Virginia Association of Counties

ACHIEVEMENT AWARDS

Virginia Association of Counties

APPLICATION FORM

All applications must include the following information. Separate applications must be submitted for each eligible program. **Deadline: June 2, 2017.** Please include this application form with electronic entry.

PROGRAM INFORMATION

County: York County

Program Title: Mosquitoes Get In But They Can't Get Out

Program Category: Environmental

CONTACT INFORMATION

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SIGNATURE OF COUNTY ADMINISTRATOR OR CHIEF ADMINISTRATIVE OFFICER

Name: Neil Morgan

Title: County Administrator

Signature:

2017 VACo Achievement Awards
Nomination Summary
York County

Program Title: Mosquitoes Get In But They Can't Get Out

Program Category: Environmental

Program Overview

York County, Virginia, uses both gravity and vacuum sewer systems. According to a two-year project done by York County Mosquito Control staff, vacuum pits, which are part of the vacuum sewer system, have shown to be a significant mosquito breeding source. These pits had not previously been treated for mosquitoes in York County or its neighboring localities. For the approximate 1,600 vacuum pits in York County, staffing levels and costs necessitated that the larvicide used in the pits provide season-long control (up to 25 weeks) with a single treatment. Forty vacuum pits in the Dare area of the county were selected for observation. Twenty pits were treated with one Natular XRT tablet each, while the other 20 were left untreated. Treatments were applied in May 2015 and May 2016; and the pits were sampled for larvae biweekly for 180 days. Throughout the project, the treated pits had significantly fewer larvae than the untreated pits. The study led to implementation of a larvicide program for the vacuum pits in York County.

Vacuum sewer systems are used in many states, particularly in low-elevation areas that are prone to flooding. Due to these systems being cost-effective, having a lower environmental impact than some systems, and being energy-efficient (compared to traditional gravity systems), vacuum systems are likely to become increasingly used throughout the country. Because of this, we recommend treating vacuum pits with extended-use larvicide, for effective control

of mosquito larvae for up to 180 days per treatment.

1. The Problem/Need for the Program:

Mosquito populations are controlled because they are vectors of disease to humans and their pets; and because they are a nuisance. According to the American Mosquito Control Association, each year there are an estimated 700 million cases and over one million human deaths from mosquito-borne diseases globally. The increase in world travel and trade make the spread of these diseases a growing concern. At this time, the mosquito is considered the deadliest animal family in the world.

One approach to controlling mosquito populations is to treat standing water. Doing this controls adult mosquitoes' ability to breed and larvae's ability to grow. Mosquito larvae hatch and grow in standing water. Identifying and treating areas of standing water can be challenging but effective. For standing water that cannot simply be dumped out, larvae can be eliminated by treating the standing water with a larvicide that kills mosquito larvae before they can emerge as adults. Because mosquitoes can breed in as little as a tablespoon of water, eliminating all standing water can be very hard to do. Mosquito Control programs are always pursuing new breeding areas, and it can take a lot of looking around to find where local mosquitoes are breeding. No area in the temperate world is completely free of mosquitoes, not even the best mosquito control program can do that. The goal of mosquito control is to lessen the impact to human populations as much as possible.

2. Program Development:

York County has 105 square miles of land and more than 200 miles of shoreline along the York River and the Chesapeake Bay, including tidal creeks and tributaries. The population of

the county as of July 1, 2015 was 67,837. This project focused on the lower part of the county, which has low elevation and high water tables. This wet, low- lying area allows nuisance mosquitoes to thrive near the people in the county. Additionally, some of York County's rural neighborhoods were constructed with septic systems for waste removal. Over time, these are being converted to vacuum and other sewer systems to comply with Chesapeake Bay regulations for ecological reasons. Thus, vacuum sewer systems are increasingly being built in wet, low-lying areas.

There is a need for these vacuum sewer systems to be treated with larvicide to prevent mosquitoes from breeding inside them. Vacuum sewer systems are designed as systems of vacuum sewer lines that transport sewage to nearby pump stations. The vacuum sewer pit is constructed of two separate chambers, one on top of the other. The bottom chamber collects the sewage, and the top chamber is empty except for pump apparatus. This top chamber is the site that collects and holds storm water, and consequently, mosquito eggs and larvae. These top chambers are cement cylinders that are 3 feet in diameter, 3 ½ feet deep, each covered by a manhole cover. Adult mosquitoes access the chamber through holes in the manhole covers and lay eggs inside. The eggs develop into larvae inside the almost closed system of the vacuum pit chamber, where they are safe from many predators. York County currently has approximately 1,600 vacuum pits in use. With the county's population growing each year, the need for more vacuum pits will continue.

York County Mosquito Control originally became interested in treating the vacuum system for mosquitoes because utility employees were experiencing mosquito bites and annoyance when opening the pits for routine maintenance. Lacking a documented history of mosquito breeding in the pits, the study seemed necessary to set a baseline. Since the spring of 2015, Mosquito Control observed many breeding mosquitoes in the vacuum pits. Meanwhile, mosquitoes have increasingly been reported in national and local news in relation

to the Zika virus. The particular mosquito found breeding in the sewer vacuum pits is the Asian tiger mosquito, the possible local vector for Zika. Since vacuum sewer systems are usually placed in central locations, if left untreated, they can facilitate the spread of mosquito-borne diseases to people in close proximity.

The purpose of this project was to establish baseline data on the mosquito species breeding in the pits and to observe the effectiveness of Natular XRT for larval control in these pits. This was accomplished by biweekly monitoring and sampling of mosquito larvae in specific treated and untreated vacuum sewer pits in York County, Virginia.

Prior to implementation of the project, its protocol was established to include forty vacuum pits, with twenty being treated and twenty left untreated. Clarke's Natular XRT was used as the treatment larvicide; its active ingredient is Spinosad. Collectors used industry-standard dippers to collect the larvae. Each vacuum pit was inspected biweekly for five months each year. Samples for species identification were taken monthly.

We utilized the county's excellent GIS (Geographic information system) mapping to identify locations, thus assisting personnel in locating the vacuum pits. A Nikon SMZ800 Zoom stereo microscope with camera was used for the identification of the mosquito larvae. After the data was collected, we developed spreadsheets to track our results, helping us determine the success or failure of the program.

3. The Cost of the Program:

The County of York has had an established mosquito control division for 40 years, and most of the equipment used for the study was already in use for mosquito control operations. Duplication of the study by a county with a mosquito control division would require: two industry-standard dippers - one for the control and one for the treated water – these would

cost approximately $23; one box of 500 Whirl Pak bags, which would cost approximately $41.75; one manhole cover remover, costing approximately$20; mosquito growing chamber, costing approximately $9.45; and if the municipality needs a high- quality microscope, it could range in price from approximately $500 to $6,000. The labor for the study cost approximately $1,500.

The larvicide tablets cost $5.00 each, and with approximately 1,600 vacuum pits on-line, it costs the County of York $8,000 to treat each vacuum pit. When the study began in 2015, an entire extended-release tablet was used for each of the 20 treated pits. At the end of the 2015 season collectors noticed the tablet was almost completely intact. For the 2016 year study the participants broke the tablet in half to see if the product would still be effective. The result of the end of the study proved the tablets could be broken in half and still be effective for 5 months. Since it was discovered the county could break the tablet in half, the cost for the product was cut in half, saving the County of York $4,000.

The cost of labor for the treatment of 1,600 vacuum pits equates to 3 teams of 3 members working 6 hours per day for 4 days. The approximate labor cost was $1,500. While there are costs for any preventative program, the benefits of this treatment are immeasurable in helping prevent outbreaks of mosquito-borne disease.

4. The Results/Success of the Program

Our vacuum pit project identified vacuum pits as potential health hazards in relation to mosquito-borne disease. Throughout the summers of 2015 and 2016, we observed mosquito larva growing in vacuum pit water consistently from April – November. These vacuum pits may be located near residences- in yards, near front porches, or in driveways. This means that the mosquitoes being bred in these pits are easily finding their way to residents and biting

them, potentially spreading disease between humans. In neighborhoods where homes are relatively close together, the likelihood of disease spread between different families is increased. Furthermore, the vacuum pits are inaccessible to residents who otherwise might be able to treat the mosquitoes. The manholes are usually only opened by utility workers, using specific tools, for biannual maintenance checks, or for necessary repairs.

Another important factor is that the mosquito found breeding in the vacuum pits is almost exclusively the Asian tiger mosquito. This species can carry and spread disease among people, including Dog Heartworm, Chikungunya virus, Dengue fever, Yellow Fever, West Nile virus, and Zika Virus. The species breeds only in man-made containers, and can be eradicated from an area with vigilant source reduction. But in areas with consistent mosquito breeding sources that are inaccessible to the general public, such as the vacuum pits, the Asian tiger mosquito will always be a problem. Along with residents getting rid of standing water sources on their properties, the eradication of the vacuum pit as a mosquito source would significantly lessen people's exposure to the dangers of the Asian tiger mosquito.

We can conclude that sewer vacuum pits are clearly a source of Asian tiger mosquitoes that feed on the blood of humans and their pets. This knowledge was gained through communication between field workers in York County Utilities and Mosquito Control divisions. This shows initiative and success in interdepartmental teamwork. Our findings that vacuum pits need to be targeted by Mosquito Control were distributed throughout our field of work. Our division gave three professional presentations at various Mosquito Control Association conferences in 2016 and 2017, which were attended by public health agencies throughout the United States. We presented these findings for the American Mosquito Control Association, Mid-Atlantic Mosquito Control Association, and Virginia Mosquito Control Association. In the spring of 2016, after much news coverage of the Zika virus spreading in the Florida Keys, our office reached out to the Florida Keys Mosquito Control Commission

and shared our newly gained knowledge with them to help eliminate the vector of the Zika virus. They had not previously considered this source of mosquitoes, and were grateful for the information.

5. Worthiness of Award:

This project promoted improved public safety by eliminating a source of Asian tiger mosquitoes, in and around neighborhoods. York County has a mosquito control program that monitors mosquitoes, and reacts to each mosquito scenario with various proven methods. We treat permanent standing water with mosquitofish, drain any standing water that we can, and treat temporary but undrainable standing water with larvicide. Before we started this project the health hazard associated with vacuum pits breeding mosquitoes had not been addressed. Various municipalities were surveyed for their awareness of vacuum pits, and none in the Hampton Roads area or the Florida Keys, where vacuum pits are very prevalent, had previously treated them as mosquito breeding sources. Finding them as an area to treat was a large gap filled by our program, and greatly lessened the number of Asian tiger mosquitoes pestering residents. After treating the vacuum pits with an extended use larvicide, the vacuum pits did not breed any more mosquitoes for a full year, so we observed measurable results. Furthermore, the sharing of knowledge and education between vector control employees is critical to mosquito control and public health, because continued evolution of community infrastructure leads to new challenges for reducing vectors of disease. We not only helped York County improve its mosquito control practices, but shared our methods with others in the same field.

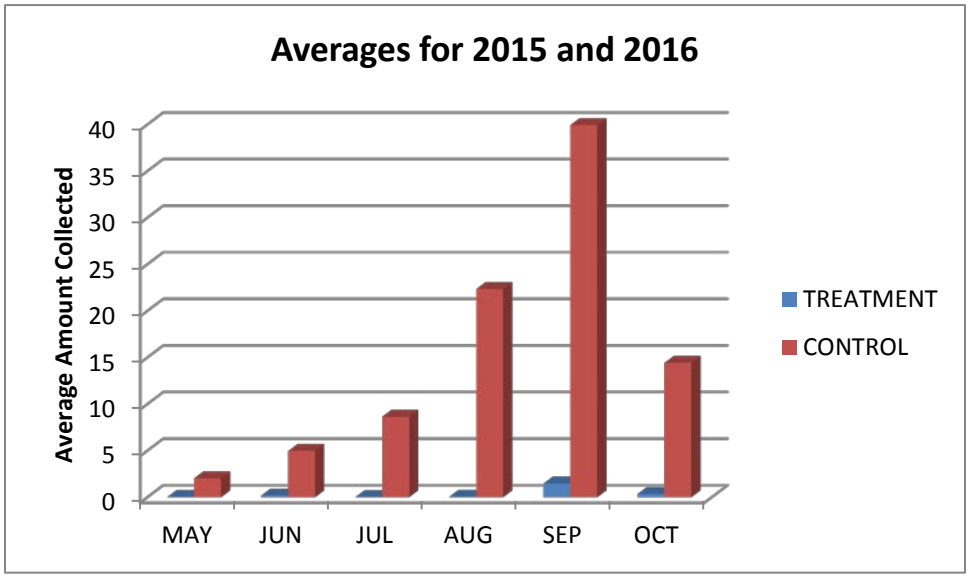
6. Program Summary:

York County's vacuum sewer system pits are a breeding ground for mosquitoes. How was that determined? York County Mosquito Control staff conducted a two-year study that showed a high number of mosquitoes breeding within these vacuum pits. These pits had not previously been treated for mosquitoes in York County or our neighboring localities. To effectively treat the approximate 1,600 vacuum pits in York County, staff used single-treatment larvicide that provides season-long control (up to 25 weeks). Forty vacuum pits in the Dare area of the county were selected for observation. Twenty pits were treated with one larvicide tablet each, while the other 20 were left untreated. Throughout the project, the treated pits had significantly fewer larvae than the untreated pits. The study led to implementation of a larvicide program for the vacuum pits in York County, helping to reduce the number of mosquitoes by eliminating these breeding sites.

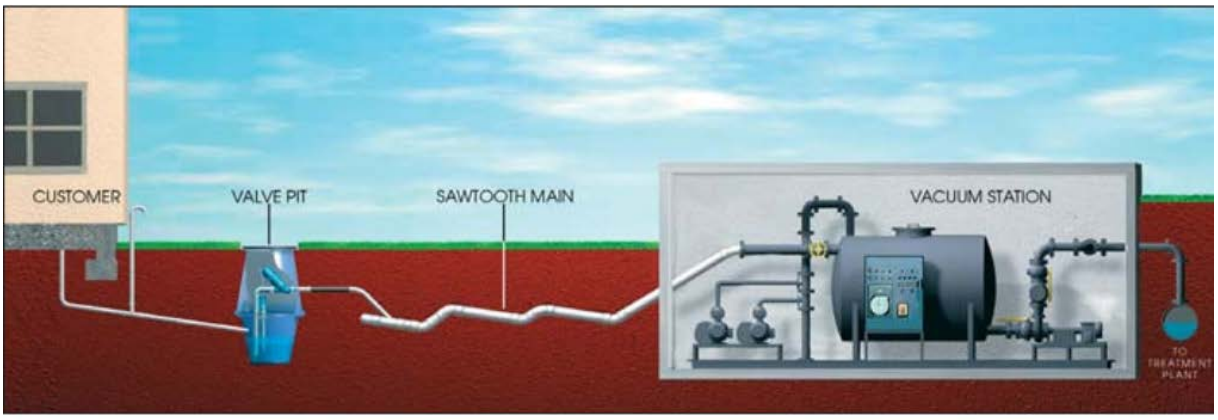
7. Supplemental Materials Attached:

Graphs, charts and photos of the program are attached to aid in understanding our testing and results.

Supplemental Materials



Graph shows the average number of larvae collected per month for treatment and control pits.



Wastewater flows by gravity from each house to a valve pit. Each pit is equipped with a normally closed vacuum interface valve that prevents system vacuum from entering the house plumbing. When 10 gal of wastewater accumulate in the sump, the interface valve opens, the contents of the sump are evacuated, and the wastewater enters the vacuum main. Wastewater then travels through the vacuum mains to the vacuum station where it is collected and pumped to the treatment plant.

This diagram is a summary of the vacuum sewer system. The "valve pit" is what we refer to as a "vacuum pit," and this is what fills with rainwater and breed mosquitos. This is the area that we treat with larvicide.

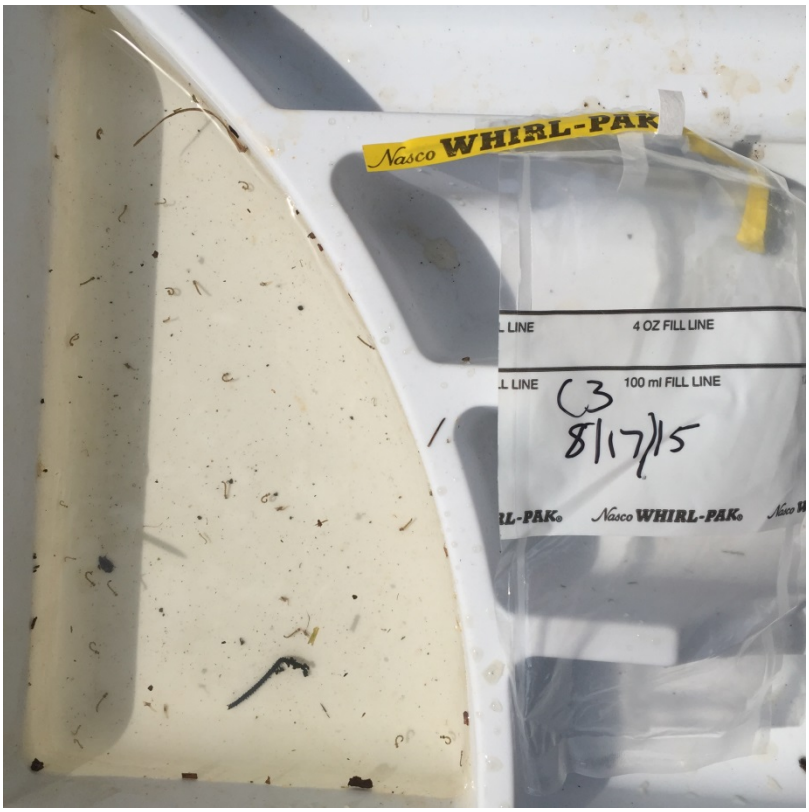


Photo shows mosquito larva collected from a vacuum pit.

Photo shows vacuum pit full of water and proximity to residence.