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Project Final Report
for the
Equine Waste BMP Demonstration Project

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Prepared by:

Carolyn Oldfield, Coordinator
Thoroughbred Resource Conservation
and Development Council, Inc.
401 East Washington Street
Georgetown, KY 40324
(502) 863-6010 ext. 4

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Kentucky Division of Water
Kentucky Division of Conservation
USDA-Natural Resources Conservation Service
University of Kentucky Agricultural Engineering
Kentucky Geological Survey
Kentucky Thoroughbred Association
Licking River Valley RC&D Council
Bourbon Co. Conservation District
Fayette Co. Conservation District
Franklin Co. Conservation District
Scott Co. Conservation District
Woodford Co. Conservation District
Lexington Fayette Urban-County Government
Scott Co. Fiscal Court
Franklin Co. Fiscal Court
Woodford Co. Fiscal Court
University of Kentucky Cooperative Extension Service
Kentucky State University
Airdrie Stud
Elmwood Farm
Brookdale Farm
Claiborne Farm
Creech Services
Crestwood Farm
Darby Dan Farm
Idle Hour Farm
Keeneland Association
Kentuckiana Farm
Kentucky Horse Park
Midwest Bio-Systems
Oakland Farm
Walking Man Productions
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EXECUTIVE SUMMARY

The image many have of Kentucky's Bluegrass Region is of rolling green fields, stately horse farms and most importantly, the horses themselves. Every year, visitors flock to Central Kentucky to enjoy its unique atmosphere. A multimillion dollar a year industry, horse farming is an integral part of the region's economy and identity.

One aspect of the horse industry that receives little attention but seriously impacts the region is the management of equine waste. Every day, close to 1,000 tons of equine waste is produced on the horse farms in Bourbon, Fayette, eastern Franklin, southern Scott and Woodford Counties. This animal waste, as well as soiled bedding material, presents a formidable disposal challenge. Ongoing USDA inventory efforts estimate that the majority (about 75%) of the farms in the area dispose of stable muck in unmanaged piles on remote parts of the farm. Often, these piles are located in sinkholes or adjacent to streams. Runoff from stable muck has the potential to have high nitrate levels, as well as elevated levels of fecal coliform bacteria and other pathogens.

As water quality concerns increase and become known to the public, horse farms, along with other agricultural and industrial enterprises may be targeted for increased regulation. This may be avoided, however, by adopting a voluntary approach to waste management.

The Thoroughbred RC&D Council, in cooperation with numerous organizations and individuals, explored ways for horse farmers to deal with equine waste. Through a series of demonstration projects, the council showcased several new management practices that were practical, effective and affordable. Four demonstration farms were established for onsite composting, and two farms were established for offsite disposal. Both options were met with a favorable response. See Appendix A.

Water quality monitoring for this project focused on a minor tributary to Houston Creek, and included the evaluation of the receiving surface waters before and after a large muck pile was moved away from the stream. Monitoring also included the evaluation of composting equine waste on the vadose zone and surface water runoff of a windrow of composting horse muck. The University of Kentucky Agricultural Engineering Department installed the upstream/downstream monitoring stations and the pan lysimeters underneath sections of the compost windrows.

Kentucky Geological Survey provided the lab analysis.

Progress was documented by photography (both print and slide), throughout the duration of the project. In addition, the Licking River RC&D Council had primary responsibility for the production of a video. Many components of the project were filmed and documented as the project was implemented. This footage was incorporated into a final video that summarized the project. A poster display was prepared and presented at the KY Division of Water Nonpoint Source Conference. Three large field days were held to demonstrate the project, along with numerous field tours of smaller groups. Several articles were written and published in local newspapers and trade magazines such as The Blood-Horse and the Thoroughbred Times.
INTRODUCTION AND BACKGROUND

Within this project area, there are approximately 28,473 horses on 1,288 farms. This region is underlain by Ordovician limestone, and exhibits pronounced karst topography. The region has been identified by the KY Division of Water Groundwater Branch as being particularly sensitive and vulnerable to groundwater contamination. In addition, many of the streams are adversely affected by nonpoint source pollution.

Thoroughbred horses are boarded in stalls throughout much of the year. Straw bedding is typically used in the stalls, and they are generally cleaned at least once a day. Other absorbent bedding materials are used to a lesser extent, and include hay bedding, wood shavings and sawdust.

Approximately 996 tons of animal waste is produced in the project area daily. The animal waste and soiled bedding material present a disposal challenge. In the past, (due to lack of a better alternative), equine waste has been placed in unmanaged piles on the back of the farm, sometimes near sinkholes and waterways. Leachate from stable muck has the potential to have high nitrate levels, as well as elevated levels of fecal coliform bacteria and other pathogens.

Some farms dispose of stable muck through land application. If muck is land applied to pastures, internal parasites can be exposed to other horses. Soil compaction resulting from daily traffic across farmland is a concern. Aesthetic reasons (appearance, flies, odor, etc.) in the horse boarding industry, which has become highly competitive for clients, also discourages adoption of land application.

Burning of stable muck is attempted by a small number of farms, but it is greatly discouraged by nuisance complaints (strong urine odors and smoke) from adjacent property owners and local governments. There are at least two facilities situated in the project focus area that provide stable muck disposal service to farms. Difficulties in farm storage and expense in handling and hauling large volumes of stable muck limit the use of these services. Less than five percent of the farms in the project focus area currently use these types of services.

Kentucky is both nationally and world renowned for the production of thoroughbred horses. This industry provides employment for over 80,000 persons in the state, and generates a significant part of Kentucky’s farm income. The industry is concentrated in the project area, and is vital to the economy of the region.

Although a number of the larger farms are often in the limelight, the majority of the industry consists of smaller operations with 20 to 30 stalls. In recent years, the horse farm industry has been financially stressed. Several farms have sold, and the conversion of Bluegrass horse farms to residential use has been identified as a regional concern and priority.
INTRODUCTION AND BACKGROUND (continued)

There is an opportunity for widespread improvement of animal waste disposal for the horse farms in the state. In particular, there is a need for practical, affordable options. The Equine Waste BMP Demonstration Project evaluated and demonstrated two new and innovative BMPs for managing the removal and/or treatment of equine waste. Onsite composting of stable muck has the potential to meet the waste treatment needs of many farms in the region, transforming waste into a valued soil amendment. The majority of farm operators in this region had not considered this option, in part from lack of financial assistance and technology transfer. The U.S. Department of Agriculture has traditionally provided assistance to agricultural producers in managing animal waste. However, farms producing horses for purposes other than draft use or human consumption had not been considered eligible for cost assistance in animal waste systems through typical conservation programs because horses are not considered livestock (change is proposed in the upcoming farm bill). In recent years, conservation programs funded by the state through local conservation districts have provided an opportunity for horse farmers to get cost/technical assistance for muck pits. Permit requirements by state agencies may also serve as a disincentive to farms.

Equipment designed to facilitate management of compost windrows has, in past years, been suited only to large, commercial operations. However, there has been a marked increase in the number and type of machines marketed for composting purposes. Smaller windrowers have recently become available which are relatively affordable, are of appropriate size for windrows made by manure spreaders in use, and do not exceed the horsepower requirements of tractors generally used in the region.

Recent advances and improvements in hay baling equipment provide an opportunity for farms, which need improved handling alternatives for moving stable muck to an offsite location. In the past couple of years, a number of manufacturers have developed and offer roll balers that are less sensitive to moisture content, and in fact are able to bale haylage (approximately 60% moisture content). By baling stable muck into compact bales, the rolls can be handled by conventional farm equipment; the logistics of handling loose material on a daily basis can be greatly improved. Such bales by design are weather resistant, and pose limited environmental risk if stored for short periods outdoors. Hauling to facilities, which accept stable muck could therefore be scheduled within the constraints of the farm workload, and would eliminate the necessity for partial loads. A limited demand exists for soiled straw bedding, which is shipped and sold to out-of-state mushroom producers. In addition, cattle producers in the region provide a seasonal demand for roll bales of stable bedding, as winter forage.

The thoroughbred industry, (both organizations and individual farms) were very cooperative in implementing this project. Efforts led by the Kentucky Thoroughbred Association (KTA), encouraged a proactive approach to the issues and the desire to find positive solutions for equine waste management in the region. The Director of the KTA donated many hours to the project and was host to several oversight committee meetings.
INTRODUCTION AND BACKGROUND (continued)

Since the thoroughbred industry was the target audience, their active participation and involvement was crucial to the success of the project. This effort initiated and led to widespread discussions throughout the area regarding equine waste. The Kentucky Horse Park was an active participant and supporter of the project. The Executive Director and Manager helped to share information and served as host for several oversight committee meetings. The Kentucky Horse Park, the only park dedicated to the horse, has over 800,000 visitors annually.

During the implementation of this project, the historic Keeneland Race Course made a significant change in handling their equine waste. Keeneland contracted with Agronom International, and made a significant investment in the construction of a biofermentation facility. The manager of the facility served on the oversight committee and hosted several field days where the Thoroughbred RC&D had an opportunity to explain the Equine Waste BMP Demonstration Project.

Leasing equipment from Midwest Bio-Systems (MBS) led to the company relocating a technical specialist to Georgetown. MBS provided much needed technical assistance to the project. They are a full service company that provides solutions for organic waste management through composting. The company offers technical training workshops and sells composting equipment.

Creech Services provided technical advice to the project and had a representative of the company attend oversight committee meetings and field days. The company bales and ships muck to out-of-state mushroom farms. As the project progressed, the company started a new business at a separate location for large scale composting. All of the associations and businesses mentioned above are located within the project area.

MATERIALS AND METHODS

The project area was in the Houston Creek Watershed (KY05100102-013), associated with the Inner Bluegrass Karst Aquifers. Houston Creek Watershed is 11,462 acres and is listed on the State Nonpoint Source Priority List of Waterbodies Impacted by Agriculture. The Inner Bluegrass Karst Aquifers are identified as impacted by bacteria and nitrates from agriculture and runoff/stormwater sewers. Impaired uses and Water Quality Standards Violated data are not presently available. This groundwater basin is in an area with well-developed karst topography, and is underlain by Ordovician limestone of Lexington Limestone Formation. See Appendix B. There are numerous springs within the Watershed, including Royal Spring, which is the primary domestic water supply for the City of Georgetown. Geology, soils, plant resources, land use, and resource concerns are similar throughout the basin. The project area includes Bourbon, Fayette, eastern Franklin, southern Scott and Woodford Counties. Water quality monitoring was completed on a minor tributary to Houston Creek, in Bourbon County (Idle Hour Farm). See Appendix C.
MATERIALS AND METHODS (continued)

The Thoroughbred RC&D Council provided general oversight of the project and updates were given at the quarterly meetings. The project coordinator and assistants, along with oversight committee members, directly guided the project and made the majority of decisions and recommendations with the concurrence of the Kentucky Division of Conservation and the Kentucky Division of Water. As the project was implemented the committee met at least twenty times. Many of the meetings had over 35 people in attendance and included field visits. See Appendix D.

BMP Implementation

Onsite composting of stable muck has the potential to meet the waste management treatment needs of the area; transforming the waste into a valued soil amendment. Traditionally, there has been a lack of appropriate financial assistance and training to make composting a viable option. However, equipment designed to facilitate management of compost windrows has become more affordable and better suited for farm-scale operations. On the four composting demonstration farms, horse muck (a mixture of used bedding, feces and urine) was daily cleaned out of the stalls and hauled from the barns in a manure spreader to the composting site. Windrows were established and grew into rows ranging from 600 feet to 1,500 feet in length. The rows, on the average were six feet tall and ten feet wide. Farm owners/managers used a thermometer to measure the temperature of the windrow at the centermost point. Temperature, odor and moisture were evaluated by project assistants and farm staff to help determine the proper turning time of the composting horse muck. Thoroughbred RC&D Council purchased a used Wildcat composting turner, and leased two compost turners from Midwest Bio-Systems. The Areomaster PT-120 is a more updated and refined version of the Wildcat turner. This machine added much to the success of the project. Idle Hour Farm was one of the final composting demonstration farms; this site will be used to give a more detailed explanation of the composting process.

Compost Demonstration Sites
Airdrie Stud (Beretone Jones) located in Woodford County, served as a compost demonstration site and was host for a field day with over 100 people in attendance. The farm also served as a training site for oversight committee members and other demonstration farms. Oakland Farm (Doug Witt) located in Bourbon County, served as a compost demonstration site and was host for a field day with over 50 people in attendance. The farm served as a training site for oversight committee and other farmers. This farm may continue composting. Elmwood Farm (John Bell) located in Scott County, served as a compost demonstration site and was host for a field day with over 50 people in attendance. Their personnel participated in oversight committee meetings and allowed farmers and others to visit the composting site on numerous occasions. They are purchasing Areomaster PT-120 and continuing composting.
MATERIALS AND METHODS (continued)
BMP Implementation (continued)

Idle Hour Farm (David Hager) located in Bourbon County, served as a compost demonstration site and was highlighted as a tour stop for the Southeastern Association of RC&D Councils Regional Conference in October, 2001 with over 400 people in attendance. They plan to continue composting using an Areomaster PT-120.

Two farms were used for the roll baling of muck demonstration. The typical baler on these farms was the same type machine used for roll baling hay. Newer models of roll balers have been designed to roll materials with higher moisture content, therefore, more effectively roll baling horse muck. On a daily basis, farm employees cleaned stalls and placed the muck in a row down the hallway of the barn. The roll baler was pulled through the material rolling up the muck. Roll bales would then be hauled to a designated area on the farm for pickup. Both demonstration sites developed agreements with local beef producers to pick up the bales.

It is important to note that many of the larger farms in the area strip clean the bedding material in stalls on a daily basis. This material may include large amounts of uneaten hay. Some farms actually use grass hay to bed down stalls, typically Bluegrass; this is very appealing to cattle farmers.

Creech Services, the company that ships muck to out-of-state mushroom farms, was not interested in using the roll bales because the consistency of the muck could not be guaranteed to the mushroom farms. In addition, the company was concerned about equipment problems in their processing facility if they were to use the roll-baled muck; the plant was designed to handle loose material. Also, the mushroom farms will only take straw bedding, not grass.

Roll Baling Demonstration Sites
Brookdale Farm (Fred Seitz) located in Woodford County, served as a roll-baling demonstration site. Farm staff spoke at field days and oversight committee meetings and allowed other farmers to visit and see roll baling process. Farm has made significant investment in roll baling equipment and facilities. A local beef cattle producer utilizes roll bales as a feed supplement. Some of the material is chopped in a tub grinder and mixed with corn and molasses. Crestwood Farm (Pope McLean) located in Fayette County, served as a roll baling demonstration site. Farm staff participated in oversight committee meetings and discussions. Farmers and others were allowed to visit the farm and see the roll baling demonstration. They plan to continue roll-baling muck and have purchased a top of the line roll baler and a tractor. Local beef cattle producers have picked up the bales and utilized them for cattle feed.
MATERIALS AND METHODS (continued)

Water Quality Monitoring and Well head Protection

Technical assistance was provided to the BMP demonstration farms by a core group of the oversight committee, and usually included RC&D Council and staff, USDA-NRCS District Conservationists, local conservation district supervisors and staff, local agriculture extension agents, and others.

All water quality monitoring took place at Idle Hour Farm in Bourbon County, and included the installation of pan lysimeters to evaluate the influence of composting equine waste in outdoor windrows upon the water quality of the vadose zone and of surface runoff. Monitoring also included pre- and post-BMP sampling of a minor tributary to Houston Creek. It was somewhat of a challenge to find a landowner with a muck pile near a tributary of Houston Creek, especially one that would continue dumping muck and allow for monitoring of the stream to document effectiveness of BMPs on the receiving waters of Houston Creek.

**Upstream-Downstream Monitoring**

Stream flow measurements at upstream and downstream locations from the equine waste muck piles were necessary to evaluate the impact on receiving waters. The landowner continued to place muck by the stream; samples were taken above and below the pile beginning in February of 1999 and continued for one year. Due to the drought of 1999, the sampling period was extended through spring of 2000 to collect more data. Water quality monitoring at this site measured chemical, physical and biological parameters. Samples were taken by project assistants and delivered to the Kentucky Geological Survey Lab in Lexington, KY, for analysis.

Two stainless steel-critical flow trapezoidal flumes were fabricated at the University of Kentucky Biosystems and Agricultural Engineering Department to accomplish this task. The flumes were installed and secured in the stream. Flumes were capable of measuring flows up to 40 cfs. Depth of flow within the flumes was measured by utilizing a stilling well and automatic stage recorder that translate a water pressure head to a voltage output and subsequently to depth of flow through a mathematical relationship programmed and calibrated with a data logger. Depth of flow was then translated to stream flow by applying an algorithm specific to the geometry of the flume. Throughout the duration of the monitoring, periodic visits were made to check the flumes, clear debris and ensure functionality, and download flow data. The equipment was taken out of service through the winter months to avoid damage due to freezing. The downstream flume had to be re-installed three times over the course of the project due to high flows and tree limbs carried by the high water dislodging the flume anchoring. Data was translated to stream flow and matched to probable precipitation events and submitted to the parties responsible for sample collection.
MATERIALS AND METHODS (continued)
Water Quality Monitoring and well head Protection (continued)

**Surface Runoff/Subsurface Leaching from Composting Windrows**
The lysimeters evaluated the influence of composting equine waste in outdoor windrows upon the vadose zone and upon surface runoff water quality. Monitoring consisted of liquid collection through stainless steel lysimeter pans and volume measurements utilizing tipping buckets. Two sets of nine pans were constructed and installed at the Idle Hour farm.

Within each set of nine pans, three were installed 1 foot below the ground surface under the windrow, three were installed at the ground surface under the windrow, and the last three installed at the ground surface slightly downgradient from the windrow. Site preparation and equipment installation was executed using a skid-steer loader with bucket and backhoe attachments. The location of the windrows and downgradient pans was scraped of vegetation and the subsurface location was excavated to a depth of just over 1 foot. This facilitated necessary grading where the pans were to be placed to achieve the proper gradient to direct captured leachate to the discharge tube and accounted for the lip of the lysimeter pan.

After placement of the pans and subsequent sand filling and trenching for tubing, drainage lines were run and the area was back-filled to original contours. Down gradient pits were excavated at each site for installation of the housing units for the tipping buckets and sample bottles. These were protected from runoff by constructing a small earthen berm around three sides, leaving only the most down gradient side open for access to the pit. Sometime after installation, it was decided that the pits needed to be moved to allow for the compost turner to pass safely along the windrow without damaging the equipment or falling into the pit area. This re-installation was performed at the same time as one of the downstream flume re-installation activities in the spring of 2001.

The lysimeter pans were filled with sand to aid in drainage and the exit tubes from the pans were encased in screening to prevent clogging of the lines. Sterile tygon tubing was used to convey the discharge to the tipping bucket sampling location. Drainage from each set of three pans was composited at a central outlet location and the flow from the pans under the windrows (surface and subsurface) was directed into a tipping bucket to account for total volume of discharge. Samples were collected in bottles located at the point of discharge. The tipping buckets and sample bottles were enclosed in housing units to minimize environmental impacts such as sediment, rain, wind, and sun in an effort to maintain the sample integrity. Lysimeters were acclimated for at least six months prior to sample collection.

Technical assistance was provided to the sample collection personnel regarding operation of the equipment, inspection and maintenance. Periodic visits to the site were made to inspect, observe and maintain monitoring equipment as needed.
MATERIALS AND METHODS (continued)
Water Quality Monitoring and Well Head Protection (continued)

Over the course of the project, repairs were necessary to patch or replace broken hoses, fix bent or dislodged lysimeter pans and re-install, clean and/or replace sand in the lysimeter pans. Photo documentation of the installation, equipment, and initial state of waste placed in the windrow was performed and included in this report. See Appendix E.

Project assistants coordinated with the KY Geological Survey on when samples could be taken to the lab. Due to various reasons, the lab was only available to receive samples certain times of the week. This, coupled with the weather presented barriers for the sampling process.

Public Information and Education

Throughout the course of the project the oversight committee led an active and effective public information and education campaign. The committee exceeded goals for these milestones as laid out in the Project Workplan and Memorandum of Agreement.

Beginning in the summer of 1996, an informational brochure was designed and approved by KY Division of Water. This brochure provided a solid overview of the project and explained why horse producers need to develop a waste management plan. The brochure also discussed the options of composting and roll baling equine waste. Brochures were distributed to horse farmers, local conservation districts, and KY Thoroughbred Association and KY Thoroughbred Farm Managers Club members. Additionally, throughout the project period, various reporters with several newspapers wrote numerous articles highlighting the project. See Appendix F.

Our first field day was held at Airdrie Stud (Mr. and Mrs. Brereton Jones) in July of 1998, in conjunction with the Woodford Co. Agriculture Day. Over 100 people were in attendance and saw the Wildcat compost turner demonstration. The Thoroughbred RC&D and the farm manager at Airdrie made presentations on equine waste management. Several of the major horse farm managers and owners were in attendance.

The project was highlighted at the “Working at a Watershed Level” Conference. This regional conference sponsored by the Council of State Governments was held in Lexington, KY in September of 1998. The field day associated with the conference focused on conservation practices in the inner bluegrass.

In October of 2000, our next field day started with a breakfast provided by the Witt’s at Oakland Farm in Bourbon County. Over 50 people were in attendance and saw the Wildcat compost turner demonstrated and heard presentations from the Thoroughbred RC&D, Midwest BioSystems, demonstration farms and others. The group traveled to Elmwood Farm in Scott County that afternoon. Following a lunch prepared by the Scott Co. FFA Alumni, the group saw the Areomaster PT-120 in action. The day concluded with a round-table discussion (bales of hay under a large shade tree); which turned out to be an informative question, answer, and comment session among a diverse group.
MATERIALS AND METHODS (continued)
Public Information and Education (continued)

This field day was promoted in the Thoroughbred RC&D Newsletter; local conservation district newsletters and over 950 brochures, that had previously been approved by the KY Division of Conservation and KY Division of Water, were mailed and distributed throughout the project area. Kristen Ingwald with The Blood-Horse Magazine was in attendance and wrote an article that was published in the October 28, 2000 issue. See Appendix G.

Much time was directed to the production of the public information video of the Equine Waste BMP Demonstration Project. The coordinator for the Licking River Valley RC&D Council had primary responsibility for this component of the project. Walking Man Productions of Lexington, KY was hired for video production.

After much planning, filming and editing the video was submitted to the KY Division of Conservation and KY Division of Water for approval. Once the recommended changes were made, the video was mass-produced and made available to the horse industry. More than five hundred videos were mailed to horse farmers in the area. The Kentucky Thoroughbred Owners and Breeders Association provided the mail distribution list. Several hundred videos were made available to people through the KY Thoroughbred Farm Managers Club, project field days and meetings. Numerous copies were mailed upon request to horse farmers of various breeds in the project area and state. See Appendix H.

RESULTS AND DISCUSSIONS

BMP Implementation

Composting
After pre-BMP monitoring had been completed on the tributary to Houston Creek, it was time for the old stockpiled muck to be moved. This was delayed due to a series of rain events that made it impossible to move the material. After several months, the area had dried enough to hire Hinkle Construction to move the material and place it into windrows. Windrows were allowed to set for several months to dry out enough to work the rows. The old stockpile of muck was a blot on the landscape from the roadside view and a home for critters. Snakes and mice were abundant as work was begun on these materials.

Most of the stockpile was extremely wet on the bottom, but had heated up at the top where there was some crusting. The piles were knocked down using a skid-steer loader for several reasons:

1. to help to dry out the materials
2. to make pulling debris out easier (large rock slabs, poles, boards, etc.)
3. to move the materials to a dry windrow site
RESULTS AND DISCUSSIONS (continued)
BMP Implementation (continued)

The composting method followed was the Advanced Composting System (ACS), which is a highly aerobic, controlled process for producing rapid and consistent quality. There are four key areas, according to Midwest Bio-Systems, that are essential in the compost processing and monitoring:

1) **Recipe**
   After laboratory testing of materials to be composted, a mixture, or recipe, is formulated, keeping in mind the priorities of material use at the site. The recipe needs to favor conditions for composting (carbon to nitrogen ratio of 25 to 30:1) and porosity (air space to allow natural “breathing” or exchange of gases).

2) **Aeration**
   Mechanical aeration with turning equipment is necessary to periodically provide a burst of oxygen, thoroughly blend materials and remove built-up carbon dioxide. Aeromaster Compost Equipment was used. If anaerobic processes take over, toxic compounds can develop and the end product will not be a desirable medium for plant growth.

3) **Moisture Management**
   As with an improper recipe, the compost process will temporarily stop when moisture levels are too high (above 60%) or too low (below 40%). To help assist the continuity of the process, water can be added to the windrows as they are turned with the Aeromaster Watering System. This system coats each particle evenly as it passes over the drum minimizing the amount of water necessary to add moisture and preventing runoff or pooling of water.

   To keep excess water out of the row, windrow placement on the site needs to be considered as well as the use of compost fabric row covers. Row covers allow breathing, or gases to be exchanged, but shed rain and snow off the row to prevent unwanted saturation. If water is a limiting factor, consider using a recipe additive that will add moisture, such as finished compost, or green chop.

4) **Humification**
   All activity and preparations at the compost site need to favor biological activity. The microscopic organisms undetectable to the human eye are the workforce of nature that takes decomposing materials and converts them to beneficial humus. If the environment for aerobic organisms to flourish is provided, they compost for us. Materials can be chopped and ground down to granulation so that it looks like compost, but it is not.
RESULTS AND DISCUSSIONS (continued)
BMP Implementation (continued)

The next step at Idle Hour was to assess available equipment and resources. The tractor that pulls a compost turner must be able to move very slowly—20 feet per minute, or .2 mph. This requires not just a low gear, but creeper gears or hydrostatic drive tractors. Since the farm did not have a slow enough tractor, an International Hydro 86 (65 horsepower) tractor was brought onto the site. An expensive tractor is not necessary. Other tractor requirements include, 540 PTO and two hydraulic outlets. One set for lifting the hood in and out of the row, and the other hydraulic set for raising and lowering the trailer axle for ease in maneuvering on uneven pad areas.

As water was not easily accessible at the compost site, the 1775-gallon water tank unit for the turner served as a holding tank. One load of water (1500 gallons) was brought to the project site during a three-month period and was sufficient for processing approximately 1000 cubic yards of compost.

Pan Lysimeter Row
A windrow research site was installed to collect water quality samples. Pan lysimeters were placed to collect surface and sub-surface water, both under a windrow and along side the windrow. The area was cleaned, the pans were checked for functionality and a new row was built over one set of pans. Windrow size: 10’ wide x 5’ high x 75’ long. The recipe for the lysimeter row was approximately 75% fresh horse muck and 25% partially composted muck, mixed with wet creek bottom (clay-type soil). This row was built September 27, 2001 (Table 1). See Appendix I for photo documentation provided by Midwest Bio-Systems.

| Table 1-Beginning Windrow Characteristics |
| %N (dry basis) | 1.6% |
| Ammonia        | 96  |
| Nitrites       | 2   |
| Nitrates       | 148 |
| PH             | 8.7 |
| Moisture       | 41.80% |
| Carbon to Nitrogen (C:N) | 21.9 |

Temperature and carbon dioxide readings were taken and recorded to monitor the compost process and to determine turning and moisture requirements. (Table 2)
RESULTS AND DISCUSSIONS (continued)
BMP Implementation (continued)

Table 2 – Windrow Characteristics
After 24 and 48 Hours

<table>
<thead>
<tr>
<th>Time</th>
<th>Characteristics</th>
<th>CO₂ Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 hours</td>
<td>120 degrees Fahrenheit</td>
<td>Dropped 3%</td>
</tr>
<tr>
<td></td>
<td>20% CO₂</td>
<td></td>
</tr>
<tr>
<td>48 hours</td>
<td>140 degrees Fahrenheit</td>
<td>Dropped 3%</td>
</tr>
<tr>
<td></td>
<td>12% CO₂</td>
<td></td>
</tr>
</tbody>
</table>

During the next two weeks temperatures remained between 135° and 160° (with the exception of 120° on October 4th, which was a very windy day). Water was added on October 8th and October 10th (100-200 gallons each time). It rained on October 5th and October 12th. Temperatures and CO₂ levels began to drop at about five weeks. Materials were stabilizing at about six weeks.

Another sample was pulled on October 31, 2001 for laboratory testing (Table 3).

Table 3 – Windrow Sample
After Six Weeks

<table>
<thead>
<tr>
<th>%N (dry basis)</th>
<th>1.20%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>85</td>
</tr>
<tr>
<td>Nitrites</td>
<td>0</td>
</tr>
<tr>
<td>Stable Nitrates</td>
<td>589</td>
</tr>
<tr>
<td>PH</td>
<td>7.5</td>
</tr>
<tr>
<td>Moisture</td>
<td>38.50%</td>
</tr>
<tr>
<td>Carbon to Nitrogen (C:N)</td>
<td>18.9</td>
</tr>
<tr>
<td>7-Day Germination</td>
<td>95%</td>
</tr>
<tr>
<td>Germination Vigor</td>
<td>90%</td>
</tr>
</tbody>
</table>

Materials were turned a total of 11 times during the six-week period. Raw forms of nitrogen were converted to stable, odorless nitrates bonded to carbon to resist leaching. In addition to converting the materials to a beneficial plant growth media, microbial characteristics were affected (Table 4).
RESULTS AND DISCUSSIONS (continued)
BMP Implementation (continued)

<table>
<thead>
<tr>
<th>Table 4 – Microbial Activity Before and After Composting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yeast and Mold Count *</td>
</tr>
<tr>
<td>Before Composting</td>
</tr>
<tr>
<td>After Composting</td>
</tr>
<tr>
<td>Microbe Quality and Diversity Index **</td>
</tr>
<tr>
<td>Aerobe to Anaerobe Ratio</td>
</tr>
<tr>
<td>E. coli</td>
</tr>
<tr>
<td>Salmonella</td>
</tr>
<tr>
<td>* Note significant reduction in yeast and mold counts</td>
</tr>
<tr>
<td>**Note index nearly doubled</td>
</tr>
</tbody>
</table>

The upside is that there was a significant reduction in the yeast and mold count as well as an increase in overall microbial quality and diversity. The downside is that we did not eliminate E. coli and the aerobe to anaerobe ratio narrowed. It is beneficial to combine windrows at about three weeks into the compost cycle after most of the volume shrinkage has occurred. Combining rows keeps the rows at optimum size, thereby retaining more heat, moisture and microbe activity.

The two rows of old stockpiled material had an uneven breakdown that had occurred over time during stockpiling and saturation of the materials due to their placement on the slope of the land. After the rows were windrowed, temperatures did elevate for a short period (7 to 10 days). This material was an ideal additive to the fresh muck the farm was producing to add both moisture and a foundation for humus, as well as added biological life.

Four rows were built beginning November 6, 2001, with fresh muck recently used and dumped out by the muck wagon. A skid-steer loader was used to add the partially composted, old stockpiled muck to the fresh muck at a 25% rate. Temperatures ranged from 120° to 150° for approximately three weeks and began to drop off. The size of the rows had decreased by 50% (row height less than three feet). At this point the rows were combined and as long as the materials were being moved, the direction of the rows were changed to run with the slope of the land. Temperatures elevated for another week after combining and by week six (December 19, 2001), temperatures were 90° and CO₂ was 0%. Samples were pulled and lab tested (Table 5).
RESULTS AND DISCUSSIONS (continued)
BMP Implementation (continued)

<table>
<thead>
<tr>
<th>Table 5- Final Analysis on Windrow</th>
</tr>
</thead>
<tbody>
<tr>
<td>%N (dry basis)</td>
</tr>
<tr>
<td>Ammonia</td>
</tr>
<tr>
<td>Nitrites</td>
</tr>
<tr>
<td>Stable Nitrates</td>
</tr>
<tr>
<td>PH</td>
</tr>
<tr>
<td>Moisture</td>
</tr>
<tr>
<td>Carbon to Nitrogen (C:N)</td>
</tr>
<tr>
<td>7-Day Germination</td>
</tr>
<tr>
<td>Germination Vigor</td>
</tr>
</tbody>
</table>

Test results show that composting converted the materials to a much safer and more beneficial soil amendment that will support and benefit plant growth. Disappointing news is that E. coli was not eliminated. Although, if spread on a field at 10 tons to the acre (< ¼ inch), E. coli would not survive very long due to the small particle size of compost and the thin spreading layer. Another tool in killing pathogens is combining rows. Two rows were combined at about the three-week point, moving and combining both rows onto a new pad location. This allowed us to pick up the bottom layer of the row that did not get adequate oxygen and add it to a new compost row.

See Appendix J for additional nutrient analyses on samples taken by Midwest Bio-Systems and evaluated by BBC Laboratories.

Roll Baling
Roll baling of equine waste has many beneficial factors to the horse operator. However, all of those benefits depend upon a reliable system for picking up the bales. The process for roll baling equine waste is very simple: clean the stalls and throw the soiled bedding into the aisle of the barn, then pull the roll baler through the barn. All of the technical process of on-farm composting is eliminated.

This is, however, where the roll baling process can become difficult. The farm owner/operator must determine where the roll bales will be stored. The market for the roll bales needs to be in place before the investment of the tractor and roll baler have been made. Crestwood Farm, the second roll-bale demonstration site for the project, knew they needed to make a change in their waste management system, and after analyzing several options, they chose the roll-baling method. The farm invested in a top of the line roll baler and purchased a tractor to pull the machine. Marketing the bales has been a challenge, but it has worked. The biggest risk to the landowner, is the loss of a significant portion of controlling the animal waste management system. This may change as future markets are found for the roll balcs.
RESULTS AND DISCUSSIONS (continued)
BMP Implementation (continued)

Many farmers are willing to accept this marketing risk and prefer roll baling to on-farm composting, since composting requires a commitment of time, labor and equipment expense. Farm labor for cleaning stalls is reduced significantly with the roll-baling option, and is much less demanding on farm employees. This is especially true for large horse operations that have many horses to manage. Farm managers would prefer their employees are taking care of horses rather than spending a lot of time cleaning stalls.

Some farms may prefer composting simply because they can turn a waste into a beneficial resource that can improve pasture quality and ultimately water quality. Also, the potential of compost to significantly reduce yeast and mold counts (See Table 2) might encourage horseman to learn more about this option. Both roll baling and on-farm composting have great potential for animal waste system management in the area.

Water Quality Monitoring and Well Head Protection

There were three primary objectives of the Quality Assurance Project Plan:
1) Evaluate on-farm composting of stable muck in outdoor windrows as a method of treating equine waste, 2) encourage adoption of equine waste best management practices by horse farm operators and 3) reduce pathogen and nutrient loading to receiving waters.

A demonstration farm was not found in the Royal Spring Recharge Area, a groundwater sub-basin of the project area. However, a sinkhole inventory was conducted in the area. Local governments in Georgetown and Lexington had purchased aerial orthodigital photography. The inventory was shared within the recharge area by the local governments in the Royal Spring Water Supply Protection Committee. This portion of the project was an in-kind contribution. An attempt was made to identify a sinkhole (that horse muck had been disposed into) within the project area, and complete a dye trace. A sinkhole that had been used several years ago for muck disposal was identified and the landowner was willing to allow the test. However, when the hydrology was evaluated, the predicted outlet was on another property owner. This landowner did not want the test to be completed for fear of harming the horses. It was the consensus of the committee not to pursue this component of the project.

Lab analysis on the equine waste composting in the windrows at Idle Hour Farm is reflective that on-farm composting can be an effective method of treating equine waste. Once the windrows were established, there was an obvious reduction in the volume of waste in a matter of weeks. This factor alone is of great value to horse farmers. In addition, odor and the visual appearance on the composting demonstration farms were improved.
RESULTS AND DISCUSSION (continued)
Water Quality Monitoring and Well Head Protection (continued)

There were problems associated with water quality monitoring in the pan lysimeters underneath the composting windrow. The lysimeter pans were placed so that the windrow ran against the natural slope of the land. Several members of the oversight committee made this decision. Some associated with the project now believe windrows should have been built with the slope to allow rainwater to run along the rows and off the pad. In this case, rain ran into the side of the row and under the row, building a layer of saturation and possible anaerobic activity.

Additionally, when the windrow was removed from the site, uncomposted muck was found layered in the top lip of the lysimeter pans. The lip acted like a cup and held materials that the turner could not reach to incorporate into the compost process. The two conditions will adversely affect water quality and compost quality.

A possible example of this could be seen in the lysimeter samples taken on October 26, 2001. The Fecal Coliform Counts from the surface sample were 376,000 CFU/100mL. A sample taken from the subsurface pan had Fecal Coliform Counts of 593,750 CFU/100mL.

Analytical problems were also encountered with the leaches collected from the lysimeters. The solutions were deeply colored. Some of the methods currently used by the laboratory involved colorimetric determination, and this represented serious interference. Attempts to remove color by treating with activated charcoal followed by filtration through pore size 0.45-micron membranes were unsuccessful. Time remaining in the project did not permit development and validation of alternative methods for these analytes.

Analytical work to assess water quality was provided by the Kentucky Geological Survey Laboratory Services. Microbiological work was subcontracted to the Environmental Engineering Laboratory, Department of Civil Engineering, at the University of Kentucky School of Engineering. Methodology and references for chemical analysis is detailed in Table 6. All determinations were carried out accompanied by appropriate quality control samples; QC reports are available from the Kentucky Geological Survey upon request. (See Table 6 for sampling methodology)
RESULTS AND DISCUSSION (CONTINUED)
Water Quality Monitoring and Well Head Protection (continued)

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Method</th>
<th>Preservative</th>
<th>Holding Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia-N</td>
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<td>4°C, H2SO4 to pH&lt;2</td>
<td>28 days</td>
</tr>
<tr>
<td>Kjeldahl-N</td>
<td>SW846-9056</td>
<td>4°C</td>
<td>28 days</td>
</tr>
<tr>
<td>Nitrate-N</td>
<td>SW846-9056</td>
<td>4°C</td>
<td>48 hours</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>EPA 354.1</td>
<td>4°C</td>
<td>48 hours</td>
</tr>
<tr>
<td>Orthophosphate-P</td>
<td>EPA 365.3</td>
<td>Filter, 4°C</td>
<td>48 hours</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D515</td>
<td>4°C</td>
<td>28 days</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>SW846-9060</td>
<td>4°C, H2SO4 to pH&lt;2</td>
<td>28 days</td>
</tr>
<tr>
<td>Orthophosphate-P</td>
<td>EPA 365.3</td>
<td>Filter, 4°C</td>
<td>48 hours</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D515</td>
<td>4°C</td>
<td>28 days</td>
</tr>
</tbody>
</table>

Revised November 1999

SM=Standard Methods for the Examination of Water and Wastewater.
APHA, AWWA, WEF
SW846=methods promulgated by EPA Office of Solid Wastes
ASTM=American Society for Testing Materials

As mentioned earlier in this report, sites for sample collection for baseline studies were selected along a small stream upstream and downstream of an existing muck pile at Idle Hour Farm. See Appendix K. Unfortunately, the water quality-monitoring component of this project was beset by problems throughout. Data Loggers intended to monitor rainfall and stream velocity malfunctioned, and no one was available at times for repair and maintenance.

Disruptive weather patterns caused the stream to run dry for much of the project and rendered the site inaccessible to equipment at other times. A series of storms washed out the flumes on several occasions. Consequently, conclusions drawn from the analytical data must be considered in only the broadest terms. For example, a notable increase in fecal coliform count could be due to an actual increase in microbial population, an artifact of apparent concentration due to reduced flow of water, or even an artifact of increased volume of water which resulted in ponding around the muck pile.
RESULTS AND DISCUSSIONS (continued)
Water Quality Monitoring and Well Head Protection

However, even with the challenges of monitoring the stream and analyzing the samples, the stream did show improved water quality after the muck pile was removed. The samples were tested for ammonia, nitrate nitrogen, nitrite nitrogen, total nitrogen, ortho phosphate, total phosphate, total organic matter and fecal coliform. Data is not sufficient to see how much the overall improvement in water quality of the stream was effected by change in waste management, or change in flow.

An example of this could be seen in the creek sample taken September 19, 2001. The fecal coliform counts for the downstream station were 15,281 CFU/100mL. The same station sampled on October 26, 2001 had counts of 5,855 CFU/100mL. But since the flow data could not be used, the amount of improvement is inconclusive.

See Appendix L for Water Quality Monitoring Reports prepared by the Kentucky Geological Survey for stream monitoring.

CONCLUSIONS

There were numerous accomplishments of this project and many lessons learned, both negative and positive. Perhaps one of the biggest accomplishments was the ability of so many individuals from different backgrounds and perspectives to come together and work toward a common cause. There was a true commitment from each and every oversight committee member to find alternatives to improper equine waste disposal and showcase these efforts on the demonstration farms. The project has been highlighted in written documents, photographs, and on video, and has increased awareness in the industry. Both of the roll-baling demonstration sites have made significant investments in equipment and have made long term plans to continue roll-baling muck. Three of the four on-farm composting demonstration sites plan to continue composting.

A key issue in agriculture today is sustainability. Roll baling equine waste takes a by-product from the horse industry and converts it into an inexpensive feed alternative for the cattle producer. This option decreases stall-cleaning time and may reduce labor costs to the horse operator. In addition to these benefits, this improved animal waste system should have a positive impact on water quality.

One beneficial component of composting is the reduction in volume of waste in a relatively short period of time. Composting has the ability to take a large volume of material and reduce it by significant amounts. This is an aspect that often gets overlooked. Finished compost can be a tremendous value-added product. Stockpiles can be converted to a valuable resource that has the potential to increase organic matter while improving soil fertility. This product may be marketed and sold off the farm, providing an opportunity for diversification.
CONCLUSIONS (continued)

A study is continuing at Idle Hour Farm to monitor the effect of compost on pasture quality. Samples were taken prior to spreading compost onto the fields. Midwest Bio-Systems is working with Venture Laboratories of Lexington, KY, on a microbiological analysis of pastures and the changes in the pasture after adding compost; especially as it relates to mycotoxins, yeast and molds. As outlined in Table 2 of this report, the composting process had a dramatic effect on the reduction of yeast and molds. This is directly related to pasture health, which is a major concern in the equine industry at the present time due to Mare Reproductive Loss Syndrome (MRLS). This is the name given to a phenomenon that occurred in the Bluegrass in the spring of 2001, causing early fetal loss and late term abortions.

Overall, the oversight committee and participants felt the project was a great success and made a positive impact in the region. There was disappointment that the water quality monitoring aspect faced so many obstacles, and the results came out inconclusive. However, this was overshadowed by the tremendous support the project gained by the industry and landowners. There is encouragement by their plans to continue the BMPs. All demonstration farms exceeded expectations on landowner reception of the overall project and continuing interest and participation.

Currently, the Thoroughbred RC&D Council and Midwest Bio-Systems are planning to conduct a composting workshop in the fall of 2002. There is significant interest among the equine industry, beef industry and others to attend this workshop. More than likely this would not have been planned if were not for the seeds planted by the Equine Waste BMP Demonstration Project. Many members of the project oversight committee will be involved with this workshop.
Literature Cited


*Agricultural Best Management Practices for Horse Operations in Suburban Communities*, a brochure developed by the Northern Virginia Soil and Water Conservation District, Fairfax, Virginia.


*Fabrication and Installation Procedures for Lysimeters and Tipping Bucket Studies*, developed by Dr. Richard Warner in association with Francis Camargo, P.E., Eric Dewalt, P.E. and Jim Wilson, Biosystems in Agricultural Engineering, University of Kentucky, Lexington, Kentucky.


*Soil Survey of Anderson and Franklin Counties, Kentucky*, H McDonald, D. Keltner, P. Wood, B. Waters, O. Whitaker, Issued 1982, United States Department of Agriculture, Soil Conservation Service (Natural Resources Conservation Service), in cooperation with the Kentucky Department for Natural Resources and Environmental Protection Cabinet and Agricultural Experiment Station.
Literature Cited (continued)

*Soil Survey of Bourbon and Nicholas Counties, Kentucky,* A. Richardson, R. Forsythe, H. Odor, Issued 1977, United States Department of Agriculture, Soil Conservation Service (Natural Resources Conservation Service), in cooperation with Kentucky Department for Natural Resources and Environmental Protection and Kentucky Agricultural Experiment Station.

*Soil Survey of Fayette County, Kentucky,* R. Sims, D. Preston, A. Richardson, J. Newton, D. Isgrig, R. Blevins, Issued 1968, United States Department of Agriculture, Soil Conservation Service (Natural Resources Conservation Service), in cooperation with the Kentucky Agricultural Experiment Station.

*Soil Survey of Jessamine and Woodford Counties, Kentucky,* H. McDonald, R. Sims, D. Isgrig, R. Blevins, Issued 1983, United States Department of Agriculture, Soil Conservation Service (Natural Resources Conservation Service), in cooperation with the Kentucky Agricultural Experiment Station and the Kentucky Department for Natural Resources and Environmental Protection.

*Soil Survey of Scott County, Kentucky,* B. Weisenberger, D. Isgrig, Issued 1977, United States Department of Agriculture, Soil Conservation Service (Natural Resources Conservation Service), in cooperation with the Kentucky Agricultural Experiment Station.

Equine Waste BMP Demonstration Project

Appendix A

Financial & Administrative Close-out
Project Outputs:

- Develop and submit for DOW approval a Quality Assurance Monitoring Plan for nonpoint source water quality monitoring. *The QA/QC was developed and approval was granted in spring of 1996.*

- Inventory sinkholes and produce four maps utilizing digital orthophotography for the Royal Spring recharge area. *Completed in March of 1998. Local governments purchased digital orthophotography and identified sinkholes in the Royal Springs recharge area. The Royal Springs Water Supply Protection Committee utilizes information.*

- Develop four BMP demonstration sites implementing equine waste management Best Management Practices (BMPs). Two sites shall demonstrate application of new technology (baling) in packaging stable muck for off-farm disposal or recycling. Two sites shall demonstrate on-farm composting for stable muck material. *The Thoroughbred RC&D Council made a request and received permission to increase demonstration sites from four to six sites. By the end of December 2001 all six demonstrations had been successfully completed (four composting and two baling).*

- Conduct water quality monitoring in accordance with approved Quality Assurance Monitoring Plan. *The Thoroughbred RC&D Council coordinated with the University of Kentucky Agricultural Engineering Department and the KY Geological Survey in completing the water quality monitoring component of the project. Both institutions followed the guidelines of the QA/QC and monitoring was completed in December of 2001.*

- Conduct two field days (one each year) to transfer ideas and technology to farm operators in the region. *Three field days were held, one in 1998 at Airdrie Stud, 2000 at the Witt and Bell Farms and 2001 at Idle Hour Farm.*

- Prepare and submit for DOW review and approval three informational articles for distribution to targeted audience through industry magazines and newsletters. *Numerous articles were printed in local conservation district newsletters, Thoroughbred RC&D Newsletter, local and regional newspapers and trade magazines like the Thoroughbred Times and The Blood-Horse. Reporters wrote many of the articles and we did not get an opportunity for internal review. Articles written in house were submitted for approval.*

- Hold two community meetings for public awareness and education related to water quality, nonpoint source pollution and equine waste BMPs. *Several meetings were held in the beginning of the project with industry leaders, farm owners/managers of potential demonstration farms and the RC&D Council to discuss the issues. Thoroughbred RC&D Council representatives attended many community meetings across the region to make people aware of the project, it was discussed at the KY Thoroughbred Farm Manager Club meetings and project videos were provided to those in attendance. The KY Thoroughbred Association and KY Thoroughbred Farm Managers Club included information on water quality and equine waste management in their newsletters.*
- Display of Equine Waste BMP Demonstration Project. *A display of the project was made and highlighted at the KY Division of Water Nonpoint Source Conference in 2000.*

- Develop public information video of Equine Waste BMP Demonstration Project and submit draft script to DOW for review and approval. *A public information video of the project was produced and the draft script was submitted to the KY DOW for approval. After approval of DOW the video was finalized and mass-produced in 2001.*

The following is a list of successes from this project that were “above and beyond” the original project objectives. These in particular serve to emphasize that this project was indeed highly successful.

- More than 500 copies of the video were distributed to horse industry operations in the area.
- The addition of two demonstration sites provided more even spatial distribution of the demonstrations across the 5-county project area. This spatial distribution enabled the project to better reach the intended audience.
- An extra field day was held which increased time span of the public outreach and contributed to the success of the project.
- During the course of this project, Keeneland Race Course (a historic race track located in Lexington, KY) made a significant financial investment in their horse muck handling systems by installing a biofermentation facility.
- Keeneland Race Course has conducted public demonstrations of their biofermentation facility and allowed the opportunity for additional public outreach by including information on this Equine Waste project in several of their field days.
- This project received publicity from outside sources that were in addition to the outreach component of the project. Several articles on the project were written by reporters for publications specializing in the horse industry. Therefore, the project was publicized to the target audience in a manner unavailable to the implementers of the project.
- The company from which the composting equipment was leased, Midwest Bio-Systems (MBS), relocated a technical specialist to the area as a result of interest in composting generated by this project. Although the company’s interest is profit-driven, their continued presence in the area is expected to result in the continuation of the objectives of this project.
- During this project a project cooperator, Creech Services, started a new business as a separate location for large scale composting.
- As a result of this project, both of the horse operations involved in the roll-baling demonstrations have made significant investments in equipment and have made long term plans to continue roll-baling muck.
- As a result of this project, three of the four on-farm composting demonstration sites plan to continue composting.
- The results of this project have spurred research by the University of Kentucky into the benefits of applying compost to horse pastures. Positive results from this research will help turn the attitude of the horse industry from viewing horse muck as a waste to viewing it as a valuable nutrient source. This attitude change, in addition to increased emphasis in the state on proper nutrient management, should result in the beneficial reuse of horse muck in a manner that will reduce even further the potential of water pollution from muck disposal practices.
### ORIGINAL BUDGET - Equine Waste BMP Demonstration Project

<table>
<thead>
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<th>Category</th>
<th>319(h)</th>
<th>Non-federal Match</th>
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</tr>
</thead>
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<td>Total:</td>
<td>123,250.00</td>
<td>82,167.00</td>
<td>205,417.00</td>
</tr>
</tbody>
</table>

* Increased because we increased number of demonstration sites from 4 to 6, and cost were under estimated.

** Reduced due to delays in site preparation, equipment problems and drought.

*** Reduced because the RCD Coordinator was project coordinator (federal employee) was not paid by project funds.
Budget Narrative:

Thoroughbred Resource Conservation and Development Council, Inc. was reimbursed $123,250. All dollars were spent; there were no excess project funds to reallocate. This project did generate overmatch provided by Thoroughbred Resource Conservation and Development Council, Inc. This overmatch was not posted to the Grant.

As noted on the Revised Budget for the Equine Waste BMP Demonstration Project, final expenditures were different than the proposed budget. The most significant change was in the *BMP Implementation* category. This figure increased because the number of demonstration sites increased from four to six, and the cost to implement demonstrations at the six farms was underestimated. This figure rose for both the federal and in-kind match. Final expenditures were $223,780.69; this includes cost for equipment rental, farm labor and implementation. The positive side to this is that the majority of the demonstration sites plan to continue their methods of waste disposal. It is important to note that equipment and the associated technical assistance was brought in from out of the region. As a direct result of the composting component Midwest Bio-Systems has relocated a field representative to our area (Georgetown, KY). The Thoroughbred RC&D Council was granted permission to purchase a used Wildcat compost turner to help implement the project. The machine, an older model, was an effective tool in implementing the project, especially in the beginning when there was not a comparable piece of equipment available in the area. Once the project is closed out, the Thoroughbred RC&D Council would like to retain the machine to help promote the growing interest in on-farm composting in the region. The Thoroughbred RC&D Council purchased a used Wildcat compost turner in November of 1997, from a local farmer in Bourbon County. The purchase price was $2,500.

One other piece of equipment was purchased with project funds. The council bought a thermometer to measure temperatures in the compost windrows. The thermometer was purchased from Forestry Supplies, Inc., in July of 1998, for $92.57. None of the equipment purchased has a current fair market value exceeding $5,000.

Final expenditures for *Water Quality Monitoring* were $18,084.85, this cost was reduced because the total number of samples taken for pre-BMP monitoring was less than planned, primarily due to a drought. In addition, equipment could not move the stockpiled muck after pre-BMP monitoring concluded because the area stayed wet for a long period of time. This delayed post-BMP monitoring and reduced the number of samples taken. The council adhered to the special grant condition placed on the project by not incurring any costs on the project until the QA/QC Plan was approved. See Appendix B.

Total *Project Management* expenditures were $35,214.53, somewhat less than planned. The majority of the funds were used to pay the two project assistants that played an integral role in implementing the project. Assistants helped with BMP Implementation, water quality monitoring (taking samples and delivering them to the lab), preparing mailings and planning field days.
Public Information and Wellhead Protection were less than budgeted, $7,276.27 and $12,494.00 respectively. The cost to complete these items was over-estimated in the budget. Final costs for Public Education was slightly more at $5,683.82, but more field days were held than planned and two brochures were produced.

The Thoroughbred RC&D Council is continuing to see the interest generated by the project, and expects to see an increase in the number of farms using on-farm composting and roll baling equine waste. The council plans to co-sponsor a composting workshop with Midwest Bio-Systems in the fall of 2002.

Equipment Purchased

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None of the equipment purchased has a per-unit fair market value exceeding $5,000.

Special Grant Conditions

The following special grant condition was placed on this project: “The contractor will not incur any costs on this competitive program project until a QA/QC Plan has been approved.” This grant condition was met. (see Appendix B)
Equine Waste BMP Demonstration Project

Appendix B

QA/QC for Water Monitoring
EQUINE WASTE BMP DEMONSTRATION PROJECT
QUALITY ASSURANCE PROJECT PLAN

1. Title Section

(a) Full project name: Equine Waste BMP Demonstration Project

(b) QAPjP preparer and agency: Dan Logan - Elkhorn Inter-County Consortium
    Douglas Hines - USDA Natural Resources
    Conservation Service
    Dr. Matthew Byers - Kentucky State University
    Dr. Richard Warner - University of Kentucky

(c) Federal funding agencies and program: USEPA, Section 319 of the CWA, fiscal year
    funding requested FY-95

(d) Date QAPjP written: February 13, 1995

(e) Name and date of the agency's most recent EPA approved Quality Assurance Program
    Plan: Kentucky State University - QA/QC Standard Operating Procedures

2. Project Description

Project objectives are:
1. Evaluate on-farm composting of stable muck in outdoor windrows as a method of
   treating equine waste
2. Encourage adoption of equine waste best management practices by horse farm
   operators.
3. Reduce pathogen and nutrient loading to receiving waters.

The project will generate nutrient and pathogen yield information for current and proposed
alternative equine waste management systems. These data will be used to assess the
effectiveness of proposed alternative systems in reducing nonpoint source pollution.
Complete details of the project are in the accompanying workplan.

3. Technical Design

Water Quality Monitoring To Be Implemented

Water quality monitoring will be of upstream-downstream design, measuring chemical,
physical, and biological parameters. In addition, chemical, physical, and biological
parameters will be monitored to evaluate leachate from BMP compost sites.
Monitoring for this project effort will address three objectives. First, to document
effectiveness of new and innovative equine waste BMPs on the receiving surface waters of
the Houston Creek Watershed. Secondly, to document effectiveness of new and innovative
equine waste BMPs on the receiving groundwaters of the project area. Finally, to evaluate the influence of composting equine waste in outdoor windrows upon the vadose zone and upon surface runoff water quality.

Corresponding land use data will be collected in order to interpret monitoring results. This data will include watershed land use (i.e. cropland, pastureland, etc.), as well as farm specific information (i.e. number of horses, lbs. animal waste, etc.). Watershed land use will be characterized on an annual basis using USDA information. Farm specific information will be collected on an annual basis through farm surveys.

Monitoring Program Elements - Receiving Waters

Monitoring of surface waters will focus on change in water quality in Houston Creek. Sampling stations will be located upstream and downstream for one BMP Demonstration Site. Monitoring of groundwater will be conducted at one additional site from a spring (which has been correlated, through fluorescein dye tracing, to sinkholes being used for stable muck disposal).

1) Chemical/Physical - Each of the three stations (two stream, one spring) will be sampled 6 times each quarter for one year prior to BMP implementation and one year following BMP implementation for each of the following: TKN-nitrogen, NO2-NO3, and total phosphorus.

2) Biological - Each of the three stations will be sampled 6 times each quarter for one year prior to BMP implementation and one year following implementation for fecal coliform.

Monitoring Program Elements - Leachate and Surface Runoff from Compost Windrows

Monitoring of leachate and surface runoff will be conducted at the two On-farm Composting Demonstration Sites.

1) Chemical/Physical - Each of the two stations will be sampled 3 times each quarter for one year for the following: TKN-nitrogen, NO2-NO3, NH3, total phosphorus, orthophosphate, BOD, and TOC.

2) Biological - Each of the two stations will be sampled 3 times each quarter for one year for fecal coliform.

The composting sites will be protected from surface water runoff from upslope. Three pan lysimeters will be used at each composting site. In addition, a tipping bucket will be used at each site to sample surface runoff. Samples will be obtained following storm events.

Monitoring activities will conform to EPA approved QA/QC Standard Operating Procedures.
4. Project Organization and Responsibility

P.I. Dan Logan
Elkhorn Inter-County Consortium
Elkhorn Creek Watershed
Georgetown, Kentucky

Co-P.I. Dr. Matthew Byers
Water Quality/Environmental Toxicology Project
Kentucky State University

Co P.I. Dr. Richard Warner
Department of Agricultural Engineering
University of Kentucky

Co P.I. Douglas Hines
USDA Natural Resources Conservation Service
Cynthiana, Kentucky

Technical Support
William Bailey USDA Natural Resources Conservation Service
Georgetown, Kentucky

Charles Farmer USDA Natural Resources Conservation Service
Lexington, Kentucky

Gary McFarland USDA Natural Resources Conservation Service
Paris, Kentucky

Randal Rock USDA Natural Resources Conservation Service
Versailles, Kentucky

Field Sampling Supervisor: Frank S. Young III Kentucky State University
Frankfort, Kentucky

Laboratory analysis will be performed by the Kentucky State University water quality laboratory.

5. Project Schedule

Detailed project schedule is found in the accompanying work plan. Sample collection will begin December 1995 and continue through December 1997.
### 6. Field Sampling Table

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* Sampling times will be based on natural rainfall events.
Y denotes yes
L denotes liter(s)

Note: Maximum sample holding time for all analyses will be six hours.
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* Sampling times will be based on natural rainfall events.
* Y denotes yes
* L denotes liter(s)

Note: Maximum sample holding time for all analyses will be six hours.

KEY:
- **TKN** : Total Kjeldhal Nitrogen
- **NO2-NO3** : Nitrite - Nitrate
- **NH3** : Ammonia
- **TP** : Total Phosphorus
- **OP** : Ortho-phosphate
- **BOD** : Biochemical Oxygen Demand
- **TOC** : Total Organic Carbon
- **FC** : Fecal Coliform

7. Sampling Procedures and Chain of Custody

Upstream, downstream, spring location, surface runoff and lysimeters will be sampled according to matrix (see section 6). Instream samples will be collected according to cross sectional area of stream, will be taken upstream from sampler, will be taken in three replicates per sampling. Spring samples will be taken as close to spring headwater source as possible, will be sampled in triplicate and combined to create a representative total 1-liter sample. Infiltration samples will be collected in 0.37-m² stainless steel pan lysimeters. Lysimeters will be constructed and installed by University of Kentucky Dept. of Agricultural Engineering. Lysimeters will acclimate for six months prior to sample collection. Runoff
will be measured and collected using custom built tipping bucket samplers which have been designed and built by R. Warner, University of Kentucky (Byers et al. 1994). Runoff will be directed into tipping buckets using portable stainless steel wire materials. Samples (1-liter) will be taken and all chain of custody documentation will be kept.

All samples will be collected by NRCS and Elkorn Consortium personnel and will be transported to the lab within six hours of sampling. All samples will be transported on ice and analyzed immediately. All laboratory tests will be conducted at KSU water quality laboratory with sampler name, sample site location, time taken, date and time lab received, and sample code recorded. Samples (biological and chemical) will be collected in autoclaved HDPE (Nalgene Company - APHA 1992, Section1060B), 1-l bottles, pre-cleaned with phosphate free, nitrate free, detergent (Contrad 70, CM Scientific), rinsed with distilled water (three times), acid washed (0.25-N HCL), and finally rinsed three times with glass distilled water unless otherwise stated. For instream measurements, field tests such as pH, temperature, and dissolved oxygen will be measured in triplicate by sampling personnel, and measurements will be recorded on each individual sample's data sheet.

8. Analytical Procedures

For this horsemuck impact study, the KSU Lab will perform the following tests; nitrate (ppm-NO3-N, Method 4500-NO3 E, Standard Methods, Cadmium Reduction, as well as splitting samples and confirming using selective ion electrode, 4500-NO3-D Method, Standard Method), pH (Method 4500-H+ Electrometric Method, standard Methods), ammonia (ppm-NH3-N, Method 4500-NH3F, Standard Methods, Selective Ion Electrode), fecal coliform bacterial analysis (Membrane Filter Method of the Coliform Group, Method 9222 and 9222B, Standard Methods - APHA, 1992), ortho-phosphate (total reactive) and total phosphorus (glass sampling vessels in ppm-PO4-P, Method 4500-P E. Standard Methods, and 4500-P B persulfate digestion for total phosphorus), biochemical oxygen demand for leachate and runoff only (Standard Method 5210B). Total organic carbon samples will be preserved by adjusting the pH to 2. TOC will be determined at University of Kentucky Department of Agronomy using complete oxidation to CO2 and infrared detection (Standard Method 5310B). All other samples taken will be analyzed the day of sampling, within six hours of sampling time, therefore no preservatives will be necessary. Samples at KSU are analyzed in triplicate, and a coefficient of variability (CV) of 5% is an acceptable level of variation for three analyses of subsamples. For all analyses listed to be done at KSU, standard curves are generated daily, and instruments calibrated with each use. In the field, dissolved oxygen (YSI Model 51B DO Meter with YSI 5700 Probe), temperature of water, and pH will be monitored in triplicate. Meteorological parameters will be included in the analysis including rainfall quantity and air temperature at time of sampling. On site rainfall data may be collected by cooperators.

REFERENCES

9. Quality Control Procedures

All samples will be subjected to Quality Control procedures. For all field collected samples, chain of custody procedures will be observed. Samples will collected in approved, clean containers. All samples will be subjected to laboratory subsampling, and triplicate analyses. For this project, the data are acceptable if recoveries of triplicate analyses fall between 95% and 105% of each other. The use of known additions (laboratory spikes) (10% of samples) will be done as appropriate during the analysis time, to be certain calibration has been maintained. For this project, the data are acceptable if recoveries of spiked samples fall between 95% and 105%. All analyses will be subjected to rigorous calibration of instruments and only slopes within 5% of the acceptable level will be tolerated. Fecal coliform bacteria will be analyzed using a series of dilutions and laboratory blanks.

The use of distilled water field blanks will be done at a rate of a single sample per sampling time. These will be tested among samples and results complied. Concentrations of nutrients in field blanks exceeding 2% of determined levels in samples will negate that sampling time and trouble shooting will be done to determine source of contamination. Quality of distilled water will be determined with each use by pre-testing conductivity (>0.5 micro-ohms resistance) and pH (5.5-7.5).

References


10. Project Fiscal Information — Optional
Equine Waste BMP Demonstration Project

Appendix C

Map of Project Area
Equine Waste BMP Demonstration Project

Appendix D

Sample of Oversight Committee Meeting Notices, Agendas and Minutes
EQUINE WASTE DEMO PROJECT
CONTACT LIST

Gary McFarland
District Conservationist
Bourbon County
(606) 987-2311

Donald Mitchell
Chm, Woodford Co. Consv. Dist.
(606) 873-4941

Don Werner
Franklin Co. Solid Waste Coordinator
(502) 875-8751

John Heick
Chm, Bourbon Co. Consv. District
(606) 987-2311

Wendy Romain
Division of Water
(502) 564-3410

Michael Duckworth
Chm, Thoroughbred RC&D Council
(606) 873-8936

Dr. George Antonious
Kentucky State University
(502) 227-6253

Robert Barton
Chm, Fayette County Consv. District
(606) 233-2761

Charles Farmer
District Conservationist
Fayette County
(606) 233-2761

Bill Bailey
District Conservationist
Scott County
(502) 863-2466

J. R. Williamson
Scott Co. Solid Waste Coordinator
(502) 867-3705

Alvin Bogie
Chm, Franklin Co. Consv. District
(502) 223-2024

Randall Rock
District Conservationist
Woodford County
(606) 873-4041

Steve Coleman/Chalky Vaughn
Division of Conservation
(502) 564-3080

Tom Leith
Coordinator
Licking River Valley RC&D
(606) 234-3352

James Marcum
District Conservationist
Franklin County
(502) 223-2024
Fred Neville
Chm, Scott Co. Consv. District
(502) 863-2466

Dr. Richard Warner
University of Kentucky
(606) 257-3000 Ext. 217

David Stipes
NRCS State Agronomist
(606) 224-7392

Douglas Hines
NRCS Soil and Water Resource Specialist
(606) 223-3364

Maner Ferguson
Fayette County CES
(606) 257-5582

Bill Waits
NRCS State Economist
(606) 224-7350

Davant Latham, Manager
Vinery Farm
(606) 846-5214

John Nicholson, Executive Director
Kentucky Horse Park
(606) 259-4201

Carolyn Oldfield, Coordinator
Thoroughbred RC&D Council, Inc.
(502) 863-6010

Jim Rehmann
Senior Environmentalist
LFUCG
(606) 258-3175

Cy Brown
Woodford Co. Solid Waste Coordinator
(606) 873-0660

Valarie C. Tipton
Bourbon Co. Consv. District
(606) 987-2311

Glen Abney
NRCS Agronomist
(606) 987-1279

David Neely
NRCS Civil Engineer
(606) 224-7386

Tim Thornton, Manager
Airdrie Stud
(606) 873-7270

David E. Hager, II, Owner/Manager
Idle Hour Farm
(606) 987-1392

Jamshid Baradar, Engineer
Kentucky Horse Park
(606) 233-4303
DATE: August 08, 1996

TO: Equine Waste BMP Demonstration Project
    Oversite Committee Members

FROM: Carolyn J. Oldfield,
     Project Coordinator

RE: Oversite Committee Meeting

The next scheduled Oversite Committee Meeting will be held
August 19, 1996, at 9:00 a.m., in the Fayette County Cooperative
Extension Service Building.

The following items will be discussed:
1. Minutes
2. Overview of Project
3. Review Memorandum of Agreement
4. Discuss potential demonstration sites
5. Education Information (Video)
6. Monitoring
7. Develop Action Plan
8. Any other business that needs discussing...

If you are unable to attend this meeting, contact me at
(502) 868-0298.

Carolyn J. Oldfield,
Project Coordinator

ckk

Attachments: 2
Minutes
Equine Waste BPM
Demonstration Project
Oversight Committee Meeting

An organizational meeting of the oversight committee was held July 17, 1996 at 1:00 P.M. in the Fayette Cooperative Extension Service Building.

Those in attendance were as follows:

Tom Leith, Coordinator, Licking River Valley RC&D Council, Inc.  
Douglas Hines, Soil and Water Resources Specialist, NRCS  
Charles Farmer, District Conservationist, NRCS Fayette Co.  
Gary McFarland, District Conservationist, NRCS Bourbon Co.  
Randal Rock, District Conservationist, NRCS Wooford Co.  
Carolyn Oldfield, Coordinator, Thoroughbred RC&D Council, Inc.  
Dr. Matthew Byers, Principal Investigator for Water Quality, KSU-CRS-USDA  
Jimmy Marcum, District Conservationist, NRCS Franklin Co.  
Dr. Dometrio Zourarakis, Senior Soil Scientist, DOC  
Bill Bailey, District Conservationist, NRCS Scott Co.  
J.R. Williamson, Solid Waste Coordinator, Scott Co. Govt.  
and a member of Thoroughbred RC&D Council, Inc.  
John Heick, Chairman, Bourbon Co. Conservation District  
and a member of Licking River Valley RC&D Council, Inc.  
Fred Neuville, Chairman, Scott Co. Conservation District  
Don Werner, Fiscal Court, Franklin Co. and Elkhorn  
Inter-County Consortium

After the introductions of those present, Douglas Hines reviewed the components of the Equine Waste proposal. He explained that two primary Best Management Practices (BMP'S) would be demonstrated to provide alternatives for practical, effective, and affordable waste management. Those two alternatives are onsite composting and roll baling the muck to move offsite. Douglas also shared with the committee, a video on tractor mounted compost equipment.

Mr. Hines then explained to the group that the Elkhorn Inter-County Consortium had requested that the Thoroughbred RC&D Council, Inc. serve as the contractor for the project. He stated that the Thoroughbred RC&D Council, Inc. had voted and approved this request at their May meeting. The oversight committee concurred with this decision.

The oversight committee asked Carolyn Oldfield (Thoroughbred RC&D Council, Coordinator) to serve as project coordinator. Valerie Tipton, Conservation Technician, with the Bourbon County Conservation District, will be asked to serve as the project technical assistant.

The Thoroughbred RC&D Council, Inc. will need to request, from the Bourbon County Conservation District, Valerie's assistance.

The group determined that the oversight committee needed representation from the Thoroughbred Industry, Carolyn Oldfield, Project Coordinator, will contact the appropriate representatives. She will also schedule the next oversight committee meeting and determine agenda items.

Meeting Adjourned.
EQUINE WASTE BMP
DEMONSTRATION PROJECT
OVERSIGHT COMMITTEE MEETING

Minutes

The second meeting of the Oversight Committee was held August 8, 1996 at 9:00 a.m. in the Fayette County Cooperative Extension Service Building.

Those in attendance were as follows:

Charles Farmer, District Conservationist, NRCS, Fayette Co.
Maner Ferguson, Agriculture Agent, CES, Fayette Co.
Douglas Hines, Soil and Water Resources Specialist, NRCS
Tom Leith, Coordinator, Licking River Valley RC&D Council, Inc.
Jimmy Marcum, District Conservationist, NRCS, Franklin Co.
Martha Newby, District Administrative Secretary, Woodford Co.
Carolyn Oldfield, Coordinator, Thoroughbred RC&D Council, Inc.
David Switzer, Executive Director, Kentucky Thoroughbred Association
Valarie Tipton, Conservation Technician, Bourbon Conservation District
J. R. Williamson, Solid Waste Coordinator, Scott Fiscal Court

After brief introductions, Carolyn Oldfield, Project Coordinator, reviewed the Memorandum of Agreement, made between the Kentucky Natural Resources and Environmental Protection Cabinet, The Division of Conservation and the Thoroughbred Resource Conservation and Development Council, Inc. The Memorandum of Understanding outlined the description and delivery of the project, the plan of work, and the specific outputs that would be required to carry out the project.

Valarie Tipton was introduced to the committee. She will serve as the project technical assistant. Valarie is a Conservation Technician with the Bourbon Conservation District and is familiar with the Houston Creek Watershed. Tom Leith, Doug Hines, Carolyn Oldfield and Valarie will meet in September to discuss implementation of the project and the specific requirements that would need to be carried out.

Carolyn Oldfield gave each committee member a copy of the Equine Waste BMP Demonstration Project Brochure. She explained that the brochure will be updated soon. David Switzer stated that the Kentucky Thoroughbred Association would mail the brochure after the revisions had been made and the demonstration sites selected. Mr. Switzer requested that he have an active role in demonstration site selection; the committee agreed and felt his input was needed to implement the project. He also asked that Carolyn Oldfield send him the criteria for site selection.
The committee determined that a representative from the Kentucky Thoroughbred Farm Managers' Club should be asked to serve on the committee. Carolyn said she would contact Neil Howard, President of the organization, and extend the invitation.

Tom Leith will be researching the production of the video for the project.

J. R. Williamson pointed out to the committee that the sinkhole evaluation in the Royal Spring Recharge Area might be done in conjunction with existing efforts by the Royal Spring Water Supply Protection Committee in accordance with the Wellhead Protection Act.

The committee also needs to contact Mac Stone at Kentucky State University for his input on composting.

Carolyn Oldfield will keep the committee informed as needed, and will schedule the next oversight committee meeting when necessary.

Meeting adjourned at 11:30 a.m.
AGENDA
EQUINE WASTE DEMO PROJECT
AUGUST 7, 1997
1:00 PM

Welcome and Introductions.................................Carolyn Oldfield

Demonstration Site Selection Process
and Overview of Sites Selected.............................Carolyn Oldfield

Discuss Project Outputs (See p. 3-4 of MOA).............Committee

1. Quality Assurance Monitoring Plan..................Complete
2. ID Sinkholes/Produce Maps
   Utilizing Digital Ortho Photo for
   the Royal Spring Recharge Area......................Jim Rebmann
   Charles Farmer
3. Develop Four BMP Demo Sites.........................Committee
4. Conduct Water Quality Monitoring..................Dr. George Antonious
   Dr. Richard Warner
5. Conduct Two Field Days...............................Committee
6. Informational Articles...............................Carolyn Oldfield
   David Switzer
7. Community Meetings................................Carolyn Oldfield.
   David Switzer
8. Display of Project..................................Committee
9. Public Information Video............................Tom Leith

Equipment Update.........................................Gary McFarland
.................................................................Valerie Tipton

Project Time Schedule....................................Carolyn Oldfield

* NOTE: The Current MOA States That The Effective Period
is May 1, 1996-------April 30, 1999.

Establish Work Assignments and Sub-Committees.........Committee
Minutes

EQUINE WASTE
DEMO PROJECT

An Oversight Committee Meeting for the Equine Waste Demonstration Project was held August 7, 1997 at 1:00 p.m. in the John R. Gaines Room at the KY Horse Park. Those in attendance were:

Charles Farmer, District Conservationist, NRCS, Fayette Co.
Douglas Hines, Soil and Water Resources Specialist, NRCS
Tom Leith, Coordinator, Licking River Valley RC&D Council, Inc.
Dr. George Antonious, CO-Investigator-Water Quality-KSU
Carolyn Oldfield, Coordinator, Thoroughbred RC&D Council, Inc.
Valarie Tipton, Conservation Technician, Bourbon Conservation District
J. R. Williamson, Solid Waste Coordinator, Scott Fiscal Court
Don Werner, Solid Waste Coordinator, Franklin Fiscal Court
Sharon Flynt, Scott Co. Conservation District Water Quality Specialist Tech.
Jim Rebmann, LFUCG, Sr. Environmental Planner
Bill Bailey, District Conservationist, NRCS, Scott Co.
David Neely, Civil Engineer, NRCS, KY
Wendy Romain, Environmental Technologist, KY Division of Water
Bill Waits, State Economist, NRCS, KY
Frank Young, Research Assistant-Water Quality, KSU

Note: Prior to the oversight committee meeting, some of the committee had visited Idle Hour Farm and met with David Hager, Owner/Manager. After leaving Idle Hour Farm we met with John Nicholson, Executive Director and Jamshid Baradaran, Engineer with the KY Horse Park. Members of the committee had already visited the Vineyard Farm and Airdrie Stud on July 17, 1997 for a site review.

After a welcome and brief introductions, Carolyn Oldfield, Project Coordinator, called the meeting to order. Dr. George Antonious was introduced to the committee. He will be taking Dr. Matthew E. Byers’s place on the committee. Dr. Byers has taken a new position with Zoeller Pump Co. in Louisville, KY.

Copies of the Memorandum of Agreement between the Kentucky Natural Resources and Environmental Protection Cabinet, Division of Conservation and the Thoroughbred Resource Conservation and Development Council, Inc. were distributed to those who did not have a copy, along with other relevant handouts.

The committee then discussed the demonstration site selection process. It was noted that David Switzer, Executive Director with the Kentucky Thoroughbred Association (KTA)
had been instrumental in finding the demonstration sites. Due to various reasons, demonstration sites could not be found in the Houston Creek watershed as the MOA had outlined. However, there was interest from farms outside of the Houston Creek Watershed. After a thorough search for sites in the Houston Creek Watershed the committee requested permission from the KY Division of Conservation (DOC) and the KY Division of Water (DOW) to extend the project boundary to include not only Houston Creek Watershed, but all of Bourbon, Fayette, Woodford, and a portion of Scott and Franklin Counties. After DOC and DOW carefully reviewed the status of the project and the MOA, they granted permission to extend the boundary. The request was granted pending that at least one site be in the Houston Creek Watershed.

The Committee had met in June with the farms that were interested in participating in the project to explain to them the purpose and details of the project. Those farms were: Idle Hour Farm (Houston Creek Watershed in Bourbon County), Vinery, Three Chimneys and Airdrie Stud (South Elkhorn Creek Watershed in Woodford County) and the KY Horse Park (Cane Run Watershed and Royal Spring recharge area in Fayette County).

Discussion then moved to the nine required project outputs.

1. Quality Assurance Monitoring Plan ..........complete

2. ID Sinkholes/Produce Maps Utilizing Digital Ortho Photography for the Royal Spring Recharge Area ..........Jim Rebmann and Charles Farmer reported that Fayette County is covered for the Digital Ortho Photography (DOQ). NRCS has worked on this and the DOQ’s should be back from Ft. Worth in 8-12 weeks. Lexington-Fayette Urban County Government (LFUCG) should have maps in a couple of months. LFUCG’s portion will be used as inkind match. J. R. Williamson and Bill Bailey will assist with this effort for the Scott County portion.

3. Develop Four BMP Demo Sites ..........As noted above, the following farms along with the KY Horse Park are willing to be demonstration sites and participate in the project: Idle Hour Farm, Vinery and Airdrie Stud. These sites will be demonstrating onsite composting. Permission was requested from DOC and DOW to increase the number of sites from four to six, the committee felt this could be done while meeting our budget since there were several places where we could see a savings. The committee will need to identify two sites that will demonstrate roll baling. Jim Rebmann noted that in Fayette County, there is a provision for the conditional use of composting. The committee does not foresee any problems with this provision and the project.

4. Conduct Water Quality Monitoring.........Dr. George Antonious with Kentucky State University and Dr. Richard Warner with the University of Kentucky will be responsible for the water quality monitoring. They will be getting together to finalize responsibilities, develop a MOA between each university and
the Thoroughbred RC&D Council, Inc., and to discuss budget requirements. A specific plan will be developed outlining the sampling schedule as to who, when and where the sample will be taken and delivered to the lab for sampling. It was noted that Idle Hour Farm in the Houston Creek Watershed is willing to be the site that will conduct water quality monitoring one year prior to changing management.

5. Conduct Two Field Days........At least two field days will be conducted. It is understood that if the number of demonstration sites increase, the number of field days may increase as well.

6. Informational Articles........All articles must be approved by the DOC and the DOW before they are published. Wendy Romain said that they would try to move the articles through the system as soon as possible. David Switzer, Executive Director with KTA, has been asked to serve as the spokesperson for the project, this will ensure continuity as we talk about the project.

7. Community Meetings..........Meetings will be held to discuss the project. The committee may also speak to various groups representing the industry.

8. Display of Project..........A display will be developed as the project progresses reflecting the milestones of the project.

9. Public Information Video........Tom Leith, Coordinator for the Licking River Valley RC&D Council, Inc. will be responsible for producing the video. The video will be at least 5 minutes long and at least 30 copies will be made.

The committee discussed the equipment requirements for the project. The MOA had outlined in the budget $19,113.00 to rent two compost windrowers. Gary McFarland, District Conservationist in Bourbon County, had identified a used compost windrower that was for sale. It has been inspected by some members of the committee and is in good condition. The DOC and the DOW felt it would be O.K. to allow the purchase of this piece of equipment with project funds, since a new windrower costs approximately $20,000.00. Overall, the committee expects to see a savings in the equipment portion of the budget.

It was noted that the MOA states the effective period for the project as May 1, 1996-April 30, 1999. The committee should not expect any problems with the timeline and extensions may be requested.

Bill Waits, State Economist with the Natural Resources Conservation Service (NRCS), will be providing a cost-benefit analysis of composting for the project as well as additional analyses. David Neely, Engineer with NRCS, will be available for technical advice to the committee.

The following work groups or sub-committees were formed to carry out the project:
Note: If you are unable to serve on the assigned committee or would like to serve on an additional committee, contact Carolyn Oldfield.

WATER QUALITY MONITORING
Dr. George Antonious
Dr. Richard Warner
Valarie Tipton
Frank Young
Sharon Flynt
Doug Hines

EQUIPMENT
Gary McFarland
Glen Abney
Valarie Tipton
Randal Rock
Bill Bailey
Charles Farmer
Jimmy Marcum
Doug Hines

VIDEO/ED/MEDIA
Tom Leith
David Switzer
Jim Rebmann
Sharon Flynt
Valarie Tipton
Bill Waits

ROYAL SPRING INVENTORY
Jim Rebmann
Charlie Farmer
J.R. Williamson
Bill Bailey

PERMIT/LEGAL
David Neely
Jim Rebmann
J. R. Williamson
Don Werner
Cy Brown
Jamshid Baradaran

The meeting adjourned at 2:30 P.M.
Agenda
Equine Waste BMP Demonstration Project
Oversight Committee Meeting
July 23, 1998

1:00 P.M.
KY Horse Park
(John R. Gaines Room)

Welcome and Introductions........................................................Michael Duckworth

Status of Demonstration Sites
and General Update on Project..................................................Carolyn Oldfield

Progress Report on Water Quality Monitoring..............................Eric Dewalt
Valarie Tipton
Dr. George Antonious

Update on Equipment.....................................................................Gary McFarland
Doug Hines

Discuss Project Outputs (See p. 3-4 of MOA).................................Committee
  1. Quality Assurance Monitoring Plan........................................Complete
  2. ID Sinkholes/Produce Maps
     Utilizing Digital Ortho Photo for
     the Royal Spring Recharge Area.......................................Jim Rebmann
     Charles Farmer
     Bill Bailey
  3. Develop Four BMP Demo Sites..............................................Committee
  4. Conduct Water Quality Monitoring......................................Dr. George Antonious
     Eric Dewalt
  5. Conduct Two Field Days......................................................Committee
  6. Informational Articles.......................................................Carolyn Oldfield
     David Switzer
  7. Community Meetings..........................................................Committee
  8. Display of Project................................................................Committee
  9. Public Information Video.....................................................Tom Leith

Project Time Schedule and Administrative Wrap Up.....................Carolyn Oldfield

Questions, Answers and Adjourn....
Agenda
Equine Waste BMP Demonstration Project
Oversight Committee Meeting
July 27, 2000

9:00 A.M.
Bourbon Co. Extension Office

Welcome and Introductions..............................Carolyn Oldfield

General Update on Project...................................Carolyn Oldfield

Discuss Project Outputs (See p. 3-4 of MOA).............Committee
1. Quality Assurance Monitoring Plan.....................Complete
2. ID Sinkholes/Produce Maps
   Utilizing Digital Ortho Photo for
   the Royal Spring Recharge Area......................Jim Rebbmann
   Charles Farmer
   Bill Bailey
   J. R. Williamson
3. Develop Six BMP Demo Sites.........................Committee
4. Conduct Water Quality Monitoring..................Valarie Tipton
   Dr. Richard Warner
5. Conduct Two Field Days.................................Committee
6. Informational Articles...................................Carolyn Oldfield
7. Community Meetings......................................Committee
8. Display of Project......................................Committee
9. Public Information Video...............................Tom Leith

Comments on general equine muck disposal....................David Switzer
                                                      Tom Keene
                                                      Ron Gullett

Questions, Answers and Adjourn to Doug Witt Farm for Composting Demonstration
of the PT-120 Areomaster leased from Midwest Bio-Systems.
Thoroughbred Resource Conservation and Development Council, Inc.

401 East Washington St.
Georgetown, KY 40324
(502)863-6010 ext.4

Equine Waste (319)th Committee Meeting
July 27, 2000

Attendance:

Charles Farmer  
Jim Rebmann 
Randal Rock 
Tom Leith 
J.R. Williamson 
David Switzer 
Gary McFarland 
Valerie Tipton 
Tom Keene 
Carolyn Oldfield 
Whitney Probst

NRCS 
LFUCG 
NRCS 
Licking River Valley RC&D 
Scott Co. Fiscal Court 
Kentucky Thoroughbred Association 
NRCS 
NRCS 
Creech Services 
Thoroughbred RC&D 
Thoroughbred RC&D

Minutes:

The committee meeting started at 9:00 AM at the Bourbon Co. Extension Office. We were welcomed by Carolyn Oldfield and introductions were given. Carolyn gave a general project update then went on to discuss the general project outputs. The Quality Assurance Monitoring Plan is now complete. We have hard copy photos of the sinkholes in the Royal Spring Recharge Area, but it was recommended that we get with Steve to obtain the ortho maps. He has approximately 99% of the state completed. Charlie Farmer has the ortho maps for Fayette Co., and will get with Bill Bailey to see what else we need for Scott Co.
We need another roll baling site to complete the six BMP Demo Sites. Charlie Farmer pointed out that we may need to be more open with incentives for having a site. Tom Keene said that we were more than welcome to take some bales from Creech Services, but they use square bales which are more dense. Dave Switzer pointed out that there may be problems taking bales off-farm sites because of co-permitting liability. We may not want to encourage that, but keeping the bales on the farm could be a good idea.

The initial water quality monitoring is complete for the contaminated stream, but we are still looking for a contaminated sinkhole. Jim Rebmann is going to look into it. Valerie Tipton is also going to contact Karen at Kentucky Geological Survey to see if she can summarize the results of the upstream/downstream water quality results.

*The second Field Day is scheduled for Monday, October 2, 2000, at 10:00 AM.* It will begin at Oakland Farm in Bourbon Co., then move to the Bell Farm in Scott Co., both of which are composting sites; Lunch will be served. Dave Switzer will try to get word of the Field Day out in newsletters, and possibly the Thoroughbred Times or the Blood Horse. We will also put it in the Conservation Newsletters. J.R. Williamson suggested that we also bring up the Farm Water Quality Plans at the field day... they are due in Dec. 2001.

The equine waste BMP information should be put out in informational articles, community meetings, a display of the project, and a public information video. The informational articles have been suggested to be in the above mentioned publications (various newsletters, The Thoroughbred Times, The Blood Horse), and other mailings. The video was discussed as to content and length. Some suggestions for content were activities from the Field Days, monitoring activities, highlights from different methods such as bio-fermentation at Keeneland, and interviews. Interviewing ideas were Dave Switzer, Tom Creech from Creech Services, Ron Gullett from Keeneland, Mr. Bickford to discuss the Water Quality Act and the potential for groundwater contamination, and Mr. Coleman to discuss the opportunity for cost-sharing in the thoroughbred industry. Carolyn and Tom Leith are going to work on the video and try to have a rough draft by January 2001. If the video is completed in time, it was suggested that the Water Quality Plan be included. For community meetings the video could be shown to the Farm Managers Club and the Ag Water Quality Workshops.

Tom Keene briefly discussed some new tactics at Creech Services. They have ordered a composting machine to help with their disposal. It will be able to turn a row 20 feet wide and 6 feet high. We will try to look at that equipment if it is possible on the upcoming Field Day. He also mentioned a new idea of having a central dumping location for local farmers to dump their muck to be composted, and a couple other marketing ideas.

David Switzer wrapped up the meeting by commenting that most horse farmers agree that there is a problem with equine waste disposal, and are interested in helping reduce it. Four major farms were interested in bio-fermentation and had meetings with George Kleen from Agronom. He stated that economics plays a major role in reducing the problem and that the goal was to provide key alternatives.

The meeting adjourned at approximately 10:30 AM and moved to Oakland Farm to see a demonstration of the new compost turner (the Aeromaster PT 120 from Midwest Bio-systems).
Equine Waste BMP Demonstration Project

Appendix E

Photo Documentation of Equipment Installation for Monitoring
Figure 1 Monitoring pit excavation for compost water quality samples at Idle Hour Farm, Paris, KY.

Figure 2 Installation of subsurface (foreground) and surface (background) lysimeter pans.
Figure 3 View of subsurface lysimeter pans with drainage lines in place.

Figure 4 Close-up of drainage line screen to prevent clogging.
Figure 5 Trench for lysimeter pan drainage lines leading to tipping buckets and sample bottles.

Figure 6 Backfilling and slope grading around lysimeter pans (left: windrow pans, right: surface runoff pans).
Figure 7 Monitoring pit with tipping bucket (inside white tub), sample bottles, and down-gradient drainage outlet pipe.
Figure 8 Completed installation showing one set of windrow surface pans (background) and surface runoff pans prior to compost windrow placement.

Figure 9 Close-up of tipping bucket showing inlet line, counter, and buckets inside weather-proof container.
Figure 10 Grading and berming around sampling pits to re-route runoff.

Figure 11 Soil backfilling, compacting and grading to bury subsurface pans, fill trenches and attain necessary slopes.
Figure 12 Initial placement of windrow over plots.
Figure 13 Transport of horse muck from piles to windrows with skid-steer loader.

Figure 14 Close-up of windrow material immediately after placement in windrow.
Figure 15 Completed windrow placement and lysimeter pan installations at onset of monitoring.
Equine Waste BMP Demonstration Project

Appendix F

Brochure of Project Overview and Newsarticles
Innovations in Poultry Management

Manure Management

The industry in this region is facing the challenge of disposing of organic waste, which poses a risk to the environment. Traditional methods of manure disposal have been ineffective, and new methods are needed to address the environmental concerns. Two decomposition sites will use methane gas to generate electricity, and several new management practices have been implemented to reduce the environmental impact of manure disposal.

Currently, the Thoroughbred Council is working to improve the system of manure management and to address the environmental concerns.

The image many have of Kentucky's Bluegrass region is of rolling green fields, healthy horses, and warm, sunny days. However, the reality is far more complex. The region faces numerous environmental challenges, including manure disposal, which poses a risk to the environment. This problem has been addressed through new management practices and decomposition sites, which utilize methane gas to generate electricity.

Other difficulties include the disposal of manure, which poses a risk to the environment. Traditional methods of manure disposal have been ineffective, and new methods are needed to address the environmental concerns. Two decomposition sites will use methane gas to generate electricity, and several new management practices have been implemented to reduce the environmental impact of manure disposal.

Currently, the Thoroughbred Council is working to improve the system of manure management and to address the environmental concerns. The council is focusing on the development of sustainable management practices that will reduce the environmental impact of manure disposal and improve the overall sustainability of the region.
Cooperating Organizations:

- Bourbon County Conservation District
- Elkhorn Inter-County Consortium
  - Cooperating Producers
- Elkhorn Land and Historic Trust, Inc.
- Fayette County Conservation District
  - Franklin County Conservation District
- Kentucky Division of Conservation
- Kentucky Division of Water
- Kentucky State University
- Kentucky Thoroughbred Association
  - Licking River Valley RC&D
- Scott County Conservation District
  - University of Kentucky
- USDA Cooperative Extension Service
  - USDA Natural Resources Conservation Service
- Woodford County Conservation District
Horses on back page

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A new method of dealing with animal waste is the use of a compost windrower. The machine.

Although backed by the farm, the project is attracting interest from throughout the state. This is the project that was selected for the farm's first program in the state. This is the project that was selected for the farm's first program in the state.

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Housing Preservation

The average house is a house of the average family. It's not built to last forever, but it's built to be a home for the family. The average family needs a house that's affordable, convenient, and safe. A housing preservation grant is a way to help families afford housing. There are many different types of housing preservation grants available. It's important to know what you're looking for before you apply. There are also many affordable housing resources available in your community. Check with your local housing authority or a community development organization to find out what's available in your area.

Continued from front page

Shoppers

60-70% of all local retail sales go to local businesses. After the age of 70, people are more likely to shop at local businesses. This is especially true for businesses that are family owned and operated. Local businesses are often able to offer personalized service and a sense of community that larger chains cannot.

Needling does not stick

Horses

The Christmas season is the peak of the horse riding season. Many equestrian events are held during this time, and the demand for horseback riding is at its highest. It's a great time to try a new riding activity or to take a break from your regular routine.

Continued from front page
In Bourbon County

Muck into mulch, Amelia’s Field transforms waste into a resource

By Lynne Wornall
Times Newsroom

It doesn’t take a magician to turn muck into money; it can be done with a machine. For the past two years Amelia’s Field has composted the muck from Runnymede’s horse stables into mulch to be used to feed their crops.

The key to the operation is a compost-turner that was purchased, used from Ohio. The piece of equipment would cost about $29,000, new, said operator Ben Arbery.

The Wildcat compost-turner owned by Amelia’s Field is the smallest one made by the South Dakota firm, but it is more than enough to handle the waste produced by the average Bluegrass horse farm. According to Arbery, the muck is first dumped on the field in rows. A tractor then pulls the compost-turner down each row, turning and chopping the straw and manure. This is usually repeated as often as once a day for about six weeks until the muck is broken down into mulch. The rate of decomposition is affected by weather, the warmer temperatures and damp weather of summer will hasten the process.

The heat produced during the decomposition generally destroys the weed seeds and bacteria that make muck an undesirable mulch. The process also reduces the large volume of bulky waste into a smaller quantity that is easier to move and to spread.

Turning the unwanted piles of straw and manure into useful mulch benefits the horse farm operator, the crops and the Bourbon County water supply

Today both Houston and Stoner Creek are high on Kentucky’s “Priority List of Waterbodies Impacted by Agriculture” in part because of runoff from muck. The EPA has recently awarded a $125,000 grant to local Soil Conservation Districts to come up with a solution to the problem of stored muck and one of the solutions they are considering is the compost-turner.

Several Soil Conservation Officers from Bourbon and Harrison County have been to Amelia’s

Laycock aquitted

By John Harren
Times Newsroom

Last Friday the 28th a Bourbon County Jury had the final say in the case that started last August 9th when Fred Laycock was charged with 2nd degree assault. It took a Bourbon County jury less than an hour to say “We the jury find the defendant not guilty.”

Dog laws

Closer Look

By Lynne Wornall
Times Newsroom

We have curfew laws to keep the kids off the streets now, what laws do we have in Paris to keep the dogs and cats off the streets?

According to City Manager Dickie Bruner, there are now laws that restrict cats in the city, but there are laws regulating dogs.

“There is a leash law within the city,” Bruner said, “dogs are prohibited from running at large.” It

Signup

Water closer

Times Newsroom

“We are very close to tap-on at resident water for residents in the area,” Hinkle said.

The Judge able for the Riddles Mill Arky Pk Grimes on 6/23, June 14-Aug 4 Community

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Blue fowl

By Bob Herr
Times Newsroom

Just when safe to grow breaks of I resistant it has been found
Blue Mold

(Continued from Page 1)

iant. The spores from the wild tobacco in Texas and Mexico would not be resistant.

Blue Mold thrives on cool, wet, low light, and high plant population conditions. Ultraviolet light kills the spores, so cloudy weather will protect the spores.

According to Nesmith, resistant Blue Mold prevention is the only avenue for growers. Most plants that come to this area from Florida, are grown in Southern Florida. They will be traveling through the area where the resistant spores are, and may become infected.

The dark, cool, moist boxes are great for Blue Mold spores. He recommends these be opened immediately and aired out and that preventative fungicide treatments be done immediately. Nesmith urges growers not to panic but be concerned. Blue Mold will only be devastating if an exact set of circumstances occur. They don’t occur that easily or that often. There is a need to be concerned. Blue Mold will only be devastating if an exact set of circumstances occurs. There is prevention, but people need to start thinking about that now!

Muck

(Continued from Page 1)

Field to see the equipment in action. They have discussed buying two or three pieces of equipment such as the compost-turner or a specially designed baler to loan to individual farmers to handle their muck.

The idea of turning muck into money is not original to Bourbon County. An Indiana businessman has been successfully composting animal wastes into potting soil and mulch for several years. "It would be an ideal new business for this community," Ardrey concluded.

Water

(Continued from Page 1)

Executive’s Office, or the Harrison Water Association Office on US 27 (The Cynthiana Road).

Residents in the Millersburg area can contact Magistrate Helen Williams and sign up. Magistrate Williams’ phone number is 987-1528.

The top-on fee to have a meter placed at a residence is $350. Residents will sign a contract between the resident and the Harrison County Water District. A meter will be placed on the property and “it will be up to the

Justice

(Continued from Page 1)

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yesterday," he
found."
Removing the Muck

The stream that flows behind Ballindaggan Farm near Lexington appeared to be an ideal natural source of water for the Thoroughbreds under the care of owner John Williams. But tests detected high levels of bacteria in the water, and Williams keeps the horses he owns and those he maintains for clients isolated from the stream; they are provided with water from the city’s system. Although the source of the contaminants is not known and it is not certain the water would cause health problems in Williams’ horses, the horseman does not want to put the valuable animals at risk.

That experience is one reason Williams is supporting a pilot project aimed at helping decrease pollutants in the water that flows through rural areas of Central Kentucky. Funded with a $123,250 federal grant from the Environmental Protection Agency, the project aims to educate and assist farms in properly disposing of the muck that is produced by the horses.

There are a number of ways in which small and large horse operations deal with the waste—nearly 1,000 tons of it produced daily by the approximately 28,470 horses on 1,288 farms within the five counties where the demonstration project will be undertaken.

Some horse farms have the muck picked up and shipped to mushroom farms in surrounding states. Lexington-based Creech Brothers Inc., which began in 1977 as a straw bedding disposal company, estimated that as much as 30,000 tons of muck are processed each year and shipped to mushroom farms.

It is estimated that about 75% of the muck produced from the growing process ends up in manure piles, often located in isolated areas on farms. When the muck is dumped into sinkholes or close to streams, the harmful substances in the equine waste pose problems for water systems, according to Dan Logan, resource specialist for the Elkhorn Inter-County Consortium.

Logan said the consortium decided to apply for the grant because of the growing problem caused by bacteria and algae from manure dumped in or alongside creeks and streams. Although the manure was not the only source of pollutants that has caused some of the water to test positive for high levels of bacteria, it is one that could be identified and for which alternatives could be found, according to Logan.

“There is not one pollutant that stands out,” Logan said. “There are so many other factors contributing to the pollution.”

Government regulations regarding disposal of livestock waste have previously been in effect, but they did not apply to equine operations because horses were not considered livestock. That has changed, Logan said, meaning that the EPA could initiate action to force farms to develop proper manure disposal methods.

While government regulation is rarely well-received, Logan said it has a benefit in this case. Including horse waste in the regulations made it possible for the consortium to obtain funds for the demonstration project. Employing responsible manure disposal techniques will stave off regulatory action by the EPA, according to Logan.

Under the EPA-funded program, which will be monitored by a committee, six sites will be chosen to demonstrate proper ways of handling equine waste. Horse farm owners and managers in Central Kentucky will be able to visit the demonstration sites to observe the techniques.

In addition to working to improve the disposal practices previously used by farms, Logan said the Equine Waste Best Management Project will focus on two methods of removing or managing animal waste.

One of the methods, on-site composting, has previously been restricted to larger horse farms. Logan said an increase in the number and types of equipment for composting make it cost-effective and practical for smaller operations to manage compost “windrows.” (A windrow is a row of straw raked into a pile before being baled or stored.)

The project outline notes that “composting of stable muck has the potential to meet the waste treatment needs of many farms in the region, transforming a waste into a valued soil amendment.” In addition to providing compost for the farm, there is also the possibility of manure being used for commercial compost, Logan said.

The other manure disposal technique emphasized in the project is moving the muck to off-site locations. Again, Logan noted, utilization of this practice has been limited in the past because baling equipment was unable to dispose of the moisture that constitutes approximately 60% of straw. Logan said newer equipment solves the moisture problem, enabling the muck to be baled and transported to a centralized location. Although voluntary action which could preclude future government mandates is one goal of the project, Logan emphasized that proper manure disposal is also a good management practice.

Williams agreed, adding that many farm owners or managers have been unaware of the potential negative impact from past manure disposal practices.

“Most farm managers are responsible people who will do something about it,” Williams said, adding that the project will be outlined at the farm managers’ September meeting. “Before, they were not aware they were causing a problem.”

The project is also supported by the Kentucky Thoroughbred Association. “It is a big problem for farms and we want to look at it in the most cost-effective way possible,” said KTA executive director David Switzer. “We are interested in looking at alternative means of handling waste disposal so we do not upset the ecological balance and the environment.”
Equine Waste BMP Demonstration Project

Appendix G

Field Day Brochure and *The Blood-Horse* Article
Equine Waste Composting Field Day

The horse industry and the Bluegrass of Kentucky go hand in hand. This industry brings millions of dollars into our economy and shapes how we feel about our region and how others see Kentucky. Along with horses comes waste, which is a growing concern among many. Animal waste is an inevitable by-product that can be turned into a value-added product with a little more management than is currently being used. Composting is not a new concept, but can have many on-farm and off-farm uses.

This Equine Waste Demonstration BMP Project has been funded by the EPA through the Kentucky Division of Water and the Kentucky Division of Conservation as a grant to the Thoroughbred Resource Conservation and Development Council. The Thoroughbred RC&D is a USDA program that serves a nonprofit council that works on projects relating to agriculture and conservation.

Field Day Agenda

9:00am Oaklend Farm
Welcome....... Maner Ferguson, Chairman, Thoroughbred RC&D Council
Managing Waste and Composting.. Midwest Bio-Systems
Discussions Ronnie Tipton, Claiborne Farm Doug Witt, Oakland Farm
Composting demonstration............. Doug Witt

11:30 Depart Oakland Farm and proceed to Elmwood Farm (Bell Property) in Scott Co.
12:15 Lunch Prepared by Scott Co. FFA Alumni

1:00 Water Quality Plan Update.. Beth Perkins, Scott Co. Conservation District
Resume Composting... Kentuckiana Farms
Discussions Mac Stone, KSU John Bell, Elmwood Farm
Tom Creech, Creech Services, Inc.

Composting Alternatives
Bio-fermentation........ Ron Gullett, Keeneland
Roll-Baling..... Tom Pierson, Brookdale Farm

*Oakland Farm is located 4.2 miles past the railroad tracks on 627.

*Elmwood Farm is located on 460 1.8 miles from Newtown Road and 1.2 miles from I-75 Exit 125.
**The entrances to both sites will be marked.

Lunch will be provided at the Bell Farm. Please RSVP by calling Carolyn Oinfeld or Whitney Probst by September 25, 2000 at (502)863-6010, ext.4.

Thoroughbred Resource Conservation and Development Council, Inc.

401 E. Washington St.
Georgetown, KY 40324
Phone: (502) 863-6010 ext. 4
Fax: (502) 863-4998
Contributing Organizations

- Cooperating Demonstration Farms
- Creech Services, Inc.
- Bourbon, Fayette, Franklin, Scott, and Woodford County Conservation Districts
- Keeneland Association, Inc.
- Kentucky Division of Conservation
- Kentucky Division of Water
- Kentucky Geological Survey
- Kentucky Thoroughbred Association
- Licking River Valley RC&D
- University of Kentucky
- USDA Cooperative Extension Service
- USDA Natural Resources Conservation Service
WHY WE’RE HERE TODAY

1) To thank the Thoroughbred RC&D for allowing us to demonstrate our Composting equipment at Oakland Farms.

2) To answer questions about our method of composting.

3) To determine the level of interest in composting as an economical waste disposal solution.

4) To offer to those interested in composting their horse muck -- full, on-site composting that:
   a) Is not intrusive to your current operation,
   b) Makes economic sense, and
   c) Is agreeable to your neighbors and regulatory bodies.

On-site operation could be handled by Midwest Bio-Systems personnel, who are trained in the ACS method of composting.

For more information, contact Dawn Angarone at (800) 335-8501
ARLINGTON RETURNS TO ITS OLD NAME

Arlington will continue to offer international racing through its schedule of grade 1 turf stakes, but when it comes to the Illinois racetrack’s name, its worldwide appeal gave way to its park-like setting.

Officials announced Oct. 23 that Arlington International Racecourse, as it has been known since its 1989 reopening after a fire, will be called Arlington Park, as it was in the old days.

“The new facility has introduced horse racing to thousands of new fans, while the park-like setting has helped longtime fans stay connected to their warm memories of Arlington Park,” said Scott Mordell, president and chief executive officer at Arlington. “Including ‘Park’ in our name signifies the wide range of special experiences available to our fans.”

A new logo highlights Arlington’s recent stock merger with Churchill Downs Inc. The green Twin Spires of Churchill Downs have been added to the new identity of Arlington Park.

WASTE-DISPOSAL OPTIONS EXPLORED

As long as people have owned horses, they’ve had to find ways to use or dispose of horse manure. The Kentucky Thoroughbred Resource Conservation and Development Council hosted a field day Oct. 2 to discuss options and demonstrate some new—and possibly profitable—ways to make manure useful.

About 40 people, from farm managers to natural resource workers, heard eight speakers and saw two composting projects in progress.

Cost and space are limiting factors in any waste-management program, and volume directly affects a method’s viability. For example, Keeneland’s biofermentation plant cost about $2 million (The Blood-Horse of April 8, page 2256), but for a facility that houses more than 4,000 horses just in September, the plant should pay for itself.

For smaller operations, roll-baling used straw and selling it isn’t uncommon, but the market for the product can be inconsistent or seasonal. Simply spreading soiled straw on cattle or horse pastures, or on fallow fields, is another option, but it’s labor-intensive.

Tom Pierson of Brookdale Farm near Versailles, Ky., oversees the farm’s maintenance division. He described the procedure of roll-baling waste in the barn aisles, storing the bales, then selling them to local cattle farmers.

An initial investment in composting falls somewhere between roll-baling and the biofermentation plant. A minimum of an acre of ground is necessary, and leasing the equipment, which consists mostly of a special tractor attachment and in some cases, water tanks, cost $20,000 to $30,000. But some of that expense could be recouped if composted material could be bagged and sold commercially.

Canterbury Park is exploring that option at its 350-acre site at the Shakopee, Minn., track. Mark Erickson, vice president of facilities at Canterbury, said his plant could set aside as many as 20 acres if it chooses the composting route.

John Mitchell, maintenance manager at Mill Ridge Farm near Lexington, and Jim Layton, manager of Loch Lea Farm near Paris, Ky., said space is the main concern. They also said few farms generate enough waste to justify the investment.

By Kristin J. Inguelli
Equine Waste BMP Demonstration Project

Appendix H

Project Video
Equine Waste BMP Demonstration Project

Appendix I

Photo Documentation of Composting and Pan Lysimeters
Midwest Bio-Systems

Idle Hour
Composting for
Thoroughbred
RC&D

185 Elkhorn Meadows
Georgetown KY 40324
Ph (800) 335-8501
Fx (502) 570-0061
www.aeromasferequipment.com

Stockpiled muck from creek bed

Rows knocked down to dry out and move to fresh row site

Thoroughbred RC&D Project
Materials after moving to fresh row site and turning with AEROMASTER compost equipment.

Lysimeter pans ready for fresh materials for composting

Rows are now about 3 weeks old
All muck windrowed at site creating four more rows

After 3 weeks materials shrink and rows are combined onto a fresh row site. At this time row direction is also changed so that rain runs along rows rather than into the side of the row.
Lysimeter pans after row is removed showing uncomposted materials that collected in the lip of pans.

Finished compost row from lysimeter row.
Equine Waste BMP Demonstration Project

Appendix J

Compost Analysis Results
REPORT

<table>
<thead>
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<th>PARAMETER</th>
<th>ENUMERATION</th>
<th>SPECIES RICHNESS DIVERSITY (SRD)¹</th>
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<tr>
<td>Heterotrophic Plate Count (Aerobic)</td>
<td>6.4 x 10⁷ CFU/gdw</td>
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<tr>
<td>Anaerobic Bacteria</td>
<td>1.4 x 10⁷ CFU/gdw</td>
<td>1.5</td>
</tr>
<tr>
<td>Yeasts and Molds</td>
<td>1.1 x 10⁴ CFU/gdw</td>
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<tr>
<td>Actinomycetes</td>
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<td>Pseudomonads</td>
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<tr>
<td>Nitrogen-Fixing Bacteria</td>
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<tr>
<td>% Moisture (dw)</td>
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<tr>
<td>Total Species Richness Diversity (SRDT)²</td>
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</table>

CFU/gdw - Colony Forming Units/gram dry weight sample
Any analysis result reported as "<" indicates a result below detection limits.

1. The species richness diversity index is derived by weighing the variety of species within a functional group (species richness) from a normalized analysis against the total number of microorganisms associated with that functional group.

2. The total species richness diversity index (SRDT) is the sum of the individual SRD's for the six functional groups.

cc: Edwin Blosser

Reviewed by: [Signature]

ENVIRONMENTAL MICROBIOLOGICAL SERVICES
1217 North Stadem Drive  Tempe, Arizona 85281  Phone 480.967.5931  Fax 480.967.5036  www.bbclabs.com
Dawn Angarone  
Midwest Bio Systems  
185 Elk horn Meadows  
Georgetown, KY  40324

Client Sample ID: Lysimeter 4.5 wks  
Project: Idle Hour  
Sample Matrix: Compost  
Laboratory ID: 12498  
Date Sampled: 10-31-01  
Date Submitted: 11-02-01  
Date Reported: 11-12-01

REPORT

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<td>Negative</td>
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<td></td>
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<td>(&lt;0.5/g)</td>
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cc: Edwin Blosser

Reviewed by: [Signature]
## Compost Quality Analysis

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<tr>
<th>Desired Level</th>
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<th>CATEGORY POINTS</th>
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<td>%N</td>
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<tr>
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<td>7.5</td>
<td>pH</td>
<td>A</td>
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<td>Salts</td>
<td>D</td>
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<tr>
<td>Conductivity (Ergs)</td>
<td>2000 - 3000</td>
<td>1160</td>
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<tr>
<td>Sulfur</td>
<td></td>
<td>Sulfur</td>
<td>C</td>
<td>5</td>
</tr>
<tr>
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<td>100 - 500</td>
<td>60</td>
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<tr>
<td>Sulphides H2S (level)</td>
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<td>10</td>
</tr>
<tr>
<td>7 Day Germ (%)</td>
<td>&gt; 80</td>
<td>95</td>
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<tr>
<td>14 Day Vigor (%)</td>
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<tr>
<td>Humus</td>
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<td>115</td>
<td>Humus and Humic Acid</td>
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<td>Humic Acid Content</td>
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<tr>
<td>Redox Potential</td>
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<td>Redox Potential</td>
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</tr>
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<td>Oxygen potential</td>
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<tr>
<td>C:N Ratio</td>
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<td>Pathogens</td>
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</tr>
<tr>
<td>E. coli</td>
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<td>pos</td>
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<td></td>
</tr>
<tr>
<td>Salmonella</td>
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<td>neg</td>
<td></td>
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<tr>
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</tr>
<tr>
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<td>Microbe Quality and Diversity</td>
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<tr>
<td>Anaerobic Bacteria</td>
<td>*</td>
<td>14M</td>
<td></td>
<td></td>
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<tr>
<td>Yeasts and Molds</td>
<td>1 - 100K</td>
<td>11K</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actinomycetes</td>
<td>1M - 100M</td>
<td>13M</td>
<td></td>
<td></td>
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<tr>
<td>Pseudomonads</td>
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<tr>
<td>N-Fixing Bacteria</td>
<td>1K - 1M</td>
<td>230K</td>
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<tr>
<td>Aerobe:Anaerobe Ratio</td>
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<td>5</td>
<td></td>
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</tr>
<tr>
<td>Maturity Index</td>
<td>&gt; 50</td>
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<td></td>
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<tr>
<td>Stability</td>
<td>&lt; 20</td>
<td></td>
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</tbody>
</table>

* Without pathogens, Grade B

**ACSM COMPOST QUALITY GRADE:** C

**MIDWEST BIO-SYSTEMS**
## Compost Quality Analysis

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<thead>
<tr>
<th>Desired Level</th>
<th>ID</th>
<th>CATEGORY POINTS</th>
<th>#</th>
<th>TOT</th>
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<tbody>
<tr>
<td><strong>Nitrogen Cycle</strong></td>
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<tr>
<td>%N</td>
<td>.6 - 1.2</td>
<td>1.6</td>
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<td>D</td>
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<tr>
<td>Ammonia (NH3)</td>
<td>&lt; 50</td>
<td>96</td>
<td></td>
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<tr>
<td>Nitrates (NO2)</td>
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<td>2</td>
<td></td>
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<tr>
<td>Nitrites (NO3)</td>
<td>700-800</td>
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<tr>
<td><strong>pH</strong></td>
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<td>7.0 - 8.1</td>
<td>8.7</td>
<td>pH</td>
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<tr>
<td>Conductivity (Ergs)</td>
<td>2000 - 3000</td>
<td>1250</td>
<td></td>
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<tr>
<td><strong>Sulfur</strong></td>
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<td>Sulfur</td>
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<tr>
<td>Sulfate (ppm)</td>
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<tr>
<td>Sulfides H2S (level)</td>
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<tr>
<td><strong>Germination</strong></td>
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<td>&gt; 80</td>
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<tr>
<td>7 Day Germ (%)</td>
<td>&gt; 80</td>
<td>14 Day Vigor (%)</td>
<td>&gt; 70</td>
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<tr>
<td><strong>Humus</strong></td>
<td>50 - 80</td>
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<td>5 - 15%</td>
<td>Humus, and Humic Acid</td>
</tr>
<tr>
<td><strong>Humic Acid Content</strong></td>
<td></td>
<td>5 - 15%</td>
<td></td>
<td></td>
</tr>
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<td><strong>Redox Potential</strong></td>
<td></td>
<td>26.5 - 29</td>
<td>29.6</td>
<td>C:N</td>
</tr>
<tr>
<td>Oxygen potential</td>
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<td><strong>Moisture %</strong></td>
<td>40 - 50</td>
<td>41.8</td>
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<tr>
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<td>neg</td>
<td>pos</td>
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<td>pos</td>
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<tr>
<td>Salmonella</td>
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<td>Fecal Coliform</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Beneficial</strong></td>
<td></td>
<td></td>
<td></td>
<td>Microbe Quality and Diversity</td>
</tr>
<tr>
<td>Microbe Concentrations</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Aerobic Count</td>
<td>100M - 10B</td>
<td>150B</td>
<td>150B</td>
<td></td>
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<tr>
<td>Anaerobic Bacteria</td>
<td>*</td>
<td>2.2B</td>
<td>C</td>
<td>15</td>
</tr>
<tr>
<td>Yeasts and Molds</td>
<td>1 - 100K</td>
<td>11M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actinomycetes</td>
<td>1M - 100M</td>
<td>190M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudomonads</td>
<td>1K - 1M</td>
<td>690M</td>
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<tr>
<td>N-Fixing Bacteria</td>
<td>1K - 1M</td>
<td>210M</td>
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<td></td>
</tr>
<tr>
<td><strong>Aerobe:Anaerobe Ratio</strong></td>
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<td>10</td>
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<td></td>
</tr>
<tr>
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<td>&gt; 50</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Stability</strong></td>
<td>&lt; 20</td>
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</tr>
</tbody>
</table>

Not acceptable as ACS Compost

**ACS COMPOST QUALITY GRADE:** N/A

**MIDWEST BIO-SYSTEMS**
# Compost Analysis Report

**Composter:** Idle Hour Project  
Thoroughbred R & D

**Representative:** Midwest Bio-Systems

**Date Sampled:** 10-31-01  
**Date Tested:** 11-16-01

## Nitrogen Tests (ppm)

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Ammonia (NH₃)</th>
<th>Nitrates (NO₂)</th>
<th>Nitrites (NO₃)</th>
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</thead>
<tbody>
<tr>
<td>Lysimeter-4 wks</td>
<td>85</td>
<td>0</td>
<td>589</td>
</tr>
<tr>
<td>New Row IH</td>
<td>96</td>
<td>2</td>
<td>148</td>
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<tr>
<td>Desired Levels</td>
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## Sulfur Tests

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<th>Sample ID</th>
<th>Sodium (ppm)</th>
<th>Sulfate S (ppm)</th>
<th>Sulfides (H₂S level)</th>
<th>7 Day Germ (%)</th>
<th>14 Day Vigor (%)</th>
<th>Humus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lysimeter-4 wks</td>
<td>84</td>
<td>60</td>
<td>0</td>
<td>95</td>
<td>90</td>
<td>115</td>
</tr>
<tr>
<td>New Row IH</td>
<td>62</td>
<td>48</td>
<td>0</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Desired Levels</td>
<td>90 - 200</td>
<td>100-500</td>
<td>0</td>
<td>&gt; 80</td>
<td>&gt; 70</td>
<td>50 - 80</td>
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</table>

## Seed Germ & Vigor Tests

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Moisture (%)</th>
<th>C:N Ratio</th>
<th>%N</th>
<th>%P</th>
<th>%K</th>
<th>%Ca</th>
<th>%Mg</th>
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<tbody>
<tr>
<td>Lysimeter-4 wks</td>
<td>38.5</td>
<td>18.9</td>
<td>1.2</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>New Row IH</td>
<td>41.8</td>
<td>21.9</td>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Desired Levels</td>
<td>40 - 50</td>
<td>15-20</td>
<td>0.6 - 1.2</td>
<td>Varies according to sample base composition</td>
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## Water Soluble Tests

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>pH</th>
<th>Conductivity (Ergs)</th>
<th>Redox Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lysimeter</td>
<td>7.5</td>
<td>1160</td>
<td>28.2</td>
</tr>
<tr>
<td>New Row IH</td>
<td>8.7</td>
<td>1250</td>
<td>29.6</td>
</tr>
<tr>
<td>Desired Levels</td>
<td>7.0 - 8.1</td>
<td>2-3000</td>
<td>26.5 - 29</td>
</tr>
</tbody>
</table>
Dawn Angarone  
Midwest Bio-Systems of Kentucky  
185 Elkhorn Meadows Drive  
Georgetown, KY  40324

<table>
<thead>
<tr>
<th>Client Sample ID:</th>
<th>New Row L.H.</th>
<th>Date Sampled:</th>
<th>11-06-01</th>
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<tbody>
<tr>
<td>Project:</td>
<td>Thoroughbred RCD</td>
<td>Date Submitted:</td>
<td>11-09-01</td>
</tr>
<tr>
<td>Sample Matrix:</td>
<td>Compost</td>
<td>Date Reported:</td>
<td>11-16-01</td>
</tr>
<tr>
<td>Laboratory ID:</td>
<td>12620</td>
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</tbody>
</table>

### REPORT

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>ENUMERATION</th>
<th>SPECIES RICHNESS DIVERSITY (SRD)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heterotrophic Plate Count</td>
<td>$1.5 \times 10^{11}$ CFU/gdw</td>
<td>2.2</td>
</tr>
<tr>
<td>(Aerobic)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaerobic Bacteria</td>
<td>$2.2 \times 10^{9}$ CFU/gdw</td>
<td>0.6</td>
</tr>
<tr>
<td>Yeasts and Molds</td>
<td>$1.1 \times 10^{7}$ CFU/gdw</td>
<td>1.7</td>
</tr>
<tr>
<td>Actinomycetes</td>
<td>$1.9 \times 10^{8}$ CFU/gdw</td>
<td>0.7</td>
</tr>
<tr>
<td>Pseudomonads</td>
<td>$6.9 \times 10^{8}$ CFU/gdw</td>
<td>0.9</td>
</tr>
<tr>
<td>Nitrogen-Fixing Bacteria</td>
<td>$2.1 \times 10^{8}$ CFU/gdw</td>
<td>0.5</td>
</tr>
<tr>
<td>% Moisture (dw)</td>
<td>163%</td>
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<tr>
<td><strong>Total Species Richness Diversity (SRDT)²</strong></td>
<td>-----</td>
<td>6.6</td>
</tr>
</tbody>
</table>

CFU/gdw - Colony Forming Units/gram dry weight sample  
Any analysis result reported as "<" indicates a result below detection limits.

1. The species richness diversity index is derived by weighing the variety of species within a functional group (species richness) from a normalized analysis against the total number of microorganisms associated with that functional group.

2. The total species richness diversity index (SRDT) is the sum of the individual SRD's for the six functional groups.

Reviewed by:  

---
Client Sample ID: New Row I.H.  
Project: Thoroughbred RCD  
Sample Matrix: Compost  
Laboratory ID: 12620  
Date Sampled: 11-06-01  
Date Submitted: 11-09-01  
Date Reported: 11-16-01

REPORT

<table>
<thead>
<tr>
<th>E. coli</th>
<th>Salmonella Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Detection level 1-23 MPN/g)</td>
<td>(Detection level 0.5/g)</td>
</tr>
<tr>
<td>AOAC 991.15 (mod.)</td>
<td>AOAC 989.13 (mod.)</td>
</tr>
<tr>
<td>Positive (&gt;23 MPN/g)</td>
<td>Negative (&lt;0.5/g)</td>
</tr>
</tbody>
</table>

Reviewed by: [Signature]

ENVERMENTAL MICROBIOLOGICAL SERVICES  
1217 North Stadem Drive  
Tempe, Arizona 85281  
Phone 480.967.5931  
Fax 480.967.5036  
www.bbc1abs.com
<table>
<thead>
<tr>
<th>FUNCTIONAL GROUP</th>
<th>INTERPRETATION OF COMPOST BIOASSAY</th>
</tr>
</thead>
</table>
| Heterotrophic Bacteria (Aerobic) | - Finished compost should have 100 million to 10 billion (10⁸ - 10⁹) Colony Forming Units/gram dry weight (CFU/gdw).  
- Composts with less than 100 million CFU/gdw will not perform as well as soil inoculants and may not be effective in suppressing plant diseases. |
| Anaerobic Bacteria | - Ratio of Aerobes to Anaerobes in the compost should be at least 10:1 or greater.  
- An overgrowth of anaerobes indicates the compost was not turned with sufficient frequency. It is important that anaerobic by-products in the compost be degraded prior to use with plants or germinating seeds. |
| Yeasts and Molds (Fungi) | - Finished compost should have between 1 and 100 thousand CFU/gdw (10³ - 10⁵ CFU/gdw).  
- These organisms are important for breaking down organic compounds, soil nutrient cycling, stabilizing soil aggregates, and controlling plant disease. |
| Actinomycetes | - Finished compost should have at least 1 million to 100 million CFU/gdw (10⁶ - 10⁸ CFU/gdw). Compost made with woody materials may have more.  
- These organisms are important for many functions including the breakdown and nutrient cycling of complex chemical substances such as chitin and cellulose, improving soil crumb structure, and assisting in the reduction of plant pathogen pressures. They are particularly efficient in alkaline soils. |
| Pseudomonads | - Finished compost concentrations should be between 1 thousand and 1 million CFU/gdw (10³ - 10⁶ CFU/gdw). Depending on starting materials, this number could be lower, but is rarely higher.  
- Pseudomonads are important in nutrient cycling, assisting plants with phosphorus availability, and some have been linked to the biological control of plant pathogens. |
| Nitrogen-Fixing Bacteria | - The number of free living (non-legume associated) nitrogen-fixing bacteria in compost varies a lot depending on the available nitrogen concentration but may be in the range of 1 thousand to 1 million CFU/gdw (10³ - 10⁶ CFU/gdw).  
- Populations of these free living nitrogen-fixing bacteria will proliferate as the available nitrogen in the compost decreases. As a consequence, there is typically an inverse relationship between biologically available nitrogen in the compost and the concentration of free living nitrogen-fixing bacteria. |

For additional information concerning these and other functional groups, visit the web sit at www.bbclabs.com
MICROBIAL DIVERSITY ANALYSIS
SOIL AND COMPOST

✦ What is species richness diversity (SRD)? Species richness is a measurement of diversity that indicates the number of different species or different types of microorganisms that are present in a sample. The SRD determination of microorganisms in a particular microbial functional group is an index of the variety of microbes in that functional group. This index is derived from a standard microbial ecology formula that weighs the variety of species within a functional group from a normalized analysis of species richness against the total number of microorganisms associated with that functional group.

✦ Why is diversity important? In soil or compost, a high species richness diversity promotes numerous interspecies relationships and interpopulation interactions. Species richness diversity is important because it allows for a more varied and flexible response to environmental fluctuations and stress. For instance, those communities with more diverse microbial populations will be more likely to cope with disturbances and stress than those communities with low diversities.

✦ How can diversity information be used? This index can be compared to other samples from a similar matrix (soil, compost, or liquid) and can be used to determine the impact of various crop management and agricultural practices on microbial diversity or to compare and evaluate different microbial products. In addition to the individual SRD determinations for various functional groups, an index for the total species richness diversity (SRDT) is a useful tool for the comparison of similar samples. This index found at the bottom line of the analysis sheet is the sum of the six individual SRD'S for the sample.

<table>
<thead>
<tr>
<th>SPECIES RICHNESS DIVERSITY INDEX CLASSIFICATION</th>
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<tbody>
<tr>
<td>SRDT Index for SOIL</td>
</tr>
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<td>greater than 12.5</td>
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<tr>
<td>7 - 12.5</td>
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<td>less than 7</td>
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</table>

Examples of Moderate Species Richness Diversity in Soil and Compost

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>Species Richness Diversity Index SOIL</th>
<th>Species Richness Diversity Index COMPOST</th>
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</thead>
<tbody>
<tr>
<td>Heterotrophic Plate Count (Aerobic)</td>
<td>2.9</td>
<td>1.6</td>
</tr>
<tr>
<td>Anaerobic Bacteria</td>
<td>1.9</td>
<td>0.8</td>
</tr>
<tr>
<td>Yeasts and Molds</td>
<td>2.3</td>
<td>0.8</td>
</tr>
<tr>
<td>Actinomycetes</td>
<td>1.2</td>
<td>0.9</td>
</tr>
<tr>
<td>Pseudomonads</td>
<td>1.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Nitrogen-Fixing Bacteria</td>
<td>0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Total Species Richness Diversity Index (SRDT)</td>
<td>10.2</td>
<td>4.9</td>
</tr>
</tbody>
</table>
Equine Waste BMP Demonstration Project

Appendix K

Baseline Stream Data
Equine Waste BMP Demonstration Project

Appendix L

Water Quality Monitoring Lab Results
August 13, 1999

Carolyn Oldfield
Thoroughbred Resource Conservation and Development Council
401 Washington Street
Georgetown, KY 40324

Dear Ms Oldfield:

Please find enclosed the following documents:

Complete results for all parameters for batch one through nine samples from the Equine Waste BMP Demonstration Project.

Best regards,

[Signature]

Henry Francis
Laboratory Manager
Carolyn Oldfield  
Thoroughbred Res. Conservation  
401 Washington Street  
Georgetown, KY 40324  

August 13, 1999

Project ID: EWDP  
Project Account: COMPOST #1  
Sample Field ID: COMPOST #1  
Sample Collector: GREG SECRIST  
Collection Date: 2/17/99  
Collection Time: 10:20:00 AM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>36</td>
<td>CFU/100mL</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>14.1</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>3.19</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.027</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.008</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.622</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.203</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.0</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.26</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Comments:
TOC analysis was subcontracted to Commonwealth Technology due to KGS instrument failure. We are satisfied by the inclusion of blind samples and the QC report provided by CTI that results are comparable to work done at KGS. No significant difference in total fecal coliform between Compost Site 1 and Compost Site 2.

Project ID: EWDP  
Project Account: COMPOST #2  
Sample Field ID: COMPOST #2  
Sample Collector: GREG SECRIST  
Collection Date: 2/17/99  
Collection Time: 10:50:00 AM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>16</td>
<td>CFU/100mL</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Result</td>
<td>Unit</td>
<td>MDL</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>17.4</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>3.93</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.027</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.008</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.614</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.200</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>1.8</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.24</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Comments:

TOC analysis was subcontracted to Commonwealth Technology due to KGS instrument failure. We are satisfied by the inclusion of blind samples and the QC report provided by CTI that results are comparable to work done at KGS. No significant difference in total fecal coliform between Compost Site 1 and Compost Site 2.

Project ID: EWDP
Lab Sample ID: GS07402
Project Account:  
Submittal Date: 3/16/99
Sample Field ID: COMPOST 1
Sample Collector: V.TIPTON
Collection Date: 3/16/99
Collection Time: 2:30:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>Less Than MDL</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>17.0</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>3.84</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.047</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.014</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.608</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.198</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>1.5</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.25</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Comments:
Project ID: EWDP
Project Account: 
Sample Field ID: COMPOST 2
Sample Collector: V.TIPTON
Collection Date: 3/16/99
Collection Time: 2:40:00 PM

Lab Sample ID: GS07403
Submittal Date: 3/16/99

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>4</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>18.4</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>4.16</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.060</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.018</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.593</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.193</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>1.5</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.30</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Comments:

---

Project ID: EWDP
Project Account: 
Sample Field ID: COMPOST 1
Sample Collector: V.TIPTON
Collection Date: 3/23/99
Collection Time: 2:55:00 PM

Lab Sample ID: GS07424
Submittal Date: 3/23/99

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.06</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.05</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>165</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>9.6</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>2.17</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.029</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Page 3 of 12

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH₃)</td>
<td>0.03</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH₃-N)</td>
<td>0.02</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>6.4</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH₃)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO₃)</td>
<td>9.4</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO₃-N)</td>
<td>2.12</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrite (NO₂)</td>
<td>0.036</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite-N (NO₂-N)</td>
<td>0.011</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO₄)</td>
<td>0.637</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO₄-P)</td>
<td>0.208</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>1.8</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.06</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Comments:

Project ID: EWDP
Lab Sample ID: GS07459
Project Account:
Submittal Date: 3/30/99
Sample Field ID: COMPOST 2
Sample Collector: V. TIPTON
Collection Date: 3/30/99
Collection Time: 2:55:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:
### Project ID: EWDP  
### Project Account: COMPOST 1  
### Sample Field ID: COMPOST 1  
### Sample Collector: V. TIPTON  
### Collection Date: 4/13/99  
### Collection Time: 1:50:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH₃)</td>
<td>0.03</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH₃-N)</td>
<td>0.02</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>13</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH₃)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO₃)</td>
<td>6.62</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO₃-N)</td>
<td>1.50</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrite (NO₂)</td>
<td>0.044</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite-N (NO₂-N)</td>
<td>0.013</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO₄)</td>
<td>0.670</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO₄-P)</td>
<td>0.219</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>1.4</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.24</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Comments:

---

### Project ID: EWDP  
### Project Account: COMPOST 2  
### Sample Field ID: COMPOST 2  
### Sample Collector: V. TIPTON  
### Collection Date: 4/13/99  
### Collection Time: 2:05:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH₃)</td>
<td>0.03</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH₃-N)</td>
<td>0.02</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>33</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH₃)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO₃)</td>
<td>7.84</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO₃-N)</td>
<td>1.77</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrite (NO₂)</td>
<td>0.073</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
</tbody>
</table>
Nitrite-N (NO2-N) 0.022 mg/L 0.001
Orthophosphate (PO4) 0.639 mg/L 0.009
Orthophosphate-P (PO4-P) 0.208 mg/L 0.003
Total Organic Carbon 1.8 mg/L 0.5
Total Recoverable Phosphorus 0.24 mg/L 0.05

Comments:

Project ID: EWDP
Project Account: 
Sample Field ID: COMPOST 1
Sample Collector: G.MCFARLAND
Collection Date: 4/27/99
Collection Time: 3:20:00 PM
Lab Sample ID: GS07631
Submittal Date: 4/27/99

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.07</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.06</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>375</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>4.9</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>1.11</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrile (NO2)</td>
<td>0.049</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrile-N (NO2-N)</td>
<td>0.015</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.687</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.218</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.3</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.34</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Comments:

Project ID: EWDP
Project Account: 
Sample Field ID: COMPOST 2
Sample Collector: G.MCFARLAND
Collection Date: 4/27/99
Collection Time: 3:25:00 PM
Lab Sample ID: GS07632
Submittal Date: 4/27/99

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH₃)</td>
<td>0.08</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH₃-N)</td>
<td>0.07</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>1400</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH₃)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO₃)</td>
<td>6.2</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO₃-N)</td>
<td>1.40</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrite (NO₂)</td>
<td>0.056</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite-N (NO₂-N)</td>
<td>0.017</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO₄)</td>
<td>0.639</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO₄-P)</td>
<td>0.208</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.5</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.33</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Comments:

Project ID: EWDP
Project Account: 
Sample Field ID: COMPOST 1
Sample Collector: V. TIPTON
Collection Date: 5/11/99
Collection Time: 3:25:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH₃)</td>
<td>0.03</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH₃-N)</td>
<td>0.03</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>10</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>0.55</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH₃)</td>
<td>0.67</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO₃)</td>
<td>4.3</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO₃-N)</td>
<td>0.97</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrite (NO₂)</td>
<td>0.106</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite-N (NO₂-N)</td>
<td>0.032</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO₄)</td>
<td>0.228</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO₄-P)</td>
<td>0.074</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.5</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.192</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>
**Project ID:** EWDP  
**Sample Field ID:** COMPOST 2  
**Sample Collector:** V. TIPTON  
**Collection Date:** 5/11/99  
**Collection Time:** 3:30:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.02</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.02</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>255</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>0.2</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>0.05</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrate (NO2)</td>
<td>0.032</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.010</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.335</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.109</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>4.2</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.162</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

**Comments:**

---

**Project ID:** EWDP  
**Sample Field ID:** Compost 1  
**Sample Collector:** V. TIPTON  
**Collection Date:** 5/26/99  
**Collection Time:** 2:50:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.31</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.254</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>152</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>1.47</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>1.79</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrate (NO2)</td>
<td>0.0285</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Page 9 of 12
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrite-N (NO₂-N)</td>
<td>0.008</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO₄)</td>
<td>0.333</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO₄-P)</td>
<td>0.108</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>5.734</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.369</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Comments:

Project ID: EWDP
Project Account: 
Sample Field ID: Compost 2
Sample Collector: V. TIPTON
Collection Date: 5/26/99
Collection Time: 3:00:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH₃)</td>
<td>0.09</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH₃-N)</td>
<td>0.078</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>1280</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>0.76</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH₃)</td>
<td>0.93</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO₃)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO₃-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrite (NO₂)</td>
<td>0.0158</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite-N (NO₂-N)</td>
<td>0.005</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO₄)</td>
<td>0.379</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO₄-P)</td>
<td>0.124</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>14.181</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.215</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Comments:

Project ID: EWDP
Project Account: 
Sample Field ID: Compost 1
Sample Collector: V. TIPTON
Collection Date: 6/28/99
Collection Time: 4:05:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.03</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.024</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>2040</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>34.2</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>7.73</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.109</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.033</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>1.000</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.326</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>5.7</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.43</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Comments:

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.06</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.05</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>&gt;&gt;3000</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>0.59</td>
<td>mg/L</td>
<td>0.50</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>0.72</td>
<td>mg/L</td>
<td>0.61</td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>41.7</td>
<td>mg/L</td>
<td>0.1</td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>9.42</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.143</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.044</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>1.079</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.352</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>6.6</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.43</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Comments:

Lab error: inadequate dilution to accurately count number of fecal coliforms present.
If there are questions regarding this data, please contact.

Henry E. Francis
Laboratory Manager

Phone: 606-257-5500
FAX: 606-257-1147
E-mail: Francis@kgs.mmm.uky.edu
March 15, 2000

Carolyn Oldfield  
Thoroughbred Resource Conservation and Development Council  
401 Washington Street  
Georgetown, KY 40324

Dear Ms Oldfield:

Please find enclosed the following documents:

- Complete results for all parameters for batch ten samples from the Equine Waste BMP Demonstration Project.
- QA/QC report for reported samples.

Best regards,

[Signature]

Henry Francis  
Laboratory Manager
Carolin Oldfield  
Thoroughbred Res. Conservation  
401 Washington Street  
Georgetown, KY 40324  

March 07, 2000

Project ID: EWDP  
Project Account:  
Sample Field ID: Compost 1  
Sample Collector: V. TIPTON  
Collection Date: February 16, 2000  
Collection Time: 3:35:00 PM

Lab Sample ID: GS09173  
Submittal Date: February 17, 2000

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH₃)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Ammonia (NH₃-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>cancelled</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH₃)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO₃)</td>
<td>49.1</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO₃-N)</td>
<td>11.1</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO₂)</td>
<td>0.029</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO₂-N)</td>
<td>0.009</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO₄)</td>
<td>0.785</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO₄-P)</td>
<td>0.250</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.2</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.23</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:  
Fecal Coliform sample was grossly contaminated in microbiology lab, so request was cancelled.

Project ID: EWDP  
Project Account:  
Sample Field ID: Compost 2  
Sample Collector: V. TIPTON  
Collection Date: February 16, 2000  
Collection Time: 3:45:00 PM

Lab Sample ID: GS09174  
Submittal Date: February 17, 2000

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH₃)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Parameter</td>
<td>Value</td>
<td>Unit</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------</td>
<td>------------</td>
<td>------------------------------</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>cancelled</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>58.1</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>13.1</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.070</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.021</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.796</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.260</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.2</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.24</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:
Fecal Coliform sample was grossly contaminated in microbiology lab, so request was cancelled.

If there are questions regarding this data, please contact.

Henry E. Francis
Laboratory Manager

Phone: 606-257-5500
FAX: 606-257-1147
E-mail: Francis@kgs.mn.uky.edu
QUALITY CONTROL DATA (REPORT # 10)

PREPARED
FOR

EQUINE WASTE BMP DEMONSTRATION PROJECT

03/07/2000

HENRY FRANCIS
<table>
<thead>
<tr>
<th>Field Sample Number</th>
<th>Lab Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Compost 1</td>
<td>1 GS09173</td>
</tr>
<tr>
<td>2  Compost 2</td>
<td>2 GS09174</td>
</tr>
</tbody>
</table>
**KENTUCKY GEOLOGICAL SURVEY**  
**COMPUTER AND LABORATORY SERVICES**  
**WATER PARAMETERS QC SUMMARY**

Sample Delivery Group: 00020011

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method No.</th>
<th>Method Detection Limit</th>
<th>Concentration QC1</th>
<th>Concentration QC2</th>
<th>Concentration Sample ID**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>True ppm</td>
<td>Found ppm</td>
<td>True ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>SM4500NH3-F</td>
<td>0.02 mg/L</td>
<td>0.44</td>
<td>0.44</td>
<td>0.44</td>
</tr>
<tr>
<td>Nitrate</td>
<td>EPA 354.1</td>
<td>0.002 mg/L</td>
<td>0.400</td>
<td>0.397</td>
<td>0.400</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
<td>0.009 mg/L</td>
<td>0.400</td>
<td>0.397</td>
<td>0.400</td>
</tr>
<tr>
<td>TOC</td>
<td>SW846-9060</td>
<td>0.5 mg/L</td>
<td>2.5</td>
<td>2.3</td>
<td>10.0</td>
</tr>
<tr>
<td>TKN</td>
<td>SM4500N.C</td>
<td>0.07 mg/L</td>
<td>0.80</td>
<td>0.80</td>
<td>1.23</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D-515</td>
<td>0.05 mg/L</td>
<td>0.43</td>
<td>0.42</td>
<td>0.43</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 - 30 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 - 30 %, which is established from internal QC guidelines.
Sample Delivery Group: 00020011  Analytical Wavelength nm: 630-660
Water Method #: SM4500NH3-F  Analyst Initials: JB
Date Analyzed: 2/22/00  MDL: 0.02 mg/L

Calibration Verification:

Linear Calibration Range: 0.05 - 1.00
Linear Calibration Coefficient: 0.99912

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.44</td>
<td>0.44</td>
</tr>
<tr>
<td>GS09174</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>Dup GS09174</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.44</td>
<td>0.44</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
NITRITE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00020011  Analytical Wavelength nm: 540
Water Method #: EPA 354.1  Analyst Initials: JB/TM
Date Analyzed: 2/22/00  MDL: 0.002 mg/L

Calibration Verification:
Linear Calibration Range: 0.01-1.00
Linear Calibration Coefficient: 0.99993

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.400</td>
<td>0.397</td>
</tr>
<tr>
<td>GS09173</td>
<td>x</td>
<td>0.029</td>
</tr>
<tr>
<td>Dup GS09173</td>
<td>x</td>
<td>0.030</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.400</td>
<td>0.396</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
Sample Delivery Group: 00020011
Water Method #: EPA 365.3
Date Analyzed: 2/22/00

Analytical Wavelength nm: 700
Analyst Initials: JB/TM
MDL: 0.009 mg/L

Calibration Verification:

Linear Calibration Range: 0.01 - 1.00
Linear Calibration Coefficient: 0.99998

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.400</td>
<td>0.397</td>
</tr>
<tr>
<td>GS09174</td>
<td>x</td>
<td>0.796</td>
</tr>
<tr>
<td>Dup GS09174</td>
<td>x</td>
<td>0.796</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.400</td>
<td>0.389</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
Sample Delivery Group: 00020011 | Instrument ID: Phoenix 8000
Water Method #: SW846-9060 | Analyst Initials: JB
Date Analyzed: 2/23/00 | MDL: 0.5 mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td></td>
</tr>
<tr>
<td>Blank</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
<th>Calibration Average =</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mg/L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 mg/L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 mg/L</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
<th>Average Blank Correction =</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td>-0.088</td>
<td></td>
</tr>
<tr>
<td>Blank</td>
<td>-0.100</td>
<td></td>
</tr>
<tr>
<td>Blank</td>
<td>-0.103</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Uncorrected TOC</th>
<th>Blank Corrected TOC, mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>QC1*</td>
<td>2.204</td>
<td>2.5</td>
</tr>
<tr>
<td>GS09174</td>
<td>2.059</td>
<td>x</td>
</tr>
<tr>
<td>Dup GS09174</td>
<td>2.028</td>
<td>x</td>
</tr>
<tr>
<td>QC2*</td>
<td>9.492</td>
<td>10.0</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
TOTAL KJELDAHL NITROGEN STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00020011  Column ID  Dionex AG4A,AS4A
Water Method #: SM4500N.C  Analyst Initials: JB/SRM
Date Analyzed: 2/23/00  MDL: 0.07 mg/L

Calibration Verification:

Linear Calibration Range: 0.1-2.9
Linear Calibration Coefficient: 0.9925

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td></td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>GS09173</td>
<td></td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>Dup GS09123</td>
<td></td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>1.23</td>
<td>1.23</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
TOTAL PHOSPHORUS STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00020011
Analytical Wavelength nm: 700
Water Method #: ASTM D-515
Analyst Initials: JB
Date Analyzed: 2/24/00
MDL: 0.05 mg/L

Calibration Verification:

Linear Calibration Range: 0.05 - 1.00
Linear Calibration Coefficient: 0.99988

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.43</td>
<td>0.42</td>
</tr>
<tr>
<td>GS09173</td>
<td>x</td>
<td>0.23</td>
</tr>
<tr>
<td>Dup GS09173</td>
<td>x</td>
<td>0.24</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.43</td>
<td>0.41</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
March 15, 2000

Carolyn Oldfield  
Thoroughbred Resource Conservation and Development Council  
401 Washington Street  
Georgetown, KY 40324

Dear Ms Oldfield:

Please find enclosed the following documents:

Complete results for all parameters for batch eleven samples from the Equine Waste BMP Demonstration Project.

QA/QC report for reported samples.

Best regards,

[Signature]

Henry Francis  
Laboratory Manager
Caroln Oldfield  
Thoroughbred Res. Conservation  
401 Washington Street  
Georgetown, KY 40324

Project ID: EWDP  
Lab Sample ID: GS09182  
Project Account: Compost 1  
Submittal Date: February 23, 2000  
Sample Field ID: Compost 1

Sample Collector: V.TIPTON  
Collection Date: February 24, 2000  
Collection Time: 3:55:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>4250</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>40.4</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>9.13</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.028</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.009</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.818</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.267</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.0</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.23</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

Project ID: EWDP  
Lab Sample ID: GS09183  
Project Account: Compost 2  
Submittal Date: February 23, 2000  
Sample Field ID: Compost 2

Sample Collector: V.TIPTON  
Collection Date: February 24, 2000  
Collection Time: 4:10:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Substance</td>
<td>Value</td>
<td>Unit</td>
<td>Comments</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------</td>
<td>----------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>15,300</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>46.5</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>10.5</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.037</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.011</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.832</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.271</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.0</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.24</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

If there are questions regarding this data, please contact.

Henry E. Francis

Phone: 806-257-5500
FAX: 806-257-1147
E-mail: Francis@kgs.mmm.uky.edu
QUALITY CONTROL DATA (REPORT # 11)

PREPARED
FOR

EQUINE WASTE BMP DEMONSTRATION PROJECT

03/15/2000

HENRY FRANCIS
<table>
<thead>
<tr>
<th>Field Sample Number</th>
<th>Lab Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Compost 1</td>
<td>1  GS09182</td>
</tr>
<tr>
<td>2  Compost 2</td>
<td>2  GS09183</td>
</tr>
</tbody>
</table>

Sample Delivery Group No: 00020013  Date Received: 02/23/00
## Water Parameters QC Summary

**Sample Delivery Group:** 00020013

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method No.</th>
<th>Method Detection Limit</th>
<th>Concentration QC1 True ppm</th>
<th>Concentration QC1 Found ppm</th>
<th>Concentration QC2 True ppm</th>
<th>Concentration QC2 Found ppm</th>
<th>Concentration Sample ID** GS0xxxx True ppm</th>
<th>Concentration Sample ID** GS0xxxx Dup ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>SM4500NH3-F</td>
<td>0.02 mg/L</td>
<td>0.36</td>
<td>0.35</td>
<td>0.36</td>
<td>0.35</td>
<td>&lt; MDL</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>Nitrite</td>
<td>EPA 354.1</td>
<td>0.002 mg/L</td>
<td>0.400</td>
<td>0.430</td>
<td>0.400</td>
<td>0.432</td>
<td>0.028</td>
<td>0.027</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
<td>0.009 mg/L</td>
<td>0.400</td>
<td>0.374</td>
<td>0.400</td>
<td>0.403</td>
<td>0.832</td>
<td>0.837</td>
</tr>
<tr>
<td>TOC</td>
<td>SW846-9060</td>
<td>0.5 mg/L</td>
<td>2.5</td>
<td>2.3</td>
<td>10.0</td>
<td>9.6</td>
<td>2.0</td>
<td>1.8</td>
</tr>
<tr>
<td>TKN</td>
<td>SM4500N.C</td>
<td>0.07 mg/L</td>
<td>0.80</td>
<td>0.80</td>
<td>1.23</td>
<td>1.22</td>
<td>&lt; MDL</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D-515</td>
<td>0.05 mg/L</td>
<td>0.43</td>
<td>0.41</td>
<td>0.43</td>
<td>0.42</td>
<td>0.23</td>
<td>0.23</td>
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</tbody>
</table>

* The acceptable range is ± 10 - 30 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 - 30 %, which is established from internal QC guidelines.
Sample Delivery Group: 00020013  
Water Method #: SM4500NH3-F  
Date Analyzed: 3/1/00  
Analytical Wavelength nm: 630-660  
Analyst Initials: JB  
MDL: 0.02 mg/L  

Calibration Verification:

Linear Calibration Range: 0.05 - 1.00  
Linear Calibration Coefficient: 0.99997  

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>Found</td>
<td></td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.36</td>
<td>0.35</td>
</tr>
<tr>
<td>GS09190</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>Dup GS09190</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.36</td>
<td>0.35</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20%, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
NITRITE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00020013  Analytical Wavelength nm: 540
Water Method #: EPA 354.1  Analyst Initials: JB
Date Analyzed: 2/24/00  MDL: 0.002 mg/L

Calibration Verification:
Linear Calibration Range: 0.01-1.00
Linear Calibration Coefficient: 0.99993

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.400</td>
<td>0.430</td>
</tr>
<tr>
<td>GS09182</td>
<td>x</td>
<td>0.028</td>
</tr>
<tr>
<td>Dup GS09182</td>
<td>x</td>
<td>0.027</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.400</td>
<td>0.432</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10%, which is established from internal QC guidelines.
**KENTUCKY GEOLOGICAL SURVEY**

**COMPUTER AND LABORATORY SERVICES**

**ORTHOPHOSPHATE STANDARDS / SAMPLES SUMMARY**

Sample Delivery Group: 00020013  
Analytical Wavelength nm: 700

Water Method #: EPA 365.3  
Analyst Initials: JB

Date Analyzed: 2/24/00  
MDL: 0.009 mg/L

Calibration Verification:

Linear Calibration Range: 0.01 - 1.00

Linear Calibration Coefficient: 0.99998

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QCI*</td>
<td>0.400</td>
<td>0.374</td>
</tr>
<tr>
<td>GS09183</td>
<td>x</td>
<td>0.832</td>
</tr>
<tr>
<td>Dup GS09183</td>
<td>x</td>
<td>0.837</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.400</td>
<td>0.403</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10%, which is established from internal QC guidelines.
# KENTUCKY GEOLOGICAL SURVEY

## COMPUTER AND LABORATORY SERVICES

### TOTAL ORGANIC CARBON STANDARDS / SAMPLES SUMMARY

<table>
<thead>
<tr>
<th>Sample Delivery Group:</th>
<th>00020013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument ID:</td>
<td>Phoenix 8000</td>
</tr>
<tr>
<td>Water Method #:</td>
<td>SW846-9060</td>
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<tr>
<td>Analyst Initials:</td>
<td>JB</td>
</tr>
<tr>
<td>Date Analyzed:</td>
<td>2/28/00</td>
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<tr>
<td>MDL:</td>
<td>0.5 mg/L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td></td>
</tr>
<tr>
<td>Blank</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
<th>Calibration Average =</th>
<th>Calibration Adjusted =</th>
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</thead>
<tbody>
<tr>
<td>10 mg/L</td>
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<tr>
<td>10 mg/L</td>
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<tr>
<td>10 mg/L</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
<th>Average Blank Correction =</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td>-0.079</td>
<td>-0.074</td>
</tr>
<tr>
<td>Blank</td>
<td>-0.069</td>
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</tr>
<tr>
<td>Blank</td>
<td>-0.075</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Uncorrected TOC</th>
<th>Blank Corrected TOC, mg/L</th>
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<tbody>
<tr>
<td>True</td>
<td>Found</td>
<td></td>
</tr>
<tr>
<td>QC1*</td>
<td>2.232</td>
<td>2.5</td>
</tr>
<tr>
<td>GS09182</td>
<td>1.951</td>
<td>x</td>
</tr>
<tr>
<td>Dup GS09182</td>
<td>1.718</td>
<td>x</td>
</tr>
<tr>
<td>QC2*</td>
<td>9.540</td>
<td>10.0</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
Sample Delivery Group: 00020013  Column ID  Dionex AS4A,AG4A
Water Method #: SM4500N.C  Analyst Initials: JB/SRM
Date Analyzed: 3/07/00  MDL: 0.07 mg/L

Calibration Verification:

Linear Calibration Range: 0.1-2.9
Linear Calibration Coefficient: 0.9925

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>GS09183</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>Dup GS09183</td>
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<td>&lt;MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>1.23</td>
<td>1.22</td>
</tr>
</tbody>
</table>

* The acceptable range is ±20% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ±20%, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
TOTAL PHOSPHORUS STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00020013  Analytical Wavelength nm: 700
Water Method #: ASTM D-515  Analyst Initials: JB
Date Analyzed: 2/24/00  MDL: 0.05 mg/L

Calibration Verification:

Linear Calibration Range: 0.05 - 1.00
Linear Calibration Coefficient: 0.99988

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.43</td>
<td>0.41</td>
</tr>
<tr>
<td>GS09182</td>
<td>x</td>
<td>0.23</td>
</tr>
<tr>
<td>Dup GS09182</td>
<td>x</td>
<td>0.23</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.43</td>
<td>0.42</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
**KENTUCKY GEOLOGICAL SURVEY**

**COMPUTER AND LABORATORY SERVICES**

**ION CHROMATOGRAPHY CALIBRATION STANDARDS**

Sample Delivery Group No. 00020013

Date 02/24/00

Column ID: Dionex Ionpac AG4A, AG4A, AS4A

Method No. SW846-9056

### Calibration Standards

<table>
<thead>
<tr>
<th>Analyte</th>
<th>RT Window</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>From</td>
<td>To</td>
</tr>
<tr>
<td>Chloride</td>
<td>1.25</td>
<td>1.75</td>
</tr>
<tr>
<td>Nitrate</td>
<td>2.84</td>
<td>3.34</td>
</tr>
<tr>
<td>Sulfate</td>
<td>4.30</td>
<td>5.20</td>
</tr>
</tbody>
</table>

### Analyte Concentration

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Concentration mg/L</th>
<th>Peak area</th>
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<tbody>
<tr>
<td>Chloride Level-1</td>
<td>2.0</td>
<td>110721</td>
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<tr>
<td>Chloride Level-2</td>
<td>5.0</td>
<td>288727</td>
</tr>
<tr>
<td>Chloride Level-3</td>
<td>10.0</td>
<td>607681</td>
</tr>
<tr>
<td>Nitrate Level-1</td>
<td>0.1</td>
<td>2241</td>
</tr>
<tr>
<td>Nitrate Level-2</td>
<td>0.5</td>
<td>14483</td>
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<tr>
<td>Nitrate Level-3</td>
<td>2.5</td>
<td>76554</td>
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<tr>
<td>Sulfate Level-1</td>
<td>10.0</td>
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<tr>
<td>Sulfate Level-2</td>
<td>20.0</td>
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<tr>
<td>Sulfate Level-3</td>
<td>40.0</td>
<td>1937306</td>
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KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
ION CHROMATOGRAPHY QC SUMMARY

Sample Delivery Group: 00020013
Date: 02/24/00
Column ID: Dionex Ionpac AG4A, AG4A, AS4A
Method No.: SW846-9056

### Chloride Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
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</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>1.49</td>
<td>8.0</td>
<td>7.81</td>
<td>98</td>
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<tr>
<td>External QC</td>
<td>1.50</td>
<td>81.1</td>
<td>88.87</td>
<td>110</td>
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<tr>
<td>GS09183</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS09183 Dup*</td>
<td>2.84</td>
<td>46.1</td>
<td></td>
<td>0.9</td>
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</tbody>
</table>

### Nitrate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>2.88</td>
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<td>External QC</td>
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<td>2.85</td>
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</tr>
<tr>
<td>GS09183 Dup*</td>
<td>2.84</td>
<td>46.1</td>
<td></td>
<td>0.9</td>
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</tbody>
</table>

### Sulfate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>4.45</td>
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<tr>
<td>External QC</td>
<td>4.43</td>
<td>218</td>
<td>223</td>
<td>102</td>
<td></td>
</tr>
<tr>
<td>GS09183</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS09183 Dup**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*%R: Recoverable percentage of the true concentration value
**RPD: Relative percent difference for duplicate analysis.
April 11, 2000

Carolyn Oldfield
Thoroughbred Resource Conservation and Development Council
401 Washington Street
Georgetown, KY 40324

Dear Ms Oldfield:

Please find enclosed the following documents:

Complete results for all parameters for batch twelve, samples from the Equine Waste BMP Demonstration Project.

QA/QC report for reported samples.

Best regards,

[Signature]

Henry Francis
Laboratory Manager
Carolyn Oldfield  
Thoroughbred Res. Conservation  
401 Washington Street  
Georgetown, KY 40324

Project ID: EWDP  
Lab Sample ID: GS09252  
Project Account:  
Submittal Date: March 15, 2000  
Sample Field ID: Compost 1  
Collection Date: March 15, 2000  
Collection Time: 4:10:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>44</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>10.1</td>
<td>mg/L</td>
<td>0.02</td>
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<tr>
<td>Nitrate-N (NO3-N)</td>
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<tr>
<td>Nitrite (NO2)</td>
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<td>mg/L</td>
<td>0.002</td>
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<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.005</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.886</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.224</td>
<td>mg/L</td>
<td>0.003</td>
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<tr>
<td>Total Organic Carbon</td>
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<td>0.5</td>
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<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.19</td>
<td>mg/L</td>
<td>0.05</td>
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Comments:

Project ID: EWDP  
Lab Sample ID: GS09253  
Project Account:  
Submittal Date: March 15, 2000  
Sample Field ID: Compost 2  
Collection Date: March 15, 2000  
Collection Time: 4:20:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

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<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Parameter</td>
<td>Value</td>
<td>Unit</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------</td>
<td>------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>63</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>16.7</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>3.77</td>
<td>mg/L</td>
<td>0.004</td>
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</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.042</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.013</td>
<td>mg/L</td>
<td>0.001</td>
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</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.850</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.212</td>
<td>mg/L</td>
<td>0.003</td>
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<tr>
<td>Total Organic Carbon</td>
<td>2.3</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.21</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

If there are questions regarding this data, please contact:

Henry E. Francis

Laboratory Manager

Phone: 606-257-5500
FAX: 606-257-1147
E-mail: Francis@kgs.missouri.edu
QUALITY CONTROL DATA (REPORT # 12)

PREPARED
FOR

EQUINE WASTE BMP DEMONSTRATION PROJECT

04/11/2000

HENRY FRANCIS
Sample Delivery Group No: 00030014  Date Received: 03/15/00

<table>
<thead>
<tr>
<th>Field Sample Number</th>
<th>Lab Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Compost 1</td>
<td>1 GS09252</td>
</tr>
<tr>
<td>2 Compost 2</td>
<td>2 GS09253</td>
</tr>
</tbody>
</table>
Sample Delivery Group: 00030014

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method No.</th>
<th>Method Detection Limit</th>
<th>Concentration QC1</th>
<th>Concentration QC2</th>
<th>Concentration Sample ID**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>True ppm</td>
<td>Found ppm</td>
<td>True ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>SM4500NH3-F</td>
<td>0.02 mg/L</td>
<td>0.36</td>
<td>0.35</td>
<td>0.36</td>
</tr>
<tr>
<td>Nitrite</td>
<td>EPA 354.1</td>
<td>0.002 mg/L</td>
<td>0.500</td>
<td>0.498</td>
<td>0.500</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
<td>0.009 mg/L</td>
<td>0.500</td>
<td>0.505</td>
<td>0.500</td>
</tr>
<tr>
<td>TOC</td>
<td>SW846-9060</td>
<td>0.5 mg/L</td>
<td>2.5</td>
<td>2.3</td>
<td>10.0</td>
</tr>
<tr>
<td>TKN</td>
<td>SM4500N.C</td>
<td>0.07 mg/L</td>
<td>0.80</td>
<td>0.80</td>
<td>1.23</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D-515</td>
<td>0.05 mg/L</td>
<td>0.43</td>
<td>0.39</td>
<td>0.43</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 - 30 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 - 30 %, which is established from internal QC guidelines.
Sample Delivery Group: 00030014  Analytical Wavelength nm: 630-660
Water Method #: SM4500NH3-F  Analyst Initials: JB
Date Analyzed: 3/21/00  MDL: 0.02 mg/L

Calibration Verification:

Linear Calibration Range: 0.05 - 1.00
Linear Calibration Coefficient: 0.99689

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.36</td>
<td>0.35</td>
</tr>
<tr>
<td>GS09253</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>Dup GS09253</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.36</td>
<td>0.37</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
NITRITE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00030014  Analytical Wavelength nm: 540
Water Method #: EPA 354.1  Analyst Initials: JB
Date Analyzed: 03/16/00  MDL: 0.002 mg/L

Calibration Verification:

Linear Calibration Range: 0.01-1.00
Linear Calibration Coefficient: 0.99992

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.498</td>
</tr>
<tr>
<td>GS09252</td>
<td>x</td>
<td>0.017</td>
</tr>
<tr>
<td>Dup GS09252</td>
<td>x</td>
<td>0.017</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.495</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

ORTHOPHOSPHATE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00030014  Analytical Wavelength nm: 700
Water Method #: EPA 365.3  Analyst Initials: JB
Date Analyzed: 03/16/00  MDL: 0.009 mg/L

Calibration Verification:

Linear Calibration Range: 0.01 - 1.00
Linear Calibration Coefficient: 0.99984

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>Found</td>
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<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.505</td>
</tr>
<tr>
<td>GS09253</td>
<td>x</td>
<td>0.650</td>
</tr>
<tr>
<td>Dup GS09253</td>
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<td>0.649</td>
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<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.491</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10%, which is established from internal QC guidelines.
**TOTAL ORGANIC CARBON STANDARDS / SAMPLES SUMMARY**

Sample Delivery Group: 00030014  
Instrument ID: Phoenix 8000

Water Method #: SW846-9060  
Analyst Initials: JB

Date Analyzed: 3/21/00  
MDL: 0.5 mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
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</tr>
<tr>
<td>Blank</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mg/L</td>
<td>Calibration Average =</td>
</tr>
<tr>
<td>10 mg/L</td>
<td></td>
</tr>
<tr>
<td>10 mg/L</td>
<td>Calibration Adjusted =</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td>-0.140</td>
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<td>Blank</td>
<td>-0.147</td>
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<tr>
<td>Blank</td>
<td>-0.149</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Uncorrected TOC</th>
<th>Blank Corrected TOC, mg/L</th>
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</thead>
<tbody>
<tr>
<td>QC1*</td>
<td>2.176</td>
<td>2.3</td>
</tr>
<tr>
<td>GS09252</td>
<td>1.933</td>
<td>x</td>
</tr>
<tr>
<td>Dup GS09252</td>
<td>1.711</td>
<td>x</td>
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<tr>
<td>QC2*</td>
<td>9.488</td>
<td>9.6</td>
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</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

TOTAL KJELDAHL NITROGEN STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00030014

Column ID: 630-660

Water Method #: SM4500N.C

Analyst Initials: JB/SRM

Date Analyzed: 3/27/00

MDL: 0.07 mg/L

Calibration Verification:

Linear Calibration Range: 0.1-2.9

Linear Calibration Coefficient: 0.9925

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Matrix blank</td>
<td>x</td>
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</tr>
<tr>
<td>QC1*</td>
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<td>0.80</td>
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<tr>
<td>GS09253</td>
<td>x</td>
<td>&lt;MDL</td>
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<tr>
<td>DupGS09253</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>1.23</td>
<td>1.22</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES

TOTAL PHOSPHORUS STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00030014  Analytical Wavelength nm: 700
Water Method #: ASTM D-515  Analyst Initials: JB
Date Analyzed: 03/27/00  MDL: 0.05 mg/L

Calibration Verification:
Linear Calibration Range: 0.05 - 1.00
Linear Calibration Coefficient: 0.99860

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
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<tr>
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<tr>
<td>QC1*</td>
<td>0.43</td>
<td>0.39</td>
</tr>
<tr>
<td>GS09253</td>
<td>x</td>
<td>0.21</td>
</tr>
<tr>
<td>Dup GS09253</td>
<td>x</td>
<td>0.21</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.43</td>
<td>0.39</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES

ION CHROMATOGRAPHY CALIBRATION STANDARDS

Sample Delivery Group No. 00030014
Date 3/16/00
Column ID: Dionex Ionpac AG4A, AG4A, AS4A
Method No. SW846-9056

Calibration Standards

<table>
<thead>
<tr>
<th>Analyte</th>
<th>RT Window From</th>
<th>RT Window To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride</td>
<td>1.25</td>
<td>1.75</td>
</tr>
<tr>
<td>Nitrate</td>
<td>2.84</td>
<td>3.34</td>
</tr>
<tr>
<td>Sulfate</td>
<td>4.30</td>
<td>5.20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analyte Level-1</th>
<th>Concentration mg/L</th>
<th>Peak area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride</td>
<td>2.0</td>
<td>128400</td>
</tr>
<tr>
<td>Chloride Level-2</td>
<td>5.0</td>
<td>284441</td>
</tr>
<tr>
<td>Chloride Level-3</td>
<td>10.0</td>
<td>608122</td>
</tr>
<tr>
<td>Nitrate Level-1</td>
<td>0.1</td>
<td>1780</td>
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<tr>
<td>Nitrate Level-2</td>
<td>0.5</td>
<td>14297</td>
</tr>
<tr>
<td>Nitrate Level-3</td>
<td>2.5</td>
<td>74791</td>
</tr>
<tr>
<td>Sulfate Level-1</td>
<td>10.0</td>
<td>419785</td>
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<tr>
<td>Sulfate Level-2</td>
<td>20.0</td>
<td>878192</td>
</tr>
<tr>
<td>Sulfate Level-3</td>
<td>40.0</td>
<td>1894578</td>
</tr>
</tbody>
</table>
KENTUCKY GEOLOGICAL SURVEY  
COMPUTER AND LABORATORY SERVICES  
ION CHROMATOGRAPHY QC SUMMARY

Sample Delivery Group: 00030014  
Date: 3/16/00  
Column ID: Dionex Ionpac AG4A, AG4A, AS4A  
Method No.: SW846-9056

<table>
<thead>
<tr>
<th>Chloride Concentration mg/L</th>
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</thead>
<tbody>
<tr>
<td>Sample ID</td>
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<tr>
<td>Lab QC</td>
</tr>
<tr>
<td>External QC</td>
</tr>
<tr>
<td>GS09253</td>
</tr>
<tr>
<td>GS09253 Dup*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nitrate Concentration mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample ID</td>
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<tr>
<td>Lab QC</td>
</tr>
<tr>
<td>External QC</td>
</tr>
<tr>
<td>GS09253</td>
</tr>
<tr>
<td>GS09253 Dup*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sulfate Concentration mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample ID</td>
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<tr>
<td>Lab QC</td>
</tr>
<tr>
<td>External QC</td>
</tr>
<tr>
<td>GS09253</td>
</tr>
<tr>
<td>GS09253 Dup*</td>
</tr>
</tbody>
</table>

*%R: Recoverable percentage of the true concentration value  
**RPD: Relative percent difference for duplicate analysis.
April 19, 2000

Carolyn Oldfield  
Thoroughbred Resource Conservation and Development Council  
401 Washington Street  
Georgetown, KY 40324

Dear Ms. Oldfield:

Please find enclosed the following documents:

Complete results for all parameters for batch thirteen, samples from the Equine Waste BMP Demonstration Project.

QA/QC report for reported samples.

Best regards,

[Signature]

Henry Francis  
Laboratory Manager
Project ID: EWDP
Lab Sample ID: GS09290
Project Account: Compost 1
Submittal Date: March 30, 2000
Sample Field ID: Compost 1
Sample Collector: V.TIPTON
Collection Date: arch 29, 2000
Collection Time: 3:30:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>20</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (N(\text{II}))</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>11.2</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
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<tr>
<td>Nitrate-N (NO3-N)</td>
<td>2.53</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.024</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.007</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.677</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.221</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.0</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.20</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

Project ID: EWDP
Lab Sample ID: GS09291
Project Account: Compost 2
Submittal Date: March 30, 2000
Sample Field ID: Compost 2
Sample Collector: V.TIPTON
Collection Date: arch 29, 2000
Collection Time: 3:40:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
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<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Parameter</td>
<td>Value</td>
<td>Unit</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------</td>
<td>------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>29</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>16.4</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>3.71</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.034</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.010</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.675</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.220</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>1.9</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.20</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

If there are questions regarding this data, please contact.

Henry E. Francis  
Laboratory Manager

Phone: 806-257-5500  
FAX: 806-257-1147  
E-mail: Francis@kgs.mmr.uky.edu
QUALITY CONTROL DATA (REPORT # 13)

PREPARED
FOR

EQUINE WASTE BMP DEMONSTRATION PROJECT

04/19/2000

HENRY FRANCIS
<table>
<thead>
<tr>
<th>Field Sample Number</th>
<th>Lab Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Compost 1</td>
<td>1 GS09290</td>
</tr>
<tr>
<td>2 Compost 2</td>
<td>2 GS09291</td>
</tr>
</tbody>
</table>
**KENTUCKY GEOLOGICAL SURVEY**

**COMPUTER AND LABORATORY SERVICES**

**WATER PARAMETERS QC SUMMARY**

Sample Delivery Group: 00030021

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method No.</th>
<th>Method Detection Limit</th>
<th>Concentration QC1</th>
<th>Concentration QC2</th>
<th>Concentration Sample ID**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>True ppm</td>
<td>Found ppm</td>
<td>True ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>SM4500NH3-F</td>
<td>0.02 mg/L</td>
<td>0.36</td>
<td>0.35</td>
<td>0.36</td>
</tr>
<tr>
<td>Nitrite</td>
<td>EPA 354.1</td>
<td>0.002 mg/L</td>
<td>0.500</td>
<td>0.501</td>
<td>0.500</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
<td>0.009 mg/L</td>
<td>0.500</td>
<td>0.491</td>
<td>0.500</td>
</tr>
<tr>
<td>TOC</td>
<td>SW846-9060</td>
<td>0.5 mg/L</td>
<td>2.5</td>
<td>2.3</td>
<td>10.0</td>
</tr>
<tr>
<td>TKN</td>
<td>SM4500N,C</td>
<td>0.07 mg/L</td>
<td>0.80</td>
<td>0.80</td>
<td>1.23</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D-515</td>
<td>0.05 mg/L</td>
<td>0.43</td>
<td>0.40</td>
<td>0.43</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 - 30 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 - 30 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

AMMONIA STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00030021

Analytical Wavelength nm: 630-660

Water Method #: SM4500NH3-F

Analyst Initials: JB

Date Analyzed: 04/04/00

MDL: 0.02 mg/L

Calibration Verification:

Linear Calibration Range: 0.05 - 1.00

Linear Calibration Coefficient: 0.99973

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix blank</td>
<td></td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.36</td>
<td>0.35</td>
</tr>
<tr>
<td>GS09290</td>
<td></td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>Dup GS09290</td>
<td></td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.36</td>
<td>0.35</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20%, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

NITRITE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00030021  Analytical Wavelength nm: 540
Water Method #: EPA 354.1  Analyst Initials: JB
Date Analyzed: 03/30/00  MDL: 0.002 mg/L

Calibration Verification:

Linear Calibration Range: 0.01-1.00
Linear Calibration Coefficient: 0.99993

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>0.002</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.501</td>
</tr>
<tr>
<td>GS09290</td>
<td>x</td>
<td>0.024</td>
</tr>
<tr>
<td>Dup GS09290</td>
<td>x</td>
<td>0.022</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.508</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
**KENTUCKY GEOLOGICAL SURVEY**

**COMPUTER AND LABORATORY SERVICES**

**ORTHOPHOSPHATE STANDARDS / SAMPLES SUMMARY**

<table>
<thead>
<tr>
<th>Sample Delivery Group:</th>
<th>00030021</th>
<th>Analytical Wavelength nm:</th>
<th>700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Method #:</td>
<td>EPA 365.3</td>
<td>Analyst Initials:</td>
<td>JB</td>
</tr>
<tr>
<td>Date Analyzed:</td>
<td>03/30/00</td>
<td>MDL:</td>
<td>0.009 mg/L</td>
</tr>
</tbody>
</table>

**Calibration Verification:**

- Linear Calibration Range: 0.01 - 1.00
- Linear Calibration Coefficient: 0.99995

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.491</td>
</tr>
<tr>
<td>GS09291</td>
<td>x</td>
<td>0.675</td>
</tr>
<tr>
<td>Dup GS09291</td>
<td>x</td>
<td>0.675</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.497</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10% of the true value, which is established from internal QC guidelines.

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KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

TOTAL ORGANIC CARBON STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00030021
Water Method #: SW846-9060
Date Analyzed: 04/04/00

Instrument ID: Phoenix 8000
Analyst Initials: JB
MDL: 0.5 mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td></td>
</tr>
<tr>
<td>Blank</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mg/L</td>
<td>Calibration Average</td>
</tr>
<tr>
<td>10 mg/L</td>
<td>Calibration Adjusted</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
<th>Average Blank Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td>-0.092</td>
<td>-0.093</td>
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<tr>
<td>Blank</td>
<td>-0.094</td>
<td></td>
</tr>
<tr>
<td>Blank</td>
<td>-0.092</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Uncorrected TOC</th>
<th>Blank Corrected TOC, mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>QC1*</td>
<td>2.207</td>
<td>2.5</td>
</tr>
<tr>
<td>GS09291</td>
<td>1.784</td>
<td>x</td>
</tr>
<tr>
<td>Dup GS09291</td>
<td>1.843</td>
<td>x</td>
</tr>
<tr>
<td>QC2*</td>
<td>9.502</td>
<td>10.0</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES

TOTAL KJELDAHL NITROGEN STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00030021  Column ID  Dionex AS4,AG4
Water Method #: SM4500N.C  Analyst Initials: JB/SRM
Date Analyzed: 4/06/00  MDL: 0.07 mg/L

Calibration Verification:

Linear Calibration Range: 0.1-2.9
Linear Calibration Coefficient: 0.9925

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>GS09290</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>Dup GS09290</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>1.23</td>
<td>1.18</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
**KENTUCKY GEOLOGICAL SURVEY**

**COMPUTER AND LABORATORY SERVICES**

**TOTAL PHOSPHORUS STANDARDS / SAMPLES SUMMARY**

Sample Delivery Group: 00030021  Analytical Wavelength nm: 700

Water Method #: ASTM D-515  Analyst Initials: JB

Date Analyzed: 04/14/00  MDL: 0.05 mg/L

Calibration Verification:

Linear Calibration Range: 0.05 - 1.00

Linear Calibration Coefficient: 0.99981

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True    Found</td>
<td></td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x       &lt; MDL</td>
<td></td>
</tr>
<tr>
<td>QC1*</td>
<td>0.43    0.40</td>
<td></td>
</tr>
<tr>
<td>GS09290</td>
<td>x       0.20</td>
<td></td>
</tr>
<tr>
<td>Dup GS09290</td>
<td>x       0.21</td>
<td></td>
</tr>
<tr>
<td>QC2*</td>
<td>0.43    0.40</td>
<td></td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
May 02, 2000

Carolyn Oldfield
Thoroughbred Resource Conservation and Development Council
401 Washington Street
Georgetown, KY 40324

Dear Ms Oldfield:

Please find enclosed the following documents:

Complete results for all parameters for batch fourteen, samples from the Equine Waste BMP Demonstration Project.

QA/QC report for reported samples.

Best regards,

[Signature]

Henry Francis

Laboratory Manager
Carolyn Oldfield  
Thoroughbred Res. Conservation  
401 Washington Street  
Georgetown, KY 40324

May 02, 2000

Project ID: EWDP  
Lab Sample ID: GS09348  
Project Account:  
Submittal Date: April 12, 2000  
Sample Field ID: Compost 1  
Collection Date: April 12, 2000  
Collection Time: 12:00:00 AM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>75</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>7.85</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>1.77</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.017</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.005</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.668</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.218</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.1</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.21</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

Project ID: EWDP  
Lab Sample ID: GS09349  
Project Account:  
Submittal Date: April 12, 2000  
Sample Field ID: Compost 2  
Collection Date: April 12, 2000  
Collection Time: 12:00:00 AM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Parameter</td>
<td>Units</td>
<td>Value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------</td>
<td>--------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:

If there are questions regarding this data, please contact.

Henry E. Francis

Laboratory Manager
QUALITY CONTROL DATA (REPORT # 14)

PREPARED
FOR

EQUINE WASTE BMP DEMONSTRATION PROJECT

05/02/00

HENRY FRANCIS
<table>
<thead>
<tr>
<th>Field Sample Number</th>
<th>Lab Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Compost 1</td>
<td>1 GS09348</td>
</tr>
<tr>
<td>2 Compost 2</td>
<td>2 GS09349</td>
</tr>
</tbody>
</table>

Sample Delivery Group No: 00040012  Date Received: 04/12/99
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method No.</th>
<th>Method Detection Limit</th>
<th>Concentration QC1</th>
<th>Concentration QC2</th>
<th>Concentration Sample ID**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>True ppm</td>
<td>Found ppm</td>
<td>True ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>SM4500NHS-F</td>
<td>0.02 mg/L</td>
<td>0.36</td>
<td>0.33</td>
<td>0.36</td>
</tr>
<tr>
<td>Nitrite</td>
<td>EPA 354.1</td>
<td>0.002 mg/L</td>
<td>0.500</td>
<td>0.498</td>
<td>0.500</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
<td>0.009 mg/L</td>
<td>0.500</td>
<td>0.516</td>
<td>0.500</td>
</tr>
<tr>
<td>TOC</td>
<td>SW846-9060</td>
<td>0.5 mg/L</td>
<td>2.5</td>
<td>2.3</td>
<td>10.0</td>
</tr>
<tr>
<td>TKN</td>
<td>SM4500N.C</td>
<td>0.07 mg/L</td>
<td>0.80</td>
<td>0.80</td>
<td>1.23</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D-515</td>
<td>0.05 mg/L</td>
<td>0.43</td>
<td>0.40</td>
<td>0.43</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 - 30 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 - 30 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

AMMONIA STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00040012  Analytical Wavelength nm: 630-660
Water Method #: SM4500NH3-F  Analyst Initials: JB
Date Analyzed: 04/25/00  MDL: 0.02 mg/L

Calibration Verification:
Linear Calibration Range: 0.05 - 1.00
Linear Calibration Coefficient: 0.99563

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.36</td>
<td>0.33</td>
</tr>
<tr>
<td>GS09349</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>Dup GS09349</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.36</td>
<td>0.33</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20%, which is established from internal QC guidelines.
Sample Delivery Group: 00040012  Analytical Wavelength nm: 540
Water Method #: EPA 354.1  Analyst Initials: JB
Date Analyzed: 04/13/00  MDL: 0.002 mg/L

Calibration Verification:
Linear Calibration Range: 0.01-1.00
Linear Calibration Coefficient: 0.99995

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
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<td>0.003</td>
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<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.498</td>
</tr>
<tr>
<td>GS09348</td>
<td>x</td>
<td>0.017</td>
</tr>
<tr>
<td>Dup GS09348</td>
<td>x</td>
<td>0.016</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.498</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

ORTHOPHOSPHATE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00040012  Analytical Wavelength nm: 700
Water Method #: EPA 365.3  Analyst Initials: JB
Date Analyzed: 04/13/00  MDL: 0.009 mg/L

Calibration Verification:

Linear Calibration Range: 0.01 - 1.00
Linear Calibration Coefficient: 0.99987

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
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<td>0.024</td>
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<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.516</td>
</tr>
<tr>
<td>GS09349</td>
<td>x</td>
<td>0.667</td>
</tr>
<tr>
<td>Dup GS09349</td>
<td>x</td>
<td>0.667</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.489</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
TOTAL ORGANIC CARBON STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00040012  Instrument ID: Phoenix 8000
Water Method #: SW846-9060  Analyst Initials: JB
Date Analyzed: 04/20/00  MDL: 0.5 mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td></td>
</tr>
<tr>
<td>Blank</td>
<td></td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mg/L</td>
<td>Calibration Average =</td>
</tr>
<tr>
<td>10 mg/L</td>
<td>Calibration Adjusted =</td>
</tr>
<tr>
<td>10 mg/L</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td>Average Blank Correction = -0.098</td>
</tr>
<tr>
<td>Blank</td>
<td>-0.096</td>
</tr>
<tr>
<td>Blank</td>
<td>-0.097</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Uncorrected TOC</th>
<th>Blank Corrected TOC, mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>QC1*</td>
<td>2.177</td>
<td>2.5</td>
</tr>
<tr>
<td>GS09348</td>
<td>2.018</td>
<td>x</td>
</tr>
<tr>
<td>Dup GS09348</td>
<td>1.791</td>
<td>x</td>
</tr>
<tr>
<td>QC2*</td>
<td>9.508</td>
<td>10.0</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
Sample Delivery Group: 00040012
Water Method #: SM4500N.C
Date Analyzed: 4/18/00

Column ID: Dionex AS4A,AG4A
Analyst Initials: JB/SRM
MDL: 0.07 mg/L

Calibration Verification:
Linear Calibration Range: 0.1-2.9
Linear Calibration Coefficient: 0.9925

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>QC1*</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>GS09348</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>Dup GS09348</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>1.23</td>
<td>1.21</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
**KENTUCKY GEOLOGICAL SURVEY**

**COMPUTER AND LABORATORY SERVICES**

**TOTAL PHOSPHORUS STANDARDS / SAMPLES SUMMARY**

Sample Delivery Group: 00040012  
Analytical Wavelength nm: 700

Water Method #: ASTM D-515  
Analyst Initials: JB

Date Analyzed: 04/14/00  
MDL: 0.05 mg/L

Calibration Verification:

Linear Calibration Range: 0.05 - 1.00

Linear Calibration Coefficient: 0.99981

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
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<tr>
<td>QC1*</td>
<td>0.43</td>
<td>0.40</td>
</tr>
<tr>
<td>GS09348</td>
<td>x</td>
<td>0.21</td>
</tr>
<tr>
<td>Dup GS09348</td>
<td>x</td>
<td>0.21</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.43</td>
<td>0.40</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

ION CHROMATOGRAPHY CALIBRATION STANDARDS

Sample Delivery Group No. 00040012

Date 4/13/00

Column ID: Dionex Ionpac AG4A, AG4A, AS4A

Method No. SW846-9056

Calibration Standards

<table>
<thead>
<tr>
<th>Analyte</th>
<th>RT Window</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>From</td>
<td>To</td>
</tr>
<tr>
<td>Chloride</td>
<td>1.25</td>
<td>1.75</td>
</tr>
<tr>
<td>Nitrate</td>
<td>2.84</td>
<td>3.34</td>
</tr>
<tr>
<td>Sulfate</td>
<td>4.30</td>
<td>5.20</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Concentration mg/L</th>
<th>Peak area</th>
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</thead>
<tbody>
<tr>
<td>Chloride Level-1</td>
<td>2.0</td>
<td>112051</td>
</tr>
<tr>
<td>Chloride Level-2</td>
<td>5.0</td>
<td>285814</td>
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<td>Chloride Level-3</td>
<td>10.0</td>
<td>609703</td>
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<td>Nitrate Level-1</td>
<td>0.10</td>
<td>1959</td>
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<td>Nitrate Level-2</td>
<td>0.50</td>
<td>14134</td>
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<tr>
<td>Nitrate Level-3</td>
<td>2.50</td>
<td>76324</td>
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<td>Sulfate Level-1</td>
<td>10.0</td>
<td>421877</td>
</tr>
<tr>
<td>Sulfate Level-2</td>
<td>20.0</td>
<td>882965</td>
</tr>
<tr>
<td>Sulfate Level-3</td>
<td>40.0</td>
<td>1906833</td>
</tr>
</tbody>
</table>
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
ION CHROMATOGRAPHY QC SUMMARY

Sample Delivery Group: 00040012
Date: 4/13/00
Column ID: Dionex Ionpac AG4A, AG4A, AS4A
Method No.: SW846-9056

<table>
<thead>
<tr>
<th>Chloride Concentration mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample ID</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>Lab QC</td>
</tr>
<tr>
<td>External QC</td>
</tr>
<tr>
<td>GS09349</td>
</tr>
<tr>
<td>GS09349 Dup</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nitrate Concentration mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample ID</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>Lab QC</td>
</tr>
<tr>
<td>External QC</td>
</tr>
<tr>
<td>GS09349</td>
</tr>
<tr>
<td>GS09349 Dup</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sulfate Concentration mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample ID</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>Lab QC</td>
</tr>
<tr>
<td>External QC</td>
</tr>
<tr>
<td>GS09349</td>
</tr>
<tr>
<td>GS09349 Dup</td>
</tr>
</tbody>
</table>

*%R. Recoverable percentage of the true concentration value
**RPD Relative percent difference for duplicate analysis.
May 05, 2000

Carolyn Oldfield
Thoroughbred Resource Conservation and Development Council
401 Washington Street
Georgetown, KY 40324

Dear Ms Oldfield:

Please find enclosed the following documents:

Complete results for all parameters for batch fifteen, samples from the Equine Waste BMP Demonstration Project.

QA/QC report for reported samples.

Best regards,

Henry Francis
Laboratory Manager
Carolyn Oldfield  
Thoroughbred Res. Conservation  
401 Washington Street  
Georgetown, KY 40324  

Project ID: EWDP  
Lab Sample ID: GS09361  
Project Account:  
Submittal Date: April 20, 2000  
Sample Field ID: Compost 1  
Collection Date: April 19, 2000  
Collection Time: 3:35:00 PM  

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>15</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>6.5</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>1.47</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.023</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.007</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.655</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.214</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.1</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.23</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:
Idle Hour Farm-Bourbon Co.

Project ID: EWDP  
Lab Sample ID: GS09362  
Project Account:  
Submittal Date: April 20, 2000  
Sample Field ID: Compost 2  
Collection Date: April 19, 2000  
Collection Time: 3:45:00 PM  

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
</tbody>
</table>

May 04, 2000
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>543</td>
<td>CFU/100mL</td>
<td>1</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>11.9</td>
<td>mg/L</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>2.89</td>
<td>mg/L</td>
<td>0.004</td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.032</td>
<td>mg/L</td>
<td>0.002</td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.010</td>
<td>mg/L</td>
<td>0.001</td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.674</td>
<td>mg/L</td>
<td>0.009</td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.220</td>
<td>mg/L</td>
<td>0.003</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.0</td>
<td>mg/L</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.22</td>
<td>mg/L</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Comments:
Idle Hour Farm-Bourbon Co.

If there are questions regarding this data, please contact:

Henry E. Francis
Laboratory Manager

Phone: 606-257-5500
FAX: 606-257-1147
E-mail: Francis@kgs.mine.uky.edu
QUALITY CONTROL DATA (REPORT # 15)

PREPARED FOR

EQUINE WASTE BMP DEMONSTRATION PROJECT

05/04/2000

HENRY FRANCIS
<table>
<thead>
<tr>
<th>Field Sample Number</th>
<th>1</th>
<th>Compost 1</th>
<th>Lab Sample Number</th>
<th>1</th>
<th>GS09361</th>
<th>2</th>
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<tr>
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<td>2</td>
<td>Compost 2</td>
<td></td>
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<td></td>
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Sample Delivery Group No.: 00040016  Date Received: 04/20/00
### Water Parameters QC Summary

**Sample Delivery Group:** 0040016

<table>
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<tr>
<th>Parameter</th>
<th>Method No.</th>
<th>Method Detection Limit</th>
<th>Concentration QC1 True ppm</th>
<th>Concentration QC1 Found ppm</th>
<th>Concentration QC2 True ppm</th>
<th>Concentration QC2 Found ppm</th>
<th>Concentration Sample ID GS0xxx ppm</th>
<th>GS0xxx Dup ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>SM4500NH3-F</td>
<td>0.02 mg/L</td>
<td>0.36 ppm</td>
<td>0.32 ppm</td>
<td>0.36 ppm</td>
<td>0.33 ppm</td>
<td>&lt; MDL</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>Nitrite</td>
<td>EPA 354.1</td>
<td>0.002 mg/L</td>
<td>0.500 ppm</td>
<td>0.493 ppm</td>
<td>0.500 ppm</td>
<td>0.491 ppm</td>
<td>0.023 ppm</td>
<td>0.021 ppm</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
<td>0.009 mg/L</td>
<td>0.500 ppm</td>
<td>0.501 ppm</td>
<td>0.500 ppm</td>
<td>0.514 ppm</td>
<td>0.674 ppm</td>
<td>0.648 ppm</td>
</tr>
<tr>
<td>TOC</td>
<td>SW846-9060</td>
<td>0.5 mg/L</td>
<td>2.5 ppm</td>
<td>2.3 ppm</td>
<td>10.0 ppm</td>
<td>9.5 ppm</td>
<td>2.1 ppm</td>
<td>1.9 ppm</td>
</tr>
<tr>
<td>TKN</td>
<td>SM4500N.C</td>
<td>0.07 mg/L</td>
<td>0.80 ppm</td>
<td>0.83 ppm</td>
<td>1.23 ppm</td>
<td>1.24 ppm</td>
<td>&lt; MDL</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D-515</td>
<td>0.05 mg/L</td>
<td>0.43 ppm</td>
<td>0.42 ppm</td>
<td>0.43 ppm</td>
<td>0.42 ppm</td>
<td>0.23 ppm</td>
<td>0.23 ppm</td>
</tr>
</tbody>
</table>

* The acceptable range is ±10 - 30% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ±10 - 30%, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

AMMONIA STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00040016  Analytical Wavelength nm: 630-660
Water Method #: SM4500NH3-F  Analyst Initials: JB
Date Analyzed: 04/25/00  MDL: 0.02 mg/L

Calibration Verification:

Linear Calibration Range: 0.05 - 1.00
Linear Calibration Coefficient: 0.99563

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>Found</td>
<td></td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.36</td>
<td>0.32</td>
</tr>
<tr>
<td>GS09362</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>Dup GS09362</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.36</td>
<td>0.33</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY  
COMPUTER AND LABORATORY SERVICES  
NITRITE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00040016  
Analytical Wavelength nm: 540  
Water Method #: EPA 354.1  
Analyst Initials: JB  
Date Analyzed: 04/20/00  
MDL: 0.002 mg/L  

Calibration Verification:

| Linear Calibration Range: | 0.01-1.00 |
| Linear Calibration Coefficient: | 0.99992 |

<table>
<thead>
<tr>
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<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.493</td>
</tr>
<tr>
<td>GS09361</td>
<td>x</td>
<td>0.023</td>
</tr>
<tr>
<td>Dup GS09361</td>
<td>x</td>
<td>0.021</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.491</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10%, which is established from internal QC guidelines.
ORTHO PHOSPHATE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00040016  
Analytical Wavelength nm: 700

Water Method #: EPA 365.3  
Analyst Initials: JB

Date Analyzed: 04/20/00  
MDL: 0.009 mg/L

Calibration Verification:

Linear Calibration Range: 0.01 - 1.00

Linear Calibration Coefficient: 0.99996

<table>
<thead>
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<th>Sample ID</th>
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<tbody>
<tr>
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<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.514</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10%, which is established from internal QC guidelines.
**TOTAL ORGANIC CARBON STANDARDS / SAMPLES SUMMARY**

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
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<td>Blank</td>
<td></td>
<td>Blank</td>
<td>-0.133</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 mg/L</td>
<td>Calibration</td>
<td>Blank</td>
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<tr>
<td></td>
<td></td>
<td>10 mg/L</td>
<td>Average</td>
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<tr>
<td></td>
<td></td>
<td>10 mg/L</td>
<td>Adjusted</td>
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**Average Blank Correction = -0.140**

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Uncorrected TOC</th>
<th>Blank Corrected TOC, mg/L</th>
<th>True</th>
<th>Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>QC1*</td>
<td>2.137</td>
<td>2.5</td>
<td>2.3</td>
<td></td>
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<tr>
<td>GS09361</td>
<td>1.982</td>
<td>x</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>Dup GS09361</td>
<td>1.723</td>
<td>x</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>QC2*</td>
<td>9.400</td>
<td>10.0</td>
<td>9.5</td>
<td></td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES

TOTAL KJELDAHL NITROGEN STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00040016  Column ID: Dionex AS4A, AG4A
Water Method #: SM4500N.C  Analyst Initials: JB/SRM
Date Analyzed: 5/02/00  MDL: 0.07 mg/L

Calibration Verification:

Linear Calibration Range: 0.1-2.9
Linear Calibration Coefficient: 0.9925

<table>
<thead>
<tr>
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<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix blank</td>
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<tr>
<td>QC1*</td>
<td>0.80</td>
<td>0.83</td>
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<tr>
<td>GS09361</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>Dup GS09361</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>1.23</td>
<td>1.24</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20%, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

TOTAL PHOSPHORUS STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00040016  Analytical Wavelength nm: 700

Water Method #: ASTM D-515  Analyst Initials: JB

Date Analyzed: 05/01/00  MDL: 0.05 mg/L

Calibration Verification:

Linear Calibration Range: 0.05 - 1.00

Linear Calibration Coefficient: 0.99993

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
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<tbody>
<tr>
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<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
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<td>&lt; MDL</td>
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<tr>
<td>QC1*</td>
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<tr>
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<td>0.23</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.43</td>
<td>0.42</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
### KENTUCKY GEOLOGICAL SURVEY

**COMPUTER AND LABORATORY SERVICES**

**ION CHROMATOGRAPHY CALIBRATION STANDARDS**

Sample Delivery Group No. 00040016

Date 4/20/00

Column ID: Dionex Ionpac AG4A, AG4A, AS4A

Method No. SW846-9056

**Calibration Standards**

<table>
<thead>
<tr>
<th>Analyte</th>
<th>RT Window</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>From</td>
<td>To</td>
</tr>
<tr>
<td>Chloride</td>
<td>1.25</td>
<td>1.75</td>
</tr>
<tr>
<td>Nitrate</td>
<td>2.84</td>
<td>3.34</td>
</tr>
<tr>
<td>Sulfate</td>
<td>4.30</td>
<td>5.20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Concentration</th>
<th>Peak area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride Level-1</td>
<td>2.0</td>
<td>111369</td>
</tr>
<tr>
<td>Chloride Level-2</td>
<td>5.0</td>
<td>288083</td>
</tr>
<tr>
<td>Chloride Level-3</td>
<td>10.0</td>
<td>611455</td>
</tr>
<tr>
<td>Nitrate Level-1</td>
<td>0.10</td>
<td>1707</td>
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<tr>
<td>Nitrate Level-2</td>
<td>0.50</td>
<td>13589</td>
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<tr>
<td>Nitrate Level-3</td>
<td>2.50</td>
<td>75568</td>
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<tr>
<td>Sulfate Level-1</td>
<td>10.0</td>
<td>431711</td>
</tr>
<tr>
<td>Sulfate Level-2</td>
<td>20.0</td>
<td>891402</td>
</tr>
<tr>
<td>Sulfate Level-3</td>
<td>40.0</td>
<td>1958862</td>
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</table>
## Chloride Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
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<tbody>
<tr>
<td>Lab QC</td>
<td>1.47</td>
<td>8.0</td>
<td>7.78</td>
<td>97</td>
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<tr>
<td>External QC</td>
<td>1.47</td>
<td>81.1</td>
<td>88.8</td>
<td>109</td>
<td></td>
</tr>
<tr>
<td>GS09362</td>
<td>1.48</td>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS09362 Dup*</td>
<td>1.47</td>
<td>5.0</td>
<td></td>
<td></td>
<td>0</td>
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</tbody>
</table>

## Nitrate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>2.69</td>
<td>1.0</td>
<td>1.07</td>
<td>107</td>
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<tr>
<td>External QC</td>
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<td>11.9</td>
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<td></td>
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<tr>
<td>GS09362 Dup**</td>
<td>2.70</td>
<td>11.8</td>
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<td>0.8</td>
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</tbody>
</table>

## Sulfate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>4.20</td>
<td>30.0</td>
<td>29.86</td>
<td>100</td>
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<tr>
<td>External QC</td>
<td>4.17</td>
<td>218</td>
<td>223</td>
<td>102</td>
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<td>GS09362</td>
<td>4.21</td>
<td>22.7</td>
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<td></td>
</tr>
<tr>
<td>GS09362 Dup**</td>
<td>4.21</td>
<td>22.6</td>
<td></td>
<td></td>
<td>0.4</td>
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</tbody>
</table>

*%R: Recoverable percentage of the true concentration value
**RPD: Relative percent difference for duplicate analysis.
The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.05</td>
<td>mg/L</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.05</td>
<td>mg/L</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>93</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>4.3</td>
<td>mg/L</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>0.972</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.041</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.012</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.752</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.245</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.4</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.21</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.09</td>
<td>mg/L</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Test</td>
<td>Unit 1</td>
<td>Unit 2</td>
<td>Unit 3</td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------</td>
<td>-----------------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.07</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>492</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>9.7</td>
<td>mg/L</td>
<td>0.02</td>
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</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>2.19</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.076</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.023</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.639</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.206</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.6</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.18</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

If there are questions regarding this data, please contact.

Henry E. Francis
Laboratory Manager

Phone: 606-257-5500
FAX: 606-257-1147
E-mail: Francis@kgs.mm.uky.edu
QUALITY CONTROL DATA (REPORT # 16)

PREPARED
FOR

EQUINE WASTE BMP DEMONSTRATION PROJECT

05/31/2000

HENRY FRANCIS
<table>
<thead>
<tr>
<th>Field Sample Number</th>
<th>Lab Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compost 1</td>
<td>GS09416</td>
</tr>
<tr>
<td>Compost 2</td>
<td>GS09417</td>
</tr>
</tbody>
</table>

Sample Delivery Group No: 00050001  
Date Received: 05/04/00
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method No.</th>
<th>Method Detection Limit</th>
<th>Concentration QC1</th>
<th>Concentration QC2</th>
<th>Concentration Sample ID**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ppm</td>
<td>True ppm</td>
<td>Found ppm</td>
<td>True ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>SM4500NH3-F</td>
<td>0.02 mg/L</td>
<td>0.36</td>
<td>0.35</td>
<td>0.36</td>
</tr>
<tr>
<td>Nitrite</td>
<td>EPA 354.1</td>
<td>0.002 mg/L</td>
<td>0.50</td>
<td>0.492</td>
<td>0.50</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
<td>0.009 mg/L</td>
<td>0.50</td>
<td>0.487</td>
<td>0.50</td>
</tr>
<tr>
<td>TOC</td>
<td>SW846-9060</td>
<td>0.5 mg/L</td>
<td>2.5</td>
<td>2.4</td>
<td>10.0</td>
</tr>
<tr>
<td>TKN</td>
<td>SM4500N.C</td>
<td>0.07 mg/L</td>
<td>0.80</td>
<td>0.80</td>
<td>1.23</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D-515</td>
<td>0.05 mg/L</td>
<td>0.34</td>
<td>0.31</td>
<td>0.34</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 - 30 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 - 30 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
AMMONIA STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00050001
Water Method #: SM4500NH3-F
Date Analyzed: 05/09/00

Analytical Wavelength nm: 630-660
Analyst Initials: JB
MDL: 0.02 mg/L

Calibration Verification:
Linear Calibration Range: 0.05 - 1.00
Linear Calibration Coefficient: 0.99729

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.36</td>
<td>0.35</td>
</tr>
<tr>
<td>GS09417</td>
<td>x</td>
<td>0.07</td>
</tr>
<tr>
<td>Dup GS09417</td>
<td>x</td>
<td>0.07</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.36</td>
<td>0.35</td>
</tr>
</tbody>
</table>

* The acceptable range is ±20% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ±20%, which is established from internal QC guidelines.
Sample Delivery Group: 00050001  Analytical Wavelength nm: 540
Water Method #: EPA 354.1  Analyst Initials: JB
Date Analyzed: 05/04/00  MDL: 0.002 mg/L

Calibration Verification:
Linear Calibration Range: 0.01-1.00
Linear Calibration Coefficient: 0.99992

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
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</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.492</td>
</tr>
<tr>
<td>GS09416</td>
<td>x</td>
<td>0.041</td>
</tr>
<tr>
<td>Dup GS09416</td>
<td>x</td>
<td>0.039</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.496</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10%, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

ORTHOPHOSPHATE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00050001  Analytical Wavelength nm: 700
Water Method #: EPA 365.3  Analyst Initials: JB
Date Analyzed: 05/04/00  MDL: 0.009 mg/L

Calibration Verification:
Linear Calibration Range: 0.01 - 1.00
Linear Calibration Coefficient: 0.99974

<table>
<thead>
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<tr>
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<tr>
<td>QC1*</td>
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<td>0.639</td>
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<tr>
<td>Dup GS09417</td>
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<td>0.654</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.492</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
TOTAL ORGANIC CARBON STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00050001  Instrument ID: Phoenix 8000
Water Method #: SW846-9060  Analyst Initials: JB
Date Analyzed: 05/10/00  MDL: 0.5 mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td></td>
</tr>
<tr>
<td>Blank</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mg/L</td>
<td></td>
</tr>
</tbody>
</table>

Calibration Average = 
Calibration Adjusted =

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
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</thead>
<tbody>
<tr>
<td>Blank</td>
<td>-0.130</td>
</tr>
<tr>
<td>Blank</td>
<td>-0.133</td>
</tr>
<tr>
<td>Blank</td>
<td>-0.140</td>
</tr>
</tbody>
</table>

Average Blank Correction = -0.134

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Uncorrected TOC</th>
<th>Blank Corrected TOC, mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>QC1*</td>
<td>2.246</td>
<td>True: 2.5, Found: 2.4</td>
</tr>
<tr>
<td>GS09416</td>
<td>2.225</td>
<td>x: 2.4</td>
</tr>
<tr>
<td>Dup GS09416</td>
<td>2.018</td>
<td>x: 2.2</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15%, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
TOTAL KJELDAHL NITROGEN STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 0050001  Column ID  Dionex AS4A,AG4A
Water Method #: SM4500N.C  Analyst Initials: JB/SRM
Date Analyzed: 5/12/00  MDL: 0.07 mg/L

Calibration Verification:
Linear Calibration Range: 0.1-2.9
Linear Calibration Coefficient: 0.9925

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
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<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>GS09416</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>Dup GS09416</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>1.23</td>
<td>1.27</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
Sample Delivery Group: 00050001  
Analytical Wavelength nm: 700  
Water Method #: ASTM D-515  
Analyst Initials: JB / TM  
Date Analyzed: 05/19/00  
MDL: 0.05 mg/L  

Calibration Verification:  
Linear Calibration Range: 0.20 - 1.00  
Linear Calibration Coefficient: 0.99838  

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix blank</td>
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<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.34</td>
<td>0.31</td>
</tr>
<tr>
<td>GS09417</td>
<td>x</td>
<td>0.18</td>
</tr>
<tr>
<td>Dup GS09417</td>
<td>x</td>
<td>0.19</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.34</td>
<td>0.31</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
ION CHROMATOGRAPHY CALIBRATION STANDARDS

Sample Delivery Group No. 00050001
Date 5/09/00
Column ID: Dionex Ionpac AG4A, AG4A, AS4A
Method No. SW846-9056

Calibration Standards

<table>
<thead>
<tr>
<th>Analyte</th>
<th>RT Window From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride</td>
<td>1.25</td>
<td>1.75</td>
</tr>
<tr>
<td>Nitrate</td>
<td>2.54</td>
<td>3.04</td>
</tr>
<tr>
<td>Sulfate</td>
<td>3.90</td>
<td>4.90</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Concentration mg/L</th>
<th>Peak area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride Level-1</td>
<td>2.0</td>
<td>107152</td>
</tr>
<tr>
<td>Chloride Level-2</td>
<td>5.0</td>
<td>276122</td>
</tr>
<tr>
<td>Chloride Level-3</td>
<td>10.0</td>
<td>582868</td>
</tr>
<tr>
<td>Nitrate Level-1</td>
<td>0.1</td>
<td>1075</td>
</tr>
<tr>
<td>Nitrate Level-2</td>
<td>0.5</td>
<td>13888</td>
</tr>
<tr>
<td>Nitrate Level-3</td>
<td>2.5</td>
<td>74318</td>
</tr>
<tr>
<td>Sulfate Level-1</td>
<td>10.0</td>
<td>413103</td>
</tr>
<tr>
<td>Sulfate Level-2</td>
<td>20.0</td>
<td>861446</td>
</tr>
<tr>
<td>Sulfate Level-3</td>
<td>40.0</td>
<td>1867293</td>
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</table>
## Chloride Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>1.43</td>
<td>8.0</td>
<td>7.91</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>External QC</td>
<td>1.43</td>
<td>81.1</td>
<td>88.7</td>
<td>109</td>
<td></td>
</tr>
<tr>
<td>GS09417</td>
<td>1.45</td>
<td>5.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS09417 Dup**</td>
<td>1.45</td>
<td>5.4</td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

## Nitrate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>2.51</td>
<td>1.0</td>
<td>1.06</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>External QC</td>
<td>2.57</td>
<td>46.02</td>
<td>47.94</td>
<td>104</td>
<td></td>
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<tr>
<td>GS09417</td>
<td>2.59</td>
<td></td>
<td>9.7</td>
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<td></td>
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<tr>
<td>GS09417 Dup*</td>
<td>2.59</td>
<td>9.6</td>
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<td>1</td>
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</tbody>
</table>

## Sulfate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>3.93</td>
<td>30.0</td>
<td>29.59</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>External QC</td>
<td>3.90</td>
<td>218</td>
<td>223</td>
<td>102</td>
<td></td>
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<tr>
<td>GS09417</td>
<td>3.93</td>
<td></td>
<td>22.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS09417 Dup**</td>
<td>3.93</td>
<td>22.2</td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

*%R* Recoverable percentage of the true concentration value  
**RPD Relative percent difference for duplicate analysis.
Carolyn Oldfield  
Thoroughbred Res. Conservation  
401 Washington Street  
Georgetown, KY 40324  

June 17, 2000  

Project ID: EWDP  
Project Account: Compost 1  
Lab Sample ID: GS09448  
Submittal Date: May 17, 2000  
Sample Collector: V. TIPTON  
Collection Date: May 17, 2000  
Collection Time: 3:05:00 PM  

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:  

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH₃)</td>
<td>0.05</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH₃-N)</td>
<td>0.04</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>203</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH₃)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO₃)</td>
<td>5.6</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO₃-N)</td>
<td>1.27</td>
<td>mg/L</td>
<td>0.004</td>
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</tr>
<tr>
<td>Nitrite (NO₂)</td>
<td>0.038</td>
<td>mg/L</td>
<td>0.002</td>
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<tr>
<td>Nitrite-N (NO₂-N)</td>
<td>0.012</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO₄)</td>
<td>0.453</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO₄-P)</td>
<td>0.148</td>
<td>mg/L</td>
<td>0.003</td>
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<tr>
<td>Total Organic Carbon</td>
<td>2.4</td>
<td>mg/L</td>
<td>0.5</td>
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<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.16</td>
<td>mg/L</td>
<td>0.05</td>
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</table>

Comments:  

Project ID: EWDP  
Project Account: Compost 2  
Lab Sample ID: GS09449  
Submittal Date: May 17, 2000  
Sample Collector: V. TIPTON  
Collection Date: May 17, 2000  
Collection Time: 3:15:00 PM  

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:  

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
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</thead>
<tbody>
<tr>
<td>Ammonia (NH₃)</td>
<td>0.11</td>
<td>mg/L</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>----</td>
<td>------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.09</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>1627</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>1.7</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>0.384</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.035</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.011</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.519</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.169</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>3.1</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.23</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

If there are questions regarding this data, please contact.

Henry E. Francis

Laboratory Manager
QUALITY CONTROL DATA (REPORT # 17)

PREPARED
FOR

EQUINE WASTE BMP DEMONSTRATION PROJECT

06/02/2000

HENRY FRANCIS
<table>
<thead>
<tr>
<th>Field Sample Number</th>
<th>Lab Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Compost 1</td>
<td>1 GS09448</td>
</tr>
<tr>
<td>2 Compost 2</td>
<td>2 GS09449</td>
</tr>
</tbody>
</table>

Sample Delivery Group No: 00050008  Date Received: 05/17/00
Sample Delivery Group: 00050008

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method No.</th>
<th>Method Detection Limit</th>
<th>Concentration QC1</th>
<th>Concentration QC2</th>
<th>Concentration Sample ID**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>True ppm</td>
<td>Found ppm</td>
<td>True ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>SM4500NH3-F</td>
<td>0.02 mg/L</td>
<td>0.36</td>
<td>0.37</td>
<td>0.36</td>
</tr>
<tr>
<td>Nitrite</td>
<td>EPA 354.1</td>
<td>0.002 mg/L</td>
<td>0.500</td>
<td>0.499</td>
<td>0.500</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
<td>0.009 mg/L</td>
<td>0.500</td>
<td>0.501</td>
<td>0.500</td>
</tr>
<tr>
<td>TOC</td>
<td>SW846-9060</td>
<td>0.5 mg/L</td>
<td>2.5</td>
<td>2.3</td>
<td>2.5</td>
</tr>
<tr>
<td>TKN</td>
<td>SM4500N.C</td>
<td>0.07 mg/L</td>
<td>0.80</td>
<td>0.80</td>
<td>1.23</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D-515</td>
<td>0.05 mg/L</td>
<td>0.34</td>
<td>0.31</td>
<td>0.34</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 - 30% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 - 30%, which is established from internal QC guidelines.
## AMMONIA STANDARDS / SAMPLES SUMMARY

<table>
<thead>
<tr>
<th>Sample Delivery Group:</th>
<th>00050008</th>
<th>Analytical Wavelength nm:</th>
<th>630-660</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Method #:</td>
<td>SM4500NH3-F</td>
<td>Analyst Initials:</td>
<td>TM/JB</td>
</tr>
<tr>
<td>Date Analyzed:</td>
<td>5/24/00</td>
<td>MDL:</td>
<td>0.02 mg/L</td>
</tr>
</tbody>
</table>

**Calibration Verification:**

- **Linear Calibration Range:** 0.05-1.00
- **Linear Calibration Coefficient:** 0.99977

### Sample ID Table

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>BDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.36</td>
<td>0.37</td>
</tr>
<tr>
<td>GS09449</td>
<td>x</td>
<td>0.09</td>
</tr>
<tr>
<td>Dup GS09449</td>
<td>x</td>
<td>0.09</td>
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<tr>
<td>QC2*</td>
<td>0.36</td>
<td>0.38</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
NITRITE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00050008  Analytical Wavelength nm: 540
Water Method #: EPA 354.1  Analyst Initials: JB / TM
Date Analyzed: 05/18/00  MDL: 0.002 mg/L

Calibration Verification:
Linear Calibration Range: 0.01 - 1.00
Linear Calibration Coefficient: 0.99953

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.499</td>
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<tr>
<td>GS09449</td>
<td>x</td>
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<tr>
<td>Dup GS09449</td>
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<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.503</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
ORTHOHOSPHATE STANDARDS / SAMPLES SUMMARY

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
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</tr>
<tr>
<td>QC1*</td>
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<td>0.501</td>
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<tr>
<td>GS09448</td>
<td>x</td>
<td>0.453</td>
</tr>
<tr>
<td>Dup GS09448</td>
<td>x</td>
<td>0.455</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.487</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

TOTAL ORGANIC CARBON STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00050008  Instrument ID: DC - 80
Water Method #: SW846-9060  Analyst Initials: TM
Date Analyzed: 5/22/00  MDL: 0.5 mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
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</tr>
<tr>
<td>Blank</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mg/L</td>
<td></td>
</tr>
<tr>
<td>10 mg/L</td>
<td></td>
</tr>
<tr>
<td>10 mg/L</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
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<tr>
<td>Blank</td>
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<tr>
<td>Blank</td>
<td>-0.065</td>
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</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Uncorrected TOC</th>
<th>Blank Corrected TOC, mg/L</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>QC1*</td>
<td>2.249</td>
<td>2.5</td>
</tr>
<tr>
<td>GS09448</td>
<td>2.350</td>
<td>x</td>
</tr>
<tr>
<td>Dup GS09448</td>
<td>2.160</td>
<td>x</td>
</tr>
<tr>
<td>QC2*</td>
<td>9.607</td>
<td>10.0</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

TOTAL KJELDAHL NITROGEN STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00050008  Column ID  Dionex AS4A,AG4A
Water Method #: SM4500N.C  Analyst Initials: JB/SRM
Date Analyzed: 5/25/00  MDL: 0.07 mg/L

Calibration Verification:

Linear Calibration Range: 0.1-2.9
Linear Calibration Coefficient: 0.9980

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
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<tr>
<td>Matrix blank</td>
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<tr>
<td>QC1*</td>
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<tr>
<td>GS09449</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>Dup GS09449</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>1.23</td>
<td>1.25</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
TOTAL PHOSPHORUS STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00050008  Analytical Wavelength nm: 700

Water Method #: ASTM D-515  Analyst Initials: JB / TM

Date Analyzed: 05/19/00  MDL: 0.05 mg/L

Calibration Verification:

Linear Calibration Range: 0.20 - 1.00

Linear Calibration Coefficient: 0.99838

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
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<tr>
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<td>0.16</td>
</tr>
<tr>
<td>Dup GS09448</td>
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<td>0.16</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.34</td>
<td>0.32</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES

ION CHROMATOGRAPHY CALIBRATION STANDARDS

Sample Delivery Group No. 00050008
Date 5/18/00
Column ID: Dionex Ionpac AG4A, AG4A, AS4A
Method No. SW846-9056

Calibration Standards

<table>
<thead>
<tr>
<th>Analyte</th>
<th>RT Window From</th>
<th>RT Window To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride</td>
<td>1.25</td>
<td>1.75</td>
</tr>
<tr>
<td>Nitrate</td>
<td>2.54</td>
<td>3.04</td>
</tr>
<tr>
<td>Sulfate</td>
<td>3.80</td>
<td>4.80</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analyte Level-1</th>
<th>Concentration mg/L</th>
<th>Peak area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride</td>
<td>2.0</td>
<td>109927</td>
</tr>
<tr>
<td>Chloride</td>
<td>5.0</td>
<td>277200</td>
</tr>
<tr>
<td>Chloride</td>
<td>10.0</td>
<td>587347</td>
</tr>
<tr>
<td>Nitrate Level-1</td>
<td>0.1</td>
<td>1299</td>
</tr>
<tr>
<td>Nitrate Level-2</td>
<td>0.5</td>
<td>13992</td>
</tr>
<tr>
<td>Nitrate Level-3</td>
<td>2.5</td>
<td>74789</td>
</tr>
<tr>
<td>Sulfate Level-1</td>
<td>10.0</td>
<td>413499</td>
</tr>
<tr>
<td>Sulfate Level-2</td>
<td>20.0</td>
<td>867581</td>
</tr>
<tr>
<td>Sulfate Level-3</td>
<td>40.0</td>
<td>1869016</td>
</tr>
</tbody>
</table>
**KENTUCKY GEOLOGICAL SURVEY**

**COMPUTER AND LABORATORY SERVICES**

**ION CHROMATOGRAPHY QC SUMMARY**

Sample Delivery Group: 00050008

Date: 5/18/00

Column ID: Dionex Ionpac AG4A, AG4A, AS4A

Method No.: SW846-9056

### Chloride Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
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</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>1.43</td>
<td>8.0</td>
<td>7.82</td>
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<td>External QC</td>
<td>1.43</td>
<td>1.1</td>
<td>88.35</td>
<td>109</td>
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</tr>
<tr>
<td>GS09449</td>
<td>1.45</td>
<td>5.1</td>
<td>5.1</td>
<td>109</td>
<td></td>
</tr>
<tr>
<td>GS09449 Dup*</td>
<td>1.45</td>
<td>5.1</td>
<td>5.1</td>
<td>109</td>
<td></td>
</tr>
</tbody>
</table>

### Nitrate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>2.61</td>
<td>1.0</td>
<td>1.06</td>
<td>106</td>
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</tr>
<tr>
<td>External QC</td>
<td>2.56</td>
<td>46.02</td>
<td>48.01</td>
<td>104</td>
<td></td>
</tr>
<tr>
<td>GS09449</td>
<td>2.59</td>
<td>1.7</td>
<td>1.7</td>
<td>104</td>
<td></td>
</tr>
<tr>
<td>GS09449 Dup*</td>
<td>2.59</td>
<td>1.7</td>
<td>1.7</td>
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</tbody>
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### Sulfate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
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</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>3.89</td>
<td>30.0</td>
<td>29.58</td>
<td>99</td>
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<tr>
<td>External QC</td>
<td>3.87</td>
<td>218</td>
<td>223</td>
<td>102</td>
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<tr>
<td>GS09449</td>
<td>3.90</td>
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<td>24.8</td>
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<tr>
<td>GS09449 Dup*</td>
<td>3.90</td>
<td>24.7</td>
<td>24.7</td>
<td>102</td>
<td>0.4</td>
</tr>
</tbody>
</table>

**%R**: Recoverable percentage of the true concentration value

**RPD**: Relative percent difference for duplicate analysis.
June 17, 2000

Carolyn Oldfield  
Thoroughbred Res. Conservation  
401 Washington Street  
Georgetown, KY 40324

Project ID: EWDP  
Lab Sample ID: GS09786  
Project Account:  
Submittal Date: May 31, 2000  
Sample Field ID: Idle Hour Farm Compost 1  
Collection Date: May 31, 2000  
Collection Time: 3:20:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>J</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>173</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>1.4</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>0.316</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.039</td>
<td>mg/L</td>
<td>0.002</td>
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<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.012</td>
<td>mg/L</td>
<td>0.001</td>
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<tr>
<td>Orthophosphate (PO4)</td>
<td>0.445</td>
<td>mg/L</td>
<td>0.009</td>
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</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.145</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.0</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.14</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

Project ID: EWDP  
Lab Sample ID: GS09787  
Project Account:  
Submittal Date: May 31, 2000  
Sample Field ID: Idle Hour Farm Compost 2  
Collection Date: May 31, 2000  
Collection Time: 3:35:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.04</td>
<td>mg/L</td>
<td>0.02</td>
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</tr>
<tr>
<td>Parameter</td>
<td>Value</td>
<td>Units</td>
<td>Detection Limit</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
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<td>-----------------</td>
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</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.03</td>
<td>mg/L</td>
<td>0.02</td>
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<tr>
<td>Fecal Coliform</td>
<td>320</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>0.4</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>0.0904</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.021</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.006</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.463</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.148</td>
<td>mg/L</td>
<td>0.003</td>
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</tr>
<tr>
<td>Total Organic Carbon</td>
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<td>mg/L</td>
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<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.22</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

If there are questions regarding this data, please contact.

Henry E. Francis

Laboratory Manager
QUALITY CONTROL DATA (REPORT # 18)

PREPARED FOR

EQUINE WASTE BMP DEMONSTRATION PROJECT

06/16/2000

HENRY FRANCIS
<table>
<thead>
<tr>
<th>Field Sample Number</th>
<th>Lab Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Compost 1</td>
<td>1 GS09786</td>
</tr>
<tr>
<td>2  Compost 2</td>
<td>2 GS09787</td>
</tr>
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Sample Delivery Group: 00050022

<table>
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<tr>
<th>Parameter</th>
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<th>Method Detection Limit</th>
<th>Concentration QC1</th>
<th>Concentration QC2</th>
<th>Concentration Sample ID**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>True ppm</td>
<td>Found ppm</td>
<td>True ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>SM4500NH3-F</td>
<td>0.02 mg/L</td>
<td>0.36</td>
<td>0.36</td>
<td>0.36</td>
</tr>
<tr>
<td>Nitrite</td>
<td>EPA 354.1</td>
<td>0.002 mg/L</td>
<td>0.500</td>
<td>0.497</td>
<td>0.500</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
<td>0.009 mg/L</td>
<td>0.500</td>
<td>0.475</td>
<td>0.500</td>
</tr>
<tr>
<td>TCC</td>
<td>SW846-9060</td>
<td>0.5 mg/L</td>
<td>2.5</td>
<td>2.3</td>
<td>10.0</td>
</tr>
<tr>
<td>TKN</td>
<td>SM4500N.C</td>
<td>0.07 mg/L</td>
<td>0.80</td>
<td>0.80</td>
<td>1.48</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D-515</td>
<td>0.05 mg/L</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 - 30% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 - 30%, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

AMMONIA STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00050022  Analytical Wavelength nm: 630-660

Water Method #: SM4500NH3-F  Analyst Initials: JB / TM

Date Analyzed: 06/06/00  MDL: 0.02 mg/L

Calibration Verification:

Linear Calibration Range: 0.05 - 1.00

Linear Calibration Coefficient: 0.99903

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.36</td>
<td>0.36</td>
</tr>
<tr>
<td>GS09787</td>
<td>x</td>
<td>0.03</td>
</tr>
<tr>
<td>Dup GS09787</td>
<td>x</td>
<td>0.03</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.36</td>
<td>0.34</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
NITRITE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00050022  Analytical Wavelength nm: 540
Water Method #: EPA 354.1  Analyst Initials: JB/TM
Date Analyzed: 06/01/00  MDL: 0.002 mg/L

Calibration Verification:
Linear Calibration Range: 0.01-1.00
Linear Calibration Coefficient: 0.99997

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
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<td>0.005</td>
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<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.497</td>
</tr>
<tr>
<td>GS09787</td>
<td>x</td>
<td>0.021</td>
</tr>
<tr>
<td>Dup GS09787</td>
<td>x</td>
<td>0.020</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.499</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
# KENTUCKY GEOLOGICAL SURVEY

## COMPUTER AND LABORATORY SERVICES

### ORTHOPHOSPHATE STANDARDS / SAMPLES SUMMARY

<table>
<thead>
<tr>
<th>Sample Delivery Group:</th>
<th>00050022</th>
<th>Analytical Wavelength nm:</th>
<th>700</th>
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</thead>
<tbody>
<tr>
<td>Water Method #:</td>
<td>EPA 365.3</td>
<td>Analyst Initials:</td>
<td>JB/TM</td>
</tr>
<tr>
<td>Date Analyzed:</td>
<td>06/01/00</td>
<td>MDL:</td>
<td>0.009 mg/L</td>
</tr>
</tbody>
</table>

**Calibration Verification:**

- Linear Calibration Range: 0.01-1.00
- Linear Calibration Coefficient: 0.99987

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.475</td>
</tr>
<tr>
<td>GS09786</td>
<td>x</td>
<td>0.445</td>
</tr>
<tr>
<td>Dup GS09786</td>
<td>x</td>
<td>0.447</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.472</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
**KENTUCKY GEOLOGICAL SURVEY**

**COMPUTER AND LABORATORY SERVICES**

**TOTAL ORGANIC CARBON STANDARDS / SAMPLES SUMMARY**

<table>
<thead>
<tr>
<th>Sample Delivery Group:</th>
<th>00050022</th>
<th>Instrument ID:</th>
<th>Phoenix 8000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Method #:</td>
<td>SW846-9060</td>
<td>Analyst Initials:</td>
<td>JB / TM</td>
</tr>
<tr>
<td>Date Analyzed:</td>
<td>06/07/00</td>
<td>MDL:</td>
<td>0.5 mg/L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td></td>
<td>10 mg/L</td>
<td>Calibration Average =</td>
</tr>
<tr>
<td>Blank</td>
<td></td>
<td>10 mg/L</td>
<td>Calibration Adjusted =</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 mg/L</td>
<td></td>
</tr>
<tr>
<td>Blank</td>
<td>-0.064</td>
<td>Blank</td>
<td>-0.072</td>
</tr>
<tr>
<td>Blank</td>
<td>-0.073</td>
<td>Blank</td>
<td>-0.073</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Uncorrected TOC</th>
<th>Blank Corrected TOC, mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>QC1*</td>
<td>2.211</td>
<td>2.5</td>
</tr>
<tr>
<td>GS09786</td>
<td>1.991</td>
<td>x</td>
</tr>
<tr>
<td>Dup GS09786</td>
<td>1.759</td>
<td>x</td>
</tr>
<tr>
<td>QC2*</td>
<td>9.461</td>
<td>10.0</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
TOTAL KJELDAHL NITROGEN STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00050022  
Column ID: Dionex AS4A,AG4A

Water Method #: SM4500N.C  
Analyst Initials: JB/SRM

Date Analyzed: 6/12/00  
MDL: 0.07 mg/L

Calibration Verification:

Linear Calibration Range: 0.1-2.9

Linear Calibration Coefficient: 0.9978

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>GS09787</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>Dup GS09787</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>1.48</td>
<td>1.43</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20%, which is established from internal QC guidelines.
TOTAL PHOSPHORUS STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 00050022
Water Method #: ASTM D-515
Date Analyzed: 6/12/00

Analytical Wavelength mm: 700
Analyst Initials: JB/TM
MDL: 0.05 mg/L

Calibration Verification:
Linear Calibration Range: 0.05-1.00
Linear Calibration Coefficient: 0.99985

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>GS09786</td>
<td>x</td>
<td>0.14</td>
</tr>
<tr>
<td>Dup GS09786</td>
<td>x</td>
<td>0.14</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.85</td>
<td>0.85</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
Sample Delivery Group No. 00050022
Date 6/01/00
Column ID: Dionex Ionpac AG4A, AG4A, AS4A
Method No. SW346-9056

Calibration Standards

<table>
<thead>
<tr>
<th>Analyte</th>
<th>RT Window From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride</td>
<td>1.25</td>
<td>1.75</td>
</tr>
<tr>
<td>Nitrate</td>
<td>2.43</td>
<td>2.94</td>
</tr>
<tr>
<td>Sulfate</td>
<td>3.25</td>
<td>4.25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Concentration mg/L</th>
<th>Peak area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride Level-1</td>
<td>2.0</td>
<td>110155</td>
</tr>
<tr>
<td>Chloride Level-2</td>
<td>5.0</td>
<td>277499</td>
</tr>
<tr>
<td>Chloride Level-3</td>
<td>10.0</td>
<td>582067</td>
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<tr>
<td>Nitrate Level-1</td>
<td>0.1</td>
<td>817</td>
</tr>
<tr>
<td>Nitrate Level-2</td>
<td>0.5</td>
<td>14260</td>
</tr>
<tr>
<td>Nitrate Level-3</td>
<td>2.5</td>
<td>74567</td>
</tr>
<tr>
<td>Sulfate Level-1</td>
<td>10.0</td>
<td>412992</td>
</tr>
<tr>
<td>Sulfate Level-2</td>
<td>20.0</td>
<td>865554</td>
</tr>
<tr>
<td>Sulfate Level-3</td>
<td>40.0</td>
<td>1867319</td>
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</table>
### ION CHROMATOGRAPHY QC SUMMARY

**Sample Delivery Group:** 00050022  
**Date:** 6/01/00  
**Column ID:** Dionex Ionpac AG4A, AG4A, AS4A  
**Method No.:** SW846-9056

#### Chloride Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>1.40</td>
<td>8.0</td>
<td>7.90</td>
<td>99</td>
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</tr>
<tr>
<td>External QC</td>
<td>1.41</td>
<td>81.1</td>
<td>89.31</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>GS09787</td>
<td>1.42</td>
<td>4.4</td>
<td>4.4</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>GS09787 Dup *</td>
<td>1.42</td>
<td>4.4</td>
<td>4.4</td>
<td>110</td>
<td></td>
</tr>
</tbody>
</table>

#### Nitrate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>2.53</td>
<td>1.0</td>
<td>1.05</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>External QC</td>
<td>2.53</td>
<td>46.02</td>
<td>48.30</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>GS09787</td>
<td>2.54</td>
<td>0.4</td>
<td>0.4</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>GS09787 Dup *</td>
<td>2.54</td>
<td>0.4</td>
<td>0.4</td>
<td>105</td>
<td></td>
</tr>
</tbody>
</table>

#### Sulfate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>3.71</td>
<td>30.0</td>
<td>29.52</td>
<td>98</td>
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</tr>
<tr>
<td>External QC</td>
<td>3.69</td>
<td>218</td>
<td>226</td>
<td>103</td>
<td></td>
</tr>
<tr>
<td>GS09787</td>
<td>3.73</td>
<td>22.5</td>
<td>22.5</td>
<td>103</td>
<td></td>
</tr>
<tr>
<td>GS09787 Dup *</td>
<td>3.73</td>
<td>22.5</td>
<td>22.5</td>
<td>103</td>
<td></td>
</tr>
</tbody>
</table>

*%R Recoverable percentage of the true concentration value  
**RPD Relative percent difference for duplicate analysis.
January 10, 2002
Carolyn Oldfield
Thoroughbred Resource Conservation and Development Council
401 Washington Street
Georgetown, KY 40324

Dear Ms Oldfield:

Please find enclosed the following documents:

Complete results for all parameters for batch nineteen-twenty two, samples from the Equine Waste BMP Demonstration Project.

QA/QC report for reported samples.

Best regards,

[Signature]

Henry Francis
Laboratory Manager
Report of Analysis

Carolyn Oldfield
Thoroughbred Res. Conservation
401 Washington Street
Georgetown, KY 40324

Project ID: EWDP
Project Account: Compost 1
Sample Field ID: Compost 1
Sample Collector: TIPTON
Collection Date: September 20, 2001
Collection Time: 2:54:00 PM
Lab Sample ID: GS12115
Submittal Date: September 20, 2001

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td>i</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>242</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>1.6</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>0.362</td>
<td>mg/L</td>
<td>0.004</td>
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</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.010</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.003</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.590</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.192</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.4</td>
<td>mg/L</td>
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<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.21</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

Project ID: EWDP
Project Account: Compost 2
Sample Field ID: Compost 2
Sample Collector: TIPTON
Collection Date: September 20, 2001
Collection Time: 12:00:00 AM
Lab Sample ID: GS12116
Submittal Date: September 20, 2001

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH₃)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH₃-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>15,281</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH₃)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO₃)</td>
<td>0.2</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO₃-N)</td>
<td>0.0452</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO₂)</td>
<td>0.038</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO₂-N)</td>
<td>0.012</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO₄)</td>
<td>0.667</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO₄-P)</td>
<td>0.218</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>4.8</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.22</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

Project ID: EWDP
Project Account: Runoff X
Lab Sample ID: GS12117
Sample Collector: TIPTON
Collection Date: September 20, 2001
Collection Time: 12:00:00 AM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:
Comments:
Location of muck pile was changed during summer. Sample collected from a vehicle rut near original muck pile site. Sample deeply colored; color not removed by activated charcoal. Determinations dependent upon colorimetric assay not possible due to this interference.
If there are questions regarding this data, please contact.

Henry Francis

Laboratory Services Manager

Phone: 859-257-5500
FAX: 859-257-1147
e-mail: kcisler@kgs.mmm.uky.edu
QUALITY CONTROL DATA (REPORT # 19)

PREPARED
FOR

EQUINE WASTE BMP DEMONSTRATION PROJECT

01/10/2002
HENRY FRANCIS
<table>
<thead>
<tr>
<th>Field Sample Number</th>
<th>Lab Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Compost 1</td>
<td>1 GS12115</td>
</tr>
<tr>
<td>2 Compost 2</td>
<td>2 GS12116</td>
</tr>
<tr>
<td>3 Runoff X</td>
<td>3 GS12117</td>
</tr>
</tbody>
</table>
## KENTUCKY GEOLOGICAL SURVEY

### LABORATORY SERVICES

### WATER PARAMETERS QC SUMMARY

Sample Delivery Group: 01090019

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method No.</th>
<th>Method Detection Limit</th>
<th>Concentration QC1</th>
<th>Concentration QC2</th>
<th>Concentration Sample 1D**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>True ppm</td>
<td>Found ppm</td>
<td>True ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>SM4500NH3-F</td>
<td>0.02 mg/L</td>
<td>0.25</td>
<td>0.22</td>
<td>0.25</td>
</tr>
<tr>
<td>Nit-ite</td>
<td>EPA 354.1</td>
<td>0.002 mg/L</td>
<td>0.500</td>
<td>0.455</td>
<td>0.500</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
<td>0.009 mg/L</td>
<td>0.500</td>
<td>0.472</td>
<td>0.500</td>
</tr>
<tr>
<td>TOC</td>
<td>SW846-9060</td>
<td>0.5 mg/L</td>
<td>1.4</td>
<td>1.3</td>
<td>2.5</td>
</tr>
<tr>
<td>TKN</td>
<td>SM4500NorgC</td>
<td>0.07 mg/L</td>
<td>0.80</td>
<td>0.77</td>
<td>1.13</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D-515</td>
<td>0.05 mg/L</td>
<td>0.24</td>
<td>0.26</td>
<td>0.24</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 - 30 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 - 30 %, which is established from internal QC guidelines.
Sample Delivery Group: 01090019

Analytical Wavelength nm: 630-660

Water Method #: SM4500NH3-F

Analyst Initials: AM

Date Analyzed: 9/25/01

MDL: 0.02 mg/L

Calibration Verification:

Linear Calibration Range: 0.05 - 1.00

Linear Calibration Coefficient: 0.99796

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.25</td>
<td>0.22</td>
</tr>
<tr>
<td>GS12115</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>Dup GS12115</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.25</td>
<td>0.23</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
LABORATORY SERVICES

NITRITE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 01090019  Analytical Wavelength nm: 540
Water Method #: EPA 354.1  Analyst Initials: AM
Date Analyzed: 9/24/01  MDL: 0.002 mg/L

Calibration Verification:

Linear Calibration Range: 0.01 - 1.00
Linear Calibration Coefficient: 0.99976

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>0.006</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.455</td>
</tr>
<tr>
<td>GS12116</td>
<td>x</td>
<td>0.038</td>
</tr>
<tr>
<td>Dup GS12116</td>
<td>x</td>
<td>0.037</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.522</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
Sample Delivery Group: 01090019
Water Method #: EPA 365.3
Date Analyzed: 9/24/01

Analytical Wavelength nm: 700
Analyst Initials: AM
MDL: 0.009 mg/L

Calibration Verification:
Linear Calibration Range: 0.01 - 1.00
Linear Calibration Coefficient: 0.99963

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>0.050</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.472</td>
</tr>
<tr>
<td>GS12115</td>
<td>x</td>
<td>0.590</td>
</tr>
<tr>
<td>Dup GS12115</td>
<td>x</td>
<td>0.596</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.468</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10%, which is established from internal QC guidelines.
# KENTUCKY GEOLOGICAL SURVEY

## LABORATORY SERVICES

### TOTAL ORGANIC CARBON STANDARDS / SAMPLES SUMMARY

<table>
<thead>
<tr>
<th>Sample Delivery Group:</th>
<th>01090019</th>
<th>Instrument ID:</th>
<th>Phoenix 8000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Method #:</td>
<td>SW846-9060</td>
<td>Analyst Initials:</td>
<td>AM</td>
</tr>
<tr>
<td>Date Analyzed:</td>
<td>09-24-01</td>
<td>MDL:</td>
<td>0.5 mg/L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td></td>
</tr>
<tr>
<td>Blank</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mg/L</td>
<td></td>
</tr>
<tr>
<td>10 mg/L</td>
<td>Calibration Average =</td>
</tr>
<tr>
<td>10 mg/L</td>
<td>Calibration Adjusted =</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td>0.388</td>
</tr>
<tr>
<td>Blank</td>
<td>0.008</td>
</tr>
<tr>
<td>Blank</td>
<td>-0.140</td>
</tr>
</tbody>
</table>

Average Blank Correction = 0.086

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Uncorrected TOC</th>
<th>Blank Corrected TOC, mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>QC1*</td>
<td>1.431</td>
<td>1.4</td>
</tr>
<tr>
<td>GS12367</td>
<td>2.500</td>
<td>x</td>
</tr>
<tr>
<td>Dup GS12367</td>
<td>2.600</td>
<td>x</td>
</tr>
<tr>
<td>QC2*</td>
<td>2.961</td>
<td>2.5</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
LABORATORY SERVICES

TOTAL KJELDAHL NITROGEN STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 01090019  Column ID  Dionex AS4A,AG4A
Water Method #: SM4500NorgC  Analyst Initials: JB/SRM
Date Analyzed: 10/10/01  MDL: 0.07 mg/L

Calibration Verification:

Linear Calibration Range: 0.1 - 2.9
Linear Calibration Coefficient: 0.9925

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.80</td>
<td>0.77</td>
</tr>
<tr>
<td>GS12116</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>Dup GS12116</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>1.13</td>
<td>1.18</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
LABORATORY SERVICES

TOTAL PHOSPHORUS STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 01090019
Analytical Wavelength nm: 700

Water Method #: ASTM D-515
Analyst Initials: AM

Date Analyzed: 09-26-01
MDL: 0.05 mg/L

Calibration Verification:

Linear Calibration Range: 0.05-1.00
Linear Calibration Coefficient: 0.99960

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.24</td>
<td>0.26</td>
</tr>
<tr>
<td>GS12115</td>
<td>x</td>
<td>0.21</td>
</tr>
<tr>
<td>Dup GS12115</td>
<td>x</td>
<td>0.22</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.24</td>
<td>0.23</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
Sample Delivery Group No. 01090019
Date 9/20/01
Column ID: Dionex Ionpac AG4A, AG4A, AS4A
Method No. SW846-9056

### Calibration Standards

<table>
<thead>
<tr>
<th>Analyte</th>
<th>RT Window</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>From</td>
<td>To</td>
</tr>
<tr>
<td>Chloride</td>
<td>1.35</td>
<td>1.85</td>
</tr>
<tr>
<td>Nitrate</td>
<td>2.75</td>
<td>3.25</td>
</tr>
<tr>
<td>Sulfate</td>
<td>4.55</td>
<td>5.55</td>
</tr>
</tbody>
</table>

### Analyte Results

<table>
<thead>
<tr>
<th>Analyte Level</th>
<th>Concentration mg/L</th>
<th>Peak area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride Level-1</td>
<td>2.0</td>
<td>0.328</td>
</tr>
<tr>
<td>Chloride Level-2</td>
<td>5.0</td>
<td>0.882</td>
</tr>
<tr>
<td>Chloride Level-3</td>
<td>10.0</td>
<td>2.119</td>
</tr>
<tr>
<td>Nitrate Level-1</td>
<td>0.1</td>
<td>0.01</td>
</tr>
<tr>
<td>Nitrate Level-2</td>
<td>0.5</td>
<td>0.045</td>
</tr>
<tr>
<td>Nitrate Level-3</td>
<td>2.5</td>
<td>0.246</td>
</tr>
<tr>
<td>Sulfate Level-1</td>
<td>10.0</td>
<td>1.328</td>
</tr>
<tr>
<td>Sulfate Level-2</td>
<td>20.0</td>
<td>2.782</td>
</tr>
<tr>
<td>Sulfate Level-3</td>
<td>40.0</td>
<td>6.118</td>
</tr>
</tbody>
</table>
KENTUCKY GEOLOGICAL SURVEY
LABORATORY SERVICES
ION CHROMATOGRAPHY QC SUMMARY

Sample Delivery Group: 01090019
Date: 9/2/2001
Column ID: Dionex Ionpac AG4A, AG4A, AS4A
Method No.: SW846-9056

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Chloride Concentration mg/L</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>1.56</td>
<td>8.0</td>
<td>7.36</td>
</tr>
<tr>
<td>External QC</td>
<td>1.58</td>
<td>64.9</td>
<td>65.77</td>
</tr>
<tr>
<td>GS12116</td>
<td>1.61</td>
<td>6.87</td>
<td></td>
</tr>
<tr>
<td>GS12116 Dup*</td>
<td>1.61</td>
<td>6.88</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Nitrate Concentration mg/L</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>2.86</td>
<td>1.0</td>
<td>1.00</td>
</tr>
<tr>
<td>External QC</td>
<td>2.85</td>
<td>19.56</td>
<td>19.03</td>
</tr>
<tr>
<td>GS12116</td>
<td>2.87</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td>GS12116 Dup*</td>
<td>2.87</td>
<td>0.24</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Sulfate Concentration mg/L</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>4.63</td>
<td>30.0</td>
<td>29.51</td>
</tr>
<tr>
<td>External QC</td>
<td>4.69</td>
<td>41.9</td>
<td>39.0</td>
</tr>
<tr>
<td>GS12116</td>
<td>4.68</td>
<td>14.78</td>
<td></td>
</tr>
<tr>
<td>GS12116 Dup*</td>
<td>4.68</td>
<td>14.79</td>
<td></td>
</tr>
</tbody>
</table>

*%R: Recoverable percentage of the true concentration value
**RPD: Relative percent difference for duplicate analysis.
Report of Analysis

Carolyn Oldfield
Thoroughbred Res. Conservation
401 Washington Street
Georgetown, KY 40324

Project ID: EWDP
Project Account:
Sample Field ID: Compost 1
Sample Collector: NIEMAN
Collection Date: October 25, 2001
Collection Time: 7:25:00 PM

Lab Sample ID: GS12357
Submittal Date: October 26, 2001

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.05</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.04</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>597</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>12.9</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>2.92</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.026</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.008</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>1.03</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.338</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.08</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.26</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Project ID: EWDP
Project Account:
Sample Field ID: Compost 2
Sample Collector: NIEMAN
Collection Date: October 25, 2001
Collection Time: 7:35:00 PM

Lab Sample ID: GS12368
Submittal Date: October 26, 2001
### Analytical Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.02</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.02</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>5,855</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>11.4</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>2.58</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.028</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.009</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
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<tr>
<td>Orthophosphate (PO4)</td>
<td>0.93</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.303</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.23</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.26</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

### Comments:

- Colorimetric methods—nitrite, orthophosphate, ammonia— not possible on highly colored samples. Color was not removed by filtration through 0.45µm pore filter nor by treatment with activated charcoal.

### Project Information

- **Project ID:** EWDP
- **Sample Collector:** NIEMAN
- **Sample Field ID:** Subsurface 1
- **Collection Date:** October 25, 2001
- **Collection Time:** 7:10:00 PM
- **Lab Sample ID:** GS12369
- **Submital Date:** October 26, 2001
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>376,000</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>2.5</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>0.565</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
</tbody>
</table>

Comments:
Colorimetric methods--nitrite, orthophosphate, ammonia-- not possible on highly colored samples. Color was not removed by filtration through 0.45μ pore filter nor by treatment with activated charcoal.

Project ID: EWDP  
Lab Sample ID: GS12371
Sample Account: Runoff 2  
Submittal Date: October 26, 2001

Collection Date: October 25, 2001  
Collection Time: 7:20:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
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</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.49</td>
<td>mg/L</td>
<td>0.02</td>
<td>E</td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.40</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>14,265</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>0.40</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>0.49</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>10.7</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>2.42</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>17.77</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
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<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.78</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:
Colorimetric methods--nitrite, orthophosphate, ammonia-- not possible on highly colored samples. Color was not removed by filtration through 0.45μ pore filter nor by treatment with activated charcoal.
If there are questions regarding this data, please contact.

Henry Francis

Laboratory Services Manager

Phone: 859-257-5500
FAX: 859-257-1147
e-mail: Francis@kgs.mm.uky.edu
QUALITY CONTROL DATA (REPORT # 20)

PREPARED
FOR

EQUINE WASTE BMP DEMONSTRATION PROJECT

01/10/2002

HENRY FRANCIS
<table>
<thead>
<tr>
<th>Field Sample Number</th>
<th>Lab Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Compost 1</td>
<td>1 GS12367</td>
</tr>
<tr>
<td>2 Compost 2</td>
<td>2 GS12368</td>
</tr>
<tr>
<td>3 Subsurface 1</td>
<td>3 GS12369</td>
</tr>
<tr>
<td>4 Surface 1</td>
<td>4 GS12370</td>
</tr>
<tr>
<td>5 Runoff 2</td>
<td>5 GS12371</td>
</tr>
</tbody>
</table>
Sample Delivery Group: 01100024

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method No.</th>
<th>Method Detection Limit</th>
<th>Concentration QC1</th>
<th>Concentration QC2</th>
<th>Concentration Sample ID**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>True ppm</td>
<td>Found ppm</td>
<td>True ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>SM4500NH3-F</td>
<td>0.02 mg/L</td>
<td>0.25</td>
<td>0.29</td>
<td>0.25</td>
</tr>
<tr>
<td>Nitrite</td>
<td>EPA 354.1</td>
<td>0.002 mg/L</td>
<td>0.500</td>
<td>0.464</td>
<td>0.500</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
<td>0.009 mg/L</td>
<td>0.500</td>
<td>0.464</td>
<td>0.500</td>
</tr>
<tr>
<td>TCC</td>
<td>SW846-9060</td>
<td>0.5 mg/L</td>
<td>2.1</td>
<td>2.3</td>
<td>2.1</td>
</tr>
<tr>
<td>TKN</td>
<td>SM4500NorgC</td>
<td>0.07 mg/L</td>
<td>0.80</td>
<td>0.88</td>
<td>1.13</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D-515</td>
<td>0.05 mg/L</td>
<td>0.60</td>
<td>0.58</td>
<td>0.60</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 - 30 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 - 30 %, which is established from internal QC guidelines.
Sample Delivery Group: 01100024  Analytical Wavelength nm: 630-660

Water Method #: SM4500NH3-F  Analyst Initials: AM

Date Analyzed: 11/2/01  MDL: 0.02 mg/L

Calibration Verification:

<table>
<thead>
<tr>
<th>Linear Calibration Range:</th>
<th>0.05 - 1.00</th>
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</thead>
<tbody>
<tr>
<td>Linear Calibration Coefficient:</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.25</td>
<td>0.29</td>
</tr>
<tr>
<td>GS12367</td>
<td>x</td>
<td>0.04</td>
</tr>
<tr>
<td>Dup GS12367</td>
<td>x</td>
<td>0.03</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.25</td>
<td>0.27</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

COMPUTER AND LABORATORY SERVICES

NITRITE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 01100024  Analytical Wavelength nm: 540
Water Method #: EPA 354.1  Analyst Initials: JB
Date Analyzed: 11/15/01  MDL: 0.002 mg/L

Calibration Verification:

Linear Calibration Range: 0.01-1.00
Linear Calibration Coefficient: 0.99985

<table>
<thead>
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<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.464</td>
</tr>
<tr>
<td>GS</td>
<td>x</td>
<td>n/a</td>
</tr>
<tr>
<td>Dup GS</td>
<td>x</td>
<td>n/a</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.471</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
ORTHOPHOSPHATE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 0[1]00024
Analytical Wavelength nm: 700

Water Method #: EPA 365.3
Analyst Initials: JB

Date Analyzed: 11/15/01
MDL: 0.009 mg/L

Calibration Verification:

Linear Calibration Range: 0.01 - 1.00
Linear Calibration Coefficient: 0.99967

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.464</td>
</tr>
<tr>
<td>GS</td>
<td>x</td>
<td>n/a</td>
</tr>
<tr>
<td>Dup GS</td>
<td>x</td>
<td>n/a</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.504</td>
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</table>

* The acceptable range is ± 10% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10%, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
TOTAL ORGANIC CARBON STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 01100024  Instrument ID: DC - 80
Water Method #: SW846-9060  Analyst Initials: AM
Date Analyzed: 10/30/01  MDL: 0.5 mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>Blank</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mg/L</td>
<td>Calibration Average =</td>
</tr>
<tr>
<td>10 mg/L</td>
<td>Calibration Adjusted =</td>
</tr>
<tr>
<td>10 mg/L</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td>Average Blank Correction = 0.085</td>
</tr>
<tr>
<td>Blank</td>
<td></td>
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<tr>
<td>Blank</td>
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<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Uncorrected TOC</th>
<th>Blank Corrected TOC, mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>QC1*</td>
<td>2.356</td>
<td>2.1</td>
</tr>
<tr>
<td>GS12367</td>
<td>2.163</td>
<td>x</td>
</tr>
<tr>
<td>Dup GS12367</td>
<td>2.361</td>
<td>x</td>
</tr>
<tr>
<td>QC2*</td>
<td>2.356</td>
<td>2.1</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
TOTAL KJELDAHL NITROGEN STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 01100024  
Analytical Wavelength nm: 630-660

Water Method #: SM4500NorgC  
Analyst Initials: JB/SRM

Date Analyzed: 11/20/01  
MDL: 0.07 mg/L

Calibration Verification:

Linear Calibration Range: 0.1 - 2.9

Linear Calibration Coefficient: 0.9959

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.80</td>
<td>0.88</td>
</tr>
<tr>
<td>GS12367</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>Dup GS12367</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>1.13</td>
<td>1.19</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
TOTAL PHOSPHORUS STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 01100024
Analytical Wavelength nm: 700

Water Method #: ASTM D-515
Analyst Initials: JB

Date Analyzed: 11/16/01
MDL: 0.05 mg/L

Calibration Verification:

Linear Calibration Range: 0.05 - 1.00
Linear Calibration Coefficient: 0.99972

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QCI*</td>
<td>0.60</td>
<td>0.58</td>
</tr>
<tr>
<td>GS12367</td>
<td>x</td>
<td>0.26</td>
</tr>
<tr>
<td>Dup GS12367</td>
<td>x</td>
<td>0.26</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.60</td>
<td>0.60</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
Sample Delivery Group No. 01100024
Date 10/26/01
Column ID: Dionex Ionpac AG4A, AG4A, AS4A
Method No. SW846-9056

### Calibration Standards

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<th>Analyte</th>
<th>RT Window From</th>
<th>To</th>
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<tbody>
<tr>
<td>Chloride</td>
<td>1.39</td>
<td>1.99</td>
</tr>
<tr>
<td>Nitrate</td>
<td>3.55</td>
<td>3.85</td>
</tr>
<tr>
<td>Sulfate</td>
<td>5.75</td>
<td>6.55</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Concentration mg/L</th>
<th>Peak area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride Level-1</td>
<td>2.0</td>
<td>0.335</td>
</tr>
<tr>
<td>Chloride Level-2</td>
<td>5.0</td>
<td>0.892</td>
</tr>
<tr>
<td>Chloride Level-3</td>
<td>10.0</td>
<td>1.96</td>
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<tr>
<td>Nitrate Level-1</td>
<td>0.10</td>
<td>0.008</td>
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<tr>
<td>Nitrate Level-2</td>
<td>0.5</td>
<td>0.044</td>
</tr>
<tr>
<td>Nitrate Level-3</td>
<td>2.50</td>
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<td>10.0</td>
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<tr>
<td>Sulfate Level-3</td>
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<td>5.894</td>
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</tbody>
</table>
## Chloride Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R</th>
<th>RPD**</th>
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</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>1.74</td>
<td>8.0</td>
<td>7.86</td>
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<tr>
<td>External QC</td>
<td>1.75</td>
<td>64.9</td>
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<td>108</td>
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<tr>
<td>GS12371</td>
<td>1.72</td>
<td></td>
<td>3.7</td>
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<td></td>
</tr>
<tr>
<td>GS12371 Dup *</td>
<td>1.71</td>
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<td>3.7</td>
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## Nitrate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>3.67</td>
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<td>95</td>
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<td>External QC</td>
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<td></td>
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<tr>
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<td>3.34</td>
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<td>10.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS12371 Dup *</td>
<td>3.54</td>
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<td>10.6</td>
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</tbody>
</table>

## Sulfate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
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<td>30.0</td>
<td>29.51</td>
<td>98</td>
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<tr>
<td>External QC</td>
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</tr>
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<td>GS12371 Dup *</td>
<td>6.04</td>
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<td>5.5</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*%R Recoverable percentage of the true concentration value  
**RPD Relative percent difference for duplicate analysis.
# Report of Analysis

January 10, 2002

Carolyn Oldfield  
Thoroughbred Res. Conservation  
401 Washington Street  
Georgetown, KY 40324

Project ID: EWDP  
Lab Sample ID: GS12476  
Submittal Date: November 29, 2001

Project Account:  
Sample Field ID: Compost 1  
Submittal Date: November 29, 2001

Sample Collector: J.NIEMAN  
Collection Date: November 28, 2001  
Collection Time: 1:00:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>530</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>7.0</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>1.58</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.066</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.020</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.997</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.325</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.9</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.23</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

Project ID: EWDP  
Lab Sample ID: GS12477  
Submittal Date: November 29, 2001

Project Account:  
Sample Field ID: Compost 2  
Submittal Date: November 29, 2001

Sample Collector: J.NIEMAN  
Collection Date: November 28, 2001  
Collection Time: 1:00:00 PM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>113,100</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>3.35</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>4.07</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>625.0</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>141</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO2)</td>
<td>0.359</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>1.10</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.002</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>2.9</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.24</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

**Comments:**

Colotimetric methods--nitrite, orthophosphate, ammonia--not possible on highly colored samples. Color was not removed by filtration through 0.45μm pore filter nor by treatment with activated charcoal.
The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>61,100</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>0.83</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>1.01</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>478.0</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>108</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>1024</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>

Comments:
Colorimetric methods--nitrite, orthophosphate, ammonia--not possible on highly colored samples. Color was not removed by filtration through 0.45µ pore filter nor by treatment with activated charcoal.

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.29</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.24</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>331</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>0.30</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>0.36</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>2.7</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>0.610</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.057</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.017</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.908</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.296</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>6.3</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.27</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>
If there are questions regarding this data, please contact.

Henry Francis

Laboratory Services Manager

Phone: 859-257-5500
FAX: 859-257-1147
e-mail: Francis@kgs.mmu.uky.edu
QUALITY CONTROL DATA (REPORT # 21)

PREPARED
FOR

EQUINE WASTE BMP DEMONSTRATION PROJECT

01/10/2002

HENRY FRANCIS
<table>
<thead>
<tr>
<th>Field Sample Number</th>
<th>Lab Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Compost 1</td>
<td>1 GS12476</td>
</tr>
<tr>
<td>2 Compost 2</td>
<td>2 GS12477</td>
</tr>
<tr>
<td>3 Subsurface 1</td>
<td>3 GS12478</td>
</tr>
<tr>
<td>4 Surface 2</td>
<td>4 GS12479</td>
</tr>
<tr>
<td>5 Runoff 2</td>
<td>5 GS12480</td>
</tr>
</tbody>
</table>
Sample Delivery Group: 01110015

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method No.</th>
<th>Method Detection Limit</th>
<th>Concentration QC1</th>
<th>Concentration QC2</th>
<th>Concentration Sample ID**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>True ppm</td>
<td>Found ppm</td>
<td>True ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>SM450NH3-F</td>
<td>0.02 mg/L</td>
<td>0.36</td>
<td>0.35</td>
<td>0.36</td>
</tr>
<tr>
<td>Nitrite</td>
<td>EPA 354.1</td>
<td>0.002 mg/L</td>
<td>0.500</td>
<td>0.498</td>
<td>0.500</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
<td>0.009 mg/L</td>
<td>0.500</td>
<td>0.469</td>
<td>0.500</td>
</tr>
<tr>
<td>TOC</td>
<td>SW846-9060</td>
<td>0.5 mg/L</td>
<td>2.5</td>
<td>2.4</td>
<td>2.5</td>
</tr>
<tr>
<td>TKN</td>
<td>SM4500NorgC</td>
<td>0.07 mg/L</td>
<td>0.80</td>
<td>0.78</td>
<td>1.13</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D-515</td>
<td>0.05 mg/L</td>
<td>0.60</td>
<td>0.57</td>
<td>0.60</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 - 30% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 - 30%, which is established from internal QC guidelines.
Sample Delivery Group: 01110015
Water Method #: SM4500NH3-F
Date Analyzed: 12/18/01
Analytical Wavelength nm: 630-660
Analyst Initials: JB
MDL: 0.02 mg/L
Calibration Verification:
Linear Calibration Range: 0.05 - 1.00
Linear Calibration Coefficient: 0.99865

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.36</td>
<td>0.35</td>
</tr>
<tr>
<td>GS12476</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>Dup GS12476</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.36</td>
<td>0.36</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
**KENTUCKY GEOLOGICAL SURVEY**

**COMPUTER AND LABORATORY SERVICES**

**NITRITE STANDARDS / SAMPLES SUMMARY**

Sample Delivery Group: 01110015  
Analytical Wavelength nm: 540

Water Method #: EPA 354.1  
Analyst Initials: JB

Date Analyzed: 11/29/01  
MDL: 0.002 mg/L

Calibration Verification:

- **Linear Calibration Range:** 0.01-1.00
- **Linear Calibration Coefficient:** 0.99973

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>0.012</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.498</td>
</tr>
<tr>
<td>GS12477</td>
<td>x</td>
<td>0.065</td>
</tr>
<tr>
<td>Dup GS12477</td>
<td>x</td>
<td>0.066</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.512</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10%, which is established from internal QC guidelines.
Sample Delivery Group: 01110015
Analytical Wavelength nm: 700

Water Method #: EPA 365.3
Analyst Initials: JB

Date Analyzed: 11/29/01
MDL: 0.009 mg/L

Calibration Verification:
Linear Calibration Range: 0.01 - 1.00
Linear Calibration Coefficient: 0.99980

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.469</td>
</tr>
<tr>
<td>GS12476</td>
<td>x</td>
<td>0.997</td>
</tr>
<tr>
<td>Dup GS12476</td>
<td>x</td>
<td>1.020</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.492</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
## TOTAL ORGANIC CARBON STANDARDS / SAMPLES SUMMARY

**Sample Delivery Group:** 01110015  
**Instrument ID:** DC-80  
**Water Method #:** SW846-9060  
**Analyst Initials:** SRM  
**Date Analyzed:** 11/30/01  
**MDL:** 0.5 mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td></td>
</tr>
<tr>
<td>Blank</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mg/L</td>
<td></td>
</tr>
<tr>
<td>10 mg/L</td>
<td></td>
</tr>
<tr>
<td>10 mg/L</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td>0.643</td>
</tr>
<tr>
<td>Blank</td>
<td>-0.057</td>
</tr>
<tr>
<td>Blank</td>
<td>-0.189</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Uncorrected TOC</th>
<th>Blank Corrected TOC, mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>QC1*</td>
<td>2.390</td>
<td>2.5</td>
</tr>
<tr>
<td>GS12476</td>
<td>2.950</td>
<td>x</td>
</tr>
<tr>
<td>Dup GS12476</td>
<td>3.010</td>
<td>x</td>
</tr>
<tr>
<td>QC2*</td>
<td>2.460</td>
<td>2.5</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
TOTAL KJELDAHL NITROGEN STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 01110015  Analytical Wavelength nm: 630-660
Water Method #: SM4500NorgC  Analyst Initials: SRM
Date Analyzed: 12/19/01  MDL: 0.07 mg/L

Calibration Verification:
Linear Calibration Range: 0.1 - 2.9
Linear Calibration Coefficient: 0.9955

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.80</td>
<td>0.78</td>
</tr>
<tr>
<td>GS12476</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>Dup GS12476</td>
<td>x</td>
<td>&lt;MDL</td>
</tr>
<tr>
<td>QC2*</td>
<td>1.13</td>
<td>1.18</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY
COMPUTER AND LABORATORY SERVICES
TOTAL PHOSPHORUS STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 01110015  Analytical Wavelength nm: 700
Water Method #: ASTM D-515  Analyst Initials: JB
Date Analyzed: 12/14/01  MDL: 0.05 mg/L

Calibration Verification:
Linear Calibration Range: 0.05 - 1.00
Linear Calibration Coefficient: 0.99876

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.60</td>
<td>0.57</td>
</tr>
<tr>
<td>GS12476</td>
<td>x</td>
<td>0.23</td>
</tr>
<tr>
<td>Dup GS12476</td>
<td>x</td>
<td>0.26</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.60</td>
<td>0.56</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
Sample Delivery Group No. 01110015

Date 11/29/01

Column ID: Dionex Ionpac AG4A, AG4A, AS4A

Method No. SW846-9056

### Calibration Standards

<table>
<thead>
<tr>
<th>Analyte</th>
<th>RT Window</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>From</td>
</tr>
<tr>
<td>Chloride</td>
<td>1.39</td>
</tr>
<tr>
<td>Nitrate</td>
<td>3.45</td>
</tr>
<tr>
<td>Sulfate</td>
<td>5.75</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Concentration mg/L</th>
<th>Peak area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride Level-1</td>
<td>2.0</td>
<td>0.331</td>
</tr>
<tr>
<td>Chloride Level-2</td>
<td>5.0</td>
<td>0.886</td>
</tr>
<tr>
<td>Chloride Level-3</td>
<td>10.0</td>
<td>1.941</td>
</tr>
<tr>
<td>Nitrate Level-1</td>
<td>0.10</td>
<td>0.007</td>
</tr>
<tr>
<td>Nitrate Level-2</td>
<td>0.50</td>
<td>0.044</td>
</tr>
<tr>
<td>Nitrate Level-3</td>
<td>2.50</td>
<td>0.243</td>
</tr>
<tr>
<td>Sulfate Level-1</td>
<td>10.0</td>
<td>1.274</td>
</tr>
<tr>
<td>Sulfate Level-2</td>
<td>20.0</td>
<td>2.703</td>
</tr>
<tr>
<td>Sulfate Level-3</td>
<td>40.0</td>
<td>5.894</td>
</tr>
</tbody>
</table>
### KENTUCKY GEOLOGICAL SURVEY
### COMPUTER AND LABORATORY SERVICES
### ION CHROMATOGRAPHY QC SUMMARY

**Sample Delivery Group**: 1110015  
**Date**: 11/29/01  
**Column ID**: Dionex Ionpac AG4A, AG4A, AS4A  
**Method No.**: SW846-9056

#### Chloride Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>1.69</td>
<td>8.0</td>
<td>7.85</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>External QC</td>
<td>1.69</td>
<td>64.9</td>
<td>69.36</td>
<td>107</td>
<td></td>
</tr>
<tr>
<td>GS12476</td>
<td>1.71</td>
<td>5.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS12476 Dup **</td>
<td>1.71</td>
<td>5.5</td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

#### Nitrate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>3.53</td>
<td>1.0</td>
<td>0.94</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>External QC</td>
<td>3.49</td>
<td>19.56</td>
<td>18.97</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>GS12476</td>
<td>3.45</td>
<td>7.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS12476 Dup *</td>
<td>3.44</td>
<td>6.9</td>
<td></td>
<td>1.4</td>
<td></td>
</tr>
</tbody>
</table>

#### Sulfate Concentration mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>RT</th>
<th>True</th>
<th>Found</th>
<th>%R*</th>
<th>RPD**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab QC</td>
<td>5.82</td>
<td>30.0</td>
<td>29.54</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>External QC</td>
<td>5.80</td>
<td>41.9</td>
<td>43.4</td>
<td>104</td>
<td></td>
</tr>
<tr>
<td>GS12476</td>
<td>5.86</td>
<td>22.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS12476 Dup *</td>
<td>5.87</td>
<td>22.5</td>
<td></td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*%R: Recoverable percentage of the true concentration value
**RPD: Relative percent difference for duplicate analysis.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>250,000</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (N-N)</td>
<td>7.6</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>9.24</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>1010.0</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>228</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>570</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>
### Project ID: EWDP  
### Project Account:  
### Sample Field ID: Runoff 2  
### Lab Sample ID: GS12516  
### Submittal Date: November 30, 2001  
### Collection Date: November 30, 2001  
### Collection Time: 10:50:00 AM  

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>0.32</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>0.26</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>321</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>2.2</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>0.497</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.035</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.011</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>0.977</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.319</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>6.0</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.29</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

### Comments:

### Project ID: EWDP  
### Project Account:  
### Sample Field ID: Surface 2  
### Lab Sample ID: GS12517  
### Submittal Date: November 30, 2001  
### Collection Date: November 30, 2001  
### Collection Time: 10:53:00 AM  

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>81,111</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>10.76</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>13.08</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>1260.0</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>285</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>483</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
</tbody>
</table>
If there are questions regarding this data, please contact.

Henry Francis
Laboratory Services Manager

Phone: 859-257-5500
FAX: 859-257-1147
e-mail: Francis@kgs.mmr.uky.edu
Caroline Oldfield  
Thoroughbred Res. Conservation  
401 Washington Street  
Georgetown, KY 40324

Project ID: EWDP  
Lab Sample ID: GS12513  
Project Account:  
Submittal Date: November 30, 2001  
Sample Field ID: Compost 1  
Submittal Date: November 30, 2001  
Sample Collector: J.NIEMAN  
Collection Date: November 30, 2001  
Collection Time: 11:12:00 AM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>1,283</td>
<td>CFU/100mL</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (-N)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Kjeldahl Nitrogen (NH3)</td>
<td>Less Than MDL</td>
<td>mg/L</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Nitrate (NO3)</td>
<td>13.1</td>
<td>mg/L</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Nitrate-N (NO3-N)</td>
<td>2.96</td>
<td>mg/L</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>Nitrite (NO2)</td>
<td>0.064</td>
<td>mg/L</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Nitrite-N (NO2-N)</td>
<td>0.019</td>
<td>mg/L</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate (PO4)</td>
<td>1.26</td>
<td>mg/L</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Orthophosphate-P (PO4-P)</td>
<td>0.411</td>
<td>mg/L</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>4.0</td>
<td>mg/L</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Total Recoverable Phosphorus</td>
<td>0.29</td>
<td>mg/L</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

Project ID: EWDP  
Lab Sample ID: GS12514  
Project Account:  
Submittal Date: November 30, 2001  
Sample Field ID: Compost 2  
Submittal Date: November 30, 2001  
Sample Collector: J.NIEMAN  
Collection Date: November 30, 2001  
Collection Time: 11:08:00 AM

The following analytical results have been obtained for the indicated sample which was submitted to the laboratory:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Unit</th>
<th>MDL</th>
<th>Qualifier</th>
</tr>
</thead>
</table>

Parameters and values are listed in a tabular format, along with comments.
QUALITY CONTROL DATA (REPORT #22)

PREPARED
FOR

EQUINE WASTE BMP DEMONSTRATION PROJECT

01/10/2002

HENRY FRANCIS
<table>
<thead>
<tr>
<th>Field Sample Number</th>
<th>Lab Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Compost 1</td>
<td>1 GS12513</td>
</tr>
<tr>
<td>2 Compost 2</td>
<td>2 GS12514</td>
</tr>
<tr>
<td>3 Runoff 2</td>
<td>3 GS12515</td>
</tr>
<tr>
<td>4 Subsurface 1</td>
<td>4 GS12516</td>
</tr>
<tr>
<td>5 Surface 2</td>
<td>5 GS12517</td>
</tr>
</tbody>
</table>
## KENTUCKY GEOLOGICAL SURVEY

### LABORATORY SERVICES

### WATER PARAMETERS QC SUMMARY

Sample Delivery Group: 01110019

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method No.</th>
<th>Method Detection Limit</th>
<th>Concentration QC1</th>
<th>Concentration QC2</th>
<th>Concentration Sample ID**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>True ppm</td>
<td>Found ppm</td>
<td>True ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>SM4500NH3-F</td>
<td>0.02 mg/L</td>
<td>0.36</td>
<td>0.36</td>
<td>0.36</td>
</tr>
<tr>
<td>Nitrite</td>
<td>EPA 354.1</td>
<td>0.002 mg/L</td>
<td>0.500</td>
<td>0.492</td>
<td>0.500</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>EPA 365.3</td>
<td>0.009 mg/L</td>
<td>0.500</td>
<td>0.463</td>
<td>0.500</td>
</tr>
<tr>
<td>TOC</td>
<td>SW846-9060</td>
<td>0.5 mg/L</td>
<td>2.5</td>
<td>2.4</td>
<td>2.5</td>
</tr>
<tr>
<td>TKN</td>
<td>SM4500NorgC</td>
<td>0.07 mg/L</td>
<td>0.80</td>
<td>0.78</td>
<td>1.13</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>ASTM D-515</td>
<td>0.05 mg/L</td>
<td>0.60</td>
<td>0.58</td>
<td>0.60</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 - 30 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 - 30 %, which is established from internal QC guidelines.
## KENTUCKY GEOLOGICAL SURVEY

**LABORATORY SERVICES**

**AMMONIA STANDARDS / SAMPLES SUMMARY**

<table>
<thead>
<tr>
<th>Sample Delivery Group:</th>
<th>01110019</th>
<th>Analytical Wavelength nm:</th>
<th>630-660</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Method #:</td>
<td>SM4500NH3-F</td>
<td>Analyst Initials:</td>
<td>JB</td>
</tr>
<tr>
<td>Date Analyzed:</td>
<td>12/18/01</td>
<td>MDL:</td>
<td>0.02 mg/L</td>
</tr>
</tbody>
</table>

**Calibration Verification:**

- Linear Calibration Range: 0.05 - 1.00
- Linear Calibration Coefficient: 0.99865

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>True</th>
<th>Concentration, mg/L</th>
<th>Found</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QC1*</td>
<td>0.36</td>
<td>0.36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS12513</td>
<td>x</td>
<td>&lt; MDL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dup GS12513</td>
<td>x</td>
<td>&lt; MDL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QC2*</td>
<td>0.36</td>
<td>0.36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
KENTUCKY GEOLOGICAL SURVEY

LABORATORY SERVICES

NITRITE STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 01110019  Analytical Wavelength nm: 540
Water Method #: EPA 354.1  Analyst Initials: JB
Date Analyzed: 11/30/01  MDL: 0.002 mg/L

Calibration Verification:

Linear Calibration Range: 0.01 - 1.00
Linear Calibration Coefficient: 0.99973

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.492</td>
</tr>
<tr>
<td>GS12514</td>
<td>x</td>
<td>0.061</td>
</tr>
<tr>
<td>Dup GS12514</td>
<td>x</td>
<td>0.058</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.506</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10% of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10%, which is established from internal QC guidelines.
Sample Delivery Group: 01110019  Analytical Wavelength nm: 700
Water Method #: EPA 365.3  Analyst Initials: JB
Date Analyzed: 11/30/01  MDL: 0.009 mg/L

Calibration Verification:

Linear Calibration Range: 0.01 - 1.00
Linear Calibration Coefficient: 0.99980

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>True</td>
<td>Found</td>
</tr>
<tr>
<td>Matrix blank</td>
<td>x</td>
<td>&lt; MDL</td>
</tr>
<tr>
<td>QC1*</td>
<td>0.500</td>
<td>0.463</td>
</tr>
<tr>
<td>GS12513</td>
<td>x</td>
<td>1.260</td>
</tr>
<tr>
<td>Dup GS12513</td>
<td>x</td>
<td>1.290</td>
</tr>
<tr>
<td>QC2*</td>
<td>0.500</td>
<td>0.524</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 10 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 10 %, which is established from internal QC guidelines.
Sample Delivery Group: 01110019  
Instrument ID: DC - 80

Water Method #: SW846-9060  
Analyst Initials: SRM

Date Analyzed: 11/30/01  
MDL: 0.5 mg/L

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td></td>
</tr>
<tr>
<td>Blank</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mg/L</td>
<td>Calibration Average =</td>
</tr>
<tr>
<td>10 mg/L</td>
<td>Calibration Adjusted =</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Carbon Analyzer Value</th>
</tr>
</thead>
<tbody>
<tr>
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<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Uncorrected TOC</th>
<th>Blank Corrected TOC, mg/L</th>
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<tbody>
<tr>
<td>QC1*</td>
<td>2.530</td>
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<tr>
<td>GS12513</td>
<td>4.100</td>
<td>x</td>
</tr>
<tr>
<td>Dup GS12513</td>
<td>4.170</td>
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</tr>
<tr>
<td>QC2*</td>
<td>2.430</td>
<td>2.5</td>
</tr>
</tbody>
</table>

* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
TOTAL KJELDAHL NITROGEN STANDARDS / SAMPLES SUMMARY

Sample Delivery Group: 01110019  Analytical Wavelength nm: 630-660
Water Method #: SM4500NorgC  Analyst Initials: SRM
Date Analyzed: 12/19/01  MDL: 0.07 mg/L

Calibration Verification:

Linear Calibration Range: 0.1 - 2.9
Linear Calibration Coefficient: 0.9955

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Concentration, mg/L</th>
<th>Comments</th>
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<tbody>
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<tr>
<td>QC2*</td>
<td>1.13</td>
<td>1.18</td>
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</table>

* The acceptable range is ± 20 % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 20 %, which is established from internal QC guidelines.
Sample Delivery Group: 01110019
Water Method #: ASTM D-515
Date Analyzed: 12/14/01

Analytical Wavelength nm: 700
Analyst Initials: JB
MDL: 0.05 mg/L

Calibration Verification:
Linear Calibration Range: 0.05 - 1.00
Linear Calibration Coefficient: 0.99876

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<td>QC1*</td>
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<tr>
<td>GS12513</td>
<td>x</td>
<td>0.29</td>
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<tr>
<td>Dup GS12513</td>
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<tr>
<td>QC2*</td>
<td>0.60</td>
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* The acceptable range is ± 2SD % of the true value, which is established from internal QC guidelines.

** For duplicate analysis, the acceptable range is a relative percent difference of ± 15 %, which is established from internal QC guidelines.
### Calibration Standards

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<thead>
<tr>
<th>Analyte</th>
<th>RT Window From</th>
<th>RT Window To</th>
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<tbody>
<tr>
<td>Chloride</td>
<td>1.39</td>
<td>1.99</td>
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<tr>
<td>Nitrate</td>
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<tr>
<td>Sulfate</td>
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<td>6.35</td>
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<table>
<thead>
<tr>
<th>Analyte</th>
<th>Concentration mg/L</th>
<th>Peak area</th>
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<tbody>
<tr>
<td>Chloride Level-1</td>
<td>2.0</td>
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<tr>
<td>Chloride Level-2</td>
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<td>Chloride Level-3</td>
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<td>Nitrate Level-3</td>
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<td>Sulfate Level-1</td>
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<td>Sulfate Level-2</td>
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<td>Sulfate Level-3</td>
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### Chloride Concentration mg/L

<table>
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<tr>
<th>Sample ID</th>
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<th>%R*</th>
<th>RPD**</th>
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<tbody>
<tr>
<td>Lab QC</td>
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<td>GS12516</td>
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<tr>
<td>GS12516 Dup **</td>
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### Nitrate Concentration mg/L

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<th>RPD**</th>
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<tr>
<td>GS12516</td>
<td>3.36</td>
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<tr>
<td>GS12516 Dup *</td>
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### Sulfate Concentration mg/L

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<thead>
<tr>
<th>Sample ID</th>
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<th>Found</th>
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<th>RPD**</th>
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<tbody>
<tr>
<td>Lab QC</td>
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<td>&lt;MDL</td>
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</table>

*%R: Recoverable percentage of the true concentration value
**RPD: Relative percent difference for duplicate analysis.