

Buckeye Hills Regional Park  
Buckeye Hills Shooting Complex  
d/b/a General Joe Foss Shooting Complex  
26700 W. Buckeye Hills Drive  
Buckeye, AZ 85326

In 1972, land was patented to Maricopa County pursuant to the Recreation and Public Purposes Act of 1969 as part of the Buckeye Hills Recreation Area. The management, operation, maintenance and improvement of the Buckeye Hills Shooting Complex shall be through a non-profit entity or government agency.

In 1985 the Town of Buckeye entered into an IGA with the County for maintenance and operation of the Range. In 2004 discussions began for the development of a new public shooting range at Buckeye Hills Regional Park. The County's Facility Management Department developed the infrastructure. Construction was completed on the Complex in February 2008. The construction of this state-of-the-art facility was completed in February 2008. The County's Fixed Asset Inventory values the range at: **\$4,785,120.00**.

The Complex has been operational since October 2008 under several Special Use Permits with the Buckeye Sportsman Club. On January 18, 2011, a Request for Proposal for the management further development of the Buckeye Hills Shooting Complex (Serial PR 11-01-RFP) was issued. The Buckeye Sportsman Club was the successful respondent and was awarded the current Use Management Agreement on June 8, 2011. This Agreement expires December 31, 2016.

The Complex consists of the following facilities or amenities:

- A. An administration and retail building.
- B. Public training range (50 yards; 40 shooting lanes; 270 feet wide).
- C. Public multi-use range (200 yards; 40 shooting lanes; 430 feet wide)
- D. Public Archery Range.
- E. Public Shotgun Range.
- F. Hunter education trail.
- G. Designated parking area with lights.
- H. Solar array and battery structure.
- I. Not developed: Park host/caretaker sites.

### **Utilities**

Electrical – Solar with generator backup. Electrical power is only available through a solar system with a back-up diesel generator. The solar system is currently disabled and the Complex is running off the back-up diesel generator. The generator is only scheduled for when the Complex is in use, not continual at 24 hours a day / 7 days a week. FMD has reported there are air quality issues and temporally the time for operating the facility with generators is being reduced to just daylight hours Thursday, Friday, Saturday and Sunday.

Water – Well

Sewer – Septic System

Building Heat - Propane

Telephone Lines – installed

**Complex manager is responsible at their expense for the following items:**

- Developing, implementing and managing a Range Operations Plan.
- Maintenance of the grounds, including, but not limited to, trash removal, range maintenance, targets, target operation mechanisms, fencing, roads and trails, casing removal, lead removal, signs or any other ancillary facilities or amenities currently, or in the future, located on the Complex. This will also include the responsibility for litter control from the Park entry to the range and within a reasonable proximity to the range.
- Ensuring compliance and associated site assessment and clean-up with the Maricopa County Air Pollution Control Regulations and other environmental statutes, regulations and ordinances as they pertain to air quality and other environmental concerns at the Complex.
- Implementing and managing an Environmental Stewardship Plan (existing plan attached as Exhibit 3) as may be modified as required to meet current environmental standards.
- Implementing and managing an Emergency Evacuation Plan.
- Developing, implementing and managing a maintenance plan and preventative maintenance plan.
- Implementing County approved capital improvement fund projects. The following describes the capital improvement funds:

Capital improvement fund will only be expended for new capital improvements or major maintenance and repair of existing facilities, structures and other improvements which substantially extend the useful life of existing facilities, structures and other improvements, to include those that will overall benefit Buckeye Hills Regional Park. Capital expenditures may include non-expendable equipment, major renovation projects and acquisition and development of areas and facilities of a substantial nature. The Range Improvement Fund will not be used for on-going operating expenditures or routine maintenance. With the County approval, items considered appropriate for Range Improvement expenditure may include:

- (1) Major repair or replacement of fencing or roofing;
- (2) Demolition of existing improvements;
- (3) Any work commonly considered a capital repair or replacement;
- (4) Major renovation projects and development or redevelopment of areas or facilities.
- (5) Facility or amenity renovation or expansion.

**Public shooting range is operated year-around:**

Summer Hours

May 1st to October 2nd  
Friday.....7 am - 1 pm  
Saturday..7 am - 1 pm  
Sunday....7 am - 1 pm

Winter Hours

October 3rd to April 30th  
Friday.....8 am - 2 pm  
Saturday..8 am - 2 pm  
Sunday....8 am - 2 pm

**Public Fees:**

- Daily Public Fee  
Adults \$7.00  
Active Military \$5.00  
Active Law Enforcement \$5.00  
Under 18 – FREE
- Trap & Skeet Fee  
\$7.00 per round General Public  
\$6.00 per round Youth, Active Military and Buckeye Shooting Complex Members
- Payment Options  
At this time payment by cash or check only

**Law Enforcement/Military/Public Safety:**

Currently there are three agreements with Law Enforcement/Military/Public Safety (Permitees) use that expire December 31, 2016; City of Buckeye, City of Goodyear and Luke Air Force Base. We recommend that the Respondent continue to provide services to these Permitees. Previous rates are listed below.

The Permittee is required to have:

- One employee certified in CPR and First Aid, with proof of certification submitted to the County.
- Sufficient quantity of Certified Range Safety Officers to implement the range operating procedures, range rules and inspection, range briefing, and emergency procedures for safe shooting activities.
- Provide own range materials (i.e. targets, target frames, cardboard and any other items necessary for training).

City of Buckeye (Law Enforcement) – exclusive use Thursdays from 0600-midnight:

Facility open/close fee \$50.00  
Range, \$5.00 per individual  
Clean up (trash/expended brass or classroom clean up) \$30/hr  
Classroom, greater than 4 hours \$50.00  
Classroom, less than 4 hours \$25.00  
Storage, \$10.00 per month

City of Goodyear (Law Enforcement)

Facility open/close fee \$50.00  
Range, \$5.00 per individual  
Clean up (trash/expended brass or classroom clean up) \$30/hr  
Classroom, greater than 4 hours \$50.00  
Classroom, less than 4 hours \$25.00  
Storage, \$10.00 per month

Luke Air Force Base (Military)

Facility open/close fee \$50.00  
Range, \$5.00 per individual  
Clean up (trash/expended brass or classroom clean up) \$30/hr  
Classroom, greater than 4 hours \$50.00  
Classroom, less than 4 hours \$25.00

### County Administrative Fee:

County receives an administrative fee that is used to offset County expenses in the maintenance of the agreement and will be applied towards maintenance responsibilities outside of the Complex for which the County is responsible. The annual administrative fee in the existing agreement is \$1,200 a year.

### Attendance and Revenue Summary (Calendar Year 2012 through August 31, 2016):

<b>Attendance Summary</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>Attendance Totals</b>
Public	5,823	5,761	6,288	6,515	3,554	24,387
Law Enforcement	-	-	134	320	299	454
Military	443	396	450	82	-	1,371
Certification	-	-	-	-	-	-
Shotgun Range	-	10	487	128	295	625
Archery Range	514	57	86	37	85	694
Hunter Education	-	-	-	-	-	-
Classroom Instruction	24	407	651	255	568	1,337
Other	88	156	157	42	490	443
<b>Total Attendance</b>	<b>6,892</b>	<b>6,787</b>	<b>8,253</b>	<b>1,744</b>	<b>5,299</b>	<b>23,676</b>

<b>Adjusted Gross Receipts</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>AGR Totals:</b>
Calendar Year End Totals:	\$ 41,167.27	\$ 42,732.80	\$ 45,787.88	\$ 11,876.40	\$ 41,462.00	\$ 141,564.35

**EXHIBIT 1 – ENVIRONMENTAL STEWARDSHIP PLAN**

**ENVIRONMENTAL STEWARDSHIP PLAN:  
BUCKEYE HILLS REGIONAL PARK  
SHOOTING RANGE**

Prepared for

**Maricopa County Facilities Management  
401 West Jefferson Street  
Phoenix AZ 85003**

Initial Plan prepared by

**Kramer One, Inc.  
6839 East Avalon Drive  
Scottsdale AZ 85251**

Through a Subcontract to

**Dick Peddicord & Company, Inc.  
1115 Coopers Landing Road  
Heathsville, VA 22473**

**10 October 2007**

**ENVIRONMENTAL STEWARDSHIP PLAN:  
BUCKEYE HILLS REGIONAL PARK SHOOTING RANGE**

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# **ENVIRONMENTAL STEWARDSHIP PLAN: BUCKEYE HILLS REGIONAL PARK SHOOTING RANGE**

## **1.0 INTRODUCTION**

Maricopa County Arizona is developing a new law enforcement firearms training facility, and a new public shooting range in the Buckeye Hills Regional Park. The facility will include, among other features, law enforcement firearms training and qualification ranges and public shooting ranges. Throughout this document, the term “the ranges” is used to refer to all the shooting ranges collectively; individual ranges are named when referred to specifically.

This Environmental Stewardship Plan (ESP) presents plans for ongoing environmental stewardship related to shooting-associated constituents throughout the life of these ranges. This ESP is consistent with the guidance and recommendations of the United States Environmental Protection Agency (EPA 2001), the National Shooting Sports Foundation (NSSF 1997), and the Interstate Technology and Regulatory Council (ITRC 2005). This ESP does not include the following topics, among others, which are addressed elsewhere:

- obtaining and complying with any environmental permits that may be required
- environmental concerns that may be associated with non-shooting activities or constituents
- Occupational Safety and Health Administration (OSHA) issues for workers

The initial ESP was developed pro-actively on the initiative of Maricopa County Facilities Management through a contract with Kramer One, Inc. and a subcontract with Dick Peddicord & Company, Inc.<sup>1</sup> in September 2007. The expectation is that the County will review the ESP periodically and revise it as appropriate based on implementation experience. All revisions of the ESP are the responsibility of Maricopa County; Kramer One, Inc. and/or Dick Peddicord & Company, Inc. assume no responsibility for the nature or consequences of any revisions or lack thereof.

### **1.1 PURPOSE OF THIS ENVIRONMENTAL STEWARDSHIP PLAN**

This ESP is specific to the environmental conditions that exist at the ranges and the activities conducted there. The purposes of this ESP are to:

- Document the present environmental setting
- Identify issues of potential environmental concern that may exist
- Identify, evaluate, and prioritize appropriate actions to manage these issues

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<sup>1</sup> Dick Peddicord & Company, Inc. 1115 Coopers Landing Road, Heathsville VA 22473. Telephone: (804) 580-3320. [www.dickpeddicord.com](http://www.dickpeddicord.com)

- Identify short- and long-term action items and the steps needed for implementation
- Develop an implementation schedule
- Identify ways to measure and document results of management actions
- Provide for periodic evaluation of progress toward environmental stewardship goals and appropriate revisions of plans

## **1.2 GOALS OF THIS ENVIRONMENTAL STEWARDSHIP PLAN**

1. Limit distribution of lead particles to Buckeye Hills Regional Park property
2. Avoid shooting over and into water, wetlands, and washes
3. Prevent shooting-associated constituents from migrating off Buckeye Hills Regional Park property through surface water, groundwater, and air
4. Periodically reclaim and recycle lead
5. Discourage ingestion of lead particles by birds and wildlife
6. Maintain this ESP as an up-to-date “living” document

## **1.3 CONSISTENCY WITH REGULATIONS AND GUIDANCE**

This ESP is consistent with U.S. EPA (2001) and NSSF (1997) documents, which compliment each other and together constitute a complete package of guidance and recommendations for environmental management of outdoor shooting ranges consistent with national laws, regulations, and policies at the time this summary was developed. The NSSF (1997) guidance discusses development of an ESP addressing a comprehensive suite of major topics, including periodically reclaiming and recycling lead and management to minimize potential lead mobility between reclamation activities. The U.S. EPA (2001) best management practice for lead focuses specifically on lead reclamation and recycling with interim management to minimize mobility. The U.S. EPA (2001) guidance provides considerable detail on many aspects of reclaiming, recycling, and related topics. It also addresses legal requirements and court rulings, and discusses the regulatory context for environmental management at outdoor shooting ranges. *Note that the discussions in this Section are subject to change with future legal or policy developments, and do NOT constitute legal guidance; an attorney experienced in environmental matters at outdoor shooting ranges should be consulted if specific issues should arise.*

Maricopa County personnel should carefully read the legal and regulatory discussion in Chapter 1 and Appendix D of the U.S. EPA (2001) guidance for an introduction to national legal/regulatory/policy perspectives on environmental issues at outdoor shooting ranges with which they should become familiar. These issues involve primarily three major Federal environmental laws and their implementing regulations:

- Resource Conservation and Recovery Act (RCRA), which governs solid and hazardous waste management
- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or “Superfund”), which governs site cleanup and environmental restoration
- Clean Water Act (CWA), which governs quality of the nation’s waters

The following summarizes some of the most important aspects of these laws and their implications consistent with U.S. EPA (2001) guidance and case law in the context of environmental management of ongoing and historical outdoor shooting range operations. *Note that (1) the following is derived from U.S. EPA policy based on the Federal judicial rules prevailing at the time this summary was developed and is subject to changes, (2) there are those who consistently advocate alternative views, and (3) the following are general statements true under most circumstances but not necessarily true in every site-specific circumstance.*

1. Shooting ranges, *per se*, are not considered hazardous waste generation, storage, transportation, or disposal facilities under RCRA or CERCLA, and a RCRA permit is not required to operate a shooting range.
2. Using bullets, cartridges, shot, wads, clay targets, and hulls for their intended purposes at shooting ranges does not constitute discharging of “solid waste” (and therefore not “hazardous waste”) under RCRA or CERCLA, and these materials are not subject to *regulatory* as distinct from *statutory* requirements of RCRA. However:
  - A. If bullets, cartridges, shot, wads, clay targets, or hulls are “left to accumulate in the environment long after they have served their intended purpose” they may come to be considered “abandoned” in the environment and therefore RCRA *regulatory* “waste” and thus possibly “hazardous waste” under RCRA and CERCLA.
  - B. Bullets, cartridges, shot, wads, clay targets, or hulls are generally not considered “abandoned” and are not regulated as wastes under RCRA or CERCLA *if they are managed properly. Proper management includes a site-appropriate combination of reclamation and recycling or reuse in conjunction with actions to minimize potential environmental activity of these materials, as discussed in EPA<sup>1</sup> and NSSF<sup>2</sup> guidance.* Because lead and other materials accumulate on operating ranges between reclaiming activities, management actions to minimize potential environmental activity of these materials as part of an Environmental Stewardship Plan may be appropriate, and may constitute evidence that the materials have not been “abandoned”.
  - C. Unrelated to points 2A and 2B, bullets, cartridges, shot, wads, clay targets, or hulls are subject to the broad *statutory* definition of solid waste (and thus possibly hazardous waste) under Sections 7002 and 7003 of RCRA, which allow suits to

compel cleanup and other actions for waste alleged to pose “imminent and substantial endangerment” to human health or the environment.

3. Under conditions specified in EPA<sup>1</sup> guidance, reclaimed materials destined for recycling or reuse may be temporarily stored on range property for periods that depend on site-specific conditions.
4. Backstop material may be moved from one area of a range to another without being considered a RCRA “waste” under conditions specified in the EPA<sup>1</sup> guidance.
5. Regardless of these RCRA implications for operating ranges, when (1) a range is closed, (2) bullets, cartridges, shot, wads, clay targets, or hulls are “abandoned”, or (3) the land use changes, other regulations may well require that the site be cleaned up to applicable standards.
6. CERCLA allows a range to be held liable for the costs of health and environmental assessments, cleanup, and restoration of damages to natural resources. While CERCLA is independent of RCRA, appropriate management actions under RCRA substantially reduce both the likelihood and the potential magnitude of CERCLA actions.
7. CWA prohibits the discharge of pollutants from a point source into “waters of the United States” without a permit, regulates alteration of wetlands, and can require cleanup or restoration of damages caused by discharges or alterations. Many surface water bodies and wetlands are “waters of the United States”. One U. S. District Court has ruled that under the CWA:
  - A. Shooting and throwing clay targets are “discharges”
  - B. Shot (including non-toxic shot), wads, and clay targets (and presumably hulls, cartridges, and bullets) are “pollutants”
  - C. Trap machines, the shooting positions, and a range as a whole are “point sources” (a term that could also include any place from which a “discharge” emanates, such as trap houses, firing lines, ditches, curbs, culverts, fields, etc.).
8. While not discussed in the EPA<sup>1</sup> guidance and not related to RCRA, CERCLA or CWA, it is important to note that various regulatory interpretations and legal rulings clearly imply that bullets, cartridges, shot, wads, targets, and hulls deposited beyond range property can be viewed as litter and/or trespass.

The facts summarized above and their implications (as well as the potential legal, financial, and public relations liabilities associated with not taking appropriate actions) make management of lead and other materials (including appropriate reclaiming and recycling or reuse consistent with EPA [2001] guidance) very advantageous for ranges. This ESP includes plans for such actions at the ranges.

## 2.0 SITE ASSESSMENT

### 2.1 DESCRIPTION OF THE SHOOTING RANGES

#### 2.1.1 Overview of Site

The ranges are located on approximately 500 acres within an approximately 4,474-acre site. The site surrounding the ranges is open and undeveloped. The ranges are near the northeast base of a mountain on the site that rises 750 feet or more higher than the ranges.

The site slopes gently downward to the northeast by about 25 feet across its entire width. The site is crossed by several well-defined washes running generally to the northeast. None are streams, and contain water only immediately after rains. However, some are considered to be subject to regulation under Section 404 of the Clean Water Act, and have been referred to as “404 washes”. Site design and construction carefully limited cumulative disruption of the 404 washes to less than 0.1 acre (Kramer 2007). There is no surface water or wetlands on the site. The site has sparse to moderate vegetation coverage typical of the area, consisting primarily of native grasses, scrub trees, and cacti (RAMM 2007a).

The surficial and shallow subsurface soil at the site has been characterized in association with 29 test pits of 3 to 9 feet depth in various locations across the site, including the backstop areas (RAMM 2007a). In general, the surficial and shallow subsurface soils to a depth of 2 to 5.5 feet throughout most of the site consisted of silty sand with scattered small amounts of gravel and cobbles. These soils contained non-plastic fines, were medium dense to dense, had light to moderate cementation and occasional interbeds of clayey sand to silty sand. Underlying these soils to approximately 4.5 to 8 feet is soft to hard and moderately to highly weathered granite, with weathering decreasing with depth. Backhoe refusal occurred at depths of 4.5 to 8 feet in this material. The silty sand in some portions of the site was underlain by silty clayey sand that extended from 4.5 feet to at least 9 feet in some locations. Backhoe refusal occurred at 9 feet in one location of silty clayey sand with traces of gravel and cobble. These soils were underlain by granite to depths of 7 to 8.5 feet in some portions of the site. At isolated locations, the silty clayey sand occurred from the surface to depths of 2.5 to 5.5 feet, and was underlain by granite.

Stabilized percolation rates ranged from 22 to 28 minutes per inch at eight locations across the site, and a rate of 15 minutes per inch was reported at one location behind the firing line of the 300-yard rifle range (RAMM 2007a). Infiltration or percolation of water into the soil was so slow that intensive investigation indicated that infiltration over the entire site is too low for a standard septic system, and an engineered system had to be installed (Kramer 2007).

No groundwater was encountered within the upper 10 feet of site soils at the time of the geotechnical investigation (RAMM 2007b). Well drilling records published by the Arizona Department of Water Resources indicate depth to groundwater in the general vicinity to be about 135 feet (RAMM 2007b). The well supplying potable water had to be drilled approximately 1.5 miles away and the water piped and pumped to the facility (Kramer 2007).

Soil pH was measured at one location, with a value of 8.1 reported (RAMM 2007a). Because of

the apparent uniformity of the surficial soils across the site and the general soil pH in this part of Arizona, this is likely to be representative of the soil across the site.

Site investigations determined that construction, operation, and maintenance of the ranges and the facility as a whole will not adversely affect archaeological sites of interest (AMEC 2004), or rare, threatened, or endangered species (Dickson 2006).

### 2.1.2 Ranges

This is a new facility at which shooting is scheduled to begin in January 2008. The shooting facility will consist of law enforcement firearms training and qualification, and public-use shooting ranges:

<u>User</u>	<u>Status</u>	<u>Type</u>	<u>Length - yd</u>	<u>Shooting Lanes</u>	<u>Width - ft</u>	<u>Backstop Height - ft</u>
Law Enforcement	Present	2 Pistol Ranges	100	40 on each range	350	20
		Rifle	300	20	190	20
	Planned	Extension of rifle range	600	20	190	20
		Utility range	100	1	225	20
Public	Present	Training	50	40	270	20
		Multi-use	200	40	430	20
	Planned	Recreational shotgun	n.a.	n.a.	n.a.	n.a.
	Planned	Archery	not addressed in this ESP			

All ranges are constructed with native soil backstops and range floors. Each range has fully grouted masonry sidewalls 8 feet high. All ranges are oriented to shoot toward the mountain that rises 750 feet or more higher than the site, providing a natural barrier that would intercept a bullet if it escaped the ranges.

Range rules require placement of all targets in relation to the backstops such that bullets fired at or through the targets from all shooting positions hit the backstops before they drop enough to hit and possibly ricochet off the range floors. To accomplish this, target positions are fixed and firing positions are varied to provide different shooting distances and angles. The exception is the Utility Range, on which tactical steel targets will be used and both target positions and firing positions will vary.

The only previous development on the site was a rifle/pistol range near the southwestern corner of the parcel (RAMM 2007a). Prior to new range construction, areas containing bullets were identified and the bullets were reclaimed. Soil containing lead was incorporated into the backstop and floor of the new 300-yard rifle range, which completely encompasses the old range location (Kramer 2007).

The range design provides for 100% of the surface runoff from a 100-year rain of 2 hour duration to be retained on the site. Therefore, runoff could carry contaminants from the site only if the runoff retention capacity is exceeded by the rare event of greater than the equivalent of a 100-year rain of 2 hour duration. Even if such a rare event were to occur, the excess runoff from the site would immediately be dwarfed by the much greater volume of runoff from the mountain and surrounding area.

The planned public recreational shotgun range will consist of trap machines fixed to throw targets in relation to the shooting positions so that wads, targets, and shot do not enter the 404 washes. This configuration will allow several shotgun stations with differing target presentations on a site that will not accommodate regulation trap or skeet fields without infringing on the 404 washes. The shotfall zones of these stations will consist of native soil.

## 2.2 GENERAL ENVIRONMENTAL BEHAVIOR OF SHOOTING-ASSOCIATED CONSTITUENTS

### 2.2.1 Bullets

Most bullets used at outdoor ranges are lead, although other bullet materials (e.g., copper) are used to some extent in jackets and solid bullet construction, especially frangible copper bullets. Lead bullets also contain other metals that may be of environmental relevance at outdoor ranges under certain conditions:

<b><u>Center fire rifle, pistol &amp; revolver projectiles</u></b> <b><u>(Remington 1995a)</u></b>	
<b><u>Constituent</u></b>	<b><u>Percent</u></b>
Lead	14-79
Copper	16-82
Zinc	6-28
Antimony	0.1-2
Arsenic	<0.5

Backstops and floors of outdoor shooting ranges contain intact bullets of the various sizes and types that have been fired on the range. Backstops also contain bullet fragments of various sizes and shapes produced when incoming bullets strike pebbles or other bullets in the backstops. These bullet fragments can be tiny, even microscopic, and include all shapes from roughly spherical to flattened flakes. Bullets and bullet fragments undergo continuous slow “weathering” that produces various compounds (e.g., oxides, carbonates, sulfates) with the metals in the bullets. Weathering rates vary greatly depending on site-specific conditions. The weathering products occur on the surfaces of bullets and bullet fragments, from which they are abraded by rain,

freeze/thaw, and other physical forces at rates that vary greatly depending on site-specific conditions and then exist as microscopic particles of metal compounds in the soil of the backstops and range floors. Even though bullets and bullet fragments are approximately five times as dense as soil and sand, small bullet fragments (particularly flattened “flakes”) can be transported by surface runoff under some site-specific conditions. Microscopic particles of weathered metal compounds are somewhat less dense than bullet fragments, although considerably more dense than soil, and can be transported by surface runoff.

### 2.2.2 Shot

No decision has yet been made about the composition of shot that will be allowed on the future public recreational shotgun range. The options at present are:

- Allow use of steel shot only. This would minimize any presently recognized potential for environmental concerns, and might be relatively easy to implement because no competitive shooting can occur on the non-regulation range.
- Allow use of both steel and lead shot. There appears to be little incentive for this option because it involves all the environmental concerns associated with lead shot.
- Allow use of lead shot only. Lead is the traditional shot material, and its use involves the environmental concerns addressed in this ESP.

Lead shot also contains other metals that may be of environmental relevance at outdoor ranges under certain conditions:

<b>Lead shot (Remington 1995b)</b>	
<b>Constituent</b>	<b>Percent</b>
Lead	50 - 92
Copper	8 - 65
Antimony	0.1 - 5.5
Arsenic	0.3 - 1.4

Shot containing copper consists only of copper-plated shot that is not used in clay target shooting. Depending on site-specific conditions, shot at clay target ranges undergoes continuous slow “weathering” that produces various compounds (e.g., oxides, carbonates, sulfates) with the metals in the shot. These weathering products occur on the surfaces of shot, from which they can be abraded by rain and other physical forces and then exist as microscopic particles of metal compounds in the soil of the shotfall zone. Even though lead shot is approximately five times as dense as soil and sand due to its composition, shot can be transported short distances by surface runoff. Microscopic particles of metal compounds weathered from shot are somewhat less dense than shot, and can also be transported by surface runoff.

Throughout this document, bullets, bullet fragments, shot, and compounds of various metals weathered from bullets or shot are collectively referred to as lead particles, recognizing that these

particles vary considerably in size and contain compounds of other metals in addition to lead. The actions recommended later in this ESP manage various aspects of the environmental behavior and potential impacts of other metals as well as lead.

### 2.2.3 Clay Targets

No decision has yet been made about the composition of the clay targets that will be used on the future public recreational shotgun range. The options at present are:

- Use only biodegradable targets. Biodegradable clay targets are formulated to contain no contaminants of environmental concern. However, as some brands of biodegradable clay targets degrade they leave a residue of acidic clay that both inhibits plant growth and enhances dissolution of the small proportion of shot that fall in the same area as the targets. Although these targets are generally well accepted by shooters, there are reports that in some situations they have excessive breakage during handling and may occasionally jam the trap machines. Even so, their environmental advantages may offset these characteristics.
- Use either biodegradable or non-biodegradable targets. There appears to be little incentive for this option because it involves all the environmental concerns associated with non-biodegradable targets.
- Use only non-biodegradable targets. These are traditional targets, consisting of approximately 2/3 powdered limestone and 1/3 asphalt pitch binder (Remington 1994). The pitch contains a class of organic compounds known as polycyclic aromatic hydrocarbons (PAH) that in general persist many years without breaking down in the environment, have low volatilities and very low solubilities in water, and are not readily taken up by plants. In addition, they are so tightly bound that within the target matrix they are almost inert biologically, leach extremely slightly, and are very stable and essentially inactive in the environment (Baer *et al.* 1995). Asphalt pitch clay target fragments have not been shown to be major environmental concerns at shooting ranges, and a thorough environmental risk assessment at a trap and skeet range (Peddicord & LaKind 2000) showed them to pose no ecological or human health risks.

Even though the constituents in asphalt pitch clay targets are very stable and essentially inactive in the environment, very small target fragments may be visually undetectable and indistinguishable from soil, and give soil samples a misleading appearance of contamination if analyzed chemically. Experience has shown that many very small target fragments occur on and in surface soil wherever asphalt pitch target debris is visible, and that in such situations extraordinary care and effort is required to collect soil samples free of small, visually undetectable target fragments. If soil samples containing visually undetectable asphalt pitch target fragments are analyzed for PAH, the small target fragments can give the samples an incorrect chemical appearance of being contaminated with PAH when, in fact, the PAH are tightly bound in the target matrix, essentially inactive in the environment, and little cause for concern. Asphalt pitch clay target

fragments contribute nothing positive to the environment and can be viewed as litter, especially if they wash off the property.

#### **2.2.4 Wads and Hulls**

Wads (Remington 2001a) and hulls (Remington 2001b) are made of polyethylene, the same plastic as milk cartons. Wads and hulls have not been shown to be major environmental concerns at clay target ranges. However, they contribute nothing positive to the environment and can be viewed as litter, especially if blown or washed off the property.

### **2.3 EXISTING ENVIRONMENTAL CONDITIONS**

At this site, the routes through which lead and other metals might have the potential to leave the ranges and interact with the environment are surface water, groundwater, and air.

#### **2.3.1 Surface Water**

The design and construction of the ranges insure that runoff from the equivalent of a 100-year rain of 2 hour duration will be retained and would dissipate by evaporation and infiltration, leaving any lead it might have contained within retention area. Even if such a rare event as the equivalent of a 100-year rain of 2 hour duration were to occur, the excess runoff from the site would immediately be dwarfed by the much greater volume of runoff from the mountain and surrounding area. Soil pH data (RAMM 2007a) indicates the native soil that comprises the backstops and range floors is in the optimum pH range of 6.5 to 8.5 (EPA 2001) for maximizing the environmental stability of lead. Either the design features or the soil pH would be very effective in protecting surface water quality. In combination, and in conjunction with the management actions specified in Section 3.2 of this ESP, they assure that the surface water will be protected from any contaminants that might escape these ranges.

#### **2.3.2 Groundwater**

The ranges are designed and constructed so that runoff will be retained, and will dissipate only by evaporation or infiltration. The nature of the soil and the very low percolation/infiltration rates (see Section 2.1.1), combined with the typically low precipitation and high evaporation rate of southern Arizona, indicate that evaporation will be the dominant mechanism and infiltration will be minimal. Evidence suggests that groundwater is relatively deep in the area, and the well supplying the facility is located approximately 1.5 miles away (Section 2.1.1). In addition, the optimum pH of the backstops and range floors will minimize the potential for metals to dissolve in water. These characteristics and features, in combination with the management actions specified in Section 3.2 of this ESP, assure that the underlying groundwater will be protected from contaminants from the ranges.

#### **2.3.3 Air**

Lead and the other metals associated with outdoor shooting ranges are essentially non-volatile. The only mechanism by which they might have a potential to affect air quality is if they were to

weather into dust-sized microparticulates, or dissolve and become sorbed onto soil dust particles. The combination of the design features of the range and the soil characteristics (Section 2.1.1) will be very effective in minimizing weathering and dissolution of metals. In combination, and in conjunction with the management actions specified in Section 3.2 of this ESP, they will minimize the presence of dust-sized metals.

### **3.0 PLAN OF ACTION**

#### **3.1 IDENTIFICATION AND EVALUATION OF POTENTIAL MANAGEMENT ACTIONS**

The existing environmental conditions at the facility that might warrant consideration for management are described in Section 2. Possible actions to manage these conditions in the context of the goals presented in Section 1.2 were identified and evaluated based on the knowledge, experience, and professional judgment of the preparer of this ESP in relation to the factors listed below.

- appropriateness to the present and anticipated future environmental regulatory status of shooting ranges
- environmental soundness
- appropriateness to site-specific conditions
- consistency with County needs
- practicality
- implementability
- cost-effectiveness
- compatibility with the needs of future shooters

#### **3.2 MANAGEMENT ACTIONS TO BE IMPLEMENTED**

The actions identified as appropriate for implementation at the ranges are described in Section 3.2. The actions to implement the ESP consist of the following general types, alone or in combination:

- a) Management Actions (e.g., assign personnel responsible for initiating, conducting, and completing the actions, and establish schedules for each major step)
- b) Operational Actions (e.g., enforce good shooting practices)

- c) Construction Actions (e.g., reclaim lead)
- d) Finance Actions (e.g., estimate the cost of actions, identify the necessary funds to finance actions, establish funding schedules)

The major steps necessary to implement each action are summarized following the description of the action. These steps may be modified as appropriate, and additional detailed steps may be identified, by those responsible for implementing the actions. Some actions are related (e.g., lead reclamation is related dust control), and implementation of related actions should be coordinated.

All work conducted at the facility that involves the potential for worker exposure to lead and other shooting-associated constituents must be conducted only by workers, including contractors, appropriately trained and personally protected under applicable Occupational Safety and Health Administration (OSHA) regulations.

***Goal 1: Limit distribution of lead particles to Buckeye Hills Regional Park property***

Experience at other rifle/pistol ranges indicates two possible means by which bullets may be found outside the backstops and side berms: occasional bullets that may ricochet off the range floors or backstops, and previously fired bullets on the face of the backstops that may be struck by incoming bullets and “flipped” over the backstops or side berms. The present design of the ranges minimizes both processes by:

- Rifle and Pistol Ranges
  - the height of the backstops and side walls
  - placement of all targets in relation to the backstops such that bullets fired at or through the targets hit the backstops before they drop enough to hit and possibly ricochet off the range floors. To accomplish this, target positions are fixed and firing positions are varied to provide different shooting distances and angles. The exception is the Utility Range, on which tactical steel targets will be used and both target positions and firing positions will vary.
- Shotgun Ranges
  - Design and placement of the future shooting stations farther from property boundaries than the maximum range of clay target loads

Therefore, it appears that the range design achieves Goal 1. In addition, management action to minimize the potential for bullets to escape the rifle and pistol ranges should be considered because bullets outside the range are less easily managed from an environmental perspective.

**Action 1:** Strictly enforce good shooting practices and rules against shooting at anything above or below targets properly mounted on the target holders. Maintain efforts to maximize familiarity and enforce compliance with range rules.

**Step 1:** Develop appropriate practices and rules, distribute them to all shooters, post them prominently at the ranges, and make compliance an important part of routine range operations.

**Step 2:** Strictly and consistently enforce the practices and rules with stringent consequences for violation during all range operations.

***Goal 2: Avoid shooting over and into water, wetlands, and washes***

Because there is no water or wetlands on the ranges and all ranges have been carefully designed and located to avoid 404 washes, it appears that no specific actions are necessary to achieve this goal.

***Goal 3: Prevent shooting-associated constituents from migrating off Buckeye Hills Regional Park property via surface water, groundwater, and air***

The most important single factor in maximizing the stability and minimizing the environmental mobility of lead in surface water and groundwater is the acidity of the soil. The native soil from which the range floors and backstops are constructed appears ideal in this regard, as does the soil in the shotfall zones of the future shotgun range. However, this should be verified by monitoring, and soil pH should be adjusted if necessary. The range design and construction described in Section 2 incorporate stormwater management features in conjunction with site conditions and soil pH to maximize protection of both surface water and groundwater. Management to maximize protection of surface water and groundwater should include maintenance of the capacity and hydraulic efficiency of the stormwater retention basins. The potential for shooting-associated constituents to reach the firing line as wind-blown microparticulate should be monitored and managed if necessary.

**Action 2:** Periodically monitor surficial soil pH, and adjust the pH (if necessary) as indicated by soil test results to maintain surficial soil pH between 6.5 and 8.5. This is the soil pH recommended by EPA (2001) at shooting ranges to minimize the potential for metals to enter groundwater or surface water in dissolved form.

**Step 1:** Monitor the pH of surficial soil approximately annually on the floor and backstop of each range. When the future shotgun range is developed, expand this monitoring to include the shotfall zone of each station. See Appendix A for soil pH monitoring procedures.

**Step 2:** Determine need for pH adjustment. If surficial soil pH is between 6.5 and 8.5, there is no need for pH adjustment. If soil pH is outside this range, consult with U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), local University agriculture department, knowledgeable nurseries or horticulturalists, or other reliable sources for advice on the appropriate material and type, amount, and application rate to return surficial soil pH to the 6.5 to 8.5 range recommended by EPA (2001) guidance.

**Step 3:** If warranted, apply the appropriate type and amount of material to adjust pH to the desired value.

**Action 3:** Periodically remove sediment that may accumulate over time in the stormwater retention areas to maintain the capacity and hydraulic efficiency of the areas.

**Step 1:** Determine the sediment accumulation in each area that warrants removal.

**Step 2:** Monitor accumulation of sediment in the stormwater retention areas.

**Step 3:** Remove sediment when accumulation warrants. The sediment will consist of fine particles of soil and rock from the backstops and range floors, and may contain lead particles. Consistent with EPA (2001) guidance, the sediment removed from the basins can be:

- replaced on the backstops or range floors where it will be included in the next reclaiming and recycling operation,
- or
- disposed off-site as solid waste or hazardous waste with appropriate testing and handling.

**Action 4:** Determine the potential for shooting-associated constituents to reach the firing line as wind-blown microparticulates, and manage if necessary.

**Step 1:** Measure and record shooting-associated constituents in the breathing zone of Range Officers on each range on a day when wind is carrying visible dust from the backstop toward the firing line.

**Step 2:** If the data indicate dust management may be warranted on a range, identify and evaluate dust management actions consistent with safe and efficient operation of that range. Possible actions that might be considered include such things as applying an approved polymer, surfactant, or other dust suppressant, or other actions consistent with safe and efficient range operations.

**Step 3:** Select, schedule, and implement appropriate dust management actions.

**Action 5:** Evaluate exclusive use of non-toxic (e.g., steel) shot by all shooters on the shotgun range when it opens.

**Step 1:** Determine the positive and negative aspects of exclusive use of non-toxic (e.g., steel) shot by all shooters, considering such factors as:

- acceptance by new and experienced shooters
- cost, including long-term environmental management costs
- means of ensuring compliance
- environmental implications
- elimination of need for reclaiming of lead shot

- other relevant factors

**Step 2:** If warranted, implement exclusive use of non-toxic (e.g., steel) shot by all shooters when the shotgun range opens.

**Action 6:** Evaluate exclusive use of biodegradable clay targets on the shotgun range when it opens.

**Step 1:** Investigate recent advances in biodegradable targets considering such factors as:

- shooter acceptance
- cost, including
  - long-term environmental management costs
  - potential breakage
  - potential to jam trap machines
- environmental implications, including potential
  - acidic residues
  - inability to support plant growth
  - absence of contaminants of environmental concern
- elimination of need for reclaiming non-biodegradable target fragments
- other relevant factors

**Step 2:** If warranted, determine the availability, cost, and performance of biodegradable targets of various compositions under the conditions at the shotgun range.

**Step 3:** If warranted, institute exclusive use of suitable biodegradable targets when the shotgun range opens.

**Action 7:** Optimize management of wads, hulls, and non-biodegradable targets (if used).

**Step 1:** Investigate possible options for periodically removing hulls and wads. At many ranges, shooters are encouraged to pick up their hulls for personal reuse or place them in convenient containers for reuse or disposal by the range. Possible options for removing wads include raking by hand or with commercial lawn equipment, and vacuuming with commercial leaf vacuums or small vacuum trucks.

**Step 2:** If non-biodegradable targets are used on the shotgun range when it opens, investigate possible options for disposing and recycling non-biodegradable target fragments (perhaps through asphalt plants) and wads.

**Step 3:** Monitor and maintain records of the quantity of non-biodegradable target fragments accumulated on the ranges.

**Step 4:** Investigate and evaluate techniques for possible use in removal of non-biodegradable target fragments.

**Step 5:** As accumulations warrant, plan and budget for non-biodegradable target fragment removal operations.

**Step 6:** When sufficient wads and non-biodegradable target fragments have accumulated to warrant removal, schedule, conduct, and record these activities. It may or may not be appropriate to:

- remove wads and non-biodegradable target fragments at the same time
- remove wads and non-biodegradable target fragments in conjunction with reclaiming and recycling shot

***Goal 4: Periodically reclaim and recycle lead***

Lead should be reclaimed from the ranges consistent with EPA (2001) guidance. County personnel should carefully review the U. S. EPA (2001) guidance on best management practices for lead at outdoor shooting ranges. In much abbreviated summary, this guidance is to reclaim and recycle lead shot as frequently as can be justified, and between reclamation activities manage the areas containing lead as appropriate to minimize physical and chemical mobility of metals.

**Action 8:** Reclaim and recycle bullets from the range floors and backstops consistent with EPA (2001) guidance.

**Step 1:** Institute a program of monitoring and maintaining records of the quantity of each type of bullet fired on each range.

**Step 2:** Determine proper methods and costs for reclaiming and recycling bullets from the range floors and backstops, and the approximate value of the recycled bullets.

**Step 3:** Plan and budget for reclamation and recycling operations when reclamation is feasible consistent with EPA (2001) guidance. Cost considerations may well dictate that the rifle and pistol ranges be considered together for bullet reclaiming.

**Step 4:** When sufficient lead has accumulated to warrant reclamation and recycling according to EPA (2001) guidance, schedule, conduct, and record these activities.

**Action 9:** If lead shot is used on the shotgun range after it opens, reclaim and recycle shot from the shotfall zones of consistent with EPA (2001) guidance.

**Step 1:** Institute a program of monitoring and maintaining records of the quantity of shot fired.

**Step 2:** Identify possible techniques for reclaiming shot, and their advantages, limitations, and cost.

**Step 3:** Determine which reclamation techniques are most appropriate for the conditions on the shotgun range.

**Step 4:** Determine the approximate costs of reclamation and recycling shot, and the approximate value of recycled shot.

**Step 5:** Plan and budget for reclamation and recycling operations when reclamation is feasible consistent with EPA (2001) guidance. Because the reclamation methods used for shot are often different from those used for bullets, it may or may not be advantageous to coordinate reclamation from both types of venues.

**Step 6:** When sufficient shot has accumulated to warrant reclamation and recycling according to EPA (2001) guidance, schedule, conduct, and record these activities.

**Step 7:** Re-establish vegetative cover, if appropriate, after reclamation.

***Goal 5: Discourage ingestion of lead particles by birds and wildlife***

There is the possibility that birds and wildlife that feed on seeds they pick from the ground surface may incidentally ingest small lead particles if they feed on ranges with brush and weeds on the backstops or range floors. Because the rifle and pistol ranges will not have vegetation to attract ground-feeding, seed-eating birds and wildlife, the potential for incidental ingestion of lead particles from these ranges is minimal. The anticipated high activity level at the facility will tend to discourage even further the use of the site by birds and wildlife. Therefore, it appears that no specific actions are necessary to achieve this goal on the rifle and pistol ranges.

**Action 10:** When the shotgun range is opened, maintain the shotfall zones in vegetation minimally attractive to ground-feeding, seed-eating birds and wildlife.

**Step 1:** Determine appropriate types of vegetation to minimize attractiveness to ground-feeding, seed-eating birds and wildlife typical of the area.

**Step 2:** Determine optimal methods and schedule for shifting vegetation, if appropriate, to the desired types in the various areas.

**Step 3:** Implement the selected methods to shift the vegetation, if appropriate, to the desired types on the shotfall zones in coordination with other management actions.

**Step 4:** Implement appropriate activities to maintain the desired vegetation on the shotfall zones.

**Goal 6: Maintain this ESP as an up-to-date “living” document.**

**Action 11:** At least annually, or whenever conditions change, the County person with overall responsibility for the ESP will report to management on implementation of the ESP during the past year and present a recommended revised and updated ESP for approval.

**Step 1:** Assign a person overall responsibility for the ESP.

**Step 2:** At least annually, or whenever conditions change, evaluate and revise the ESP as appropriate by considering and addressing relevant issues, including but not limited to:

- which goals of the ESP were fully achieved, partially achieved, not achieved, and not addressed
- lessons learned through implementation experience with the ESP, including topics that may require improvement
- which activities can be combined or conducted with better efficiency and effect
- what activities (if any) are no longer appropriate
- what activities (if any) should be added
- changes that have occurred in the operation of the facility, government regulations, new environmental considerations, etc. that may make revisions to the ESP appropriate
- advances in science and technology that can be practically and advantageously implemented
- any other issues appropriate to be considered for the improvement and implementation of the ESP

**Step 3:** Prepare an updated ESP for the coming year for recommendation to the appropriate officials for approval.

## **4.0 IMPLEMENTATION**

### **4.1 SCHEDULE OF ACTIONS TO IMPLEMENT PLAN**

The schedule of actions to implement the ESP considered appropriate at the time of development of the ESP is presented in Appendix B.

## **4.2 RESPONSIBILITY FOR ACTIONS TO IMPLEMENT PLAN**

The responsibilities for implementation of the ESP considered appropriate at the time of development of the ESP are presented in Appendix C.

## **5.0 MEASURING SUCCESS**

It is important to not only conduct the management actions identified in this ESP, but to (1) determine the success of those actions in achieving their objectives, and (2) maintain records documenting the success. These records will provide the basis for updating and refining the ESP as discussed in Section 6.0, and will be useful if the County ever finds it desirable to document its environmental stewardship activities.

Appropriate approaches to measuring success should be developed by the individuals responsible for implementation of each action, including detailed procedures as necessary for measuring and documenting success and for determining appropriate refinements. It may be desirable for management to keep the documentation of the ESP in a central file, in addition to the responsible individuals keeping records on each action. Measurement and documentation approaches may include such things as:

- records such as designs, requests for bids, invoices, checks, receipts for lead sold, dated before-and-after photographs, etc.
- range signs, instructions to range officers, notices to users, etc.
- records that demonstrate the need and the completion of the action (e.g., internal records of accumulation of bullets, dust observations, etc.)
- records of the factors considered in making decisions
- descriptions of the development of cost estimates, etc.

## **6.0 NOTICE**

Kramer One, Inc. or Dick Peddicord & Company, Inc. accepts no responsibility or liability associated with any use Maricopa County or other entity may make of this Environmental Stewardship Plan or its contents, recommendations, or guidance or lack of guidance. Based on project activities, Kramer One, Inc. or Dick Peddicord & Company, Inc. does not warrant that there are no toxic or hazardous materials or contamination associated with the subject properties. Kramer One, Inc. or Dick Peddicord & Company, Inc. accepts no liabilities if such are found in the future, or could have been found if additional sampling or studies were conducted. Kramer One, Inc. or Dick Peddicord & Company, Inc. does not assume responsibility for other environmental issues that may be associated with the subject properties.

This project was conducted for Maricopa County, and relied on the County for the completeness and accuracy of the site-specific information and data it provided. The project was based in part on third party information not within the control of either Maricopa County, Kramer One, Inc., or Dick Peddicord & Company, Inc. While it is believed that the third party information is

appropriate for the uses made of it, neither Maricopa County, Kramer One, Inc., nor Dick Peddicord & Company, Inc. assumes responsibility for its accuracy or the implications of its use.

In view of the rapidly changing status of environmental laws, regulations, and guidance, Kramer One, Inc. or Dick Peddicord & Company, Inc. cannot be responsible for changes in laws, regulations, guidance, or procedures that occur after this project has been completed and which may affect the subject properties.

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# Appendix A

## Procedures for Soil pH Measurements

### PROCEDURES FOR SOIL PH MEASUREMENTS

#### BUCKEYE HILLS REGIONAL PARK SHOOTING RANGE

The following procedures are acceptable for determining soil pH on the Buckeye Hills Regional Park shooting ranges.

Soil pH should be determined separately for each of the following areas on an approximately annual basis:

- Backstop of each rifle/pistol range
- Floor of each rifle/pistol range
- Shotfall zone of each station of the shotgun range when it opens

Within each area, approximately one cup of soil should be collected from the top 1-2 inches of soil at approximately 10 locations scattered throughout the area. Shot, clay target fragments, grass, twigs, leaves, stones, and similar debris should be removed from the samples. If any of these contains large sub-areas of obviously different soil types (e.g. sandy and clayey) or conditions (e.g., well drained and poorly drained), a separate set of soil samples should be collected from each soil type.

For each area, the soil from all sampling locations within that area should be combined in a clean plastic container and thoroughly mixed to make one large sample representative of the area. Three separate subsamples of mixed soil should be taken from the container for pH measurement. Each sample should be placed in a clean glass jar and kept in the dark at room temperature until delivered to the laboratory for pH determination. All samples should be provided together for analysis within a day or two of collection. The sample containers should be marked in a manner that provides no indication of their source to the laboratory (e.g., sample 1, sample 2), but range personnel should keep records by which each sample can be identified as to which area it represents.

All pH measurements should be made by a competent soils laboratory, which can be identified in consultation with the USDA Natural Resources Conservation Service (NRCS), local University agriculture department, knowledgeable nurseries or horticultural firms, or other reliable sources.

Alternatively, range personnel can make pH determinations from the in-place soil in the field using a professional-quality soil pH probe available from scientific or horticultural equipment firms. Using this approach, a single measurement is made directly from the soil at each of the approximately 10 locations scattered throughout the area being tested.

When results are reported from the laboratory (or obtained from field measurements), the average of the three pH values from each area should be used as the basis for deciding on appropriate actions. If records from the first two sampling periods indicate that all three values

from a particular area are always within 0.3 pH units of each other, it is acceptable to only collect one sample from each area (i.e., one sample from each mixed container of soil) for pH measurement in the future.

Documentation of all pH sampling and results should be maintained as part of the ESP records.

## Appendix B

### Schedule of Actions to Implement Environmental Stewardship Plan

#### SCHEDULE OF ACTIONS TO IMPLEMENT ENVIRONMENTAL STEWARDSHIP PLAN: BUCKEYE HILLS REGIONAL PARK SHOOTING RANGE

The following schedule of actions to implement the ESP is considered appropriate at the time of development of the ESP. Implementation experience or unforeseen circumstances may warrant modifications to the schedule indicated below. The actions and steps are summarized here from their full descriptions in Section 3.2 of the text. At the end of the presentation of the schedule, the schedule is summarized in tabular format.

**Action 1:** Enforce good shooting practices and rules against shooting at anything above or below targets properly mounted on the target holders.

**Step 1:** Develop, distribute, and post rules, and make compliance important.

**Step 2:** Strictly enforce the practices and rules.

**Action 2:** Periodically monitor surficial soil pH, and adjust the pH (if necessary).

**Step 1:** Monitor the pH of surficial soil approximately annually on the floor and backstop of each range, and on the shotfall zone of each station when the shotgun range is developed.

**Step 2:** Determine need for pH adjustment.

**Step 3:** If warranted, apply the appropriate type and amount of material to adjust pH.

**Action 3:** Periodically remove sediment from the stormwater retention areas.

**Step 1:** Determine the sediment accumulation in each area that warrants removal.

**Step 2:** Monitor accumulation of sediment in the stormwater retention areas.

**Step 3:** Remove sediment when accumulation warrants.

**Action 4:** Determine the potential for shooting-associated constituents to reach the firing line as wind-blown microparticulates, and manage if necessary.

**Step 1:** Measure shooting-associated constituents in the breathing zone of Range Officers on a windy day.

**Step 2:** If warranted, identify and evaluate dust management actions.

**Step 3:** Select, schedule, and implement appropriate dust management actions.

**Action 5:** Evaluate exclusive use of non-toxic shot on the shotgun range when it opens.

**Step 1:** Determine the positive and negative aspects of exclusive use of non-toxic shot.

**Step 2:** If warranted, implement exclusive use of non-toxic shot when the shotgun range opens.

**Action 6:** Evaluate exclusive use of biodegradable clay targets on the shotgun range when it opens.

**Step 1:** Investigate recent advances in biodegradable targets

**Step 2:** If warranted, determine the availability, cost, and performance of biodegradable targets.

**Step 3:** If warranted, institute exclusive use of suitable biodegradable targets.

**Action 7:** Optimize management of wads, hulls, and non-biodegradable targets (if used).

**Step 1:** Investigate possible options for periodically removing hulls and wads.

**Step 2:** If used, investigate possible options for disposing and recycling non-biodegradable target fragments and wads.

**Step 3:** Record the quantity of non-biodegradable target fragments accumulated.

**Step 4:** Investigate and evaluate techniques for removal of non-biodegradable target fragments.

**Step 5:** Plan and budget non-biodegradable target fragment removal operations.

**Step 6:** When warranted, schedule, conduct, and record removal of wads and non-biodegradable target fragments.

**Action 8:** Reclaim and recycle bullets from the range floors and backstops consistent with EPA guidance.

**Step 1:** Maintain records of the quantity of bullets fired on each range.

**Step 2:** Determine proper methods and costs for reclaiming and recycling bullets, and their value.

**Step 3:** Plan and budget reclamation and recycling operations when feasible.

**Step 4:** When warranted, reclaim and recycle according to EPA guidance.

**Action 9:** Reclaim and recycle lead shot from the shotgun range after it opens.

**Step 1:** Maintain records of the quantity of lead shot fired.

**Step 2:** Identify techniques for reclaiming shot, and their advantages, limitations, and cost.

**Step 3:** Determine the most appropriate techniques.

**Step 4:** Determine costs of reclamation and recycling shot, and its value.

**Step 5:** Plan and budget reclamation and recycling when feasible.

**Step 6:** When warranted, reclaim and recycle according to EPA guidance.

**Step 7:** Re-establish vegetative cover, if appropriate.

**Action 10:** When the shotgun range is opened, maintain the shotfall zones in vegetation minimally attractive to ground-feeding, seed-eating birds and wildlife.

**Step 1:** Identify vegetation to minimize attractiveness to ground-feeding, seed-eating birds and wildlife.

**Step 2:** Determine methods and schedule for shifting vegetation to the desired types.

**Step 3:** Implement the selected methods to shift the vegetation.

**Step 4:** Maintain the desired vegetation.

**Action 11:** Report to management on implementation of the ESP and recommend updated ESP.

**Step 1:** Assign a person overall responsibility for the ESP.

**Step 2:** Periodically revise the ESP as appropriate.

**Step 3:** Prepare an updated ESP for the coming year for approval.

**Summary of Schedule of Actions to Implement ESP**

<u>Action</u>	<u>Spring 2008</u>	<u>Summer 2008</u>	<u>Autumn 2008</u>	<u>Winter 2008</u>	<u>Spring 2009</u>	<u>Summer 2009</u>	<u>Autum n 2009</u>	<u>Winter 2009</u>	<u>As Appropriate</u>
Action 1 Step 1 Step 2	X								X
Action 2 Step 1 Step 2 Step 3	X	X							X
Action 3 Step 1 Step 2 Step 3		X							X X
Action 4 Step 1 Step 2 Step 3	X				X				X X
Action 5 Step 1 Step 2		X							X
Action 6 Step 1 Step 2 Step 3			X	X					X
Action 7 Step 1 Step 2 Step 3 Step 4 Step 5 Step 6			X	X					X X X X
Action 8 Step 1 Step 2 Step 3 Step 4	X	X X	X	X	X	X	X	X	X X
Action 9 Step 1 Step 2 Step 3 Step 4 Step 5 Step 6 Step 7									X X X X X X X
Action 10 Step 1 Step 2 Step 3				X	X				X

Step 4									X
Action 11									
Step 1	X								
Step 2									X
Step 3					X				

## Appendix C

### Responsibility for Actions to Implement Environmental Stewardship Plan

#### RESPONSIBILITY FOR ACTIONS TO IMPLEMENT ENVIRONMENTAL STEWARDSHIP PLAN: BUCKEYE HILLS REGIONAL PARK SHOOTING RANGE

The following assignment of responsibilities for actions to implement the ESP is considered appropriate at the time of development of the ESP. Implementation experience or unforeseen circumstances may warrant modifications to the responsibilities indicated below. The actions are summarized here from their full descriptions in Section 3.2, which the responsible persons should consult before implementation. At the end of the presentation of the responsibilities, the responsibilities are summarized in tabular format

**Action 1:** Enforce good shooting practices and rules against shooting at anything above or below targets properly mounted on the target holders.

**Action 2:** Periodically monitor surficial soil pH, and adjust the pH (if necessary).

**Action 3:** Periodically remove sediment from the stormwater retention areas.

**Action 4:** Determine the potential for shooting-associated constituents to reach the firing line as wind-blown microparticulates, and manage if necessary.

**Action 5:** Evaluate exclusive use of non-toxic shot on the shotgun range when it opens.

**Action 6:** Evaluate exclusive use of biodegradable clay targets on the shotgun range when it opens.

**Action 7:** Optimize management of wads, hulls, and non-biodegradable targets (if used).

**Action 8:** Reclaim and recycle bullets from the range floors and backstops consistent with EPA guidance.

**Action 9:** Reclaim and recycle lead shot from the shotgun range after it opens.

**Action 10:** When the shotgun range is opened, maintain the shotfall zones in vegetation minimally attractive to ground-feeding, seed-eating birds and wildlife.

**Action 11:** Report to management on implementation of the ESP and recommend updated ESP.

**Summary of Responsibilities for Actions to Implement ESP  
Responsible Buckeye Hills Shooting Range**

<b><u>Action</u></b>	<b><u>Position</u></b>	<b>or</b>	<b><u>Individual</u></b>
Action 1	Buckeye Hills Range Manager		
Action 2	Buckeye Hills Range Manager		
Action 3	Buckeye Hills Range Manager		
Action 4	Buckeye Hills Range Manager		
Action 5	Shotgun Range Manager		
Action 6	Shotgun Range Manager		
Action 7	Shotgun Range Manager		
Action 8	Buckeye Hills Range Manager		
Action 9	Shotgun Range Manager		
Action 10	Shotgun Range Manager		
Action 11	Buckeye Hills Range Manager		