal Aviation Administration, the U.S. Air Force, the U.S. Army, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the U.S. Department of Agriculture to Address Aircraft-Wildlife Strikes, many signatories and dates, the last of which is 29 July 2003. ..\3 Resource Toolbox\8.09 Coordination-DoD Federal State Local\Aircraft Wildlife Strikes MOA.pdf

- Protocol for Military Clearance, April 2004, To prevent the introduction or dissemination of exotic plant pests and animal disease agents into the United States, by establishing and implementing guidelines, regulations, and policies that mitigate risks associated with military movement of troops, vehicles, equipment, and vessels of conveyance. ..\3 Resource Toolbox\8.09 Coordination-DoD Federal State Local\Protocol for Military Clearance USDA APHIS 042004.doc

- The 165th Airlift Wing, Georgia Air National Guard Bird Aircraft Strike Hazard (BASH) Plan, 17 August 2007.
- There are no MOUs established with State Agencies for the 165th Airlift Wing, Georgia Air National Guard.

8.10 Pesticide Approval Process

#Annex_6 provides a list of pesticides currently used at the 165th Airlift Wing, Georgia Air National Guard.

The following steps need to be taken to ensure the pesticides used on base are properly approved.

1.) Access the approved list of State pesticides via the following link: http://state.ceris.purdue.edu/state.htm

2.) Match current pesticides used on base with state list and determine if any of the pesticides are not authorized.

3.) Go to the AFPMB website: http://www.afpmb.org/. Under "Resources" select **DoD Standard Pesticides and Pest Control Equipment Lists**

The document "ARMED FORCES PEST MANAGEMENT BOARD (AFPMB) STANDARD PESTICIDES LIST AVAILABLE TO DOD COMPONENTS AND AGENCIES October 1, 2006" can either be opened as a PDF file or can be downloaded to your computer. Compare the list of pesticides used at the base with the Authorized Use List from Armed Forces Pest Management Board. Note that MSDSs and labels can be obtained from this document.

4.) Complete "Pesticide Use Approval" (See #Annex_2) in the CNR Database and submit to the NGB/A7A Pest Management Consultant annually before the end of the FY (September 30).

8.11 Sale and Distribution of Pesticides

Pesticides are not sold or distributed on this installation.

8.12 IPM References and Links

Some links to key IPM websites follow.

DoD Pest Management Instruction (DODI) 4150.07 (May 29, 2008)

..\3 Resource Toolbox\4.1.2 DODI\dod4150.7-i.pdf

DoD Unified Facilities Criteria (UFC) 4-218-10N, Design: Pest Management Facilities

http://www.wbdg.org/ccb/DoD/UFC/ufc_4_218_10n.pdf

Armed Forces Pest Management Board (AFPMB) Publications

http://www.afpmb.org/

USAF Pest Management Program, Air Force Instruction (AFI) 32-1053

http://www.e-publishing.af.mil/shared/media/epubs/AFI32-1053.pdf

U.S.A.F. Air Combat Command (ACC) Pest Management Program Guidance

https://ce.acc.af.mil/ceo/ceoo/Pest_Management/ACC_Pest_Management_Home_Page.html [Although not specific to ANG, this guidance is based on common DoD requirements.]

U.S. Army Environmental Center "Guidelines to Prepare Pest Management Plans for Army Installations and Activities," September 1996

http://aec.army.mil/usaec/pest/pestmgmtplans0996.pdf

[Although not specific to ANG, this guidance is based on common DoD requirements.]

The U.S. Environmental Protection Agency pesticide information website:

http://www.epa.gov/pesticides/

Air Force Civil Engineering Support Activity guidance "Air Force Self-Help Pest Management Program for Military Housing (MH) Occupants and Building Managers:"

http://www.afcesa.af.mil/shared/media/document/AFD-070613-048.pdf

U.S. Army Pest Management Model Plan

http://chppm-www.apgea.army.mil/ento/plan/model.htm

U.S. Army Center for Health Promotion and Preventative Medicine (CHPPM)

http://chppm-www.apgea.army.mil/

U.S. Army Environmental Center - Pesticide Applicator Certification Equivalents

http://aec.army.mil/usaec/pest/certificates00.html

U.S. Environmental Protection Agency (EPA) Pesticide Program

http://www.epa.gov/pesticides/

U.S. E.P.A. Endangered Species Protection Program (Pesticide Use Limitations)

http://www.epa.gov/espp/bulletins.htm

U.S. E.P.A. Integrated Pest Management Program for Schools (IPM examples)

http://www.epa.gov/pesticides/ipm/schoolipm/

U.S. E.P.A. ECOTOX Database

http://www.epa.gov/ecotox

U.S. Department of Agriculture Japanese Beetle Control Program Manual

http://www.aphis.usda.gov/ppq/manuals/domestic/pdf_files/Japanese_Beetle.pdf
http://www.aphis.usda.gov/publications/plant_health/content/printable_version/jb_poster8-03.pdf
http://www.aphis.usda.gov/publications/plant_health/content/printable_version/jbidcard5-07.pdf

U.S.D.A. Plant Protection and Quarantine Program

http://www.aphis.usda.gov/plant_health/

National Plant Board website (includes identification of plant pest issues)

http://nationalplantboard.org/index.html

National Invasive Species Council

http://www.invasivespecies.gov/

Integrated Pest Management Information By States

http://www.ipmcenters.org/producers/homepages/state.html

National Pesticide Information Center

http://npic.orst.edu/

Invasive Species Assessment Protocol (NatureServe)

http://www.natureserve.org/getData/plantData.jsp

Noxious Weeds in U.S. and Canada

http://invader.dbs.umt.edu/Noxious_Weeds/

U.S. Geological Survey West Nile Virus Mapping

http://westnilemaps.usgs.gov/

Annexes

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ANNEX 1

Integrated Pest Management Strategies

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The Integrated Pest Management Strategies for Annex 1 are located at:

Annex Files\Annex 1 - IPM Strategies.pdf

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ANNEX 2

Annual Pesticide Use Proposal

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At the beginning of each fiscal year, in conjunction with review of pest-specific management strategies, each installation shall propose a list of pesticides for approval by the NGB/A7A Pest Management Consultant The pesticides proposed are those intended for use on installation (by contractors or by base personnel) to control pests identified, or anticipated to occur, on installation during the upcoming fiscal year (see: DoDI 4150.07 (May 29, 2008) Section 5.3.22.6). Pesticide use approval is submitted through the Air National Guard CNR Database using the Pesticide Use Approval questionnaire shown in this Annex. In order to complete the approval process:

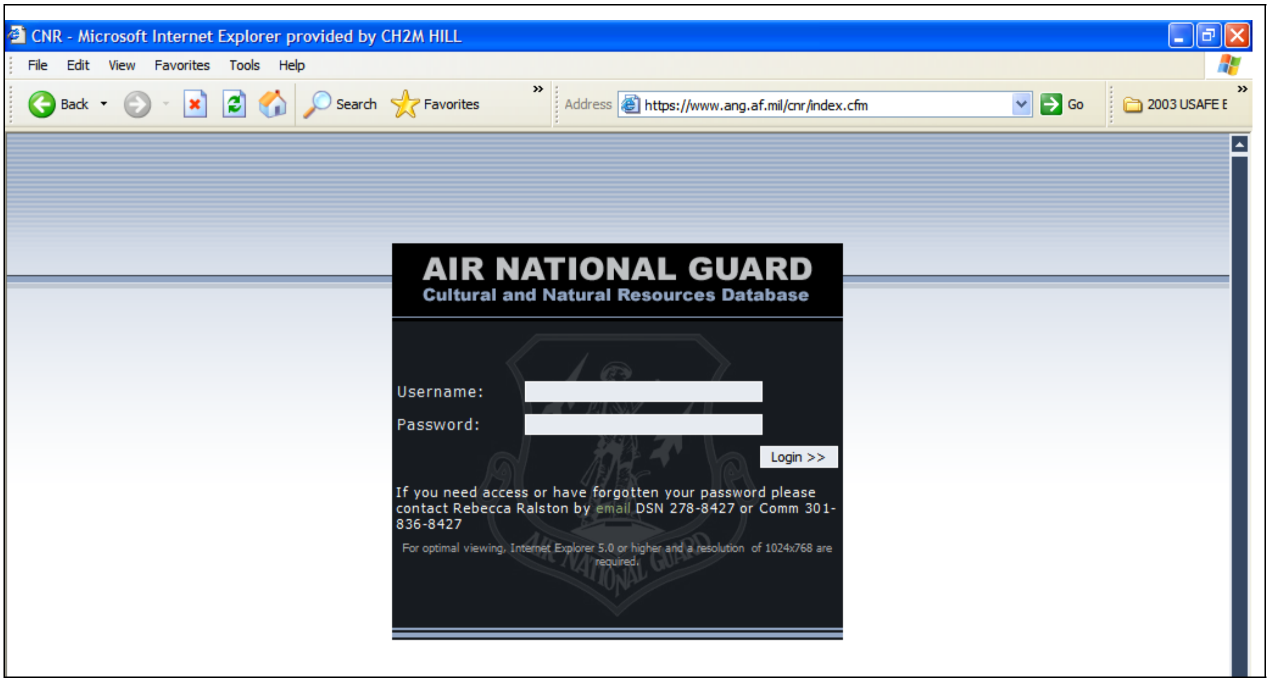
1) Review prior year pest-monitoring information and pest management strategies contained in installation integrated pest management plan. Determine whether any new pest management strategies are needed, or old strategies need to be updated or removed.

2) Identify pesticides suitable for the installation pest-specific strategies. The installation Pest Management Coordinator must preferentially nominate pesticides that are on the current AFPMB Standard Pesticides Available to DoD Components and All Federal Agencies list [for updated list see: http://www.afpmb.org/standardlist.htm .]

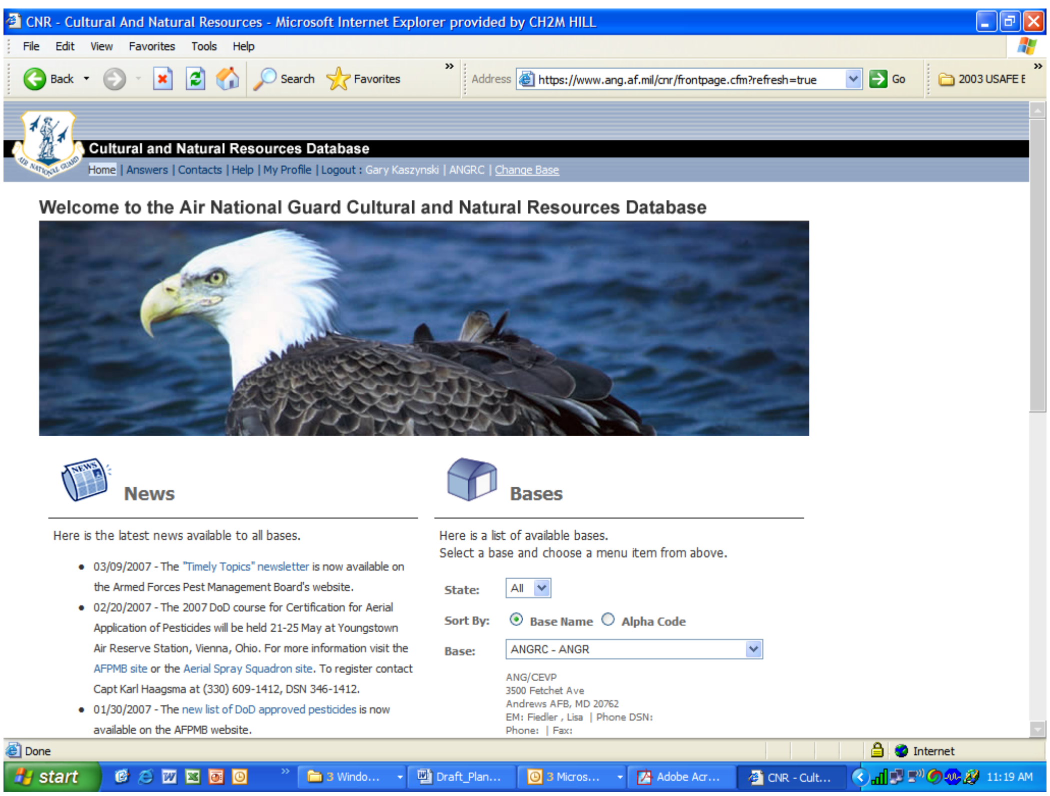
3) To access the Cultural and Natural Resource Database, use the following link: https://cnr.ang.af.mil/

For installation self-help program, if any, identify pesticides to be nominated from current Air Force Self-Help Pest Management Program guidance, see:

http://www.afcesa.af.mil/shared/media/document/AFD-070613-048.pdf



Enter your Username and Password and click on the Login>> icon.



Select your “State:” from the pull down menu and then select your “Base:”

Click on “Questions,” click on “Pest Management,” then click on “Pesticide Use Approval.”

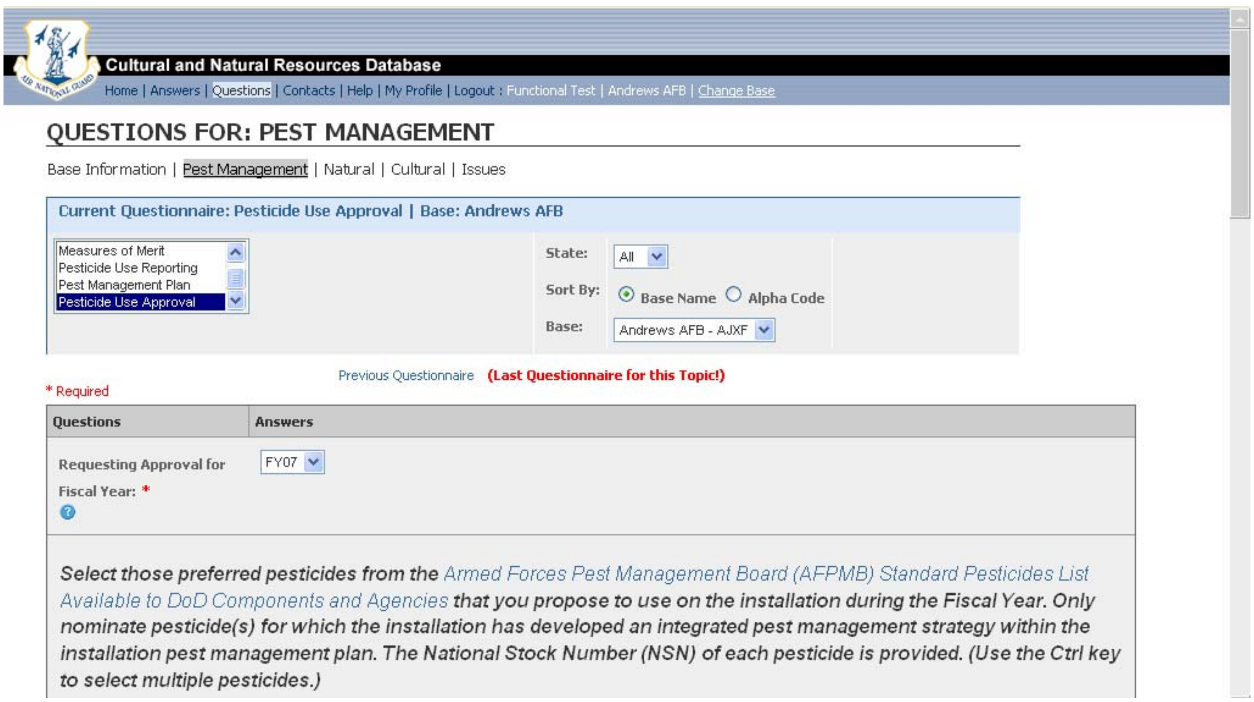
The CNR User then nominates pesticides from the AFPMB Standard Pesticides Available to DoD Components and All Federal Agencies list for NGB/A7A Pest Management Consultant approval.

4) The CNR User then submits an e-mail notification to the NGB/A7A Pest Management Consultant using the link at the bottom of the page.

5) The CNR User saves the record by hitting the Save button.

If AFPMB-listed pesticide(s) are not suitable for a particular pest-control problem, the CNR User may also request approval for non-AFPMB-listed pesticides. Submit the chemical and common names, EPA Registration Number, target pest, location of intended application, and explain why AFPMB-listed pesticide is unsuitable. The e-mail notification for non-AFPMB-listed pesticides should include the MSDS and Label as attachments. An installation may submit multiple requests for pesticide use approval throughout the FY.

NOTE: **NGB/A7A Pest Management Consultant approval of a pesticide is only valid for the requested FY**



INSECTICIDES:	01-543-0662: (Advance 360A Dual Choice Ant Bait Stations) Abamectin 0.011% 00-145-0016: (Phostoxin/Fumitoxin) Aluminum phosphide 55% (tablets) ***RUP*** 00-442-5698: (Phostoxin/Fumitoxin) Aluminum phosphide 55% (pellets) ***RUP*** 01-377-7049: (Bactimos Briquets) Bacillus thuringiensis 10% 01-287-3938: (Perma-Dust) Boric Acid (aerosol) 01-525-6888: (Talstar One) Bifenthrin 7.9% (liquid) 00-932-7297: (Sevin 80S/AllPro Carbaryl 80S) Carbaryl 80% (water dispersible powder) 01-104-0887: (Carbaryl 4L) Carbaryl 43.4% (liquid) 01-525-7139: (Phantom) Chlorfenapyr 21.45% (liquid) 01-313-7359: (Tempo SC Ultra) Cyfluthrin 11.8%
HERBICIDES:	00-392-7593: (Hyvar X-L) Bromacil 21.9% lithium salt of bromacil liquid 01-408-9079: (Hyvar X) Bromacil 80% wettable powder 01-005-7523: (Reward) Diquat 35.3% water soluble liquid 00-815-2799: (Reward) Diquat 35.3% water soluble liquid 01-341-9346: Diuron minimum 80% (granular) 00-001-7710: (Krovar I DF) Diuron-Bromacil mixture 40% bromacil/40% diuron (granular) 01-356-6001: (Sonar SRP) Fluridone 5% (pellets) 01-356-8888: (Sonar A.S.) Fluridone 41.7% (liquid) 01-525-5869: (Plateau) Imazapic 23.6% (liquid) 01-108-9578: (Roundup Pro/Glypos Pro/Glypro Plus) Isopropylamine salt of glyphosate 41% (water soluble liquid)
RODENTICIDES:	00-089-4664: 0.005% diphacinone 01-151-4884: (Maki) 0.005% broadiolone pellets 01-508-6085: (Talon-G) 0.005% brodifacoum pellets 01-501-2858: (Contrac Blox) 1 oz bait blocks 01-503-5348: (Final Blox) 20 gram bait blocks 01-435-9320: (ZP Rodent Bait) 2% zinc phosphide ***RUP*** 00-753-4972: (LIQUA-TOXII) concentrate 0.106% sodium salt of diphacinone 01-435-9318: (ZP Tracking Powder)10% zinc phosphide ***RUP***

INSECT REPELLENT (Personal, Clothing, or Netting Application):	01-278-1336: (Permethrin Arthropod Repellent) aerosol 01-284-3982: Ultrathon (3M/EPA 58007-1) 01-334-2666: 40% permethrin liquid (2-Gal sprayer) 01-137-8456: (Chigg-Away) 3% benzocaine and 10% precipitated sulfur 01-288-2188: (Sunset) 20% DEET/SPF15 01-452-9582: (Sunset) 20% DEET/SPF15 01-493-7334: (New CFP w/ DEET) camouflage face paint 01-345-0237: (IDA) permethrin 00-142-8965: (Cutter Repellent Stick) 30% DEET
ALGAECIDES/FUNGICIDES:	00-063-3981: (Cuprose) Copper Sulfate 80.16% pentahydrate crystal 00-282-0971: (COP-R-NAP) Wood Preservative copper naphthenate mixture 01-209-6298: (COP-R-NAP RTU) Wood Preservative copper naphthenate mixture 01-360-4741: (MITC-FUME) Methylisothiocyanate ***RUP*** 01-457-6588: (Heritage) Methyl Azoxystrobin 50%
NON-AFPMB LISTED PESTICIDES (Provide name, EPA registration number, target pest, location of intended application, and explain why AFPMB-listed pesticide is unsuitable):	

All pesticides requested are registered within this State for the subject FY: (select State registrations can be verified on-line through NPIRS)

○ Yes ○ No

CLICK HERE TO SEND AN E-MAIL TO THE ANG PEST MANAGEMENT CONSULTANT TO REQUEST APPROVAL.
Then hit the Save button below.

Save Delete Reset

Previous Questionnaire

Privacy and Security Notice • Accessibility • Links Disclaimer • Plug-Ins/Viewers
Supported by GUARDIAN ; DSN 278-8799, Comm (301) 836-8799

The following sources of information are available on state pesticide registrations:

http://ppis.ceris.purdue.edu/npublic.htm

http://www.kellysolutions.com/

http://npic.orst.edu/state1.htm#map

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ANNEX 3

Points of Contact

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USDA

http://www.aphis.usda.gov/plant_health/

Local USDA Point of Contact (POC):

To report an animal pest or disease, contact:

Area Veterinarian-in-Charge
1498 Klondike Rd, Suite 200
Conyers, GA 30094
Phone: (770) 922-7860
Fax: (770) 483-9000

To report a plant pest or disease, contact:

State Plant Health Director
1498 Klondike Road, Suite 200
Conyers, GA 30094
Phone: (770) 922-9894
FAX: (770) 922-4079

Custom and Border Protection, Agriculture Dept.

Mr. Frank Krainin, Mr. Kevin Mataxas, or Ms. Laury Juda at 912-232-7507 (24 hour) or 912-966-0557 Ext. 228.

http://www.aphis.usda.gov/ppq/manuals/domestic/pdf_files/Japanese_Beetle.pdf

http://www.aphis.usda.gov/publications/plant_health/content/printable_version/jb_poster8-03.pdf

http://www.aphis.usda.gov/publications/plant_health/content/printable_version/jbidcard5-07.pdf

Poison Control

1-800-222-1222	Nationwide
1-800-282-5846	Georgia Poison Control Center

US Navy QAE Courses

http://www.afpmb.org/pubs/courses/courses.htm

https://www.netc.navy.mil/centers/csfe/cecos/default.cfm?fa=courses.custom&pg=courseschedules

Career Training

https://wwwmil.afcesa.af.mil/Directorate/CEO/Training/QTPs/PubFiles/cfetp3e4x3.pdf

https://wwwmil.afcesa.af.mil/Directorate/CEO/Training/QTPs/ceof_3e4x3.htm

Air Force Career Field Manager for AFSC 3E4X3:

MSgt Kevin "RED" Delaney, USAF
HQ AFCESA/CEOF
DSN 523-6381
COMM 850-283-6381
kevin.delaney@tyndall.af.mil.

NGB/A7A Pest Management Consultant

Mr. Steve Covell
NGB/A7AN
3500 Fetchet Ave.
Andrews AFB, MD 20762
Tel: 301-836-8327
FAX: 301-836-7427
e-mail: stephen.covell@ang.af.mil

University of California Integrated Pest Management

The following link provides a comprehensive list of links to sites developed by government agencies or educational institutions through the University of California. This link also includes web-links to IPM centers affiliated with land-grant universities and National USDA Regional IPM Centers.

http://www.ipm.ucdavis.edu/

National Pesticide Information Retrieval System (NPIRS)

The National Pesticide Information Retrieval System (NPIRS) is a collection of pesticide-related databases available by subscription. NPIRS is under the administration of the Center for Environmental and Regulatory Information Systems, CERIS, at Purdue University in West Lafayette, Indiana. Click on the "State" tab to search your state's pesticide registration data by clicking the state abbreviation in the map or by clicking the state name in the list.

http://state.ceris.purdue.edu/

Installation POCs

The following table can be used to document internal installation POCs.

165TH AIRLIFT WING, GEORGIA AIR NATIONAL GUARD INTERNAL POCS

Installation POC Name	Rank/Title	Office	DSN Telephone Number	Commercial Telephone Number
SMSgt Tammy Quackenbush	**Facility Manager**			**912-966-8362**
MSgt Jacqueline Terry	**Supply Officer**			**912-966-8116**
Mr. Warren Lawson	**Pest Mgt Coordinator**			**912-966-8226**
MSgt Brian Saxton	**Work Control**			**912-966-8226**
SSgt Maureen Whitaker	**Work Control**			**912-966-8226**
MSgt Iris Framer	**Budget Analyst**			**912-966-3305**
Jessie Parisano	**Environmental Specialist**			**912-966-8496**

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ANNEX 4

Certificates of Training/Competency

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Certificates of Training/Competency and Pesticide Applicator Certificates:
[Annex Files\Annex 4 - GAANG training records.pdf]

Self Help Pest Management Program: Instructions and Acknowledgement of Understanding:
[Annex Files\Annex 4 - Self Help Acknowledgement.pdf]

Summarize the information on training and certification of pesticide applicators and PMQAEs in the following tables:

INSTALLATION CERTIFIED MILITARY PESTICIDE APPLICATORS

Name	Rank	Certifying Authority (State/DoD)	Date of certification (mm/dd/yyyy)	Certificate expiration date (mm/dd/yyyy)	Certificate number	Categories in which certified
Antonio D Lane		**DoD**	**08/08/2007**	**05/31/2010**	**AF-528-05-0507**	**Industrial, Institutional, Structural, Health Related, Ornamental and Turf, Public Health, Aquatic, Right-Of-Way**

INSTALLATION CERTIFIED CIVILIAN PESTICIDE APPLICATORS

Name	Job title	Certifying Authority (State/DoD)	Date of certification (mm/dd/yyyy)	Certificate expiration date (mm/dd/yyyy)	Certificate number	Categories in which certified
Warren Brad Lawson	**Pest Management Coordinator**	**State**	**09/13/2005**	**09/13/2010**	**05291**	**Ornamental and Turf**
Mike Oliver		**State**	**12/29/2006**	**12/29/2011**	**06520**	**Ornamental and Turf**

INSTALLATION SELF-HELP PARTICIPANTS

Name	Rank / Job title	Installation Work location (ex. BLDG #)	Date "Acknowledgement of Understanding" signed (update annually)	Authorized self-help pesticide / materiel [and target pest(s)]

CERTIFIED CONTRACTOR PESTICIDE APPLICATORS

Name of applicator	Company Name (and contract #)	Date of certification (mm/dd/yyyy)	Certificate expiration date (mm/dd/yyyy)	State Certificate number	Categories in which certified
Robert Foster	**Cox Termite & Pest Control**	**08/21/2007**	**06/30/2009**	**116226**	**Industrial, Institutional, Structural, Health Related, Ornamental and Turf, Public Health**
Christopher Cowart	**Cox Termite & Pest Control**	**07/01/2007**	**06/30/2009**	**15236**	**Industrial, Institutional, Structural, Health Related, Public Health**
Don Spaulding	**Younce Terminix**	**07/01/2007**	**06/30/2009**	**114047**	**Industrial, Institutional, Structural, Health Related, Ornamental and Turf, Public Health**

INSTALLATION PEST MANAGEMENT QUALITY ASSURANCE EVALUATORS (PMQAES)

Name of PMQAE	Date of PMQAE certificate issuance (mm/dd/yyyy) [to be renewed every 3 yrs.]	Certifying Schoolhouse (USAF/Army/Navy)	Contract Nos. (and contractors) monitored [and target pest(s)]
MSgt Jacqueline Terry	**12/07/2007**	**Army**	**165th - Cox Termite - PO #411-32-0000066968** **CRTC - Cox Termite - PO #411-33-0000066969** **224th - Younce - PO #411-32-0000066971** **Townsend Range - Younce - PO #411-33-0000066970**

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ANNEX 5

Installation Map(s)

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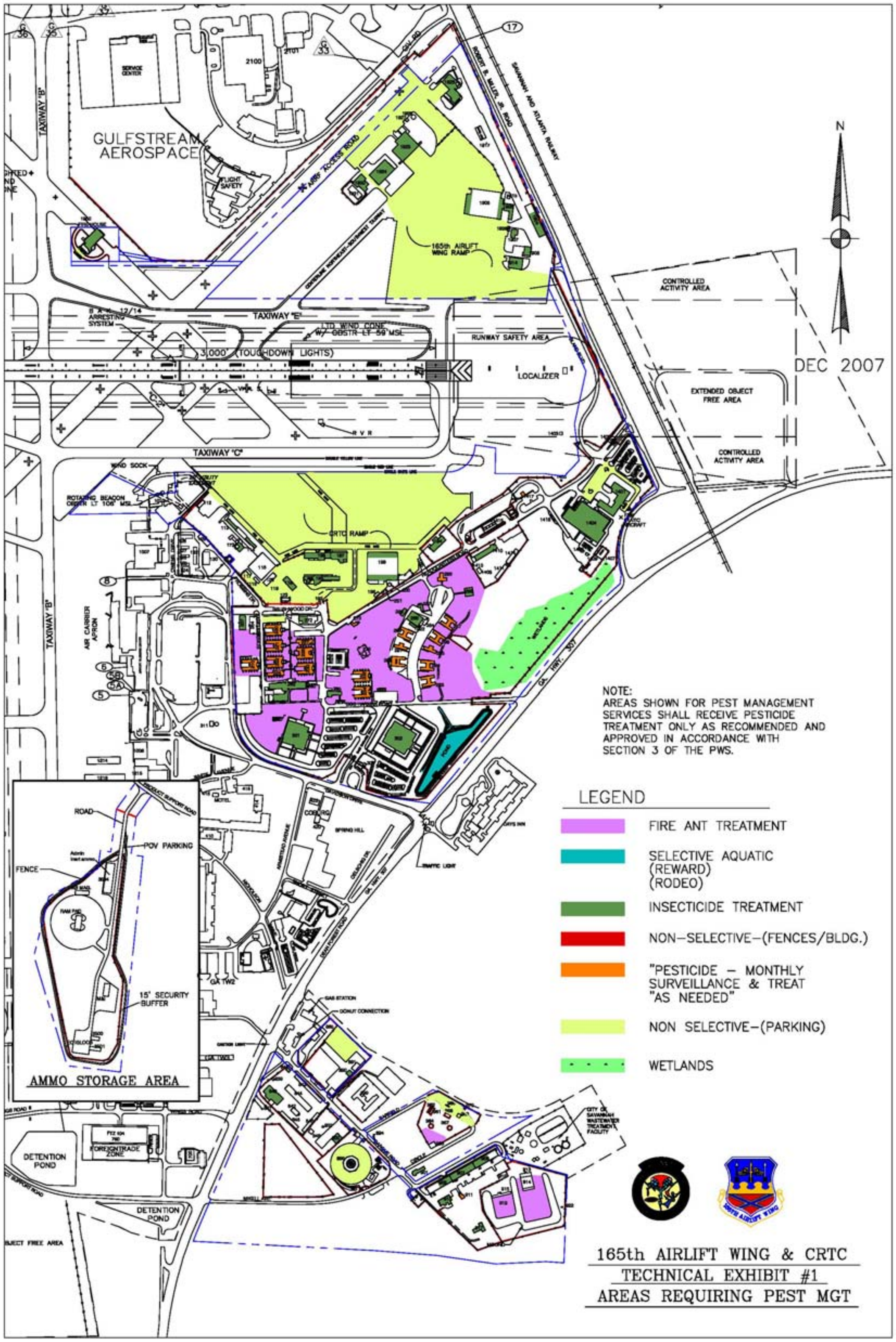
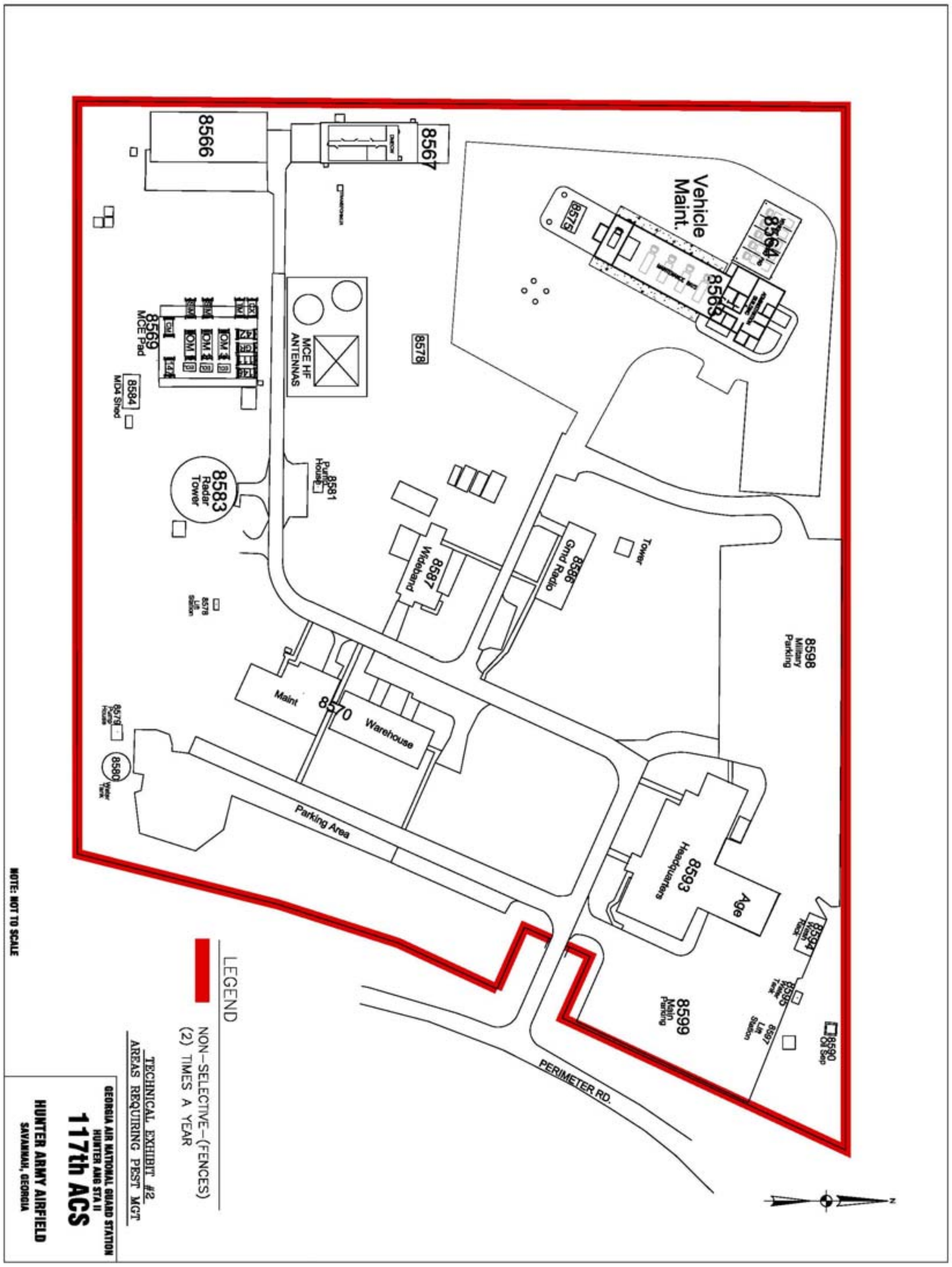
Installation Map(s)

Installation maps can also be viewed electronically at: Annex Files\Annex 5 - Installation Maps

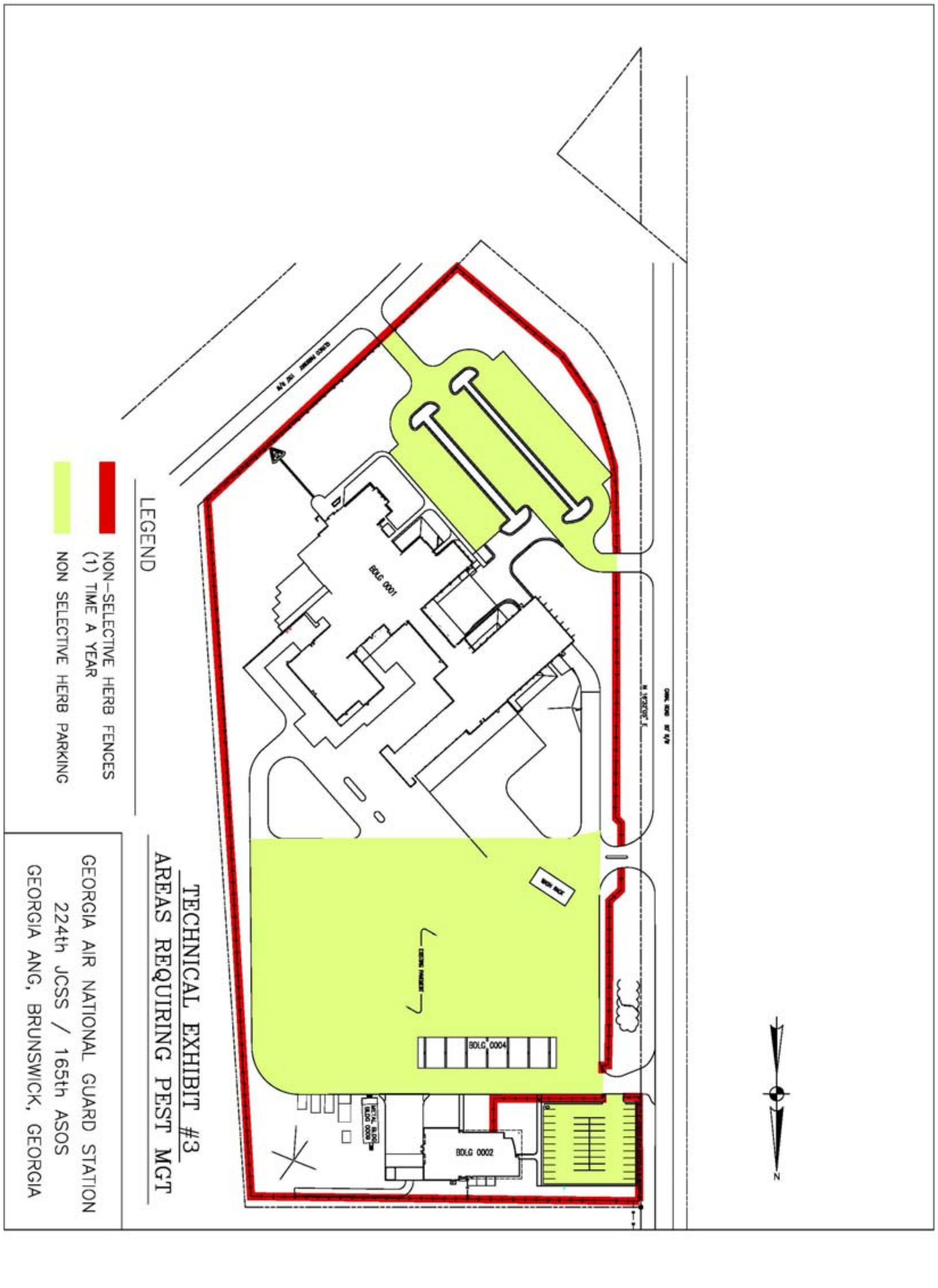


GULFSTREAM
AEROSPACE
TAXIWAY "B"
TAXIWAY "E"
TAXIWAY "C"
165th AIRLIFT WING RAMP
CRTC RAMP
CONTROLLED ACTIVITY AREA
EXTENDED OBJECT FREE AREA
RUNWAY SAFETY AREA
LOCALIZER
3,000' (TOUCHDOWN LIGHTS)
DEC 2007
N
NOTE:
AREAS SHOWN FOR PEST MANAGEMENT SERVICES SHALL RECEIVE PESTICIDE TREATMENT ONLY AS RECOMMENDED AND APPROVED IN ACCORDANCE WITH SECTION 3 OF THE PWS.
LEGEND
FIRE ANT TREATMENT
SELECTIVE AQUATIC (REWARD) (RODEO)
INSECTICIDE TREATMENT
NON-SELECTIVE-(FENCES/BLDG.)
"PESTICIDE - MONTHLY SURVEILLANCE & TREAT "AS NEEDED"
NON SELECTIVE-(PARKING)
WETLANDS
ROAD
POV PARKING
FENCE
15' SECURITY BUFFER
AMMO STORAGE AREA
DETENTION POND
165th AIRLIFT WING & CRTC
TECHNICAL EXHIBIT #1
AREAS REQUIRING PEST MGT

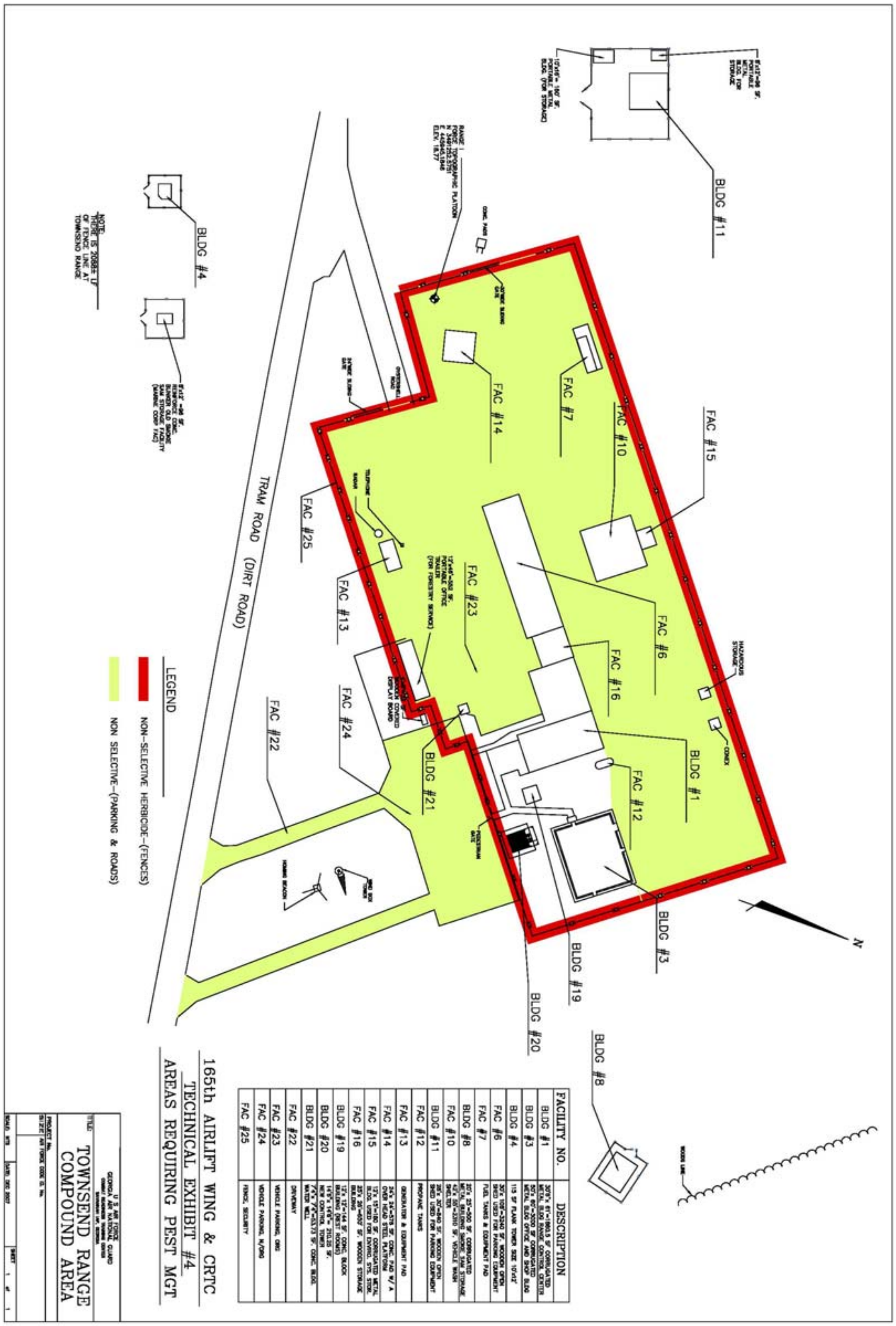
MAP OF 165TH AIRLIFT WING, GEORGIA AIR NATIONAL GUARD MAP SHOWING LOCATIONS OF PESTICIDE APPLICATIONS



MAP OF 117TH ACS, GEORGIA AIR NATIONAL GUARD MAP SHOWING LOCATIONS OF PESTICIDE APPLICATIONS



MAP OF 224TH JCSS & 165TH ASOS, GEORGIA AIR NATIONAL GUARD MAP SHOWING LOCATIONS OF PESTICIDE APPLICATIONS



MAP OF TOWNSEND RANGE COMPOUND AREA, GEORGIA AIR NATIONAL GUARD MAP SHOWING LOCATIONS OF PESTICIDE APPLICATIONS

USAF Real Property Inventory Detail Report

The Real Property Detail Report can be obtained by contacting the Real Property Manager, Ronald Morrison (APHIS RP), at (912) 966-8562.

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ANNEX 6

Projected Annual Pesticide Requirements

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Minimizing the need for pesticide disposal begins with careful planning and identification of an installation's pesticide requirements. USERS SHOULD STOCK ONLY THOSE PESTICIDE QUANTITIES THEY WILL USE IN A REASONABLE PERIOD OF TIME, USUALLY THROUGH ONE PEST CONTROL SEASON. While pesticides used for indoor pests can be applied year round, most of these pesticides should not be stored for more than two years. The AFPMB strongly recommends that an installation's strategic and operational environmental plans incorporate and utilize Integrated Pest Management Techniques (IPMT) when establishing short-term (yearly) and long-term pesticide requirements. Be sure to develop projections for installation self-help program, if any.

The following link contains a tool for the Installation Pest Management Coordinator to prepare an estimate of the annual pesticides required at the installation. ..\3 Resource Toolbox\Annex 6 Project Annual Pestides Reqs\Annex 6 Projected Annual Pesticide Requirements.xls

This spreadsheet contains "pick lists" of the pests listed in Chapter 5, table 5.1 of this plan (5.0 Priority of Pest Management Work), and assists the user in determining the "Projected Annual Requirement" for each pesticide used and based on "Quantities in Stock", the tool will provide an "Amount Required to Purchase."

Instructions for completing the spreadsheet:

For each pesticide used at the installation, obtain the "Product Coverage Area", "Application Rate", and the corresponding units of each, from the pesticide label or directions and enter data in the green shaded boxes. In the yellow shaded boxes, estimate the "Treatment Amount," using the same units as the "Product Coverage Area", and the "Application Frequency per YEAR" for your specific base. Determine and enter, in the blue shaded boxes, the "Purchase Unit" (i.e., what unit the product is sold in, e.g., case of sodapop) and the "Issue Unit" (i.e. bottle of sodapop), # of Issue Units per Purchase Unit (i.e. how many bottles of sodapop in the case), and the "Size of Issue Unit" (how many ounces in the bottle of sodapop). The "Size of Issue Unit" must be in the same units as the "Application Rate". Finally, enter the "Quantity in Stock" in the orange shaded boxes. The "Purchase Unit Size" (ounces of sodapop in the entire case), "Quantity Needed" (total number of ounces needed for the year) and "Projected Annual Requirement" (total number of cases for the year) will be calculated automatically. The "Projected Annual Requirement" is rounded up to the nearest whole number.

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Projected Annual Pesticide Requirement

	Pest	Trade Name/NSN	Formulation	EPA Registration Number	Type of Application	Product Coverage		Application Rate		Treatment Amount		Application Frequency/ YEAR	Purchase Unit	Issue Unit	# of Issue Units per Purchase Units	Size of Issue Unit		Purchase Unit Size	Quantitiy Needed	Projected Annual Requirement		Qnty Stoc
						Amount	Units	Rate	Units	Amount	Units					Size	Units			Amount	Units	
1	VEGETATION OVERGROWTH	ROUNDUP PRO [6840-01-108-9578]	Solution	524-475	Manual & Powered Apllication	1	Acre	3.8	Liters	18.75	Acres	2	1	1	1	9.5	Liters	9.5	142.5	15	1	14
2	VEGETATION OVERGROWTH	QUIK PRO [6840-01-545-4540]	Dust/Granule	524-535	Manual & Powered Apllication	1	Acres	0.375	Pounds	20	Acres	4	1	1	1	9.5	Pounds	6.8	30	4	1	1
3	VEGETATION OVERGROWTH	CIDE KICK [6840-01-356-8897]	Solution	067690-IN-001	Manual & Powered Apllication	1	Acres															1.75
4	VEGETATION OVERGROWTH	REWARD [6840-01-005-7523]	Solution	100-1091	Manual & Powered Apllication	1	Acres	2	Gallons	0.5	Acres	3	1	1	1	1	Gallon	1	3	3	1	0.5
5	VEGETATION OVERGROWTH	RODEO [6840-01-356-8893]	Solution	228-385	Manual & Powered Apllication	1	Acres	1	Gallon	2.5	Acres	2	1	1	1	2.5	Gallon	2.5	5	2	1	2
6	VEGETATION OVERGROWTH	SURFLAN [6840-01-318-7417]	Solution	70506-44-10404	Manual & Powered Apllication	1	Acres	1	Gallon	0.5	Acres	2	1	1	1	1	Gallon	1	1	1	1	1
6	VEGETATION OVERGROWTH	TALSTAR ONE Scheduled for Disposal/DRMO	Emulsion		Manual & Powered Apllication	1000	Square Feet	0.5	Fluid Ounces	8000	Square Feet	8	1	1	1	16	Fluid Ounces	16	32	2	1	2
7	ANTS	MAXFORCE FC ANT BAIT [6840-01-298-1122]	Bait	432-1256	Manual & Self-Help	1	Each	1	Unit	32	Each	6	1	1	1	96	Unit	96	192	2	1	192
8	WASP, BEES & HORNETS	ZERO-IN WASP & HORNET Scheduled for Disposal/DRMO	Aersol	1021-1649-70799	Manual & Self-Help																	10
9	WASP, BEES & HORNETS	FREEZE WASP & HORNET KILLER [6840-00-459-2443]	Aersol	499-362	Manual & Self-Help	1	Each	1	Unit	4	Each	6	1	1	1	1	Unit	1	24	24	1	0
10	COCKROACHES	INVADER Scheduled for Disposal/DRMO	Aersol	9444-186																		18
11	COCKROACHES	PT 250 PROPOXUR [6840-01-338-2486]	Aersol	499-501	Manual Application	1	Each	1	Unit	4	Each	6	1	1	1	1	Unit	1	24	24	1	0
12	ANTS	AMDRO [6840-01-287-3913]	Bait	73342-1	Manual Application	1	Each	1	Unit	32	Each	6	1	1	1	96	Unit	96	192	2	1	192
13	MICE & RATS	FINAL BLOX [6840-01-503-5348]	Bait	12455-89	Manual Application	8	Each	0.32	Pound	24	Each	12	1	1	1	1	Pound	8	16.8	2	1	1.9
14	ANTS & CRAWLING INSECTS	DIATOMACEOUS EARTH (DE) ORGANIC (NON-NSN)	Dust	59913-1-42697	Manual Application	1	Each	1	Unit	32	Each	6	4	4	4	4	Pound	4	16	16	1	0
15	ANT & ROACH KILLER	CEDAR OIL 2% ORGANIC (NON-NSN)	Aersol	Exempt 25B	Manual & Self-Help	1	Each	1	Unit	4	Each	6	1	1	1	1	Unit	1	24	24	1	0

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ANNEX 7

Statements of Work for Pest Monitoring/Surveillance and Control Services

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Introduction

Exemplar statements of work for contract “pest monitoring and surveillance services” and for “pest control services” are available at the following toolbox link..\3 Resource Toolbox\Annex 7 SOWs\Pesticide Surveillance and Application SOWs.doc

Basic requirements for obtaining contractor pest control services by Government Purchase Card, or by any umbrella State or Federal Purchase Order, are summarized in the ANG guidance document at toolbox link ..\3 Resource Toolbox\Annex 7 SOWs\PM GPC AND STATE AND FEDERAL PO requirements ANG.doc.

Many ANG installations are reliant upon the services of outside pest control contract services. The installation decision whether to use contract pest control services should be based upon economic analysis described in Annex_9. Pest control services are normally funded under "entomology" within the State-Federal cooperative agreement Facility Operations and Maintenance Activities (FOMA). The AFPMB encourages use of IPM contract services where the installation has determined that they are economically advantageous or when advantageous for non-routine, large-scale, or emergency services, especially when specialized equipment or expertise is needed. However, use of contract services does require close monitoring and recordkeeping. Regularly scheduled, periodic pesticide applications are not approved for DoD property except in situations where the installation pest management plan clearly documents that no other technology or approach is available to protect personnel or property of high value. Installations shall not use preventive pesticide treatments, to include automated misting devices, unless the ANG pest management consultant has given approval based upon current surveillance information or records documenting past disease vector or pest problems that require this approach.

Any installation using contractor pest control services, including termiticide applications for new construction, should have a properly trained DoD employee who is a designated Pest Management Quality Assurance Evaluator (PMQAE). Under AFI32-1053, if an installation’s pest management contract efforts are less than 0.25 work year annually, the presence of a trained PMQAE at the installation is not mandatory; except that DoD-certified pesticide applicators or PMQAEs must inspect contract applications of pesticides for the control of termites and other wood-destroying organisms (DODI 4150.07 (May 29, 2008), Section E4.1.8.17.2.].

A PMQAE in the Air Force is defined as: "A quality assurance inspector who is an Air Force employee, trained in pest management, who protects the Government's interest through on-site performance evaluation of commercial pest management contracts or other contracts that involve the use of pesticides" [AFI 32-1053, Attachment 1, Glossary]. Only a DoD employee may directly oversee Federal contracts. And, the AFI specifically states that the person must be an "Air Force employee," (i.e., a Federal employee). None of the PMQAE duties may be delegated to a non-Federal employee. Each installation PMQAE must be either a DoD certified pesticide applicator, or obtain DoD PMQAE training and certification. The requisite PMQAE training may be obtained through any of the DoD Service schoolhouses. Training opportunities are listed on the AFPMB website at: http://www.afpmb.org/pubs/courses/courses.htm

Pesticides proposed for use on ANG installations, and contracts, must be pre-approved by the ANG Pest Management Consultant (NGB/A7A) via the CNR on-line database. The AFPMB pesticides committee reviews a wide range of EPA-registered pesticides for potential use on DoD installations. The pesticides are reviewed not only for active and inactive ingredients, but also for label directions, before listing on the AFPMB STANDARD PESTICIDES LIST AVAILABLE TO DOD COMPONENTS AND AGENCIES, available at http://www.afpmb.org/standardlist.htm. Active ingredient is not the sole determinant of whether a product is accepted. Substitution of products with differing EPA registration numbers is not allowed without prior authorization from the ANG Pest Management Consultant (NGB/A7A). Placement of a pesticide on the AFPMB standard list does not, in itself, authorize use of that pesticide on any ANG installation. Specific advance authorization must be obtained from the ANG Pest Management Consultant (NGB/A7A) for use of the product within a pest-specific control strategy for identified grounds or facilities, whether for application by certified contractor or for application by qualified installation personnel.

Whether or not pest control contract services are provided to the installation through an umbrella State contract, each proposed SOW submitted for approval to the NGB/A7A Pest Management Consultant should include the following provisions, among others (see "toolbox" sample language):

1) Only pesticides pre-approved by the NGB/A7A Pest Management Consultant within pest-specific management strategies of the currently-approved installation IPM Plan may be applied. Contractor shall review and comply with pest-specific strategies of installation IPM Plan for each targeted pest. If need for any additional pesticide is identified, contractor shall preferentially nominate only products that are on the current Armed Forces Pest Management Board (AFPMB) STANDARD PESTICIDES LIST AVAILABLE TO DOD COMPONENTS AND AGENCIES (available at: http://www.afpmb.org/pubs/standardlists/dod%20pesticides%20list.pdf).

2) Contractor shall only use State-certified pesticide applicators that are qualified in the appropriate pest-control categories. Each individual pesticide applicator shall be State-certified, even if State otherwise allows non-certified personnel to apply pesticides under supervision.

3) Contractor shall operate consistent with principles of integrated pest management (IPM), using effective pesticides that are safest to human health and the environment, except when more-toxic pesticides are specifically required for pre-construction termiticide applications. For pre-construction application of termiticides, the SOW shall specify that termiticides are applied at the highest EPA-labeled concentration and application rate (per DODI 4150.07 (May 29, 2008), Section E4.1.8.17.1).

4) Contractor shall prepare and maintain daily records of all pest management efforts, both chemical and non-chemical, including surveillance using DD Form 1532-1 and associated directions. Contractor shall promptly provide signed copies of completed reports to installation IPM Coordinator through Contracting Officer.

The current Performance Work Statement for Pest Control Services can be found electronically at:

Annex Files\Annex 7 - Performance work statement for pest control services.pdf

ANNEX 8

DD Form 1532-1 Pest Management Maintenance Record and USDA PPQ Form 523 Emergency Action Notification

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BUILDING/AREA					SIZE	TYPE OF CONSTRUCTION	USE DESIGNATION				
Date	Units Serviced	Work Origin	Unit of Measure	Target Pest	Control Operation	If Pesticide is Used				Labor Time	Appli-cator Initials
						Name	EPA Reg	% Conc	Amount		

Form Approved. OMB No. 0704-0188 **REPORT CONTROL SYMBOL:**

PEST MANAGEMENT MAINTENANCE RECORD

The public reporting burden for this collection of information is estimated to average 4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to the Department of Defense, Executive Services and Communications Directorate (0704-0188). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ORGANIZATION.**

MEASUREMENT UNITS
MSF = 1,000 square feet
LFF = Linear feet
MCF - 1,000 cubic feet
AC = Acres

ORIGIN OF WORK
SW = Scheduled work
SC = Service or trouble call
WR = Work request
R = Routine inspection

TYPE OF CONSTRUCTION
CO = Concrete
BV = Brick veneer
WO = Wood
BL = Block
ST = Steel, sheet metal
OT = Other

DD FORM 1532-1, AUG 96

Date	Units Serviced	Work Origin	Unit of Measure	Target Pest	Control Operation	If Pesticide is Used				Labor Time	Applicator Initials
						Name	EPA Reg	% Conc	Amount		

REMARKS

Remarks.

DD FORM 1532-1 (BACK), AUG 96

Reset

(Attach additional card to continue record)

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information is 0579-0102. The time required to complete this information collection is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

FORM APPROVED - OMB NO. 0579-0102

U.S. DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
PLANT PROTECTION AND QUARANTINE

EMERGENCY ACTION NOTIFICATION

SERIAL NO.

1. PPQ LOCATION

2. DATE ISSUED

3. NAME AND QUANTITY OF ARTICLE(S)

4. LOCATION OF ARTICLES

5. DESTINATION OF ARTICLES

6. SHIPPER

7. NAME OF CARRIER

8. SHIPMENT ID NO.(S)

9. OWNER/CONSIGNEE OF ARTICLES

Name:

Address:

PHONE NO.

FAX NO.

SS NO.

TAX ID NO.

10. PORT OF LADING

11. DATE OF ARRIVAL

12. ID OF PEST(S), NOXIOUS WEEDS, OR ARTICLE(S)

12a. PEST ID NO.

12b. DATE INTERCEPTED

13. COUNTRY OF ORIGIN

14. GROWER NO.

15. FOREIGN CERTIFICATE NO.

15a. PLACE ISSUED

15b. DATE

Under Sections 411, 412, and 414 of the Plant Protection Act (7 USC 7711, 7712, and 7714) and Sections 10404 through 10407 of the Animal Health Protection Act (7 USC 8303 through 8306), you are hereby notified, as owner or agent of the owner of said carrier, premises, and/or articles, to apply remedial measures for the pest(s), noxious weeds, and or article(s) specified in Item 12, in a manner satisfactory to and under the supervision of an Agriculture Officer. Remedial measures shall be in accordance with the action specified in Item 16 and shall be completed within the time specified in Item 17.

AFTER RECEIPT OF THIS NOTIFICATION, ARTICLES AND/OR CARRIERS HEREIN DESIGNATED MUST NOT BE MOVED EXCEPT AS DIRECTED BY AN AGRICULTURE OFFICER. THE LOCAL OFFICER MAY BE CONTACTED AT:

16. ACTION REQUIRED

☐ TREATMENT:

☐ RE-EXPORTATION:

☐ DESTRUCTION:

☐ OTHER:

Should the owner or owner's agent fail to comply with this order within the time specified below, USDA is authorized to recover from the owner or agent cost of any care, handling, application of remedial measures, disposal, or other action incurred in connection with the remedial action, destruction, or removal.

17. AFTER RECEIPT OF THIS NOTIFICATION COMPLETE SPECIFIED ACTION WITHIN (Specify No. Hours or No. Days):

18. SIGNATURE OF OFFICER:

ACKNOWLEDGMENT OF RECEIPT OF EMERGENCY ACTION NOTIFICATION

I hereby acknowledge receipt of the foregoing notification.

SIGNATURE AND TITLE:

DATE AND TIME:

19. REVOCATION OF NOTIFICATION

ACTION TAKEN:

SIGNATURE OF OFFICER:

DATE:

PPQ FORM 523 (JULY 2002) Previous editions are obsolete.

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ANNEX 9

Cost Comparison Analysis Tool

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COST COMPARISON ANALYSIS						
Category	Type	Description	Quantity	Unit	Unit price	Extension
Annual Cost for In-House Services						
Labor	**Salary and Benefits (Monitoring, Application, Recordkeeping, Reporting)**		**320**	**Hours**	**$20.09**	**$6,429**
Training	**Travel Expenses and Fees**		**1**	**LS**	**$2,000**	**$2,000**
Labor	**Respirator Fit Program**	**Industrial Hygienist**	**10**	**Hours**	**$80**	**$800**
Equipment	**Supplies, Vehicles, Facilities**		**1**	**LS**	**$1,500**	**$1,500**
Materials	**Cost of Pesticides**		**1**	**LS**	**$2,576**	**$2,576**
PPE	**Personal Protective Equipment**		**1**	**LS**	**$300**	**$300**
TOTAL						**$13,605**
Annual Cost for Contract Services						
Contractor Bid	**Price**					
Bid 1 - Monitoring						
Bid 1 - Application	**$11,192**					
Contract Admin.	**$396**					
QAE Oversight	**$825**					
TOTAL	**$12,414**					

The cost analysis shown above, which shows contracts as more cost effective than in-house services, applies to control of pests within buildings and immediately adjacent grounds. The control of pests on right-of-way, the airfield, the munitions storage area, and other improved and unimproved grounds (mostly involving application of herbicides) is performed in-house by state personnel. Treatment of these areas is conducted in-house based on availability of qualified installation personnel and because the training and equipment required represent sunk costs.

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