The Committee on Homeland Security, Subcommittee on Transportation and Protective Security and the Committee on Oversight and Government Reform, Subcommittee on Intergovernmental Affairs joint hearing:

"Innovations in Security: Examining the Use of Canines."

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Chairman Palmer, Chairman Katko, and members of the committee, thank you for the opportunity to testify regarding "Innovations in Security: Examining the Use of Canines." on behalf of the Penn Vet Working Center at the University of Pennsylvania.

Background on PVWDC

The Penn Vet Working Dog Center is the nation's premier research and educational facility dedicated to harnessing the unique strengths of our canine partners and producing an elite group of scent detection dogs for public safety and health. The Penn Vet Working Dog Center was developed based on my experience caring for and subsequently monitoring the health of the search and rescue dogs that responded to the 9/11 terrorist attacks. The Penn Vet Working Dog Center opened on September 11, 2012 as the legacy of the dogs that served at 9/11. As pioneers in the working dog field, our goal is to increase collaborative research and the application of the newest scientific findings and veterinary expertise to optimize the availability and performance of lifesaving detection dogs. The Working Dog Center is a living laboratory, where we study and test strategies to optimize canine health and performance. In our program, we start with puppies at 8 weeks of age. These dogs have either been donated to us by breeders who meet our health and performance standards or they have been the result of our breeding program. Our breeding program was started through a cooperative research agreement with DHS in which we were able to obtain the remaining female Labradors from the TSA breeding program that was closed in 2013. This enabled us to continue to work with the genetic stock and build on the progress that had been achieved in the 10 years of the TSA breeding program. Our program is unique in that the puppies come to school every day. They live with foster families on evenings and weekends to help develop the social skills that they will need in careers with canine handlers. During their days of training, we introduce foundation skills, including search, fitness, obedience, and environmental exposure. The puppies are evaluated, data is collected and progress is recorded. We consider their basic schooling to be like a liberal arts degree. As part of our program we then determine the career that each dog is best suited for based on their physical and behavioral attributes. We recognize that each dog is an individual and just like freshmen entering college will gravitate toward a major in which they can be successful, we apply this approach to our dogs. We firmly believe that it is the early training providing a positive learning environment and mitigating any problems before they become entrenched, combined with placing dogs in their

chosen careers ranging from law enforcement patrol to explosive detection to search and rescue to cancer detection that has allowed us to have 42/45 of the dogs completing our program to graduate into detection careers. These careers include 20 Law Enforcement canines (single - explosives or narcotics, or dual purpose – patrol) working at the Federal, state, county and local levels, 6 FEMA Urban Search and Rescue dogs and 4 state or local search and rescue dogs, 2 bed bug detection dogs, 2 private explosive detection dogs, 1 private narcotics detection dog, 1 accelerant detection dogs, 3 diabetes alert dogs and 3 cancer detection dogs. Our 5 years of experience and data collection have led us to several insights that we believe have value in optimizing the use and procurement of detection dogs. Several of these concepts, including the need for a National Center of Excellence for Detection Dogs and a National Breeding Program were also shared in the Senate Homeland Security Committee Hearing on March 3, 2016 (dogs of DHS: How the canine programs contribute to homeland security (S-Hrg. 114-673). The whitepaper describing a proposal for a National Breeding Cooperative was delivered at the US Detection Dog Conference hosted by the American Kennel Club on Mar 1, 2017. A copy of this document is included in the materials for this hearing.

This hearing aims to address three main areas: **Use of Dogs for National Security, Procurement of Dogs and Issues with Supply of Dogs.**

Based on our research across a wide array of relevant topics and our experiences with numerous national, regional, and local canine agencies, industry and academic partners as well as our own program, I will address some of the highlights within these three areas.

Use of Dogs for National Security

Dogs have been well recognized as a force multiplier. Gen. David H. Petraeus, the commanding general of Multi-National Force, Iraq, said, "The capability that military working dogs bring to the fight cannot be replicated by man or machine. By all measures of performance, their yield outperforms any asset we have in our inventory. Our Army would be remiss if we failed to invest more in this incredibly valuable resource." (Feb. 8, 2008)
https://www.army.mil/article/56965/military_working_dogs_guardians_of_the_night

Dogs are highly efficient in their ability to locate odor and communicate that information. In addition, the presence of a dog at the airport or the train station is a recognized deterrent. In disasters, like the hurricanes and earthquakes of the past month, none of the modern drones or technology can match the efficiency of a trained search and rescue dog in locating victims. Dogs are diverse in their skills and the applications in which dogs support National Security are constantly expanding.

Dogs both direct and indirectly support national security. The most obvious direct application is the explosive detection canine (EDC). There are several different roles for these dogs based on the search environment. Traditional EDCs have been trained to screen stationary objects,

packages and vehicles. The military has expanded search capacity to involve improvised explosive devise (IED) detection dogs which work often at a distance from the handler screening roads, hazards and buildings for evidence of IEDs. Passenger screening canines can be used to screen humans as they move through a fixed point or along a specific path or as patented by Auburn University, the "vapor wake" or person-borne dogs will follow a moving person carrying explosives through a crowd. Law enforcement applications of tracking and criminal apprehension are also vital canine roles in local and national security applications.

Many of the other jobs currently performed by detection dogs indirectly support National Security. Narcotics detection dogs are critical in stemming the drug trade. The USDA Beagle Brigade serves by preventing the introduction of threats to agriculture. In response to manmade or natural disasters, search and rescue dogs are vital for saving lives. Human remains detection dogs have a role in criminal investigation and disaster response. Wildlife conservation dogs are invaluable in the battle against smuggling of ivory and other illegal wildlife products. The Penn Vet Working Dog Center is launching a new study to determine if dogs can play a role in combating the illegal antiquities trade that often supports drug or arms trade.

There is also a huge demand for working dogs in other fields. Dogs that could serve in National Security careers may instead be sold to commercial organizations that utilize dogs for bed bug detection or other detection roles or might be sold as hunting or sport dogs. Another competing interest for working dogs is the growing area of medical detection, service and assistance dogs. On the flip side, assistance dog breeding programs often have dogs that are too high energy for assistance work and those dogs may become available for explosive detection or other careers that could support National Security. This potential synergy highlights the need to look broadly at sources of dogs.

Overall there is a great and increasing demand for dogs with the health, behaviors and skills necessary for a wide array working careers and currently there is no comprehensive plan to increase the supply of these invaluable canines or the research to enhance their success.

While dogs are our most effective means, it is important to remember that they are not perfect. Their performance is reliant on appropriate training, good health, teamwork with a handler, and ongoing training. While these are not topics for this hearing, they must be considered in the overall plan to maximize the effectiveness of dogs in National Security. I serve on The National Institute of Standards and Technology (NIST) Organization of Scientific Area Committees subcommittee, Dogs and Sensors, which is working to create National Standards for the care, utilization, training and certification of detection dogs across a wide variety of disciplines based on scientific evidence. There is clearly a need to support the development of rigorous scientific data to develop and validate these standards.

Procurement of Dogs

With the high demand for dogs, one of the challenges faced is how to affordably procure the number of healthy, high quality dogs capable of performing the tasks required. This raises two important points, the first is related to the cost or affordability of dogs and the second is the source of dogs.

When considering the affordability of a detection dog it is important to define the costs. There are several components of the cost of a dog that may be overlooked by simply considering the amount of money paid to purchase a dog. To evaluate the accurate cost of a dog, all of the costs or cost savings should be considered over the career of that dog. If we are to follow the funds from the beginning to the end of a career we can more accurately evaluate the value and true cost of the dog. The first cost even prior to purchasing a dog is the cost of actually identifying potential dogs for purchase. The purchase of dogs from Eastern Europe typically involves travel of staff to evaluate a dog, for dogs purchased from vendors or breeders in the US the cost (personnel, time) of screening the dogs needs to be considered. Once a dog has been selected based on the screening methodology, the purchase price is a clear expense; however, not all dogs that are screened are deemed acceptable to enter or complete a training program; therefore, the cost of time and investment in dogs that eventually fail must also be tracked. The next expense is the training of the dog, if a dog requires a shorter training period before being paired with a handler, that represents a cost savings and conversely if the dog requires remedial training that increases the cost. Medical care is also a cost that must be considered. Dogs with good structure and sound health will represent a cost savings. Dogs with injuries or medical conditions will represent an additional expense resulting from the cost of treatment, lost days of work/training or these dogs may be discharged from the program representing a total loss. The expected working lifespan of the dog should also be considered. Depending on the intensity of the work a dog may be actively employed for 5-8 years. If a dog can enter the workforce at 18 months rather than 24 months of age and remain healthy to work until it is 10 rather than 9, the value of that dog is increased and the overall cost decreased. One of the biggest factors in the cost of the working dog is the cost of the human partner. The time spent training the handler initially is often up to 400 hours for a single purpose detection dog, and twice that time for a dual-purpose dog. In addition, the SWDDOG guidelines (https://swgdog.fiu.edu/) have put forth that dogs should have 16 hours a month of ongoing training and NIST is maintaining these recommendations. Canine handlers also require specially outfitted vehicles that should be included in the cost calculation. Finally, the cost of space/housing for the dog should be considered. At the Penn Vet Working Dog Center we are advocates of dogs living with their handlers, but even this incurs an expense. If dogs are kept in a kennel facility, then the infrastructure, utilities, kennel personnel and disease control expenses must be included.

In summary, the initial price of the dog is a small fraction of the total cost of employing a detection canine. Wise choices on the health and training of the dog and selection of the handler can help to reduce the lifetime cost of dogs.

Source of dogs

The main options for sourcing dogs are imports, domestic breeders, a dedicated breeding program or shelter dogs.

Traditionally, the majority of dogs for the US military and domestic law enforcement agencies have been imported from Eastern Europe. With increased demand on Eastern European resources, Mexico and South America are expanding their breeding of working dogs. One of the main reasons cited for the reliance on imports is the ready availability of affordable working type Shepherds. Despite the fact that the US is the number one producer of Labrador Retrievers, many of the working Labradors are also imported. Challenges faced when relying on importation of dogs from foreign sources stem from a lack of control over factors that could impact the success and availability of these dogs. The availability of imported dogs can be impacted by political instability, disease (e.g Chagas disease in Mexico), or competing demands from countries willing to pay more. The genetics of the imported dogs is rarely documented and therefore systematic improvement in genetics in completely out of the control of the end user. Without knowledge of the genetics, inbreeding and disease propagation risks increase; whereas in a controlled breeding program selective breeding can be utilized to decrease the incidence of crippling diseases like hip dysplasia. One of the common reasons for dogs to fail is lack of environmental stability (e.g. ability to walk on slippery floors, metal stairs, loud noises). Early exposure to new and unusual environments is critical to build the confidence of the dogs, but, this is out of the control of the purchaser for imported dogs. Finally, the world-wide demand for working dogs has put pressure on the supply resulting in lower quality dogs, limited availability and increased price.

Although many Labradors are currently imported, domestic Breeders of predominantly sporting dogs (e.g. Labradors, German Shorthair Pointers etc) do provide many of the dogs currently working as single purpose detection dogs. The greatest challenge is that the goal of these breeders is to produce high end hunting dogs which command top dollar. They are more likely to sell their best dogs to private hunters or sports competitors for a higher price than they could get from the government. One agency that relies on these sources has commented that they are screening hundreds of dogs in order to identify the ones that are appropriate to enter training in explosive detection. This difficulty in obtaining the dogs suggests that dedicated breeding programs that specifically select for the desired traits of explosive detection and other types of working dogs are warranted. Another challenge with purchasing dogs from breeders is that dogs enter training between 12 and 18 months and unless the breeder is training the dogs as gun dogs, the expense of raising the dogs until they are purchased can be prohibitive.

A dedicated Breeding Program would allow for careful selection of the genetic traits that are most desired for the different types of careers. The government experience with breeding programs has not enjoyed the same success as private service dog organizations (e.g. The Seeing Eye, Guiding Eyes), but even with the successful models there is room for improvement. A

single source breeding program is a risk due to disease and environmental hazards. A new concept would be to form a breeding cooperative (see the details in the Appendix) in which many breeders or organizations participate to sell dogs that meet the health, behavior, and genetic requirements. As with the private breeder model, more research is necessary to optimize the selection process. However, if the experience at the Penn Vet Working Dog Center can be replicated (early training and allowing the dogs to be sold to different agencies for diverse careers), the successful placement of the dogs is likely to be high; thereby reducing the cost per dog and the challenge of disposition of dogs that do not meet the criteria. At the Penn Vet Working Dog Center we are exploring models of cost effective early training involving prisons or community programs (e.g. community colleges). For this program to be effective, additional and ongoing research will be necessary.

Finally, many citizens are keen to address the dog overpopulation problem while supporting National Security. This is a valiant effort and may provide some dogs to support the mission as evidenced by some of the shelter based dogs that are currently working. The challenge with this approach is that the health and behavior of these dogs is frequently unknown or unacceptable. Some organizations that focus on shelter dogs have been reported to screen up to 1000 dogs to find 1 suitable candidate. The expense of this approach makes it unsuitable for a primary source of dogs.

Unfortunately, we do not have time to address the Screening and Training of Dogs that would further contribute to the success. But hope that these topics will be the focus of future hearings.

Issues with Supply of Dogs

It is currently impossible to determine the total number of working dogs in this country. Estimates have ranged from 10,000 to 40,000. What is clear is that there is a need to replace dogs as they retire and the demand for dogs for new programs is increasing. Many of the key issues with dogs obtained based on the source of procurement have been defined above. A critical factor in expanding the capacity of dogs serving National Security is that any increase in demand is unlikely to be filled quickly. Because there is not a readily available surplus of dogs, to increase production of dogs, the lead time is approximately two years. This lag time is based on the time required to breed and raise these dogs for the type of work. If dogs can enter the workforce earlier and work effectively longer, then the overall demand for replacements will decrease. Another unknown factor is the future applications that will further increase the demand for dogs that meet the criteria for detection work.

Conclusions

In conclusion, thank you for this opportunity to present the research and experience of the Penn Vet Working Dog Center, and the vision that we see for a viable solution to improve the availability and success of working dogs supporting our national security. We firmly believe that

the application of sound scientific principles to all aspects of dog selection, training and deployment will enhance National Security in an efficient and cost effective manner. To achieve the full potential, a federally hosted collaboration between academic institutions, government agencies, organizations, breeders and industry to create a National Detection Dog Center of Excellence is critical. This Center of Excellence would research, validate and disseminate best practices to advance the scientific approach to dog selection, care and training. Furthermore, to address the impending crisis of detection dog availability, a new and cooperative model of detection dog breeding, early training and distribution must be critically evaluated. We look forward to continuing our collaborations and research in support of this vital mission and welcome your questions and comments.

Respectfully submitted,

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PVWDC Contact and Staff and Collaborator Acknowledgements

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A Plan For Producing A Large Number of Healthy, High-Quality Puppies Purpose-Bred For Scent Detection Work: An Approach Capable of Surviving Government Whims

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February 28 – March 1, 2017
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Historical Perspective

Since 1968, various arms of the United States government have started, then disbanded at least four canine breeding programs. In every case, these programs were begun to produce purpose-bred dogs specifically to meet a need described by the agency overseeing the program. In every case, each of these programs operated for about 10 years, then was disbanded when funding cuts were imposed.

The Transportation Security Administration (TSA) breeding program operating from Lackland AFB, San Antonio, TX from 2002 - 2012 is the most recently disbanded among these government owned breeding programs. It operated long enough to produce about 3 generations of purpose-bred puppies, then just as it was beginning to show a demonstrable response to genetic selection, it was disbanded, ostensibly to "save money". Puppies it was producing were healthy animals endowed with sufficient motivation and drive to work well in airport baggage screening operations and in other similar, high-stress environments. Now, some 5 years beyond closure, TSA is finding it very difficult to acquire a sufficient number of young, healthy dogs to meet operational demands.

Prior to the TSA program, US Customs operated a breeding program out of Front Royal, Virginia. Earlier than it, the US Army began a research project in 1968 (Division of Biological Sensor Research) with the mission to genetically improve the military working dog. Most US military acquired dogs in that era were being deployed in Vietnam, and some of the dogs bred in this project were among those so deployed. It was closed in 1976. For a number of years, US Border Patrol has operated a small breeding program from El Paso, TX, but details about it are difficult to obtain. Animal and Plant Health Inspection Service (APHIS) was reported to be breeding beagles used in arrival areas of international airports, where the Beagle Brigade dogs assisted in screening both passengers and luggage for the presence of food or animal products banned from entry into the US. According to their current website (1) and Wikipedia (2), young dogs for their training program are now obtained from private sources or rescue shelters, with about 160 dogs working in the field.

Genetic improvement of a set of traits in a breeding population occurs over multiple generations of selection. Selection is the only one of the four forces operating to change gene frequency that can be controlled by man; the other three being: mutation, migration, and chance. To turnover one generation in a well-managed canine breeding program requires about 3 years.

For most newly begun breeding programs, the first 3 generations of selection are usually required to develop smoothly operating young breeder selection procedures. Unfortunately, it is in this initial start-up period that government managers have been most inclined to abandon newly begun projects. This was true for the most recent TSA breeding program, and it was true of the earlier US Army program begun in 1968. The "take-home" message from these past government-owned attempts to produce large numbers of purpose-bred dogs is clear: Government has neither the will nor the long-term ability to sustain a breeding program for more than about a decade.

In every case known to the authors of this paper, when each of the recent canine breeding programs was disbanded, the breeding stock that could have been available to restart the program were mostly lost due to old age. This rendered all genetic improvement obtained in the younger generations of puppies lost as well. In the case of the most recently closed TSA program, some of the younger bitches remained intact, and a small number of them (4 or 5) have more recently produced litters, but for all intents and purposes, the genetic improvement obtained by that program was lost.

The U.S. needs a new approach. In the United States, a new approach for producing a large number of healthy, high-quality, purpose-bred dogs for use by government agencies at all levels needs to be implemented. It is the purpose of this document to describe a plan that will accomplish this goal with the expectation that young dogs produced by the plan will need to compete for placement with US Government purchasing agents alongside all other dogs being presented as available for purchase under terms of the then current purchase order's specifications, whatever those may be.

Guidelines to Focus Discussion

The US Federal government has proven beyond doubt that, as an institution, it is unable to guarantee the long-term existence of a canine breeding program. At the same time, the US Federal government has shown over multiple decades that its various law enforcement agencies both desire and demand use of purpose-bred, well-trained dogs to accomplish their missions. The existence of this dichotom creates a huge challenge: how can US-based dog breeders be organized to produce a sufficient number of high-quality, healthy, purpose-bred dogs to meet procurement needs of government agencies?

There is no simple answer to the question posed above, but there are several guidelines that can be stated and that should be considered while formulating a solution:

1. Stakeholders in this discussion MUST avoid supporting the establishment of another government-controlled breeding program! Let the government buy dogs from non-government entities when it has both money and demand, but otherwise leave dog breeders with freedom to sell their puppies to other willing buyers. These could include state or local police, other law enforcement agencies, service or guide dog agencies, or even members of the pet-buying public.

2. Create a participation structure, perhaps in the spirit of a breeding cooperative, among non-government entities and private breeders who desire to work together to achieve the common goal of this project: the production of an adequate number of healthy, high-quality, purpose-bred dogs for scent detection work.

3. To ensure survival of genetically improved seedstock, ownership of breeding bitches must remain in the hands of non-government entities. Furthermore, it is imperative that the ownership structure of the breeding bitches distributes control among a rather large number of individuals and/or entities. Such a distributed ownership model will help ensure that the loss of a single or a small number of participants does not jeopardize long-term survival of the overall breeding program. Ideally, owners of breeding bitches will also be geographically distributed, to help ensure safety from disease outbreak or natural or man-caused calamity.

4. The need for ownership of breeding bitches to remain in the hands of non-government or private breeders creates a unique opportunity for the Penn Vet Working Dog Center (PVWDC), the Auburn Canine Performance Sciences (ACPS) group, and other similar centers in US veterinary schools and academic institutions. The nugget of this opportunity is for these academic-based units to band together as the Governing Board of a collaborative breeding program that coordinates the breeding decisions made among a group of breeders who choose to become affiliated with the program. This Governing Board could be known as the Detection Dog Center of Excellence (DDCoE) or, perhaps, as the Working Dog Center of Excellence.

5. Ideally, the DDCoE can be legally established as a 501(c)(3) non-profit corporation, so it can legally issue receipts for donations made to it by private individuals.

6. A US Federal government agency, like TSA, needs to work with a small group of canine suppliers who provide them with dogs meeting the government's contract specifications. The DDCoE is perfectly positioned to be this aggregator of young dogs purchased under terms of a TSA Purchase Order.

7. Private breeders accepted as participants in the breeding cooperative would be invited to nominate one or more of their breeding quality bitches for enrollment in the breeding cooperative.

8. Contingent upon an initial positive screening of a nominated bitch by the DDCoE, each bitch considered for enrollment would undergo a no-cost and much more thorough medical screening exam, including screening for aspects of her behavior and scent detection ability. Bitches that pass this in-depth screening would be enrolled in the program.

9. A breeding bitch accepted into the program may participate for the production of one or more litters, at the discretion of the bitch's owner. Furthermore, enrollment of a breeding bitch in the DDCoE breeding cooperative means that the bitch's owner has an opportunity to negotiate a litter ownership contract with the DDCoE before the litter is conceived. It also means that DDCoE retains the right to refuse a litter contract on a bitch. This means that the DDCoE can somewhat control the flow of new puppies into the production pipeline, depending upon their forecast of available puppy raising homes / facilities and the demand for young working quality dogs at 14-months of age.

10. For a bitch with a previously negotiated litter ownership contact in place, the choice of a mate for a particular bitch would be made following protocols defined by the Governing Board and administered on their behalf by a trained staff person. Veterinary care for an enrolled bitch during gestation and whelping could be provided by the DDCoE facilities or their agents at a subsidized or no cost rate to the bitch's owner, as an additional incentive for participation in the cooperative.

11. A bitch's owner could be given several choices for ownership of the resulting litter, but the election of exactly which option is chosen would be decided before the mating event actually occurs. The ownership options are not limited to, but could include:

    a. Donation of complete litter ownership to the DDCoE in exchange for a tax-deductible donation receipt, validated by the appropriate DDCoE representative.

    b. Owners of the bitch could choose to sell ownership rights of the complete litter to the DDCoE prior to the mating event, and if this option is elected, then the price per puppy in the complete litter would be settled as part of contract negotiations.

    c. Owners of the bitch could choose to retain ownership of up to 2 puppies in the litter if 7 or more puppies are weaned, or 1 puppy if 3-5 puppies are weaned. Additional negotiation can be conducted in the case of only 1 or 2 puppies weaned. If this option is selected by the bitch's owner, then the owner will have the right to choose the 1st puppy, then the DDCoE will choose a puppy, followed by the bitch's owner choosing the 3rd puppy. All remaining puppies then belong to DDCoE. If ownership of 1 or 2 puppies is retained by the breeder, they will be encouraged to enter health and behavior information into the common database, thus ensuring continuity of records for the complete litter.

    d. Total ownership of the complete litter could be retained by the bitch's owner at the time of contract negotiation. In this case, the bitch's owner would bear all the risk associated with selling the puppies, with no guarantee from DDCoE that the cooperative will buy any of the puppies. When the litter is weaned, however, under this option, the DDCoE will have the right of first refusal to buy as many or as few puppies from the litter as they wish, depending upon the then current needs of the cooperative.

12. Regardless of the method of acquisition, puppies owned by DDCoE become their sole property, thus conveying to the DDCoE the opportunity to sell those puppies to any government agency at any mutually agreed upon price. Of course, along with this right to sell the puppies also conveys the responsibility to ensure that each puppy is properly raised and socialized. This is the only way to maximize the probability that a young dog will meet the government's procurement contract specifications.

13. Funds generated from the sale of puppies will be distributed among DDCoE members following some previously agreed upon formula.

14. A US Federal government Purchase Order gives the Government the right to buy dogs at a pre-set price, but it cannot require the government to purchase any minimum number of dogs per year. If DDCoE has dogs for sale, but the US Purchasing Agent is not buying dogs when they are ready for delivery, then DDCoE retains complete flexibility to sell young dogs into any other markets that are then buying dogs. In other

words, DDCoE is free to sell dogs in excess of the Federal government's demand to any private party or local or state agency willing to pay the asking price.

15. Assuming that puppies are born with a strong genetic foundation, then their socialization experience during their first year of life will largely determine each puppy's ultimate success or failure. To ensure proper socialization, DDCoE must utilize puppy raising protocols designed to meet the special needs of scent detection dogs, perhaps by adapting already existing protocols being followed by PVWDC and ACPS. Opportunities may exist to engage local college students to be puppy raisers, but other local residents within a reasonable driving time of either UPenn or ACPS could also be recruited as puppy raiser volunteers. It might also be possible to resurrect the cadre of volunteer puppy raisers living in the greater San Antonio, TX area, who previously were puppy raisers for TSA. Other puppy raising alternatives may be developed using prison workers, based upon experience gained by ACPS in their puppy raising schemes.

16. If the DDCoE model can be made to work with PVWDC and ACPS as the initial proof of concept, then the DDCoE Board of Governors could entertain the option of expanding institutional membership to include other veterinary schools and academic institutions with canine science programs and appropriate veterinary support. This would contribute to maintaining geographic diversity among owners of the breeding bitches. Furthermore, it would distribute some of the workload for supplying high-quality working dogs among a larger group of similar, but geographically separated schools.

17. To enable using genetically superior males as sires of the puppies born into this Detection Dog Breeding Cooperative, DDCoE must establish a frozen semen bank to augment matings done using natural service or fresh-chilled semen. Properly using frozen semen requires developing a network of veterinarians (theriogenologists) skilled in using trans-cervical insemination (TCI), and they must be able to be in the right place at the right time to optimize semen placement. When done properly by skilled personnel, experience gained by at least one guide dog organization (Guiding Eyes for the Blind) has shown TCI inseminated bitches produce, on average, litters of about the same size as litters conceived by natural mating. Key to successfully using TCI by skilled personnel is that they use the technique at least monthly, so they can maintain technical proficiency.

18. Frozen semen on each stud collected should be permanently stored in multiple geographic locations, like Philadelphia and Auburn, to provide a bit more security from loss due to some physical or natural calamity.

19. Studs destined to have their semen frozen for placement in the semen bank need to be collected prior to their reaching 3-4 years of age. From experience gained in the guide dog world, semen quality often, but not always, begins declining in year 4 of a stud's life.

Data Management Requirements

Managing a geographically dispersed breeding colony, like the one envisioned for DDCoE, will require access to an online, easily accessible record keeping system. This system needs to provide at least the following minimum functionality:

1. It will calculate a coefficient of inbreeding for each individual dog, based on information derived from pedigree relationships stored in the database.

2. It will enable knowing before a mating is made what would be the inbreeding coefficient of the resulting litter should that mating actually occur.

3. It will calculate estimated breeding values (EBVs) for the most important traits impacting a dog's ability to perform its job.

4. It will provide summary reports of the breeding colony and of individual dogs that assist in overall implementation of the breeding plan.

5. It will enable managers of the breeding colony to access their data from a separate analytic platform, like SAS or R, thus enabling DDCoE managers to summarize their data in any manner they wish.

To undertake a project to create a database with the characteristics described above would be a multi-year, multi-million dollar effort, if it were being started now by an entity of government or business. Fortunately, an online, world-accessible database meeting all the criteria described above is now nearing the end of development and is sufficiently functional that a few organizations have begun using it. It is known as the International Working Dog Registry, which is a product offered as an online service by the International Working Dog Breeding Association (http://www.iwdba.org).

What is the International Working Dog Registry and What Services Will It Offer?

The International Working Dog Registry (IWDR) is an online database registry where dog owners can add, edit, and view electronically stored records on their dogs. The database enables storing ancestral records for as many generations into the past as users are willing to enter data, and it includes the ability to store both health and work performance information on individual dogs. These health and work performance measurements are known as phenotypes.

By combining phenotypes with pedigree information, the database enables using complex genetic modeling techniques to obtain an estimated breeding value (EBV) for a set of phenotypes on each dog. These EBVs estimate the genetic potential of each young dog as a potential parent that would transmit a sample-half of its genetic make-up (its genes) to its puppies. A major feature of the user's online experience is the ability to search among dogs ranked by EBVs, to identify a shortlist of suitable studs who could be mates for a particular bitch they intend to breed. A key component of this search is to find studs that will produce litters with small coefficients of inbreeding, thus preserving genetic diversity within the breeding population.

The IWDR needs to be placed in context as one of four absolutely necessary, but distinctly different components of a breeding program. These include:

- Deciding upon a set of **goals or objectives** the breeder wishes the population to possess,
- Choosing a **primary production scheme** as either purebred or crossbred production
- Defining the **selection criteria** that will be used for choosing young animals to become parents of the next generation of offspring, and
- Gaining access to a **record keeping system** to support and enable the choices made for components 1, 2, and 3.

To any dog breeder, whether a private breeder producing only a few puppies or the manager of a large working dog breeding colony that produces hundreds of puppies per year, defining specific responses for components 1-3 above is fairly straightforward. Obtaining access to a high-quality record keeping system capable of completing complex genetic model calculations, however, is beyond reach for all but a few who manage large breeding colonies. Even then, large breeding colonies are limited to working only with records accumulated on dogs bred within their own colony. They lack the ability to pool records from many related dogs of the same breed owned by other people, so the full power and potential of complex pedigree-driven genetic models remains untapped.

The IWDR will provide services to help identify superior dogs in a breeding group. When these genetically superior dogs are allowed to become parents, genetic improvement will occur. From around the world, livestock—beef, dairy, pork, and sheep—breeders have had access to EBVs for decades. These livestock producers have learned to use EBVs as an important tool to aid them in defining **selection criteria** useful for identifying the best young animals to keep as replacement breeders, thus becoming parents of the next generation of offspring. Systematic and repeated use of these tools has resulted in dramatic genetic improvement for these livestock species. Similarly, large poultry breeding firms and plant seed production companies have also realized major genetic improvement in their commercial products by applying these techniques.

The dog breeding world, in contrast, has largely ignored EBVs, instead clinging tightly to the more easily understood, but often deceiving belief that by choosing young dogs to keep for breeding based on phenotype will eventually lead to overall genetic improvement of the group. While for some traits, this belief may be true, it is not a generally true statement applicable to all canine traits and all breeding groups. In fact, it is more accurate to say that basing selection decisions solely on the phenotypes of young dogs will likely, for many traits, result in little or no genetic improvement, and may lead to genetic decline.

A recently published, peer-reviewed paper (3) illustrates this phenomenon in dogs scored for hip quality in the U.S. Scientists from Cornell University summarized the OFA data for 74 breeds (760,455 hip scores), and reported that total genetic improvement across all breeds was 16.4% of the phenotypic standard deviation for hip quality, which translates to about 0.41% standard deviation units per year. That degree of change, however, was not uniform across breeds, with both German Shepherd Dogs and Golden Retrievers actually experiencing declining hip quality over the years, while Labrador Retrievers experienced about average improvement. Among the 74 breeds studied, the 5 breeds showing the largest overall improvement in hip quality were: Akita, Kuvasz, Siberian Husky, Afghan Hound, and Belgian Tervuren. Clearly, these are 5 breeds where poor hip quality can directly impact their ability to work, so breeders of those dogs were probably quite diligent in choosing young dogs for breeding that possessed high-quality hips and that also came from parents and grandparents who also had high-quality hips.

The knowledge exists to dramatically improve the quality of breeder selection decisions in dogs, but no organization has yet begun implementing a strategy to make these tools generally available. The IWDR will provide these tools to dog breeders through an easily accessible web-site. Once logged-on to the site, each dog breeder will have access to modern genetic tools useful for accurately identifying genetically superior young dogs that should be kept for breeding. These tools will be driven by phenotype and pedigree data entered by end users (crowd sourced data) who are committed to genetically improving dogs in their respective breeds.

Maintaining genetic diversity in dog breeds is an ongoing challenge for all dog breeders. A tool provided by IWDR will calculate the expected inbreeding of a future litter, should a particular male be chosen as the mate for a specific bitch. When time and resources permit, it is also planned to build a tool to display Wright's coefficient of relationship among all members of a small group of dogs, say a maximum of 20.

An owner of breeding bitches enrolled in the DDCoE program would be required to become a registered user of IWDR. They would then use IWDR to enter all relevant data on each bitch, her heat cycle parameters, her mating details, and all data on the puppies born in the litter. The IWDR record created for each puppy would then be constantly updated by the puppy's various human caretakers who provide for the puppy's day-to-day welfare as the puppy develops into a mature young dog. When a 14-month old dog is purchased by a US Gov't agency or by a state or local law enforcement group, access to the puppy's IWDR record will transfer to the dog's new agency, thus enabling each dog's caretaker throughout the rest of the dog's life to constantly update its medical and working history. In a few years, a very complete history of medical and working ability measurements will have been accumulated in one place, thus enabling even more genetic specificity to be built-in to the complete DDCoE production scheme.

By the Numbers

Cost of producing training-ready 14-month old puppies

Currently, 14-month old dogs with little or no medical history-- but obviously alive and sitting in front of a US Government purchasing agent-- can be bought for approximately $6000, although this does not factor in the cost of personnel involved in traveling, purchasing, or screening the dog. In many cases, the provenance of this dog will be unknown, its true age will be uncertain, it probably began life somewhere in eastern Europe, and it may have passed through several owners, until it was imported into the U.S. by one of numerous canine brokers. Dogs that fall into this category, in the eyes of a U.S. Government Purchasing Agent, are equal in working merit to an American-bred dog, with a known provenance from day one of life, a known medical history documenting the dog as meeting certain standards, and a known socialization background.

Recently, PVWDC estimated that their cost would be about $36,000 to produce an American-bred dog with a known background and history, properly socialized, and made available for training at 14-months of age. In the guide dog world, most U.S.-based organizations publically quote $50,000 as the cost of producing one fully-trained guide dog placed for work in a local community. That is probably an underestimate in 2017, however, since that number has been unchanged for at least 20 years. The true cost is likely closer to $65-70,000 per trained guide. If the U.S., the AKC, and stakeholders attending the Working Dog Supply Workshop are serious about increasing the number of American-bred dogs used for work in the U.S. Government, then changes in the procurement process must occur. Dog suppliers must be adequately paid to cover the true cost of production plus a reasonable profit.

The most obvious change that could be made is to write into the product delivery specifications of U.S. Government Purchase Orders terms and conditions that can only be met by dogs with a known, provable provenance. While it would be illegal for a Purchase Order to contain specifications that could only be met by the product from one targeted supplier, it is completely legal to specify more stringent requirements that could be met by any number of suppliers. It is even feasible to mount a campaign among a few key members of Congress that could result in

legislation requiring that the Government first consider purchasing dogs for homeland security uses with a known, provable provenance that includes having been born in the U.S. It is not, however, legal for the Purchase Order specifications to be so restrictive as to require that a dog be a registered, purebred dog, since it is a long-standing fact that many mixed-breed dogs have worked well as scent detection dogs.

As a route for influencing the specifications written into a U.S. Government Purchase Order, a scientifically based research and development project could be initiated to develop and validate a scent detection ability test. The purpose of this test is twofold: (1.) determine whether or not a given dog meets contract specifications for its scent detection ability, and (2.) as an objective measure of general scent discrimination ability of the dog. This second use would directly enable the DDCoE to use this phenotype as a genetic selection criterion for identifying the best young dogs that should be kept for breeding. To be useful as a selection criterion will require proving that the phenotype measurement is variable among all dogs and that a significant portion of the observed variation can be attributed to additive genetic differences among individuals. Additively genetic differences arise from the fact that each animal receives a sample half of its genetic makeup from each parent. Although the samples received by full-sibs are similar, they are only identical in the very few littermates that are genetically identical twins. Full-sibs are more genetically similar than half-sibs, and half-sibs are more similar than more distantly related individuals. These differences in degree of similarity can be used statistically to estimate what portion of phenotypic differences among individuals can be attributed to additive genetic differences. It is the additive genetic variation that is passed downstream by parents to their offspring. Other genetic sources of variation do exist, but variation attributable to those genetic effects are created by the unique way in which genes came together in a specific individual. Even more important to this distinction, however, is that these unique combinations get severed when only a sample-half of the individual's genetic material is passed on to each of its offspring.

Number of litters required to deliver 100 contract-ready dogs per year

The production of a large number of healthy, high-quality working dogs for any purpose generally should be viewed as a production process (4), much like those employed for centuries to produce livestock. When viewed as an animal production system, efficiencies in operation can be identified that, when leveraged, will improve the quality of dogs produced. As time works to advantage by gaining experience, it will likely also be possible to improve the number of successful dogs produced per 100 puppies born (4). With these points in mind, a first-cut at answering the question posed above is developed below, based upon the following assumptions:

1. To make the calculations scale either up or down, these calculations document the number of matings required per year to yield 100 14-month-old Labrador Retriever dogs suitable for delivery under terms of a government contract. Should an actual contract call for delivery of 240 dogs, for example, then multiply the number of litters required to produce 100 contract dogs by 2.4.

2. Conception rate = 85%, at least in the beginning. When the project has gained some years of experience, this might improve, but if bitches are routinely being inseminated using frozen semen delivered by TCI, then conception rates are expected to be lower than when matings are done by natural service or by artificial insemination with fresh-chilled semen.

3. Litter size, on average = 7.5, although if TCI and frozen semen are widely used in the project, litter size will likely be lower, at least in the beginning.

4. Percent of puppies surviving birth and continuing life until weaning = 94%.

5. Percent of puppies tested at 8 weeks of age that pass the test and enter into a puppy raising home = 100%. This potential point of loss is placed here to enable considering losses at this point at some future time, but in the beginning, puppy testing may not be done. Some work done in the guide dog world suggests, however, that some aspects of behavior can be most accurately evaluated in 8-week old puppies because at that time-point in life, there has not yet been much opportunity for the canine brain and physiology to have been molded by the environment in which the puppy is raised. Puppy testing among litters bred for superior scent detection ability may be worthy of exploration at the research level.

6. Percent of dogs entering the puppy raising phase that actually complete it = 95%

7. Among dogs returning from puppy raising homes, the percent that pass medical screening = 80%

8. It is expected that US Gov't contract specifications will be quite stringent and difficult to meet. With that in mind, a conservative acceptance rate at 12-14 months of age = 35% is assumed. This may seem low to a casual outside observer, but experience from the guide dog world suggests that this is a realistic starting point. As genetic improvement occurs, especially when coupled with advances in socialization strategy developed as the DDCoE program gains experience, this acceptance rate could improve to 50%, which has been reported as a "general average" across the working dog industry (4). It would be phenomenal if it eventually improved to 65%. It may be helpful, especially when explaining this acceptance rate to outside observers, to instead talk about this number as a screening ratio. The screening ratio in the beginning will be about 1 acceptable dog for each 3 dogs screened. As improvements in process accumulate over time, it could improve to become 1 acceptable dog for each 2 dogs screened, and eventually, it may become 2 acceptable dogs for each 3 dogs screened.

Given the assumptions stated in points 1-8 above, the calculations shown in Table 1 below work backwards from the number of dogs delivered to determine the number of litters that would need to be born per year in order to meet the goal. Results are shown rounded to the nearest whole number, but the calculations were done retaining fractional parts of all values.

Given the assumptions stated above, a total of 53 litters would need to be born each year to produce qualifying 100 puppies at 14 months of age. To produce that many qualifying puppies requires having 400 puppies born per year. Since only 85% of matings result in a positive conception, a total of 63 mating events would need to be done per year. Since some bitches may cycle twice in a 12-month period, it would likely require fewer than 63 bitches to be enrolled in order to obtain the 100 qualifying puppies, but these numbers help define the parameters of the production system.

As experience is gained, there are numerous places in the production system where improvements in process can be expected. Puppy raising is one process, for example, where significant improvements can be made. PVWDC has shown that intensive early training and environmental exposure has a positive impact on overall success rate. When coupled with

flexibility in deciding what working career is best for a particular dog, PVWDC has recently been placing 92% of its puppies into working careers. In South Africa, Slabbert (5) has shown a large positive impact on learning among puppies that followed mom as she did the task the puppies were destined to also master.

Table 1. Number of Labrador Retriever litters required to be born to enable delivery of 100 14-month old dogs that meet contract specifications.

Description	Factor	Number
Puppies meeting contract specifications		100
Screening ratio or acceptance rate	35%	286
Successfully passes medical screening	80%	357
Successfully completes puppy raising	95%	376
Successfully passes puppy testing	100%	376
Percent surviving to weaning	94%	400
Puppies required per year		400
Average litter size	7.5	
Successful pregnancies per year		53
Conception rate	85%	
Number of matings that must be attempted		63

Please note that the cells in Table 1 are “live”, which means that, if you are reading this as Microsoft Word document, a double-click within a cell will load the entire table into Microsoft Excel. This will enable different values to be entered in any cell, in which case, all calculations would be immediately updated.

American Kennel Club Role

The American Kennel Club (AKC) is viewed by the American public as the face of purebred dog breeding. As an organization with vast experience dealing with public issues, there are at least 4 ways the AKC could support domestic dog breeders who wish to participate in the DDCoE consortium.

Recruiting participants. To start enrolling private dog breeders as participants in the DDCoE will require identifying current Labrador Retriever breeders who should be invited to participate. The AKC could help in this phase by identifying a pool of potential applicants who could be approached by the DDCoE.

Once the DDCoE has been legally and operationally established, its credibility would be substantially enhanced by receiving an AKC endorsement. This could be accomplished by articles published in AKC publications. It could also include receiving permission to use the AKC logo and name on promotional materials describing the DDCoE to private breeders, potential puppy raisers, and members of the dog-loving public. Steps that structure the messaging in a clear and positive format are welcome, and having input from AKC media-relations professionals would be welcome.

Identifying funding sources. To start the DDCoE will require seed money. At $36,000 per dog delivered under a Purchase Order contract, the Center would receive $3.6 million in gross income for each 100 dogs delivered. Until the Center can begin delivering dogs in substantial numbers, there will be no income, but there will be considerable expense. Help from the AKC in finding funding sources to cover those expenses would be most welcome and appreciated.

Electronic access to AKC pedigrees. It is certain that many of the dogs that would be parents of puppies born into the DDCoE breeding program will be themselves registered with the AKC. Maintaining an accurate record of pedigree relationships among AKC-registered purebred dogs with records also entered into the IWDR database is vital to accurately calculating inbreeding coefficients and estimated breeding values. The accuracy of stored pedigrees would be greatly facilitated by having electronic access to read pedigree information through an API (application program interface) to the AKC pedigree database.

Banishing the puppy mill stigma. As part of the definition of a puppy mill provided by the American Society for the Prevention of Cruelty to Animals (6) is the statement that a breeding bitch is bred on every heat cycle. In a well-managed canine breeding colony designed to produce a large number of working dogs, a "best practice" is to breed a young bitch beginning on her first heat cycle after reaching 18- to 20-months of age, then to breed her thereafter on each cycle until she reaches 4-years of age. For most bitches, this will result in 4 litters, but occasionally, it will result in 3 or 5 litters. Adopting this policy, however, offers a number of benefits. First, by keeping bitches in breeding only to age 4, the length of the generation interval can be reduced. Since genetic improvement occurs only by turning-over generations combined with selection, a shorter generation interval maximizes the amount of genetic improvement obtained per year. If one intends to obtain 4 litters from a bitch, but only breeds her after having skipped a heat cycle, then the retirement age of the bitch is moved from age 4 to something beyond age 6 or 7. The length of an average generation, then, would move from 3 years to about 6 years, thus cutting in half the amount of genetic improvement realized per year. Second, young bitches are in the prime of their reproductive health until about age 4. Many studies have shown that average litter size begins declining after 4 years of age, so retiring bitches at age 4 contributes to maximizing litter size while each bitch is young and healthy. Third, veterinary theriogenologists advise dog breeders that a bitch's reproductive health is best maintained by breeding her on each heat cycle while she is young. Studies have shown that even young bitches managed by skipping a heat cycle are more prone to develop female reproductive issues, like pyometra (7), than bitches bred on every cycle in their youth. Should animal activists oppose the long-term operation of DDCoE by claiming that the breeding program is another "puppy mill" public relations help from the AKC would be very valuable.

Summary

A plan for creating and administering a canine breeding cooperative is developed. The purpose of this cooperative is to coordinate a group of organizations and private breeders who wish to produce healthy, high-quality purpose-bred scent detection dogs. A basic tenet of the plan is to keep ownership of the breeding stock in the hands of private breeders and organizations. Doing so will help ensure the long-term survival of genetically advanced breeding stock, especially during times of scarce Government funding for purchasing dogs.

The basic plan calls for the creation of a Detector Dog Center of Excellence. This Center will be responsible for coordinating the breeding plan. It can also be the canine supplier who deals with the many complex issues of US Government purchase orders. The Center will be loosely

affiliated with a group of existing U.S. veterinary schools, like the University of Pennsylvania and Auburn University, both of which currently have education programs focused on working dogs.

Private breeders and working dog breeding organizations would be invited to apply for membership in the breeding cooperative. Center of Excellence managers will screen each application, which will include information about both the people and the breeding bitches they are nominating for enrollment.

Because the Center of Excellence serves as the product supplier in this scheme, during times when US Government demand for dogs is reduced, the Center will be legally free and able to sell dogs to state or local governments. This will preserve their ability to remain fiscally solvent. Dogs coming into the Center's control that are unsuited for scent detection work may be sold to agencies who will place them into other forms of service work.

Ownership of puppies born to bitches enrolled in the program would be pre-determined by contractual agreement made before a bitch is bred. The Center of Excellence will assume responsibility for puppy raising and for administering phenotype measurements required to identify the best young dogs to keep as replacement breeders. When a dog is approximately 14-months old, it will enter the inventory of young adult dogs available for sale. The overall intent of this plan is to enable government and law enforcement agencies to buy American-bred working dogs, thus embracing the themes of "Keep America Safe" and "Made in America".

Works Cited

1. **US Customs and Border Protection.** Agriculture Canine. *U.S. Customs and Border Protection.* [Online] 05 23, 2016. [Cited: 02 24, 2017.] https://www.cbp.gov/border-security/protecting-agriculture/agriculture-canine.

2. **Wikipedia.** Beagle Brigade. *Wikipedia.* [Online] 02 24, 2017. [Cited: 02 24, 2017.] https://en.wikipedia.org/wiki/Beagle_Brigade.

3. *Monitoring Hip and Elbow Dysplasia Achieved Modest Genetic Improvement of 74 Dog Breeds over 40 Years in USA.* **Hou, Yali, et al.** [ed.] Stephen, Univ. of Queensland, Australia Moore. 10, 10 4, 2013, PLOS One, Vol. 8, pp. 1-12. doi: 10.1371/journal.pone.0076390.

4. *The advent of canine performance science: Offering a sustainable future for working dogs.* **Cobb, Mia, et al.** s.l. : Elsevier, 10 2014, Behavioural Processes, Vol. 10, pp. 96-104.

5. *Observational learning of an acquired maternal behavior pattern by working dog pups.* **Slabbert, Johannes.** San Antonio, TX, USA : s.n., 2005. International Working Dog Breeding Conference.

6. **ASPCA.** Puppy Mills. *aspca.org.* [Online] [Cited: Feb 17, 2017.] http://www.aspca.org/animal-cruelty/puppy-mills.

7. **Dennis, Jeff and Hamm, Brian Lucas.** Canine pyometra: Early recognition and diagnosis. *dvm360.* [Online] [Cited: Feb 17, 2017.] http://veterinarymedicine.dvm360.com/canine-pyometra-early-recognition-and-diagnosis.

Committee on Oversight and Government Reform
Witness Disclosure Requirement — "Truth in Testimony"

Pursuant to House Rule XI, clause 2(g)(5) and Committee Rule 16(a), non-governmental witnesses are required to provide the Committee with the information requested below in advance of testifying before the Committee. You may attach additional sheets if you need more space.

Name: Cynthia M. Otto, DVM, PhD

1. Please list any entity you are testifying on behalf of and briefly describe your relationship with these entities.

Name of Entity	Your relationship with the entity
Penn Vet Working Dog Center	Founding director, employee of the University of Pennsylvania

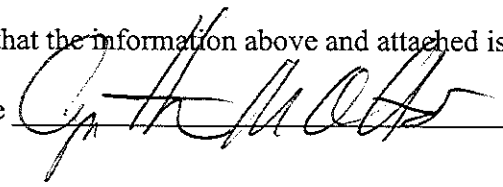
2. Please list any federal grants or contracts (including subgrants or subcontracts) you or the entity or entities listed above have received since January 1, 2015, that are related to the subject of the hearing.

Recipient of the grant or contact (you or entity above)	Grant or Contract Name	Agency	Program	Source	Amount
Penn Vet Working Dog Center	TSA breeding program dogs and data	DHS	CRADA	DHS docket-2013-0064	0
Penn Vet Working Dog Center	Validation Protocol for Pet Pace Collar	DHS	PetPace subcontract	HSHQDC-17-9-00016	$56,534
Penn Vet Working Dog Center	Canine Mounted Track and Transport Device	DHS	SBIR (subcontract)	H-SB015.1-007	$29,144

2. Please list any payments or contracts (including subcontracts) you or the entity or entities listed above have received since January 1, 2015 from a foreign government, that are related to the subject of the hearing.

Recipient of the grant or contact (you or entity above)	Grant or Contract Name	Agency	Program	Source	Amount

I certify that the information above and attached is true and correct to the best of my knowledge.

Signature  Date: 9/26/2017

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Recipient of the grant or contact (you or entity above)	Grant or Contract Name	Agency	Program	Source	Amount
Penn Vet Working Dog Center	Determining Efficacy of Naloxone Administrated through a Nasa	DHS	FFP contract	HSHQDC-17-P-00112	$68,288.04

2. Please list any payments or contracts (including subcontracts) you or the entity or entities listed above have received since January 1, 2015 from a foreign government, that are related to the subject of the hearing.

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I certify that the information above and attached is true and correct to the best of my knowledge.

Signature: Cynthia M. Otto Date: 9/26/2017

Cynthia M. Otto DVM, PhD

Dr. Otto is a tenured associate professor of Critical Care at the University of Pennsylvania, School of Veterinary Medicine, after 23 years as an attending clinician in the Emergency Service, in 2015 she transitioned to full-time Executive Director of the Penn Vet Working Dogs Center and Canine Sports Medicine clinician. Dr. Otto is board-certified in both veterinary emergency and critical care and veterinary sports medicine.

She has been involved in disaster medicine as a member of the Pennsylvania Urban Search and Rescue Task Force 1 from 1994 to 2010 and Veterinary Medical Assistance Team – 2 from 1999 to 2016. She began monitoring the health and behavior of Urban Search and Rescue dogs in October of 2001 after serving as a first responder for the 9/11 attacks. This work inspired her to establish the Penn Vet Working Dog Center, the premier national research and development program for detection dogs.

Her research program has been funded by the National Institutes of Health, the Department of Defense, the Department of Homeland Security, the American Heart Association, the American Kennel Club Canine Health Foundation, American Kennel Club Companion Animal Recovery, Morris Animal Foundation, Kleberg Foundation, Kaleidoscope of Hope and other foundations. She has published over 60 articles in peer reviewed journals, authored over 10 book chapters and lectured nationally and internationally on Emergency Medicine, Disaster Medicine and Working Dogs.

She was named Pennsylvania's 2002 "Veterinarian of the Year" and received an Alumni Recognition Award in 2006 and the OSU Distinguished Alumus Award in 2008 from the Ohio State University. The Philadelphia Kennel Club named her "Dog's Best Friend" in 2016.

Advisory Positions

Urban Search And Rescue Veterinary Group – 2007 - present

Pennsylvania State Animal Response Team Board 2010-present

US Special Operations Command Committee on Canine Tactical-Combat Casualty Care 2010 - 2012

Scientific Working Group on Dog and Orthoganol Detector Guidelines 2011-2014

NIST Organization of Scientific Area Committees (OSAC) Dogs and Sensors Subgroup 2014-present