URBAN LIVESTOCK TECHNICAL WORKGROUP GUIDELINES

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INTRODUCTION

There is a growing desire by people in more urban and suburban environments to move towards being self-sufficient when it comes to feeding their families. There are also those who are interested in some financial gain in producing their own food. The result of all this is a changing landscape and a greater need for careful consideration for both community planners and people thinking about growing food. A lot of research and practical work has been done to produce food in rural settings; however, this is not the case for urban and suburban settings. While much of the management will be the same, there are special considerations that must be made to be productive in a more densely populated area. While this document does cover a number of production issues, it does not cover all of them. There is a much greater emphasis on livestock related issues since these operations are where most of the conflict between neighbors occurs in rural areas. It is important to remember that in more densely populated areas, it is not acceptable to infringe on your neighbors' right to enjoy their property. This should be an overriding goal as communities move forward. While this document provides many practices to assist with this goal, there is a great deal that is not known or tested in an urban setting to clearly outline practices that assures this goal. There is little doubt that a better understanding will occur over the years ahead.

There are many issues that must be considered when thinking about growing food in an urban environment. Some of these include changes to the land associated with human activity; some include health for both humans and livestock, while others involve cultural practices associated with growing food; the who, what, when, where, and how of agricultural production is important.

This document provides ideas to consider and sources for greater detail for both policy makers and urban producers. It is arranged in major sections including Understanding Your Soils, Livestock Health, Livestock Housing, Waste and Manure Management, Livestock Slaughter and Euthanasia, and Pest Control. Each chapter will introduce the broad issue to be considered and, when available, web links to sites to provide greater section detail and guidance. For purposes of this document, livestock includes all food producing animals.

I. UNDERSTANDING YOUR SOILS

There are many constituents in the soils of Michigan: minerals, organic material, nutrients and in some cases contaminants that can be harmful to plants and animals, including humans. Soil contamination is caused by harmful amounts of contaminants present in the soil. Contaminants can be natural components of soil, like metals, or manmade substances, like

flame retardants. Contaminants can be present in soil in harmful amounts due to natural background, such as arsenic in some areas of Michigan, or human activity, such as cadmium from machine shops and metal works. Because some contaminants can be taken up by plants, it is possible to produce contaminated fruits and vegetables. Livestock eat dirt as they graze and poultry can peck at the ground, which can create dust that when inhaled can contaminate meat or other animal products, like eggs and milk. Understanding the potential constituents of your soil is an important part of determining if the site being considered for growing food or raising certain livestock is appropriate.

An urban environment is expected to have more soil contamination than a rural one, in part because of more industrial activities, a greater density of pre-1978 structures, and more vehicular traffic. For example, past management practices for industrial waste included on-site burial for solid waste and on-site lagoons for liquid waste, both of which had the potential of contaminating soil, groundwater, and surface water.

Old commercial and residential structures can also contribute lead to soil and dust from peeling paint since paint made before 1978 commonly contained lead. Additionally, the past use of leaded gasoline has also increased lead concentrations in urban soil. Lead in soil is a particular concern because it is recognized as an important source and predictor of child blood lead levels. http://www.sciencedirect.com/science/article/pii/S0160412013001475
No safe blood lead level in children has been identified. Even low levels of lead in blood have been shown to affect IQ, ability to pay attention, and academic achievement. The effects of lead exposure cannot be corrected.
http://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm

Site Evaluation

An evaluation of a potential site for urban livestock must include the history of the site and its surrounding area to help ensure all potential soil contaminants are identified. Past and current activities together with their typical corresponding contaminants are shown in Appendix A, Sources of Contaminants in Soil.

This may also include a review of what others in the area have seen in their soil sample analysis. Soil analysis for all potential contaminants can be expensive, so doing your homework to narrow down the possibilities can save you money. Site evaluation is important because it will provide a sense of security that you are not going to produce a potentially contaminated crop or animal food product.

Soil Sampling

Soil samples need to be representative of the site's soil and prepared in such a way that the laboratory analysis is accurate.

Representative Sampling

The sampling method may be different depending on the total area to be sampled. For example, if an area the size of a typical urban residential back yard is sampled, the instructions given in the *Urban Agriculture in Michigan: Things to consider about soil and water* document may be sufficient.
http://www.michigan.gov/documents/mdard/Urban_Agriculture_in_Michigan_-_Things_to_consider_about_soil_and_water_452158_7.pdf?20150114151547.
For a larger area, a method using incremental sampling may need to be considered. http://www.itrcweb.org/ism-1/. Please note that the incremental sampling method may need to be conducted by an environmental professional.

Sample Preparation

Soil sample preparation will be different for different types of analytes (potential contaminants). It is important to obtain specific instructions from the laboratory that will be conducting the soil analysis. For example, an analysis for some types of analytes will need the addition of a preservative such as an acid or base to the soil sample.

Interpretation of Laboratory Results

Activities associated with raising livestock in urban areas need to be safe for the livestock, the people working with the livestock, the people consuming the livestock and livestock products, and the environment. Unfortunately, there is no set of soil contaminant concentrations that assures protection of all these exposure pathways. The Michigan Departments of Agriculture and Rural Development (MDARD), Community Health (MDCH), and Environmental Quality (MDEQ) have developed several guidance documents for urban gardening that include lists of soil and water contaminant concentrations protective for gardeners and people consuming the crops. http://www.michigan.gov/documents/mdard/Urban_Agriculture_in_Michigan_-_Things_to_consider_about_soil_and_water_452158_7.pdf?20150114151547 and http://www.michigan.gov/documents/mdard/Working_With_Soil_in_Urban_Areas_452152_7.pdf?20150114151547 However, these concentrations may not be protective for livestock and people consuming the livestock and livestock products. For example, there is some evidence that the lead concentrations may be too high for consumption of chicken eggs from chickens raised on soils with these contaminant levels.
http://cwmi.css.cornell.edu/lead_nyc_garden_eggs.pdf

Information regarding safe concentrations of soil contaminants for protection of people consuming the livestock and livestock products are shown in Appendix B, Soil Contaminants and Livestock.

Reduction of Exposure Risk

If a site is known or suspected to have contaminated soil, there are measures that can be implemented to help reduce the exposure risk. These actions include the following:

- Remove contaminated soil and replace with clean soil. This may be the most expensive option; however, it is a more permanent solution than the others.
- Place a barrier between contaminated soil and livestock. Examples include covering the contaminated soil with a sufficient layer(s) of clean soil, concrete, geotextile fabric, and/or rock. The initial cost may be less expensive than soil replacement; however, ongoing monitoring and maintenance will incur future costs.
- Keep livestock above contaminated soil. This action may not be feasible for large livestock; however, it may be workable for chickens, rabbits, and other small animals.
- In the case of growing crops, consider the use of raised beds.

II. LIVESTOCK HEALTH

An increasing number of people wish to raise livestock species in urban areas. The introduction of livestock species to urban environments does concern some people who are nervous about the potential for introducing diseases that are harmful to humans. It will be the responsibility of the urban livestock owner to develop and follow animal management plans for their animals to minimize the risk of disease.

Management practices are the key to animal health whether there are 100 animals or 2. It is widely agreed that disease prevention is ultimately more cost effective than trying to treat a disease after it develops, therefore, animal health plans should include all aspects of animal care, including but not limited to; housing, nutrition, sanitation, and preventive medicine. The primary focus of this section will involve preventive medicine issues; however, proper housing, nutrition, and sanitation are equally important and can greatly reduce the need for medical treatment.

Preventive Veterinary Medicine

The goal of preventive veterinary medicine is to prevent animal disease, promote animal health and wellbeing, protect human health by reducing the risk of zoonotic diseases (those that can be passed from livestock to humans), and prevent contamination of food products meant for human consumption. Preventive veterinary medicine may include the use of veterinary drugs

such as vaccinations, de-wormers, treatments for internal and external parasites, and medicated feeds. Owners should discuss the use of veterinary drugs with their animals' veterinarian, and the veterinarian's recommendations should be an integral part of the animals' health management plan. Even the best animal health plan can fail, and owners may find themselves having to treat animals for illnesses.

It is important for a person choosing to raise livestock animals to know what the normal, healthy appearance is for the animal. Knowing what the healthy animal looks like helps owners recognize when there is something wrong. Appendix C, Appearance Chart, lists some of the common indicators of health and illness in chickens, goats, pigs, and rabbits. When signs of illness are seen, owners should seek veterinary help.

State law only requires dogs to be vaccinated for rabies; however, all mammals can be infected by the rabies virus, including humans. In an urban setting, livestock have an increased risk of contact with the public and are in close proximity to the owner's house, as well as neighboring houses. The livestock may interact with other wildlife, which can pass a virus onto the livestock. Interactions between the livestock and people, as well as consumption of some foods produced by an infected animal, can lead to the livestock passing rabies onto humans. (Compendium of Animal Rabies Control, 2008, National Association of State Public Health Veterinarians).

All drug use, whether part of a preventive medicine plan or used to treat illness should be discussed with the veterinarian before use. The veterinarian will know the disease risks in the area when developing a preventive animal health plan. There are also regulatory reasons why owners should have a working relationship with their veterinarian.

Extra Label Drug Use

The Food and Drug Administration (FDA), is the federal agency responsible for approving drugs for use in animal agriculture. The FDA requires all animal drugs to have the following information on the label or a package insert: list of species for which the drug is approved, the approved dose and route of administration for each approved species, a list of prohibited uses by species, if any, and withdrawal times for milk, meat, and eggs for consumption, if applicable. The term 'extra label' means the drug is being used in a manner different from what is printed on the label or package insert without the consent and advise of a veterinarian. For example, Pen G (penicillin) is an injectable antibiotic approved for use in horses, cattle, sheep, and swine, but not approved for goats, therefore, when Pen G is used to treat a goat the use is "extra label". The only time a product may be used in a manner different from what is listed on the label is if the extra label use is prescribed by, or under the direct supervision of a veterinarian

with whom the user has a valid veterinarian-client-patient relationship (VCPR). (CFR - Code of Federal Regulations Title 21) http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?CFRPart=530). This relationship is required by federal law when using any drug on an animal contrary to label instructions.

Extra label drug use is a concern in both rural and urban agriculture; however, it may occur more often in urban settings because urban farmers may have difficulty forming the required VCPR with a veterinarian. The majority of veterinarians in urban settings work with companion animal species (cats and dogs) or exotic animal species (pocket pets, ferrets, pet birds, and reptiles), so it may be more difficult for urban farmers to find veterinarians willing and able to work with livestock. Increased extra label drug use may lead to increased drug residues in tissue (meat), milk, and eggs.

Drug Residues in Meat, Milk, and Eggs

When veterinary drugs are given to animals raised for food, it may be found in the milk, muscles, organs, and eggs for a measurable period of time after administration. This is why the FDA has established withdrawal times for all drugs approved for use in food producing animals. The withdrawal time is the time elapsed between administration of the last dose to the animal, and when the animal will be safe to slaughter (or milk/eggs will be safe for human consumption). All federally approved drugs include the required withdrawal times for that drug on the product label or package insert. If a veterinarian prescribes extra label use of a drug, they are required to put a label on the drug, which includes what they determine the withdrawal time(s) is for meat, milk, or eggs. Below is an example of a residue warning taken from the package insert for Pen G penicillin.

> **Pen G Penicillin Residue Warnings:**
> Exceeding the daily dosage of 3,000 units per pound of body weight, administering for more than four consecutive days, or exceeding the maximum injection site volume per injection site may result in antibiotic residues beyond the withdrawal time. Milk taken from treated dairy animals within 48 hours after the last treatment must not be used for food. Discontinue use of this drug for the following time period before treated animals are slaughtered for food:
> Cattle - 14 days, Sheep - 9 days, Swine - 7 days.
> A withdrawal period has not been established for this product in pre-ruminating calves. Do not use in calves to be processed for veal.

All federally inspected slaughter facilities have inspectors testing meat and organs for drug residues. Carcasses with residues are condemned so they never enter human food channels. Urban farmers are more likely to use custom slaughter facilities (*See Section V. Livestock*

Slaughter and Euthanasia) or process animals themselves which means tissue samples are less likely to be tested for drug residues.

Reportable Diseases

Reportable animal diseases are diseases that must be reported to the State Veterinarian when suspected or confirmed to be present in one or more animals. Diseases can be reportable for different reasons; 1. The disease is known to exist in Michigan and is reported for the purpose of surveillance; 2. The disease does not exist in Michigan and would have a significant impact on animal health and/or Michigan's animal industry if it was found here; or 3. The disease is zoonotic and would be a threat to human health. Michigan maintains a list of reportable diseases which is updated annually. 2015 Michigan Reportable Animal Diseases List

If the State Veterinarian is notified of a suspected or confirmed reportable disease, a state field staff veterinarian will likely visit the premise where the animal resides to confirm the disease is present and to determine what steps need to be taken to control the spread of the disease. These steps may include: 1. Issuance of a quarantine confining the animal(s) to the premise until they are shown to be free of the disease, either through medical treatment or confirmatory laboratory testing; 2. Some diseases may involve a lifelong quarantine so the animal(s) are confined until they die or are slaughtered; or 3. Depending on the disease, the animal(s) may be ordered by the State Veterinarian to be euthanized in order to protect human and animal health, and the animal industry. In many cases, the premise must be cleaned and disinfected after the infected animal is no longer at the premise.

Animal Identification

In Michigan, cattle, sheep, goats, and swine under specific circumstances, are required to have official identification before leaving the premise where they have been living. In order for an owner to obtain official identification for their animals, they must have a premise identification number. Owners can visit MDARD - Animal ID - State of Michigan (http://www.michigan.gov/mdard/0,4610,7-125-48096_48149---,00.html) to register their premise and obtain approved eartags for their cattle, sheep, and goats. Swine are required to have official identification for the sale of breeding sows and for taking the animal to exhibition. Official Swine ID Options . For further information, owners can call the Michigan Department of Agriculture, Animal Industry Division at 1-800-292-3939.

III. LIVESTOCK HOUSING

The keeping of small livestock and poultry in urban areas presents opportunities to acquaint neighborhoods and household members with the production of food. Although there are social

and physical challenges, owners' attention and care to good husbandry of animals, hygiene, upkeep of animal housing, fencing, and outdoor areas can help to diminish neighbor concerns.

General Shelter Characteristics

The provision of a comfortable shelter for animals should be a high priority for the urban agriculturalist. Since Michigan lies in a temperate zone and is capable of producing severe weather extremes, animals must be provided with a partial (three-sided) or fully enclosed solid roofed shelter ,depending on the species. In addition to providing comfort, shelters also serve to contain animals from sunset to sunrise, which minimizes potential for disturbance to neighbors, encourages animals to feel secure, and prevents predation. Larger livestock such as goats, pigs, and sheep may be housed in three-sided or fully enclosed roofed sheds. The indoor surface floor can be compact earth or concrete layered with bedding or litter but should be designed to prevent excess wetness resulting in odor, and problems with foot health. Partial and full enclosures should be oriented based on local geography and weather patterns such that they protect from extreme heat or cold and prevailing winds and rain. Animal housing must be sited according to local or city ordinances and typically away from neighbors' property to avoid creating noise, smell, and other potential nuisance.

Smaller livestock, like rabbits and poultry, may be kept loose in a coop/room or in specially designed hutches or enclosures that are solid roofed. Each coop or hutch must contain a nesting box, food and water containers, and in the case of chickens, areas for perching. Flooring within the coop or hutch should allow for easy daily cleaning and prevention of manure build-up. The provisioning of food in bowls or feeding devices, and water in bowls, bottles, or water devices should be appropriately designed for the species. Since small livestock and poultry are prone to predation, coops, hutches, and other shelter types should be designed to prohibit intrusion by foxes, predatory birds, raccoons, dogs, cats, and small predators such as rats.

All shelters should provide a source of ventilation such as wire screened windows or vents that may be opened or closed to maintain desired thermal comfort and to allow fresh air flow to prevent accumulation of indoor gas or humidity. Shelters must be maintained in good physical condition, and kept clean and attractive. More specific recommendations for type and design of animal shelters can be found in numerous places online.

Animals per Unit Area

The number of animals allowed per unit area is dependent on the configuration of the "useable space" of the outdoor area, area inside the animal shelter, breed type, physical status, and behavioral needs of the animals. While this document includes recommendations for minimum

space per animal based on the physical and behavioral needs of adult animals or animals of a certain weight class, these are only recommendations and care must be taken to evaluate each outdoor area and shelter for its unique attributes and ability to house and maintain animals safely and comfortably. Where standards have been set for livestock density based on science and/or legal requirements, numbers will be provided. Where there is not specific consensus or consensus on space allowance, no numerical reference is provided.

The intended purpose of keeping farm animals also guides the number to be kept. If animals are kept primarily for the provision of household food, then no more animals should be kept than what the household requires (nor should it exceed the animal unit capacity of the lot and shelter). The optimal number of animals required to meet household needs can be calculated. For example, all breeds of egg-laying hens have been evaluated for their egg production. These statistics can easily be found on-line. The number of eggs required to provide for the household can be estimated by using the average weekly number of eggs laid by that breed of hen and the average weekly household egg consumption (meals and baking). Keeping records of individual hen daily egg production can provide a more accurate representation of the home flock capability. The same approach may be used to calculate animal numbers required for provisioning meat and milk for the household. If household consumption and the provision of food to persons living outside the household is a goal, the same estimates can be applied except calculated for more people. In either case, the animal units on the lot will have an upper limit set either by the estimated need for the household (plus others) or the limitations of the lot space and shelter space to accommodate the animals.

Animal Space Recommendations for Indoor Areas

The indoor space within the animal shelter is a source of useable space. Most indoor areas provide animals' access to floor space where animals may rest, move about, and fulfill behavioral or dietary needs. Deductions should be made for space that is inaccessible to animals. Only useable space should be counted to determine the number of animals that can be housed within the sheltered area. The recommendations below were derived through review of empirical work and evidence produced through scientific inquiry and practical experience. Based upon size, breed/strain, and physical and behavioral needs, these minimum recommended allowances must be carefully considered as type of indoor housing varies. Since animal size will vary, space allowances (ft^2 per animal) should be adjusted upward if the minimum recommendations do not allow animals to comfortably lie down together, stand-up, turn around, stretch their limbs, gain access to food and water, or permit normal postural adjustments for maintenance behaviors such as grooming or preening while kept indoors. This should be an overall goal when examining space for livestock.

Table 1
[1]Recommended Minimum Indoor Useable Floor Space Allowance per Adult Animal or Final Market Weight

Poultry		
	Egg laying hen	1.0 ft^2 (smaller breeds/strains); 1.5 ft^2 (larger breeds/strains)
	Meat chicken	1.0 ft^2 per 7 lbs. body weight
Turkey		
	Light weight	4.2 ft^2
	Heavy weight	5.0 ft^2
Rabbit		
	[2]Enclosed hutch	1.5 ft^2 (small breeds); 5.0 ft^2 (larger breeds)
	[3]Loose floor pen	6.1 ft^2
***Sheep**		
	Market lamb	7.5 ft^2 (45 – 65 lbs.); 9.0 ft^2 (65 -90 lbs.); 11 ft^2 (91 - 110 lbs.) market weight
	Ewe	14 ft^2 – 20 ft^2 (non-pregnant – with lambs)
	Ram	20 ft^2 – 32 ft^2 (135 - 300 lbs. adult weight)
Goat		
	Doe and kid	18.0 ft^2
	Buck	40.0 ft^2
Pig		
	Market pig	9.1 ft^2 (market weight ~264 lbs.)
	Sow	35 ft^2 (sow with litter); 16.0 ft^2 (5 – 20 sows per pen)

[1] Derived from recognized and scientifically developed guideline resources including: Humane Farm Animal Care Certified Humane, American Humane Heartland Certified, and Federation of Animal Science Societies unless otherwise specified.
[2]American Rabbit Breeders Association based on U.S. Department of Agriculture regulations for housing rabbits.
[3] European Union recommendations for floor space.
*Space allowance should be increased for fully fleeced and horned sheep.

Animal Space Recommendations for Outdoor Areas

Outdoor useable space can be measured by calculating the total area of the lot where the animals will be kept, minus the area occupied by animal shelter(s) and other buildings inside the lot (or space restrictions such as patio areas), and deducting any other restrictions required by city or local ordinances, such as property line setbacks. The outdoor useable space is generally the area that will be available for open unobstructed use by the animals.

The outdoor areas used by animals should be properly fenced to contain animals and prevent intrusion by outside predators or burrowing under the fence, provide shaded area, and be

maintained such that dust, mud, water, and manure do not accumulate. Maintaining ground surface vegetation is important to mitigating dust, facilitates the use and spread of animal manure, and prevents surface run-off. Maintaining vegetation by resting, reseeding, and rotation of the outdoor areas are important. Sheep and goats graze vegetation and poultry scratch/peck the ground for seeds, worms, and insects, and dust bathe that can create patches or complete loss of vegetation. Rabbits burrow and graze; and pigs create wallows for dissipating body heat and forage by rooting the ground. Through the use of temporary interior fencing, outdoor areas may be divided and used in a rotation. This allows one area to rest and the restoration of ground surface vegetation while the other area is in use. It is highly advisable to maintain vegetative cover because it helps to avoid odor and health concerns.

Recommendations for space allowance per animal will vary depending on the purpose of the outdoor space. If animals are expected to obtain part or all of their daily dietary needs, then the type, quantity, and quality of available vegetation will determine the number of animals able to be supported. For the purpose of this document, and under most conditions of urban agriculture, open useable space is primarily meant to meet the behavioral rather than dietary needs of the animal. Below is the minimum recommended space per animal for the provision of access to daylight, performance of important behaviors, and exercise.

Table 2
[1]Recommended <u>Minimum</u> Outdoor Useable Space Allowance per Adult Animal

Poultry		
	Egg-laying hen	43.6 ft^2
	Meat chicken	10.8 ft^2 (fast growing strains); 21.6 ft^2 (slow growing strains)
	Turkey	65 ft^2
Rabbit		No specific allowances set
Sheep		25 – 40 ft^2
Goat		No specific allowances set
Pig		No specific allowances set

[1] Space allowances are derived from Humane Farm Animal Care standards unless otherwise specified. These standards were developed by a scientific committee and member farmers.

Nutrition and Feeding

An important aspect of maintaining the health and welfare of urban livestock and poultry is the provision of a nutritionally robust diet and access to fresh potable water. The daily diet should be formulated in the right amount and ratio specifically for the species and the animal's stage of life and production. Free access to water is important. Water should be provided in containers that are easily accessed, cleaned to prevent build-up of sediment and algal growth, and regularly checked, especially during hot weather or freezing cold. Buckets or other water containers should be placed to avoid injuring the animal, drowning, or contamination by feces. Buckets, troughs, or bunks used to feed animals should be kept clean. Leftover feed should be cleaned out and properly disposed of in a secured container to prevent rodent, bird, or other wildlife attraction.

Michigan State University (MSU) Extension (http://msue.anr.msu.edu/topic/info/agriculture) can provide guidance on the nutritional and water requirements for each species and other information resources on animal care. Pre-formulated feed can be purchased at local feed and livestock stores and sometimes hardware stores. Commercially available feed rations are available for organic standard food production. Commercial pre-formulated feed rations typically contain a mix of grains. Ruminant (multi-chambered digestive tract) species such as sheep, goats, and rabbits also have a requirement for preserved or dried stemmed and leafed forages such as hay and legumes such as alfalfa. Hay can be bought as bales from local farmers or feed stores, or in some cases the requirement met through a complete ration such as alfalfa cubes or pellets. Hay should be soft, dry, light green, and easily pulled apart in flakes. Hay should not be dusty or moldy.

When using automated feeding or watering devices, it is imperative such devices are checked daily to detect blockage, breaks, or power outages to ensure proper feed and water delivery. Regular maintenance to assure smooth operation is important. As these automated devices typically rely on electrical power, in the event of a power outage, emergency back-up power or alternative strategies for delivering feed and water to livestock and poultry should be in place.

Maintaining Feed and Forage Quality

The tag on each bag of a commercial grain-based feed ration will provide information on the nutritional composition of the feed and its ingredients. Forages, such as grasses and legumes, also constitute an important part of some farm animal diets. To maintain feed ration quality, the proper storage of animal feed and forage is important to preventing spoiled or contaminated feed and moldy or poor quality hay. Freshness and storage of feed is as important to maintaining animal health as it is to properly storing food for the human diet. The feed tag provided on each bag of commercial feed has an expiration date. The expiration date

is based on optimal storage conditions. Feed products will degrade more quickly and feed spoilage increases under inadequate storage conditions.

Storage of feed includes safeguarding from the attraction of wilds birds, deer, rodents, and insects that can contaminate feed products with feces and saliva or introduce microbial growth and spoilage. It may also present potential nuisance for neighbors. Grain based rations or complete feeds, such as forage cubes, must be stored in pest resistant sealable metal containers or bins. Avoiding direct ground contact by placing the container and any unopened stored bags of feed on wooden pallets or raised platforms away from walls discourages access by pests. Containers should also be stored within a room or area that provides shelter, prevents intrusion by pests, and is not subject to moisture or flooding. Hay bales or loose forages should be stored under a roofed or covered area as moisture will cause mold and spoilage. Bales should be elevated off the ground on wooden pallets or a platform and securely stacked on edge (strings or wire on sides not on top and bottom) to allow airflow and prevent spoilage. Left over spoiled or spilled feed should be cleaned up and properly disposed. (*See Feed Storage.*)

IV. WASTE AND MANURE MANAGEMENT

No two farming operations in Michigan are the same due to a large number of site variables. As a result, waste and manure management practices will vary from farm to farm. While the source of manure is obvious, there are other waste streams on a farm. Items such as weeds that have been pulled and piled, discarded materials from crops such as carrot tops, potato skins, cracked eggs, spoiled food, and other organic parts from the growing and harvesting of food can also be sources of your waste stream. The key to not impacting your neighbors is to keep from having organic materials around your facility begin to rot. These management practices will prevent negative impacts on neighbors, the environment, and your livestock.

Periodically scrape the manure or collect organic materials from outside areas

Every day or every few days as needed, all manure and other organic accumulations should be scraped and removed from outside areas. Keeping this area clean and dry will prevent odors, as well as aid in keeping livestock healthy. When dealing with manure, practices such as adding lime or wood shavings can help to further minimize odors with the goal of eliminating odor impacts on neighbors.

Periodically clean all livestock shelters

Every day or every few days as needed, indoor areas should be cleaned and all manure and soiled bedding should be removed. Additives such as lime wood shavings may be used to help reduce odors.

Remove manure from the property

If manure has to be temporarily stacked on the premises prior to being removed, it should be placed in a covered bin or on a concrete pad and covered. Keep the area covered at all times to eliminate odor impacts on neighbors and reduce the chance for attracting pests. Like pet manure, small amounts of manure can be disposed of in regular garbage removal. For larger amounts, there may be a need to move waste to someone who is handling these materials in other ways (e.g. county or farm composting facility or a farmer who is willing to take the material for their use).

Composting

If you plan to compost the manure and other organic waste streams generated on-site, a compost bin should be used. A fully enclosed design keeps pests out, minimizes odor, and will allow you to control moisture and aeration. By continuously turning the material, you will allow oxygen into the system and prevent odors from negatively impacting neighboring properties.

Effective composting will involve several factors:

- Materials high in carbon; typically leaves, straw, and woody materials.
- Materials high in nitrogen; typically grass and manure.
- Good composting processes will need air, water, and to maintain temperatures as recommended in the resources below.

There are many sites that provide valuable information about composting.
https://extension.unh.edu/resources/files/Resource000471_Rep493.pdf

http://umaine.edu/publications/1021e/

http://urbanext.illinois.edu/compost/process.cfm

Runoff

Make sure that no runoff leaves the manure, waste, or compost pad. Pooling of runoff from these sites onto bare ground can cause negative environmental impacts, as well as create odors. All manure containment areas should be kept dry to eliminate potential odors.

In addition, no manure or wash water runoff should be allowed to flow onto neighboring properties, into the storm water system, a road ditch, stream, creek, or other waterway. A direct discharge into a waterway is illegal and you may incur penalties.

Utilization

Manure or compost can be utilized on site in areas such as gardens. However, because manure contains pathogens, the grower should be sure that manure does not come into contact with crops that will be directly consumed. Understanding the nutrient values in manure or compost is important. Your manure or compost should be analyzed for these nutrients. This, in addition to the soil analysis, will assure you are utilizing the proper amount of manure or compost needed for the plants being grown. Also, anytime manure is utilized in a garden or around the property, it should be disked, or turned into the soil, immediately to eliminate any potential for odors. Assistance with soil testing can be found at http://www.spnl.msu.edu/. Assistance with manure analysis can be found at http://uwlab.soils.wisc.edu/manure/.

Fencing and Trees

The use of fencing and/or trees can help to dissipate odors moving towards neighboring properties. Perennial flowers, shrubs, or grasses will also help to control odors, as well as provide a pleasing aesthetic for the neighboring properties. Additional technical assistance and information can be found at https://store.extension.iastate.edu/Product/Animal-Housing-Landscaping-Overview.

Feed Storage

All feed should be stored in metal containers with secured lids to prevent pest infestation. Any spilled feed should be cleaned up immediately and all spoiled feed should be put in the trash or composted.

V. LIVESTOCK SLAUGHTER AND EUTHANASIA

In some cases, urban agriculture my involve slaughtering of livestock for food purposes. All slaughtering activities should be handled in an enclosed area. All wash water and slaughter by-products should be captured. This material should not be allowed to flow to a storm water drain or any other body of water. Cleanup should occur as soon as processing is completed. By-products should be securely bagged and tied prior to placing it in the garbage.

Processing By-Products

All processing by-products such as wash water, stems, cull products (not acceptable for consumption or further processing), and fruit and vegetable materials should be captured. This material should not be allowed to flow to a storm water drain or any other body of water. The cull products and fruit and vegetable materials can be composted or put in the garbage. Cleanup should occur as soon as processing is completed.

Regulatory Agencies

Depending on the size and type of operation, there are two different regulatory agencies that may be involved in slaughtering livestock for consumption. The United States Department of Agriculture (USDA) Food Safety and Inspection Service (FSIS) regulates the slaughter and processing of meat and poultry. Operations either require carcass-by-carcass inspections by the USDA, or fall under an exemption. Operations that fall under an exemption can be subject to periodic sanitation inspections by the USDA. MDARD regulates food in commerce in the state of Michigan. Operations that provide food, but are exempt from USDA FSIS inspections, require a license from MDARD. Periodic sanitation inspections are part of the MDARD requirements. Operations that solely produce food inspected under USDA FSIS do not require a MDARD license. Operations that have multiple products or conduct multiple services may be regulated under both agencies.

There is a big difference between a carcass-by-carcass inspection program, conducted by USDA FSIS, and periodic sanitation inspections, conducted by MDARD. The carcass-by-carcass inspection program focuses on the health and condition of each individual animal and requires a USDA FSIS inspector to be onsite during all times of production. The periodic sanitation inspection conducted by MDARD occurs on a routine basis and focuses on the sanitary conditions of the facility/equipment and hygienic practices of personnel. An inspector does not need to be present during all times of production under this program.

Animal Species

The type of animal being slaughtered will impact what regulations apply to the operation. In order to address the different risks associated with different species, the USDA has two separate sets of rules addressing slaughter and processing of animals. One set of rules addresses “meat” and the other addresses “poultry”. The term “amenable species” is used to describe the species of animals covered by the USDA regulations. Amenable species in the Poultry Products Inspection Act include turkeys, chickens, ducks, geese, squab, guinea fowl, and ratites (ostrich, emu and rhea). Amenable species in the Federal Meat Inspection Act include cattle, swine, sheep, goat, and equine.

Non-amenable species are not covered by the USDA rules, but do fall under MDARD licensing and inspection requirements. Examples of non-amenable meat species include mammals such as reindeer, elk, deer, antelope, water buffalo, bison, squirrel, opossum, raccoon, rabbits, nutria or muskrat, and non-aquatic reptiles such as land snakes. Non-amenable poultry includes game birds such as pheasant and quail. The food risks associated with these species are not fully known or controlled under the specific USDA inspection requirements. Therefore, MDARD's general food safety regulations apply.

Federal Meat Inspection Act
Poultry Products Inspection Act
The Michigan Food Law P.A. 92 of 2000 as amended

Information for obtaining an MDARD license can be found at http://www.michigan.gov/mdard/0,4610,7-125-1569_16958_16974-53792--,00.html.

Information for obtaining a USDA FSIS license can be found at http://www.fsis.usda.gov/wps/portal/fsis/home

Exemptions

There are some exemptions to the USDA regulations. Both the meat and poultry acts contain "Personal" and "Custom" slaughter exemptions for personal or household use. These two exemptions also apply to MDARD licensing. For your own personal food safety, exempt operations are still expected to have good sanitary standards and provide products that are sound, clean, and fit for human food. However, the carcass-by-carcass inspection requirement does not apply. Food products resulting from these exempt services cannot be sold and must be marked "Not for Sale". The personal slaughter exemption pertains to situations where the owner of the animal slaughters and processes their own animal for personal use. The custom slaughter exemption pertains to situations where someone other than the owner slaughters and processes the animal. The meat is then provided back to the owner for personal use and cannot be sold or used to make food that will be sold. The custom exemption also applies to animals taken by lawful hunting or trapping.

Meat

For amenable species, there are no other exemptions for slaughter under the Federal Meat Inspection Act. All slaughter of cattle, swine, sheep, goat, and equine for meat or meat products requires a USDA carcass-by-carcass inspection. For non-amenable species (reindeer, elk, deer, antelope, water buffalo, bison, squirrel, opossum, raccoon, rabbits, nutria or

muskrat), all slaughter and processing activities for meat or meat products require MDARD inspection and licensure.

There are several additional USDA exemptions for poultry.

1. 1,000 or fewer birds processed annually: A person may raise, slaughter, cut up, and sell at retail up to 1,000 poultry and is exempt from all USDA inspections. **MDARD inspection and licensure apply**. USDA may conduct random or complaint initiated investigations.
2. 1,001 to 20,000 birds processed annually: A person may raise, slaughter, cut up, and sell at retail or wholesale from 1,001 to 20,000 chickens or turkeys if the products are labeled "Exempted under Public Law 90 – 492". This type of establishment is exempt from Ante mortem and Post mortem USDA inspection, but is subject to USDA sanitation inspections on a periodic basis. **MDARD inspection and licensure may apply** (depending on the scope and complexity of the operation).
3. 20,001 or more birds processed annually: Full USDA FSIS inspections required. No exemption.
4. Markets that sell live poultry at retail and slaughter at the request of the retail customer are exempt from all USDA inspections. **MDARD inspection and licensure apply.**

To qualify for any one of the poultry exemptions, the conditions or standards below must be met:

- The poultry is healthy when slaughtered.
- The slaughter and processing are conducted under sanitary standards, practices, and procedures that produce poultry products that are sound, clean, and fit for human food (not adulterated).
- The poultry is not misbranded, identified as exempt product and labeled.
- The business operates under only one exemption during calendar year.
- Product cannot bear the official USDA mark of inspection.
- Poultry products do not move in inter-state commerce.
- Labelling requirements are met.

More information related to on-farm processing of pastured poultry can be found at Guidance for Determining Whether a Poultry Slaughter or Processing Operations is Exempt from Inspection Requirements of the Poultry Products Inspection Act:

Waste

All wash water and slaughter by-products should be captured. This material should not be allowed to flow to a storm drain or any body of water. Wash water can go down a household drain to a treatment plant. Clean up should occur as soon as processing is completed.

Humane Slaughter

All slaughter activities must meet the requirements of the Humane Slaughter of Livestock Act 163 of 1962. The act requires that a humane method of slaughter is used, which is defined as: (1) A method whereby the animal is rendered insensible to pain by mechanical, electrical, chemical, or other means that is rapid and effective, before being shackled, hoisted, thrown, cast or cut; or (2) A method in accordance with ritual requirements of any religious faith whereby the animal suffers loss of consciousness by anemia of the brain caused by the simultaneous and instantaneous severance of the carotid arteries with a sharp instrument. Humane Slaughter of Livestock act 163 of 1962

The American Veterinary Medical Association (AVMA) Guidelines for the Euthanasia of Animals: 2013 Edition (https://www.avma.org/kb/policies/documents/euthanasia.pdf) explains in detail the acceptable methods for euthanasia as well as the proper way to perform each method for each species. The document also provides details regarding when a method might not be appropriate for the age or size of an animal. In order for any of the methods to be considered humane, the person dispatching the animal must be adequately trained in the method being used. If a person dispatching the animal does not have adequate training, even an approved method can become accidental torture of the animal.

On rural farms, the most common method of euthanasia for cattle, swine, sheep, and goats is gunshot, and for chickens, the most common method is cervical dislocation. Gunshot is not likely to be an allowed method inside city limits in most jurisdictions, so people wishing to slaughter their own livestock will need to find someone who is trained or willing to train them in one of the other methods. For farm animals, killing for slaughter or for welfare reasons is often done the same way. Local authorities should be consulted regarding restrictions on dispatching livestock for slaughter or welfare reasons. Acceptable methods for both include:

Poultry – gunshot, manually applied blunt force trauma, cervical dislocation, decapitation, electrocution, and captive bolt.

Sheep/goats – gunshot, captive bolt followed by an adjunctive method such as exsanguination (bled out).

Swine – gunshot, non-penetrating and penetrating captive bolts, electrocution, and blunt force trauma (in suckling piglets only).

Euthanasia for welfare reasons can be done by a veterinarian using injectable euthanasia agents or gas overdose, but the carcass would then need to be disposed of in a manner consistent with the Bodies of Dead Animals Act rather than being used for food. Bodies of Dead Animals: Public Act 239 of 1982, Regulations for Public Act 239 of 1982

VI. PEST CONTROL

Pesticide Use According to Label

Any person who uses a pesticide must follow all label use directions. Every label contains pesticide use restrictions, directions for use, and in the case of agricultural pesticides, worker protection standards.

Pesticides are classified as general use or restricted use. In agricultural production settings, general use pesticides may be applied by an uncertified applicator but the uncertified applicator must have received handler training in accordance with the federal worker protection standards. Applicators that use or supervise the use of restricted use pesticides must become a private certified applicator. (*See Applicator Certification.*) This certification meets the requirements of the federal worker protection standards.

Pesticides may only be applied to crop sites that are listed on the pesticide's label. The label will also have other use directions such as proper mixing and loading instructions, limitations on the rate of application, the number of applications or the frequency of the application, requirements for personal protective equipment, and storage and disposal directions. Many agricultural pesticides include a preharvest interval. The preharvest interval is the number of days after a pesticide application that a producer must wait before harvesting the crop. More information about pesticide labels can be found at http://www.epa.gov/pesticides/regulating/labels/product-labels.htm.

Agricultural pesticides contain very specific federal worker protection standards to protect the pesticide applicator, called a handler, and workers who may enter treated areas, called workers. These standards require pesticide safety training, restrictions on reentry intervals during which time workers and handlers may not reenter the treated area, decontamination materials, posting, and recordkeeping requirements. More information on the federal worker protection standards can be found at http://www.epa.gov/pesticides/health/worker.htm.

Pesticide Selection

When selecting a pesticide for use on a crop, the producer should consider toxicity as one way to reduce pesticide risk. Pesticide labels contain signal words that are based on the toxicity of the pesticide. The three signal words are caution (lower risk), warning (greater risk) and danger/poison (highest risk). The level of risk is determined when the U.S. Environmental Protection Agency (EPA) initially registers the pesticide based on the registrant's research data. More information on signal words can be found at http://npic.orst.edu/factsheets/signalwords.html.

Another consideration when choosing a pesticide is its toxicity to pollinators. Pollinators include honeybees, bumblebees, and other bee species that forage for nectar and pollen. Pesticides that are in any way toxic to honeybees will include label use directions that restrict use when bees are foraging in the treatment area. These restrictions are often found under the Environmental Hazards label statements. EPA is currently modifying pesticide labeling to add additional use restrictions to protect pollinators that will be found in other sections of the pesticide label, so reading and following all label use directions is very important. More information on EPA's efforts to protect pollinators through label use directions can be found at http://www2.epa.gov/pollinator-protection.

Producers can also implement a variety of stewardship practices to protect pollinators. Information on stewardship and best practices to protect pollinators can be found at http://pesticidestewardship.org/PollinatorProtection/Pages/default.aspx.

Business Licensing

In the event an urban agricultural producer wishes to hire a pesticide applicator to perform applications to their crops, the producer should check to make sure the business is properly licensed with MDARD. Licensed businesses use certified applicators and have a minimum of two seasons of application experience. They must also carry general liability insurance. A list of licensed businesses in Michigan can be found on the MDARD's web site at http://michigan.gov/mdard/0,4610,7-125-1569_16988_35288-11993--,00.html.

Applicator Certification

Any agricultural producer who wants to purchase and use a restricted use pesticide must first become a private certified applicator. Information on how to become a certified applicator can be found on MDARD's web site at http://michigan.gov/mdard/0,4610,7-125-1569_16988_35289---,00.html.

The certification process includes obtaining the private core training manual from MSU, studying the manual, and passing the private core exam. Bring a completed application and the

fee with you to your exam session. To schedule an exam, visit the online pesticide exam schedule at https://secure1.state.mi.us/OPES/Login.aspx.

Drift

Pesticide drift from the treatment site is a violation of State law. Drift may be the result of windy conditions, small droplet size, high spray pressure, or low volume applications. Written drift management plans can be a useful tool in preventing drift. Regulatory information related to drift management plans can be found in Regulation 637, Rule 10, which can be found at http://www7.dleg.state.mi.us/weborrgsa/102_10_AdminCode.pdf.

APPENDIX A

SOURCES OF CONTAMINANTS IN SOIL

Contaminants	Sites and Sources Agriculture, green space	Car wash, parking lots, road and maintenance depot, vehicle services	Dry cleaning	Existing commercial or industrial building structures	Junkyards	Machine shops and metal works	Residential areas; buildings with lead-based paint; where coal, oil, gas or garbage was burned	Stormwater drains and retention basins	Underground and aboveground storage tanks	Wood preserving	Chemical manufacture, clandestine dumping, hazardous material storage and transfer, industrial lagoons and pits, railroad tracks and yards, research labs
Arsenic											
Asbestos				X							
Barium		X			X	X	X	X		X	X
Cadmium		X			X	X	X	X		X	X
Chromium		X			X	X	X	X		X	X
Copper											
Fluoride											X
Mercury											
Lead				X			X				
Molybdenum											
Selenium											
Sodium		X						X			X
Sulfer											
Zinc		X			X	X	X	X		X	X
Dioxin[8]											
PCBs[7]				X							
PAHs[1]		X					X				
Petroleum Products[2]		X		X	X	X	X	X	X	X	X
Pest/Herb[3]	X							X	X		
Solvents[4]		X	X	X	X	X		X	X	X	X
Surfactants[5]		X				X					
Phenols[6]										X	X
Nitrate	X										X
Sulfate					X					X	X
Radioactivity											X
Other											
References	A	A	A	A	A	A	A	A	A	A	A

SOURCES OF CONTAMINANTS IN SOIL (continued)

Contaminants	Waste Incineration: municipal waste combustion, hazardous waste incineration, medical waste incineration, crematoria, sewage sludge incineration, tire combustion, combustion of wastewater sludge at bleached chemical pulp mills, biogas combustion	Power/Energy Generation: motor vehicle fuel combustion, wood combustion, oil combustion, coal combustion	Other High-Temperature Sources: cement kilns, lightweight aggregate kilns, asphalt mixing plants, petroleum refining catalyst regeneration, cigarette smoking, pyrolysis of brominated flame retardants, carbon reactivation furnaces, kraft black liquor recovery boilers, and others	Minimally Controlled and Uncontrolled Combustion Sources: combustion of landfill gas, accidental fires, landfill fires, forest and brush fires, backyard barrel burning, residential yard waste burning, land-clearing debris burning, uncontrolled combustion of polychlorinated biphenyls, volcanoes, fireworks, open burning and open detonation of energetic materials
Arsenic Asbestos Barium				
Cadmium Chromium Copper				
Fluoride Mercury Lead				
Molybdenum Selenium Sodium				
Sulfer Zinc Dioxin[8]	X	X	X	X
PCBs[7] PAHs[1] Petroleum Products[2]				
Pest/Herb[3] Solvents[4] Surfactants[5]				
Phenols[6] Nitrate Sulfate				
Radioactivity Other				
References	B	B	B	B

SOURCES OF CONTAMINANTS IN SOIL (continued)

Contaminants	Metal Smelting and Refining: ferrous and nonferrous metal smelting/refining, ferrous foundaries, scrap electric wire recovery, drum and barrel reclamation furnaces, solid waste from primary/secondary iron/steel mills/foundries	Chemical Manufacturing and Processing Sources: bleached chemical wood pulp and paper mills; manufacture of chlorine, chlorine derivatives, and metal chlorides; manufacture of halogenated organic chemicals; other chemical manufacturing and processing sources	Ball clay	High Traffic Areas	Treated Lumber	Manure	Existing or former smelters, fossil fuel-fired electrical power plants, or cement manufacturing facilities	Structures once painted with lead-based paint
Arsenic					X		X	
Asbestos								
Barium								
Cadmium								
Chromium					X			
Copper					X	X		
Fluoride								
Mercury								
Lead				X			X	X
Molybdenum								
Selenium								
Sodium								
Sulfer								
Zinc				X		X		
Dioxin[8]	X	X	X					
PCBs[7]								
PAHs[1]				X				
Petroleum Products[2]								
Pest/Herb[3]								
Solvents[4]								
Surfactants[5]								
Phenols[6]								
Nitrate								
Sulfate								
Radioactivity								
Other								
References	B	B	B	C, D	C	C	D	D

SOURCES OF CONTAMINANTS IN SOIL (continued)

Contaminants	Tailings from current or former metal ore mines	Paint (before 1978): Old residential buildings; mining; leather tanning; landfill operations; aircraft component manufacturing	High traffic areas: Next to heavily trafficked roadways or highways; near roadways built before leaded fuel was phased out	Treated lumber: Lumber treatment facilities	Burning wastes: Landfill operations	Contaminated manure: Copper and zinc salts added to animal feed	Coal ash: Coal-fired power plants; landfills	Sewage sludge: Sewage treatment plants; agriculture	Petroleum spills: Gas stations; residential/commercial/industrial uses (anywhere an aboveground or underground storage tank is or has been located)	Pesticides: Widespread pesticide use, such as in orchards (especially pre-1947); pesticide formulation, packaging and shipping
Arsenic	X			X						X
Asbestos										
Barium										
Cadmium								X		
Chromium				X						
Copper				X		X		X		
Fluoride										
Mercury										X
Lead	X	X	X					X		X
Molybdenum							X			
Selenium										
Sodium										
Sulfer							X			
Zinc			X			X		X		
Dioxin[8]					X					
PCBs[7]										
PAHs[1]			X		X				X	
Petroleum Products[2]									X	
Pest/Herb[3]										X
Solvents[4]										
Surfactants[5]										
Phenols[6]										
Nitrate										
Sulfate										
Radioactivity										
Other										
References	D	E	E	E	E	E	E	E	E	D, E

SOURCES OF CONTAMINANTS IN SOIL (continued)

Contaminants	Commercial/industrial site use	Dry cleaners	Burning coal, lead-acid batteries, leaded gasoline, lead-based paints, solder	Burning coal, rechargeable batteries, TVs, steel, phosphate fertilizer, galvanized water pipes	Certain pesticides, iron and steel production, treated lumber, burning coal	Metal plating, treated lumber	Attic and wall insulation, insulated water pipes, roofing shingles, ceiling and floor tiles, cement, automobile parts	Parking lots and carwashes	Demolished commercial or industrial buildings	High-traffic roadways (vehicle exhaust)	Former parks and lands adjacent to railroad rights-of-way
Arsenic	X				X						
Asbestos							X		X		
Barium											
Cadmium	X			X							
Chromium	X					X					
Copper											
Fluoride											
Mercury	X										
Lead	X		X						X	X	
Molybdenum											
Selenium											
Sodium											
Sulfer											
Zinc	X										
Dioxin[8]											
PCBs[7]								X	X		
PAHs[1]	X									X	
Petroleum Products[2]	X							X			
Pest/Herb[3]											X
Solvents[4]	X	X						X			
Surfactants[5]								X			
Phenols[6]											
Nitrate											
Sulfate											
Radioactivity											
Other											
References	E	E	F	F	F	F	F	G	G	G	G

SOURCES OF CONTAMINANTS IN SOIL (continued)

Contaminants	Federal-Mogul nearby properties, Detroit, Michigan	Tittabawassee River Floodplain, Michigan	St. Louis, Michigan
Arsenic Asbestos Barium			
Cadmium Chromium Copper			
Fluoride Mercury Lead	X		
Molybdenum Selenium Sodium			
Sulfer Zinc Dioxin[8]		X	
PCBs[7] PAHs[1] Petroleum Products[2]			
Pest/Herb[3] Solvents[4] Surfactants[5]			
Phenols[6] Nitrate Sulfate			
Radioactivity Other			PBBs, DDT
References	H	I	J

SOURCES OF CONTAMINANTS IN SOIL (continued)

[1]PAHs = Polycyclic Aromatic Hydrocarbons (benzo[a]pyrene, benzo[b]fluoranthene, etc.)

[2]Petroleum Products = gasoline, kerosene, fuel oil.

[3]Pest/Herb = Pesticides and/or Herbicides

[4]Solvents = tetrachloroethene, trichloroethene, trichloroethanes, dichloroethenes, dichloroethanes, etc.

[5]Surfactants = various products such as Triton, Dowfax, and others.

[6]Phenols = phenol, chlorophenols, methylphenols, nitrophenols.

[7]PCBs = Polychlorinated Biphenyls

[8]Dioxins can persist in the environment for decades (half-life about 50 - 100 years), so dioxins from sources that were active in the 1800's and 1900's may still be present today.

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APPENDIX B

SOIL CONTAMINANTS AND LIVESTOCK

Line	State	Jurisdiction	Regulatory/Guidance	Application	Contaminants Specified	References	Details
1	New York	Statewide	Regulatory	Brownfield and Superfund Remedial Soil Cleanup. Unrestricted use soil cleanup objectives protect for child and adult consumption of vegetables from a home garden and home produced animal products such as meat, eggs and milk.	Metals and other inorganics, PCB's, pesticides, semivolatile organic compounds, and volatile organic compounds.	(a), (b)	Maximum soil concentrations for unrestricted land use are listed for 85 contaminants.
2	New York	Statewide	Guidance	Protection of human, plant, and animal health for all land uses.	Arsenic, Cadmium, Hexavalent Chromium, Trivalent Chromium, Copper, Lead, Nickel, and Zinc.	(c)	New York's unrestricted use soil cleanup objectives (maximum soil concentrations) (Line 1) are listed for these 8 contaminants.
3	New York	Statewide	Guidance	Urban gardening that includes raising chickens for eggs.	Lead: Two Guidance Values. Guidance Value I is 200 ppm, Guidance Value II is 400 ppm.	(d)	No practices recommended for <200 ppm lead in soil, some for 200 to 400 ppm, and additional ones for >400 ppm.
4	California	Statewide	Guidance	Eggs from backyard chickens that forage on the ground.	Dioxin: Consumption Advisory.	(e)	"Do Not Eat" advisory for eggs from chickens that have contact with the ground located near industries releasing dioxins into the environment.

(a) New York State Department of Environmental Conservation. Subpart 375-6: *Remedial Program Soil Cleanup Objectives*. Effective December 14, 2006.

(b) New York State Department of Environmental Conservation and New York State Department of Health. New York State Brownfield Cleanup Program, *Development of Soil Cleanup Objectives*, Technical Support Document. September 2006.

(c) Cornell University, Waste Management Institute, College of Agriculture and Life Sciences, Department of Crop & Soil Sciences. *Guide to Soil Testing and Interpreting Results*. April 2009.

(d) New York State Department of Health; Cornell University, College of Agricultue and Life Sciences, Department of Crop and Soil Sciences; and Cornell University, Cooperative Extension, New York City. *Understanding Your Test Results: Lead in Soil and Chicken Eggs*. October 2012.

(e) California Department of Health Services, Environmental Health Investigations Branch. *Backyard Chicken Eggs in California: Reducing Risks Questions and Answers*. August 2004.

APPENDIX C

APPEARANCE CHART

SPECIES	HEALTHY APPEARANCE	SIGNS OF ILLNESS
Chickens	Dry nostrils Red comb Bright eyes Shiny feathers Good weight and muscle tone Clean vent feathers Smooth legs Straight toes Bright, alert, and responsive	Discharge from eyes and/or nostrils Swelling around the eyes Coughing Excessive soiling of feathers around vent Pale or discolored comb Lameness, swelling of legs/feet Splay leg Droopy/lethargic
Goats	Energetic Curious Feet planted squarely and well balanced when standing Chewing cud when laying down Tail held above or over the back Hair coat rich and shiny Bright, alert, and responsive Nonvocal unless hungry, thirsty, or in rut	Not eating or drinking Diarrhea Painful urination Bloated belly with vocalizations Poor hair coat Pale or discolored gums Drainage from eyes and/or nostrils Limping and/or swelling of foot/leg Lumps under jaw Coughing, sneezing Drooping tail Not chewing cud Pressing head against wall/fence Refusing to get up or difficulty rising Hot udder Grinding teeth Isolation from flock mates Circling, head tilt, stumbling

APPEARANCE CHART (continued)

Pigs	Bright and clean hair coat Free and easy movement Good growth for its age Bright, alert, and responsive	Twisted, swollen, misshapen snout Discharge from eyes or nostrils Sniffling and/or coughing sounds Swelling along the jaw line Dull, sunken eyes Listless or depressed Swelling in foot/leg, lameness Dull hair coat, hair on end Slow to get off their beds Eating less or not at all Diarrhea Vomiting Abortions/stillborns Uncoordinated "Poor doers" when nursing age
Rabbits	Bright, alert, and responsive Fur is clean, shiny, well groomed Normal movement Pelleted fecal material Eating/drinking normally	Grinding teeth Hot or cold ears Discharge from eyes and/or nose Coughing, sneezing Listless, depressed Not eating/drinking Wet chin or drooling Stumbling or limping Diarrhea Open mouth breathing Hunched position Blood in urine Enlarged abdomen Hair loss Head tilt

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