RESPONSE TO COMMENTS

PUBLIC HEARING FOR FIRE MOUNTAIN FARMS/ROSMAN UNIT APPLICATION FOR COVERAGE UNDER THE GENERAL PERMIT FOR BIOSOLIDS MANAGEMENT

HEARING HELD OCTOBER 11, 2016

LINCOLN COUNTY COURTHOUSE DAVENPORT, WASHINGTON

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Submitted @ hearing Oct. 11/2016

Testimony to Ecology hearing

My name is Morton Alexander. I own land and a home in Mill Canyon down below Garry Rosman's home and acreage. My address is 32621 Mill Canyon Road North, Davenport, WA 99122.

My 2 parcels in Township 26, Range 38 are:
Parcel # 2638020700013 is PT N2SWNE; N2SENW
Parcel # 2638020700016 is PT SENENW; PT SWNWNE MAP 211 .20 RD/A

My home and my organic fruit trees are gravity fed with the water from my spring. The rights to the Turnley Spring on my land are owned by me and my neighbor, Deanne Burdine. Another neighbor has an organic herb business which depends on this water. Many neighbors appreciate being able to collect clean drinking water from this source. One of Garry's parcels listed on the Rosman Site Application is parcel # 2638019700000. It is directly uphill from my spring, and of utmost concern to me.

Many scientific sources, ranging from the Sierra Club to Cornell University, give us cause for great concern about the potential for contamination of our water and soil and even the air from application of sewage sludge on the land above us. Even "very high quality" bio-solids contain heavy metals and millions of pathogens, such as human viruses, bacteria and parasites,[1]

Following a number of illnesses and some deaths linked to contact with applied bio-solids that have occurred, there is consequently now public outcry. Some towns in New Hampshire have banned the practice or severely limited it. There will be legislation introduced in our state to label foods grown in bio-solids. The Commonwealth of Pennsylvania is currently re-evaluating its regulations on the use of sewer sludge,[2]

Dr. Caroline Snyder, Professor Emeritus at the Rochester Institute of Technology, has given testimony to a legislative committee in Pennsylvania. Below, I quote some of her work which will be separately submitted to you in more detail by Darlene Schanfald of The Sierra Club.

"Land application of sludge is wrought with uncertainties. Experts estimate that sludge generated in industrialized urban centers -- and most land-applied sludge is generated in these areas -- contains not only pathogens and toxic metals, but thousands of anthropogenic chemical compounds for which there are not even basic toxicity data. ... Pathogens are evolving and becoming more virulent.

"Land-applied municipal sewage sludge (bio-solids) is a highly complex and unpredictable mixture of biological and chemical pollutants. Most of the 90,000 man-made chemical compounds in commerce today--with 1,000 new ones added annually-

Summary of Comments on Alexander2.pdf

Page: 1

Number: 1 Author: COCA461 Subject: Inserted Text Date: 9/28/2017 10:20:32 AM -07'00'

The concentration of metals and pathogens are regulated per WAC 173- 308-160 and 170 and must meet acceptable limits to be approved for land application.

Number: 2 Author: COCA461 Subject: Inserted Text Date: 3/27/2017 11:24:15 AM -07'00'

No evidence of deaths. See Item 4 Health

- end up in sewage, and many of those, concentrate in the resulting bio-solids. They include carcinogens, mutagens, neurotoxins, endocrine disrupters, solvents, pharmaceuticals, radioactive waste, leachates from landfills and superfund sites, as well as disease causing and antibiotic resistant pathogens. Upgrading and building improved treatment plants that will remove more pollutants from sewage, will cause sludge to become even more contaminated. Bio-solids generated in our large industrialized urban centers -- and 84% of land applied sludge originates in those centers -- is very likely the most pollutant rich waste mixture of the 21st century."

Many of my neighbors at Tolstoy Farm are worker/owners in a Community Supported Agriculture business ("Tolstoy Farms") that successfully markets certified organic produce throughout the region. They are concerned about the increased danger of contamination to their produce and damage to their business reputation by the introduction of these toxins in our area. This is their livelihood, not just some extra income as the case may be for others involved in this dispute. Tolstoy Farms has hundreds of customers in the region who depend on them for a weekly supply of certified organic produce. This case is also being watched by the community of people who are concerned about the health and safety of the Spokane River which is fed by tributary watersheds such as ours.[1]

A few years ago, there was a catastrophic flood of the main creek in our canyon. It flooded fields and homes, and permanently diverted the creek from its long established path. Much debris was brought down to the canyon from fields above. It prompted Creek Restoration Engineer Brian Belsby to identify our canyon as a flood plain, an alluvial fan vulnerable to whatever material is conveyed down from above.

Science is well divided on the safety of this practice of spreading sewage sludge on fields that grow food and nurture wildlife, as well as above springs that feed people and their crops. The state, however, is firmly on one side of this controversy. The Orwellianly named Department of Ecology is dedicated to moving this product of human and industrial waste into the countryside while it minimizes the public health concerns. To this end it engages into contracts with vendors of questionable repute such as Fire Mountain Farms, which in the past had a permit suspended for violations of environmental standards.

As a retired state employee of 20 years of service, I have learned that state agencies become vulnerable to exploitation by the vendors of services that they contract with. The agency becomes wed to a certain model of practice and tainted by that relationship which then supersedes the agency's regulatory or public service role.

So, who is this vendor who in 2000 was reported by King TV to make around $400,000 a year spreading sludge? At an "informational meeting" convened by Ecology staff Betty Ann Bickner on Garry Rosman's farm, a man simply introduced himself to me as "Bob" (no last name). I had to figure out on my own that this guy

Number: 1 Author: COCA461 Subject: Inserted Text Date: 3/27/2017 11:06:17 AM -07'00'

See Item 5 HG Review.

was the wealthy vendor himself. He acted as though the meeting would just be a lecture provided by himself, while the many neighbors from Mill Canyon would stand around in Garry's parking lot and listen. I insisted that we sit down for an extended exchange. He swore that his practice is safe. His son complained about "all the paperwork" they have to do. (Looking at the Rosman Site Application, one can see that most of that paperwork is completed with standard boilerplate). After the meeting, Mr. Thode then gratuitously offended two women present by expressing his belief in an extreme right wing slander about environmentalism, just for good measure. What professionalism. During the meeting, Mr. Thode said that for jobs on the west side of the state he usually will get an assessment done by a hydrologist, but he didn't think it was needed here in the drier part of the state.

My neighbor owning adjacent land in Mill Canyon is Donald Hanson, Design Engineer with the Natural Resources Conservation Service, Washington State NRCS Office, USDA. He is not opposed to the practice of application of bio-solids as a soil amendment, but disputes the plan put forward by Fire Mountain Farms. Based on the NRCS soil survey, he challenges their assessment of the soils atop and in our canyon as to their capacity for an appropriate rate of agronomic absorption. Mr. Hanson is submitting his soil studies in evidence, separately.[1]

The questions raised by Mr. Hanson show that there definitely is a need for an independent professional to review Mr. Thode's work. This need is heightened by Ms. Bickner's comments that this is one of the best possible sites, and that this application's approval will be a test case for our area.

Finally, many people wonder who is really in charge of this process, Fire Mountain Farms or the Department of Ecology? It is hard to tell when a notice for this hearing, supposedly a function of the regulator, is issued by the vendor. This, and the revelation that the taking and testing of soil samples is left to the applicator rather than the regulator, is representative of a trend easily seen throughout the country. - The absence and failure of governmental regulation such as is seen in Flint, Michigan, North Dakota, and too many other sites of industrial pollution of natural resources.[2]

I appreciate Garry's willingness to negotiate. He seems to respect the concerns of people in the canyon about applications too near our watershed area. If there is any hope of responsibility and moderation in this matter, it will probably be up to him rather than the vendor or the regulator.

Questions:

- Why are wells recorded in the first Rosman Site Application, but not springs?[3]

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Number: 1 Author: COCA461 Subject: Inserted Text Date: 9/28/2017 10:35:34 AM -07'00'

See Item 7 Agricultural Disposal
of Manure, Food-Processing Waste, and Sewage Sludge.

Number: 2 Author: COCA461 Subject: Inserted Text Date: 9/28/2017 11:11:26 AM -07'00'

The notice for a public hearing is published in the local area newspaper per (rule).
Soil sampling is performed per Section 9.2 of the and under the approval of the Dept. of Ecology. The sampling may be performed by the farmer or the permit holder and sample results are evaluated by a third party independent lab.

Number: 3 Author: COCA461 Subject: Inserted Text Date: 9/28/2017 11:15:24 AM -07'00'

The identification of wells and springs in the SSLAP conform to the requirements of Section 2.6.1 and the General Permit for Biosolids Management Appendix 3 .

- Why did the first Rosman Site Application include land not owned by Garry, such as Sections 17 and 20? Who did that and why?[1]

- Why does the first Rosman Site Application not include coyotes in its list of wildlife present in the canyon?[2]

- Given the level of distrust by neighbors in Mr. Thode's practice, what provisions will be made to monitor his work and what are the penalties for un-permitted dumping?[3]

- Is there a minimum amount of acreage required for an application?[4]

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Number: 1 Author: COCA461 Subject: Inserted Text Date: 9/28/2017 11:18:15 AM -07'00'
The discussion of why Section 17 and 20 is no longer relevant as they were removed prior to the public hearing.

Number: 2 Author: COCA461 Subject: Inserted Text Date: 9/28/2017 11:27:58 AM -07'00'
The canyon is beyond the evaluation area and not included in the SEPA Checklist.

Number: 3 Author: COCA461 Subject: Inserted Text Date: 9/28/2017 11:37:38 AM -07'00'
Biosolids applications on Roseman Farms will be monitored by Ecology staff. Enforcement provisions are found in RCW 70 95J.060 & 070 to include both civil and criminal provisions

Number: 4 Author: COCA461 Subject: Inserted Text Date: 9/28/2017 11:39:04 AM -07'00'
There are no
minimum acreage requirements.

Subject:	Davenport WA meeting 10/11/2016
From:	Earthchild Marie (earthchild_marie@yahoo.com)
To:	bettyann.bickner@ecy.wa.gov; earthchild_marie@yahoo.com; beemrmax2002@yahoo.com;
Cc:	Wayne.drafft@ecy.wa.gov;
Date:	Wednesday, October 12, 2016 2:21 PM

Hello.

First, I would like to apologize for being late to last nite's meeting. I do not use the telephone because I am nearly deaf, nor do I read newspapers. It was just happenstance that I heard of the meeting!

I was not informed by you of the meeting or of the time, even tho several weeks ago at Roseman's, I signed a list that someone said would get me notified of any further developments.

I live in Mill Canyon and am a member of the Board of Directors of the Mill Canyon Benevolent Society, which owns the land used by Tolstoy Farms, which as you know, raises and sells Organic Food.

I, too, get my drinking water from Morton Alexander's spring.[1]

Betty Ann, I mentioned that the Cadmium/Zinc ratio of the sewage sludge is important to us because it basically lets you know how toxic this stuff is. I think that the public at least has the right to that much information. As Morton and Max pointed out last night, there are other concerns also: Pathogens, chemicals, etc....All of which have been thoroughly researched for years. You should not be relying on Firemountain to do your research for you![2]

I am asking that each load of "biosolids" which is dumped ANYWHERE the state of Washington, before leaving the pickup site, be tested for the Cadmium/Zinc ratio of said load. For your education, please see the following website: www.arltma.com/articles/CadmiumToxDox.htm You may need to click on "minerals" at this link to read the article, however.

I want the Ecology department to publish the ratio on its website every week, and I want this information provided by email to each landowner surrounding said dump site whenever a load is dumped..

I shall print this email and the attached reference, and snail-mail them to the Ecology department in Spokane as a public comment which I expect to be considered ASAP.[3]

Sincerely Yours,

Earthchild Marie Brito Earthchild_Marie@yahoo.com
P0 Box 633
Reardan WA 99029

Summary of Comments on Brito2.pdf

Page: 1

Number: 1 Author: COCA461 Subject: Inserted Text Date: 3/27/2017 11:34:05 AM -07'00'
See Item 6 Water Rights.

Number: 2 Author: COCA461 Subject: Inserted Text Date: 3/27/2017 11:34:36 AM -07'00'
FMF does not do research for the Dept. of Ecology.

Number: 3 Author: COCA461 Subject: Inserted Text Date: 9/28/2017 12:01:13 PM -07'00'
Biosolids are tested for both Cadmium and Zinc and must meet acceptable limits for land application.
See WAC 173-308-160. Ecology does not post the requested information on our website. You may request this information through public disclosure.

Cadmium Toxicity

Frequently Asked Questions

Newsletters

Articles

References

Book Store

Introduction

Cadmium is an extremely toxic metal which has no known necessary function in the body. Cadmium toxicity contributes to a large number of health conditions, including the major killer diseases such as heart disease, cancer and diabetes.

Cadmium displaces zinc in many metallo-enzymes and many of the symptoms of cadmium toxicity can be traced to a cadmium-induced zinc deficiency.

Cadmium concentrates in the kidney, liver and various other organs and is considered more toxic than either lead or mercury. It is toxic at levels one tenth that of lead, mercury, aluminum, or nickel.

Cadmium toxicity is increasing in incidence today for several reasons. One of the primary reasons is a zinc deficiency in many commonly eaten foods. Zinc, which is protective against cadmium, is becoming increasingly deficient in the soil and consequently in foods. Food processing and eating of refined foods further reduces zinc intake.

Exposure to cadmium is also increasing due to its use as a coating for iron, steel and copper. It is also used in copper alloys, stabilizers in rubber and plastics, cigarette papers, fungicides and in many other products. Often these industries then pollute water, air and food with this metal.

Sources Of Cadmium

Food Sources

The most common sources of cadmium toxicity are foods such as rice and wheat which are grown in soil contaminated by sewage sludge, super phosphate fertilizers and irrigation water.

Large ocean fish such as tuna, codfish and haddock concentrate within their tissues relatively large amounts of cadmium. Oysters, although containing large amounts of cadmium also contain large amounts of zinc which serves to protect against cadmium toxicity.

Besides contaminated produce and organ meats such as liver and kidneys, a significant source of cadmium toxicity is a diet high in refined foods. Zinc, which normally protects against the toxic effects of cadmium, is largely removed during the milling process, leaving cadmium behind.

Candies, Processed And Refined Foods

Many processed foods have had the protective elements zinc and calcium removed in the refining process. Cadmium, however, remains and is readily absorbed since the zinc and calcium are not available to compete for absorption.

Cadmium may also be used as plating material in food-processing plants, thereby finding its way into processed food products. Processed meats, refined grains, instant coffee and cola drinks are among the most common sources of cadmium toxicity.

Widespread use of white flour and white rice, along with causing various vitamin and mineral deficiencies, contribute to cadmium toxicity by their high cadmium/zinc ratio. An excessive carbohydrate intake also serves to reduce tissue zinc levels, further aggravating a cadmium toxicity problem.

Canned Foods

Solder used to seal cans is a common source of cadmium.

Drinking Water

Cadmium used in industry finds its way into many water supplies. Soft water is more dangerous since the calcium in hard water has a protective effect. Old galvanized pipes and new plastic (PVC) pipes are sources of cadmium in our

drinking water.

Batteries, Semiconductors, Electroplating, Polishes

Cadmium is used in numerous industries, in battery electrodes, semiconductors, etc. Workers in these industries are at risk of exposure. Dental amalgams and appliances may also contain cadmium.

Cigarette Smoke

One package of cigarettes deposits between two and four micrograms of cadmium into the smoker's lungs. Cigarettes are especially dangerous because cadmium is efficiently absorbed when inhaled.

Motor Oil, Exhaust, Incineration of Rubber Goods, Tires, Plastics and Paints

Cadmium levels are highest in urban areas where incineration takes place and where vehicle exhaust levels are higher.

Congenital Cadmium Intoxication

Cadmium was passed to the fetal rat brain when the pregnant mother was given a subcutaneous cadmium injection. We commonly observe high concentrations of cadmium in babies and young children, with no other possible source except from the mother.

Congenital cadmium toxicity is becoming increasingly common and probably helps account for the increase in birth defects, hyperkinesis, learning disorders, minimal brain dysfunction and the *failure to thrive syndrome.*

Detection Of Cadmium

Blood Tests

Even when high dietary cadmium is fed, the blood level of cadmium remains extremely low. Even intravenously injected cadmium rapidly disappears from the blood. Consequently, cadmium data from blood have little diagnostic value.

Challenge Tests

Chelating agents may be given and a 24-hour urine sample collected to detect cadmium in arteries and blood. However, cadmium which is stored in the liver, bones, joints and other tissues will not be detected using challenge tests.

Hair Analysis

Cadmium levels in the hair show statistically significant correlations with cadmium levels in the kidneys.

However, *excessive tissue cadmium is often not revealed on the first mineral test.* As with the other toxic metals, cadmium can be so tightly bound that it may require months or even several years on a nutritional program before cadmium is released from storage and is revealed on a hair analysis.

Metabolism Of Cadmium

Absorption

Absorption of cadmium is highest through inhalation. Women are more prone to cadmium toxicity than men. This may be due to the fact that females in general tend to have a lower metabolic rate than males.

Dietary absorption of cadmium is favored by a deficiency of calcium, zinc, copper, iron and protein in the diet.

Retention

About 50 percent of ingested, or inhaled cadmium is stored in the liver and kidneys. High concentrations of cadmium are also deposited in the pancreas and salivary glands. Other storage sites may also include the joints, arteries, periosteum or covering of the bones and virtually all body tissues.

In the blood, cadmium moves from the plasma to the red blood cells, where it binds mainly to metallothionein and hemoglobin.

Cadmium ingestion stimulates production of metallothionein, a zinc and cadmium binding protein.

The cadmium content of the body increases with age in industrialized societies, from less than 1 mcg. in the newborn, to 15-20 mg. in adults.

Excretion

Metallothionein plays an important role in the excretion of cadmium, inasmuch as it acts as a chelating agent. Excretion of cadmium occurs through the kidneys and liver, but the excretion rate is normally very low. The biological half-life of cadmium is probably between 10 and 30 years.

Metabolic Effects Of Cadmium

Effects On Energy Production

Cadmium is a well-known inhibitor of cellular respiration. It forms strong covalent bonds with many bio-molecules and so its potential targets for damage are numerous. Some of the most vulnerable enzymes are glutathione reductase and the enzymes of the Krebs energy cycle - pyruvate and a-ketoglutarate dehydrogenase.

Displacement Of Zinc

Many of the toxic effects of cadmium including kidney disease, neurological damage, arteriosclerosis and birth defects stem from replacement of zinc in sensitive enzyme binding sites.

Metallothionein binds zinc and copper as well as cadmium. Cadmium binds more tightly to metallothionein, and as a result, less copper and zinc are bound which results in a copper and zinc deficiency. Since binding to metallothionein is necessary for utilization of zinc and copper, cadmium poisoning can lead to a zinc and copper deficiency.

An interesting aspect of cadmium poisoning is that by replacing zinc in critical enzyme systems; *cadmium can perform a homeostatic function.* That is; many zinc-dependent enzymes can continue to function to a certain extent with cadmium instead of zinc. However, enzymatic activity is reduced and problems eventually occur as a result of impairment of the zinc-dependent enzymes.

Renal Effects

Many of the toxic effects of cadmium stem from its accumulation in the kidneys. Renal dysfunction affects calcium, vitamin D, phosphorus and sodium levels, resulting in proteinuria, glycosuria, renal hypertension and other metabolic disorders.

Carcinogenesis And Teratogenesis

Cadmium has been suggested as an etiologic factor in certain human cancers. Birth defects, probably due to zinc deficiency, have been observed in mice, rats and hamsters.

Metabolic Dysfunctions Associated With Elevated Cadmium

It is difficult to ascribe metabolic dysfunctions to cadmium toxicity alone; inasmuch as many metabolic dysfunctions are the result of displacement of zinc, or a zinc deficiency. However, the major categories of metabolic dysfunctions associated with cadmium toxicity include:

Nervous System

Neurotransmitters: Cadmium inhibits release of acetylcholine, probably by interfering with calcium metabolism. Cadmium also activates the enzyme cholinesterase, while zinc inhibits cholinesterase activity. Cooper and Steinberg concluded that cadmium at any dose was a more potent blocking agent of cholinesterase activity than lead.

Adenylate cyclase and monoamine oxidase activity is inhibited by cadmium. Uptake at synapses of choline, catecholamines, gamma-aminobutyric acid (GABA) and glutamic acid is inhibited.

Cadmium also inhibits the methylation of phospholipids, interfering with

cellular membrane functions.

Other damage: Cadmium causes hemorrhages in the autonomic ganglia with secondary nerve cell necrosis. Also reported is direct damage to nerve cells, particularly nerve fibers.

Peripheral neuropathy can also result.

Musculo-Skeletal System

Alterations in calcium and phosphorus metabolism can result in osteoporosis, osteomalacia and arthritic conditions. Interference with zinc metabolism can result in neuromuscular dysfunctions associated with a zinc deficiency.

Cardiovascular

Cadmium replaces zinc in the arterial walls, leading to reduced flexibility and strength of the arteries. The body then will coat the arteries to prevent aneurysms, resulting in atherosclerotic plaque, narrowing of arteries and hypertension.

Digestive System

Interference with zinc-dependent enzymes such as carboxypeptidase can result in impaired digestion.

Reproductive System

Cadmium may contribute to prostate difficulties and impotence problems by interfering with zinc enzymes and by interference with cellular energy production.

Endocrine/Metabolic System

Growth impairment and the *failure to thrive syndrome* are often associated with cadmium toxicity. Zinc is essential for normal growth.

Excretory System

The major storage sites of cadmium are the kidneys. It is not known whether the cadmium itself or the cadmium bound to metallothionein is responsible for tubular damage, which can result in high blood pressure and other renal disease.

Dental

Alterations in calcium and vitamin D metabolism can result in dental caries and tooth deformities.

Mental/Psychological

Cadmium is associated with hyperactivity and learning disability, most likely due to a cadmium induced zinc deficiency. Inhibition of acetylcholine release may also result in hyperkinetic behavior.

Metabolic Dysfunctions Associated With Cadmium Toxicity

Alcoholism

Alcoholism is frequently associated with a zinc deficiency and with hypoglycemia. Cadmium may be implicated in alcoholism, principally due to its effect upon zinc metabolism.

Alopecia

Alopecia (loss of hair) is commonly associated with a cadmium-induced zinc deficiency.

Anemia

Anemia is an early sign of cadmium toxicity.

Atherosclerosis

Zinc is necessary for the optimal metabolism of fats. By interfering with zinc levels, cadmium toxicity can contribute to atherosclerosis.

Arteriosclerosis

Zinc is required to maintain the normal elasticity of arteries. By displacing

zinc, cadmium causes the arteries to become less elastic and therefore more vulnerable to rupture. The body may then deposit calcium plaques to help strengthen the arterial walls.

Arthritis, Osteo and Rheumatoid

Displacement of zinc by cadmium results in impaired protein synthesis. Inadequate protein synthesis interferes with regeneration of joint surfaces, which leads to pain and inflammation of the joints.

Bone Repair, Inhibited

Zinc is required for bone repair. Cadmium can also displace calcium in bone structures.

Cancer

Cadmium toxicity is intimately associated with various malignancies. A high percentage of cancer patients on tissue mineral analysis programs, at one time or another, reveals cadmium toxicity. Interference with zinc-dependent enzymes may be the link to malignancy.

Cardiovascular Disease

Dr. Isabel H. Tipton at the University of Tennessee noted that victims of cardiovascular disease, particularly stroke victims, had high levels of cadmium in their body tissues.

Cerebral Hemorrhage

Weakness and hardening of cerebral arteries, due to cadmium toxicity, results in an increased tendency for cerebral hemorrhage.

Cirrhosis of the Liver

Zinc deficiency due to cadmium impairs detoxification of alcohol in the liver, which may explain the connection between cadmium toxicity and liver cirrhosis.

Diabetes

Zinc is required for the production, release and transport of insulin. By interfering with zinc metabolism, cadmium can initiate or aggravate a diabetic condition.

Emphysema

Cadmium from cigarettes acts as a lung irritant. Cadmium also replaces zinc in collagen, causing brittleness and breakage of the fragile alveoli in the lungs.

Enlarged Heart

An enlarged heart is often secondary to narrowed arteries and high blood pressure. Cadmium toxicity is a common contributor to these cardiovascular conditions.

Fertility, Decreased

Zinc is critical for male fertility. Sexual potency is decreased, due to a cadmium-induced zinc deficiency.

Hemochromatosis

This disorder involves deposition of excessive iron in the tissues. Hemochromatosis may be due to inadequate ability of the liver to detoxify iron. Cadmium toxicity may impair the ability of the liver to detoxify iron. A deficiency of zinc and copper due to cadmium toxicity may also be involved in this disorder.

Hypercholesterolemia and Hyperlipidemia

By causing a zinc deficiency, excess cadmium can cause a rise in cholesterol levels.

Levels of other fats may be adversely affected if liver function is impaired by cadmium toxicity.

Hypertension

High levels of cadmium are considered to be an important causative factor in

hypertension. Cadmium, by impairing kidney function and causing hardening of the arteries, can result in high blood pressure.

Hypoglycemia

A zinc deficiency, secondary to a cadmium toxicity, is a frequent cause of hypoglycemia.

Inflammation

Cadmium causes an increased retention of sodium by way of its action on the kidney. This *aldosterone-like effect* is capable of inducing an inflammatory process.

Also, zinc has an anti-inflammatory effect. Zinc deficiency due to cadmium toxicity can increase inflammation.

Libido, Decreased

By interfering with zinc metabolism, cadmium can cause impotency or decreased libido.

Lung Disease

Cadmium can adversely affect the elasticity of lung tissue.

Migraine Headache

By interfering with zinc metabolism, cadmium toxicity may allow tissue copper buildup to occur, resulting eventually in the causation of migraine headaches.

Osteoporosis

High levels of cadmium can cause demineralization of the bones and total inhibition of bone repair mechanisms. Zinc is essential for bone mineralization.

Renal Arteriosclerosis

Cadmium concentrates in the kidneys, thus contributing to renal arteriosclerosis.

Renal Dysfunction and Hypertension

Cadmium has a unique tendency to concentrate in the human kidney. There it can cause renal hypertension and proteinuria. Cadmium acts directly on the kidney to enhance sodium and water retention. No other substance, save aldosterone, is known to enhance resorption of sodium.

Schizophrenia

Cadmium-induced schizophrenia is most likely due to displacement of zinc. Zinc is a central nervous system stabilizer and is now considered a neurotransmitter substance. A low zinc level may result in mood alterations and can allow copper to accumulate in excess in the brain. Copper toxicity is linked to a specific type of schizophrenia.

Vascular Disease - Strokes (cerebral vascular disease)

When cadmium replaces zinc in the cerebral arteries, vascular elasticity is diminished. Frequently the body coats the weakened arteries with fatty or calcium plaques to protect against rupture of the artery. If a bit of plaque or cholesterol breaks free, it can lodge in a cerebral artery, causing a stroke.

Metabolic Dysfunctions, Signs And Symptoms That Can Be Caused By A Cadmium-Induced Zinc Deficiency

Acne	Hair-coarse in eyebrows
Alcoholism	Hair growth, decreased
Amenorrhea	Influenza
Atherosclerosis	Leukemia
Appetite (loss of)	Liver damage
Back pain, low	Prostatitis
Bone Disorders	Psoriasis

Colds	Retinal detachment
Cholesterol, elevated	Reye's Syndrome
Cirrhosis of liver	Schizophrenia
Circulation, poor	Sexual ardor diminished
Cutaneous striae	Skin lesions
Diabetes	Taste, lost sense of
Eczema, facial	Ulcer, stomach
Epilepsy	Vascular disease
Fatigue	Wound healing, delayed
Fertility, decline in	

Effects On Other Minerals

Displacement Of Zinc

As described above, cadmium can replace zinc in many metallo-enzyme binding sites.

Disruption Of Calcium And Phosphorus Metabolism

Cadmium deposited in the kidneys disturbs the calcium and phosphorus balance, probably by altering vitamin D metabolism. A disturbance in the calcium/phosphorus ratio can result in osteoporosis, osteomalacia and pseudo-fractures.

Cadmium has a potent inhibitory effect upon calcium incorporation, even when dietary calcium intake is adequate. This may be due to inhibition of 1,25 dihydroxycalciferol by the renal tubules.

Effects On Sodium Levels

By damaging the filtering capacity of the renal tubules, cadmium causes sodium retention which can contribute to a wide array of disorders ranging from hypertension to hyperactivity.

Reduction Of Copper In The Liver

Cadmium reduces copper levels in the liver. Cadmium binds more tightly to metallothionein than does copper. Because copper is not adequately bound, it becomes biounavailable.

Manganese

Hepatic and renal manganese are apparently increased by cadmium.

Effects Of Other Nutrients On Cadmium

Zinc

Zinc is a cadmium antagonist. Adequate zinc in the diet affords some protection from exposure to cadmium. Zinc may also be administered to assist in detoxifying cadmium.

Calcium And Vitamin D

Adequate calcium and vitamin D intake can help prevent or reverse the osteomalacia induced by cadmium toxicity. Presumably cadmium causes disruption of calcium metabolism by altering vitamin D metabolism in the kidney.

A calcium deficiency results in increased cadmium absorption from the intestines and its subsequent deposition in bone and soft tissues.

Copper

Copper competes with cadmium for absorption in the gut. Copper also enhances recalcification of bones, helping to reverse cadmium-induced osteoporotic changes.

Iron

Adequate dietary iron protects against cadmium absorption.

Selenium

Induction of testicular tumors and sarcomas by cadmium is inhibited by selenium.

Manganese

Manganese when taken with appropriate amounts of zinc and copper exerts a protective effect against low levels of cadmium toxicity.

Vitamin C.

Large amounts of vitamin C have been found to prevent signs of cadmium poisoning in quail.

Protein

Different sources of protein are more effective in protecting against cadmium toxicity than others. Egg white had a more protective effect than casein, soy, or gelatin, probably due to the high amounts of selenium in egg white.

A low protein intake can contribute to an increased cadmium toxicity.

Pyridoxine

Pyridoxine (vitamin B-6) appears to increase the toxic effects of cadmium, probably by enhancing its absorption.

Detoxification Of Cadmium

Although the medical literature states that cadmium toxicity is largely irreversible, we have had excellent success in reversing cadmium-induced pathology using the mineral balancing approach.

The nutritional method involves several aspects, all of which must be combined for greatest effectiveness.

Improving Energy Levels

The most important principle for correcting cadmium toxicity is increasing biochemical energy production, which frees more energy for all normal metabolic activities. This is accomplished by precisely balancing the tissue electrolyte levels and ratios as revealed in an unwashed hair sample.

Antagonists

Dietary cadmium absorption can be reduced by administration of iron, zinc and copper. Zinc and calcium are cellular antagonists to cadmium. Selenium appears to reverse certain effects of cadmium toxicity.

Chelating Agents

Vitamin C can bind cadmium and facilitate its removal. Sulfur compounds may also be helpful. EDTA therapy is used by some doctors to remove cadmium from the kidneys.

Improving Channels of Elimination

Any therapy which improves the activity of the kidneys will assist detoxification of cadmium. Kidney glandular substance, combined with synergistic factors, to support kidney activity has proven to be effective.

Diet

Diet plays an important role not only in avoiding sources of cadmium including refined and contaminated foods, but also to help balance the oxidation rate and provide adequate protein, minerals and vitamins.

Reduce Exposure

Occupational cadmium exposure, cigarette smoking and ingestion of cadmium-contaminated foods should be discontinued.

Combined Therapy

While these methods seem simple enough, their application at times is complex because cadmium may perform an adaptive function by raising sodium levels. In order to reduce cadmium levels, *the need for this adaptation must be*

removed.

Over the years, we have researched many aspects of cadmium detoxification and have identified those nutrients which are most effective.

The dosage of manganese, iron, calcium, zinc, inositol, choline, methionine, vitamin C, selenium and other nutrients should be adjusted for each individual. A hair mineral retest should be done every three months to maintain optimal mineral ratios and levels to assure optimal results.

Protection Against a 'Cadmium Crisis'

The active removal of cadmium from tissue storage occasionally results in a cadmium crisis which causes disagreeable symptoms. These symptoms may include fatigue, metallic taste in the mouth, low back pain, stomach distress, poor appetite, skin eruption and/or headache.

These symptoms are temporary, but can be reduced or eliminated by increasing the intake of vitamin C and calcium. The dosage of vitamin C and calcium during a *crisis period* can be increased to 3000 mgs. for vitamin C and 1600 mgs. for calcium. The dosage can be reduced as symptoms subside.

References:

1. Cranston & Passwater, Trace Elements, Hair Analysis, And Nutrition, Keats Publishing, Inc., New Caanan, CT, 1983.
2. Larson and Piscator, 1971; Itokawa et al., 1974; Pond and Walker, 1975.
3. Linder, M., ed., Nutritional Biochemistry and Metabolism, Elsevier Science Publishing Co., Inc., New York, 1985.
4. Nriagu, J. O., ed., Changing Metal Cycles and Human Health, Springer-Verlag, 1984.
5. Pfeiffer, C., Mental and Elemental Nutrients, Keats Publishing Co., New Canaan, Ct., 1975.

Analytical Research Labs, Inc. • 2225 W. Alice Avenue - Phoenix, Arizona 85021 USA

October 25, 2016

To Betty Ann Bickner,

My name is Deanne Burdin. I have lived 45 years in Mill Canyon.

My water source is a spring located below the Rosman property. I have concerns about sewage sludge being applied on farm land above where I live.

I've seen snowmelt, turn into runnoff from the fields every year, at least once. Sometimes we have summer rainstorms & the flash flooding.

See Item 5 HG Review. [1]

Garry Rosman told me that runnoff only runs down roads. That doesn't make sense to me because is starts running from fields & roads are not everywhere. What's to keep it from flowing into the canyon, where there is no road. Also the runnoff does not stay on the roads.

See Item 5 HG Review. [2]

Is it possible for the sludge to be applied away from the canyons, where it will not have the potential to runnoff with snow melt or rain toward water sources? I hope for that.

Thank you, Deanne Burdin

Biosolid applications will be buffered from the canyons and can not be applied on snow or frozen ground. Turnley Springs is not in the flow path for surface runoff. See Item 5 HG Review. [3]

Summary of Comments on Burdine.pdf

Page: 1

Number: 1 Author: BBIC461 Subject: Text Box Date: 2/22/2017 3:12:01 PM

See Item 5 HG Review.

Number: 2 Author: BBIC461 Subject: Text Box Date: 2/22/2017 3:12:06 PM

See Item 5 HG Review.

Number: 3 Author: BBIC461 Subject: Text Box Date: 9/28/2017 12:05:41 PM -07'00'

Biosolid applications will be buffered from the canyons and can not be applied on snow or frozen ground. Turnley Springs is not in the flow path for surface runoff. See Item 5 HG Review.

--------- Original Message ---------

Subject: Rosman site groundwater question
From: "Corrina Barrett" <corrina@haveviolinwilltravel.com>
Date: 4/13/15 10:48 pm
To: operations@firemtn.us

I recently became aware of the biosolids application on Rosman's land due to the recent posting of the expansion of your operations. I was not previously aware that biosolids were being applied uphill from us and our neighbors. Many of our neighbors have been utilizing spring water for their drinking water for many years, and have the water rights to do so. This is a serious concern if class B biosolids are being applied directly uphill. My understanding is that the class B biosolids may still contain pathogens. Please give us your thoughts on this. [1]

Thank you,

Corrina Barrett

Summary of Comments on C Barrett 2_2.pdf

Page: 1

Number: 1 Author: COCA461 Subject: Inserted Text Date: 9/28/2017 12:08:58 PM -07'00'

The concentration of metals and pathogens are regulated per WAC 173- 308-160 and 170 and must meet acceptable limits to be approved for land application.

10/27/2016
Washington State Department of Ecology
Wayne Krafft and Betty Ann Bickner

Comments regarding Garry Rosman biosolids application.

Please view the video at https://youtu.be/FEeeXQHBfWk.

Our driveway 3/5/14

Our driveway 3/6/14

Flooding is most intense in the canyon when the ground is frozen and the water cannot soak in. It rushes across the surface in sheets, taking topsoil and rolling boulders. Any biosolids near the surface in fields that drain to the canyon would surely be carried down into the canyon waterways during flooding.[1]

As you can see in the youtube video, Sabin Creek flowed across the county road and down our driveway during the flood of 3/5/14.

The intensity of the flooding in 2014 was such that, in many places, 2-4 feet of rocks and boulders were deposited in the creek bed, forcing the creek to take a new path, our driveway. Which it scoured and removed in some places 2 feet of dirt, rock, and gravel. From this we can see the potential for flood

Summary of Comments on Microsoft Word - Document2

Page: 1

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 1/30/2017 1:19:01 PM

Biosolids are restricted from land application on frozen ground.

Our driveway 3/7/14 (Before the flood, these pipes were buried under the driveway)

The previous creekbed, now full of rock pushed downstream by flood waters.

waters in this area to move dirt from one place to another.

Water draining from the fields may not be the same as a flooding creek, nonetheless if the ground is frozen there is nowhere for rain and snowmelt to go except downhill. In a flood event, especially from a bare field, it is going to take topsoil with it.

And at times when the ground is not frozen? I have been told that the topsoil in our area is remarkably thin. The topsoil is the filter that is supposed to keep the biosolids out of the groundwater. If that filter is insufficient, we could have contamination in our spring, which as you have been notified is an important drinking water source for many people in Mill Canyon.

Thank you for your consideration.

Corrina Barrett
Mill Canyon Resident

Page: 2

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 2/6/2017 11:52:36 AM
Biosolids are restricted from land application on snow.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 9/28/2017 12:17:03 PM -07'00'
Biosolids are applied at an agronomic rate limiting the nutrients to the needs of the crop and prevents infiltration past the root zone.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 9/28/2017 12:18:02 PM -07'00'
There is no evidence springs will be contaminated See Item 5 HG Review

10/25/2016

Betty Bickner, Waste 2 Resources Norhteast Regional Office Section Manager

Washington State Department of Ecology

Dear Ms. Bickner,

In this second response, we, The Community Committee of Concerned Residents and Landowners in Green Canyon and Mill Canyon (Lincoln County, WA), write to express our additional concerns and suggestions pertinent to the biosolids land-application plans for the Rosman Farms. These comments are an addendum to comments we provided on 9/23/2016, which we reference and incorporate herein.

We have now examined the "Site Specific Land Application Plan for Rosman Farms Unit (Permit No. BT9902, 9/23/2016 version; SSLAP), and we developed here numerous unacceptable features regarding minimum requirements to land apply biosolids as per section 2.6 of the Department of Ecology "General Permit for Biosolids Management."

Furthermore, we argue that the farming community to the East of Rosman Farms deserves special considerations owing to their livelihood depending heavily on organic food product sales that must meet stringent codes to enjoy continued certification and supportive customers.

In summary, we recommend that the permit application by Fire Mountain Farms, Inc. be **denied until revised to meet minimum requirements and attend to the special circumstances in Green Canyon and Mill Canyon to the East of Rosman Farms. We also implore the Department of Ecology to exercise its authority to protect the special needs of neighbors who rely on organic farming for their livelihoods owing to the potential for irreparable harm that can be avoided at little expense to Rosman Farms and Fire Mountain Farms, Inc.**

The remainder of our submittal details our argument for these recommendations.

Recommendations for the Fire Mountain Farms, Inc. permit application and DOE response regarding special permit requirements

We write to emphasize first that pertinent aspects of the "General Permit for Biosolids Management" are not met in the "Site Specific Land Application Plan for Rosman Farms Unit (Permit No. BT9902, 9/23/2016 version).

1) Since the permit does not indicate that exceptional quality biosolids only will be applied at the site(s), the requirement that "all new land application sites, where nonexceptional quality biosolids will be applied, must be tested for the pollutants listed in WAC 173-308-160 Table 3 to determine background levels" is not met.[1]
2) The practice of applying nutrients to soils in the fall is controversial, and the soils on the Rosman Farms are especially susceptible to potential pollution due to runoff mechanisms that are common during the fall, winter, and spring when little if any living plants are established and precipitation creates high-moisture/saturated conditions in the soils near the surface frequently in these soils. Specifically, the runoff mechanisms that exacerbate the potential for pollution in this area are due to farmland having steep slopes, soil-surface-freezing that creates a nearly impermeable layer, rain on snow which is frequently combined with Chinook winds that cause flash flooding, potential soil-surface crusting that reduces infiltration capacity, and the soils are classified as highly erodible leading to tons of sediment yield per acre per year where erosion is not properly controlled. The permit ought to address these issues by clearly outlining the periods of the year during which land application of biosolids will not be executed. Similarly, the permit ought to indicate the required soil moisture conditions for land application of the biosolids to guide application technicians with respect to local field areas where biosolids shall not be applied.[2]
3) The SSLAP is incomplete. For example, in Section 10.3, the SSLAP refers to "Appendix 8." No such appendix is included in the document. The applicant ought to thoroughly review and correct errors in the document such as this before the DOE allows the permit. Our committee recommends denying the application so long as it is incomplete.[3]
4) In Section 12.0, the erosion control plan is inadequate. As per the Department of Ecology website that explains soil erosion control requirements associated with biosolid applications to land, the permit must show that consultation with qualified Natural Resource Conservation Service technicians, working with Rosman Farms, to develop appropriate conservation plans is required (http://www.ecy.wa.gov/programs/swfa/biosolids/management.html). Other critical components of conservation plan are repeated here since this same Department of Ecology website highlights the special attention required to control erosion where highly erodible soils exist (see maps and comments we summited on 9/23/2016). The permit is mute regarding this topic, and this alone disqualifies allowance of the permit.[4]
5) Water management requirements, especially for dust control during dry periods of the year, are not addressed in the SSLAP as per the Department of Ecology biosolid management (http://www.ecy.wa.gov/programs/swfa/biosolids/management.html) recommendations associated with wind erosion. Associated with this, the Department of

Summary of Comments on community 2nd response sent 10 25 2016.pdf

Page: 2

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 9/28/2017 1:22:53 PM -07'00'
This is an existing permit condition. Backround soils testing is done prior to land application approval.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 2/22/2017 10:54:29 AM
Fields are not evaluated by season or date but by conditions of the area like no snow or frozen ground and by depth of the water table and not during rising water tables.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 9/28/2017 1:25:52 PM -07'00'
The SSLAP is a draft submitted by FMF and will have errors corrected prior to acceptance by ecology.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 9/28/2017 1:32:34 PM -07'00'
Rosman Farms currently has an erosion control plan filed with the NRCS. See Item 3.

Ecology website clearly states that "conflicts between biosolids application and conservation compliance are most likely in the drier areas (below 16 inches annual precipitation) that use a winter wheat-summer fallow system." The Rosman farms mean annual precipitation is 14.54 inches (in Davenport, WA; http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wa2007). Furthermore, the soils at the site are especially susceptible to wind erosion during fallow years and bare soil conditions, both conditions that are common in wheat-fallow rotation practices.[1]

6) Required groundwater issues have not been adequately addressed in the SSLAP. It is common to experience perched groundwater in and associated with wheat fields. Mr. Rosman is likely to know of all these local points in his fields. He is likely to know of neighboring wet spots and seeps and springs near his fields as well. The appropriate measure for the SSLAP is to document where all of these points exist to guide biosolids land application technicians to respect proper buffer zones surrounding each point to prevent groundwater pollution that typically moves down slope and becomes surface runoff during the wetter periods of each year (Appendix A). Otherwise, the SSLAP is deficient.[2]
7) At a minimum, the Department of Ecology should seek assistance and cooperation of the Lincoln County Health Department and/or other pertinent entities regarding potential problems and hardships that may manifest themselves due to biosolids land applications and neighboring organic food production operations as per the General Permit for Biosolids Management, Section 1.6.[3][4]
8) The DOE establishes that which is called a "complete application for coverage package" in Section 2.4 of the General Permit for Biosolids Management. It is stated that this package includes, but is not limited to, a number of required submittals. We urge the DOE to exercise the inclusion of special requirements for this SSLAP to address the additional stringencies that should be met to adequately protect the livelihood of multiple organic farmers in the area. In addition, to complete the circle, an open book policy regarding the details of all biosolids land application practices ought to be documented[5] and required of Rosman Farms and Fire Mountain Farms, Inc. thus allowing neighbors free access to all pertinent records for the project.[6]
9) The community petitions the DOE to exercise discretion and establish additional sampling and analysis of the soils as per Section 8.2 to monitor soil accumulations of pollutants in the biosolids' (elements/chemicals). For this, extension of the soil testing ought to include periodic analysis of soils such that accumulations of these elements/chemicals are shown to not reach excessive levels (using as a basis the required soil background levels mentioned in Section 9.2).[7]
10) The DOE has the obligation to require that the SSLAP provide for safeguards and monitoring to avoid excessive sediment transport from proposed lands for biosolids applications to their respective intermittent and permanent streams found in multiple locations surround the site. Flood events during the spring in this area have been severe. They carry tons and tons of sediments from the Rosman Farms and deposit some of those sediments near neighbors' homes and potentially in their fields. In addition to requiring stringent conservation measures to arrest the severe soil erosion that is typical in these

Page: 3

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 2/22/2017 11:22:44 AM
Rosman Farms employs Best Management Practices for erosion control. See Item 3 Erosion.

Author: BBIC461 Subject: Sticky Note Date: 2/22/2017 11:22:59 AM

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 2/22/2017 11:24:37 AM
See Item 5 HG Review.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 9/28/2017 1:40:02 PM -07'00'
Ecology consulted with USDA and it was their conclusion due to the distance to Mill Canyon the organic certification was not challenged by the Rosman Farms activities.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 9/28/2017 1:38:21 PM -07'00'
Ecology consistently partners with Lincoln County. Ecology will cooperate with and seek assistance should issues arise.

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 9/28/2017 1:45:32 PM -07'00'
Documentation in the form of records is a permit condition, records are available through the public records discloser process.

Number: 6 Author: BBIC461 Subject: Inserted Text Date: 2/22/2017 11:44:26 AM
Sites are posted at time of application and the state has a Public Disclosure Policy

Number: 7 Author: BBIC461 Subject: Inserted Text Date: 9/28/2017 1:58:30 PM -07'00'
Prior to a site used for land application soils are tested for pollutants. Pollutant accumulation is evaluated through biosolids test analysis. Soils and biosolids are tested for nutrients prior to each application.

soils when such storm events/runoff over frozen soils/snowmelt events occur, appropriate monitoring of sediment deposit constituent chemicals is in order to demonstrate that dangerous toxins are not being unfairly dumped into the organic food production fields. 1

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 9/28/2017 2:02:42 PM -07'00'

There is no evidence that biosolids will be carried to any farms or threaten organic certification for farmers in Mill Canyon. Biosolids may not be applied on frozen or snow covered ground. See Item 5 HG Review.

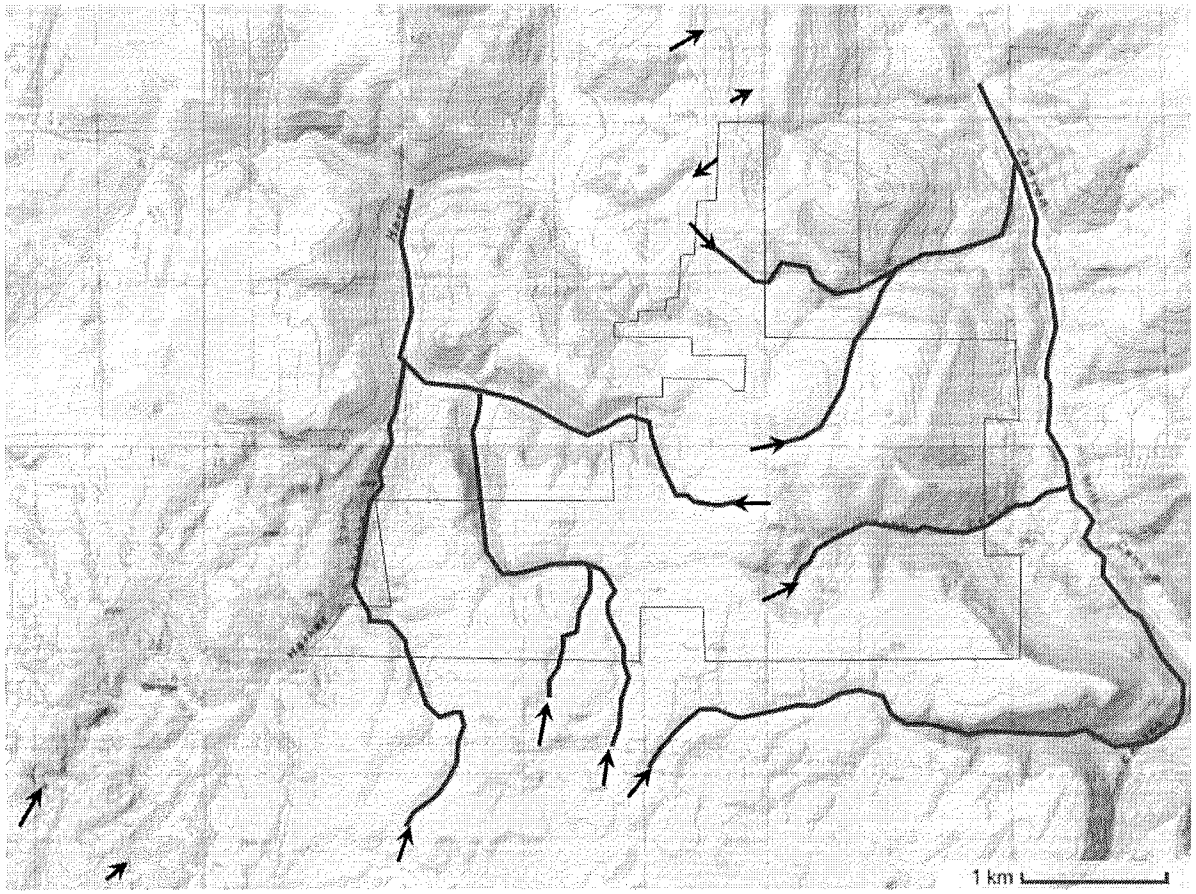
Appendix A – Permanent and intermittent surface water channels

Maps retrieved 10/24/2016 at: http://www.topozone.com/washington/lincoln-wa/ and some streams were penciled-in to enhance their visibility for the reader.

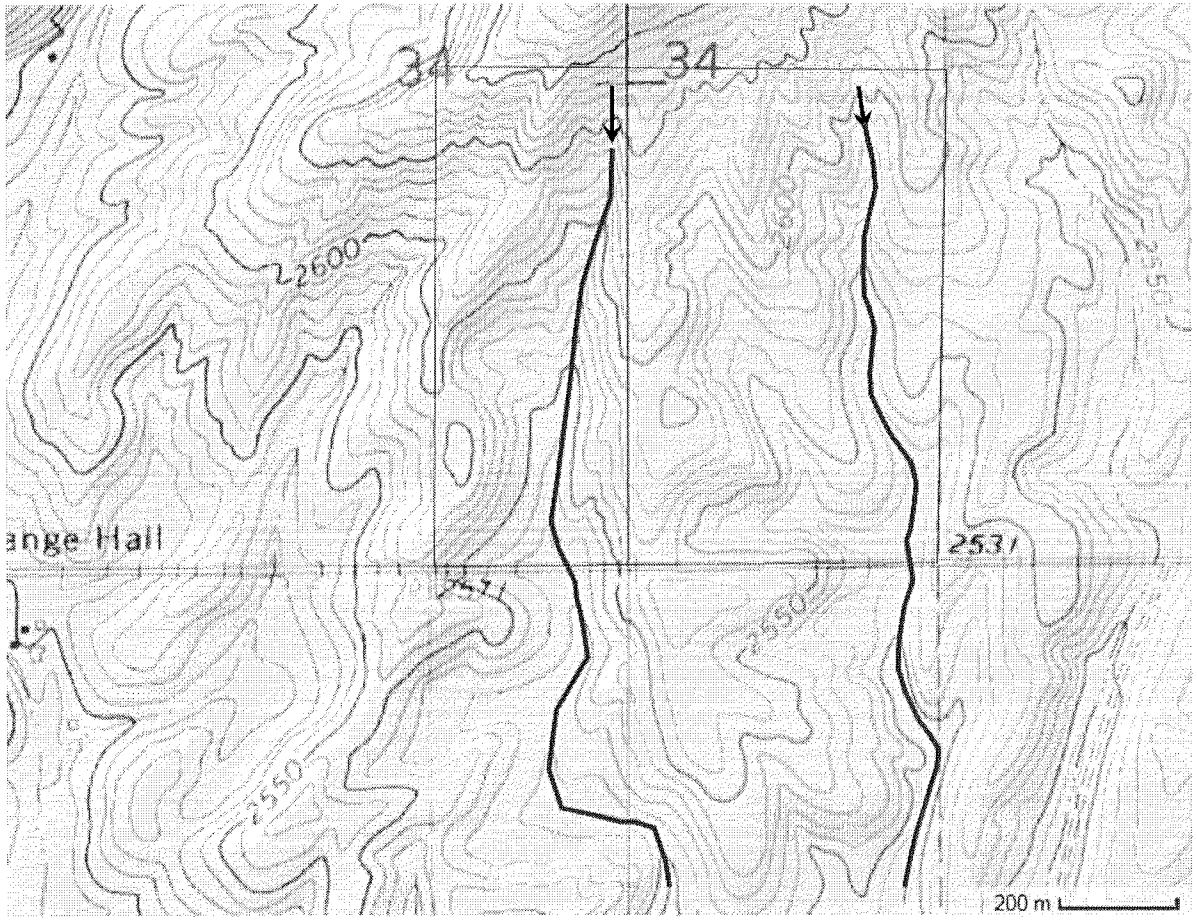
The following two maps show the locations and headwaters for numerous permanent and intermittent streams that border or cross through the proposed sites for biosolids applications. It is common knowledge that each of these streams has tens of seeps each that feed them each spring when the highest moisture conditions exist. Furthermore, farmers encounter dozens of wet localities (mud-holes) in their fields during these same periods, and they have to avoid passing through them to avoid damaging their soils as well as getting stuck. All of these wet spots are like miniature temporary wetlands due to the saturated soil conditions, and biosolids cannot be applied over them or near to them to prevent movement of polluting substances during much of the year. Specific details showing all wet localities, seeps, and buffer strips as well as timeframes depicting when applications of biosolids are not allowed must be elaborated to guide technicians who will be responsible for biosolids application before the application meets state regulations pertinent to surface water quality.[1]

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 9/28/2017 2:21:50 PM -07'00'

No areas are identified as areas of low ground water which are required to be identified per Appendix 3 (10) of the General Permit for Biosolids Management.



Arrows indicate headwaters of permanent and intermittent streams (approximate paths of some streams are enhanced for clarity)



Arrows indicate headwaters of permanent and intermittent streams (approximate paths of some streams are enhanced for clarity)

Betty

Dear Mr Thode,

I am writing you today regarding your current 'Site Specific Land Application Plan' at the Roseman Farms Unit above and near Mill Canyon Rd and Greene Canyon Rd in the rural landscape outside Davenport, WA and Lincoln County. This Application for Coverage under General Permit of Biosolids Management was not something I came across directly through your notification process, though it is not the first time I have written you regarding the application of biosolids above us requesting a community meeting. Last time, I had hoped that this matter was resolved after Gary Roseman had told all of us that he would not go through with the plan respecting our concerns regarding locale T26 R38 17,18,19,20 as well as T26 R37 12,13, 23,24.

As you may not know or may have forgotten we are a certified organic farm and intentional community (Mill Canyon Benevolent Society) and have been for many years. Over the last 50 years, we at Tolstoy Farm, as we are known by, have established our livelihoods and businesses in Mill Canyon and Greene Canyon vicinity. We are very connected with the Spokane Farmers Market and Washington Tilth. We are concerned about our water supply; of which we have water rights for and use to grow our gardens, our bathing and drinking, etc., thus being further jeopardized by chemical fertilizers, microbial contamination, and higher levels of heavy metals and/or pharmaceuticals.

Since we also live in the canyon below these proposed sites where air-borne particulates may filter down past the rim of the canyon through the air stream, we are further concerned.

I realize people have their own ideas about the science of what constitutes higher levels of contaminants; or prospects of microbial pathogens in treating their soil as a replacement to chemical fertilizers. However, the procurement and application of biosolids is not that of which I earn my salt or could as a certified organic farmer.

Also to add to our specific concerns, it is important to note that we have seen high creek flows and floods in the canyons. The depth of the water table as measured is not static, but fluctuates over time. When the ground is frozen the snow melt runs off the surface directly into the creek, making the whole area act as something of a floodplain.

Human folly as well, in the application and management of these biosolids, could directly affect our land and livelihoods over time.

Proving all this to you is not why I am writing to you at this time but that a public forum/meeting has been requested, which I feel is imperative if you wish to persist in your endeavor with Mr. Roseman or other landholders. I have discussed the matter with other members of MCBS, neighbors and affiliates, some who have already contacted the media and will so further, and who at this point feel betrayed by Mr. Roseman in his going forward with further development of the site plan and his continuance of septic dumping through B&B Septic in the Angel Springs (Sec 12, 13) vicinity.

Ernest Barrett

Summary of Comments on E Barrett 2 Letter2.pdf

Page: 2

Number: 1 Author: COCA461 Subject: Inserted Text Date: 10/27/2017 11:44:31 AM -07'00'

A public hearing was held on October 11, 2016 in response to requests.

10/27/2016

Washington State Department of Ecology

Wayne Krafft and Betty Ann Bickner

Regarding my neighbor Garry Rosman and his intent to apply biosolids to his farmland and adjacent fields above Mill, Green, Harker Canyon and our respective watershed, I ask that the Department of Ecology deny the FMF-Rosman Farms SSLAP because it provides incomplete and inaccurate information, in violation of WAC 173-308-310(8)(d), which specifies minimum content for the site-specific application plan.[1]

This application and it's attached SEPA Checklist do not consider local springs, creeks and seeps along our canyons rim and adjacent fields proposed for biosolids application. These springs have been a sole source of drinking water in our community for greater than 50 years. They are unique to these parts represented by the upper arm of the Columbia basin and should be preserved for generations to come.[2]

This application is also lacking in that it does not provide an accurate assessment of wetlands, riparian habitat or current flood zone classification bordering these seeps. In March of 2014, we experienced such profound flood conditions they were deemed by the Lincoln County Public works as two 50 year floods in the same month. (See video at https://www.youtube.com/watch?v=FEeeXQHBfWk) Our canyon should be identified as an alluvial fan, which can be verified with a topographical map.[3] That we consistently experience flooding is further mentioned in the Tolstoy Farms 2014 SEPA Checklist put together by Brian Belsby of Belsby Engineering (file titled: LCCD – Sabin Creek SEPA.pdf, submitted in a separate email).

Summary of Comments on Microsoft Word - biosolids management letter.docx

Page: 1

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 11:48:36 AM -07'00'

The SSLAP was submitted as a complete document, it is also a draft and subject to updates. Ecology will ensure the SSLAP meets the requirements of the rule prior to issuance of coverage under the general permit.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 11:55:40 AM -07'00'

There is no evidence that land application of biosolids at this site will negatively impact groundwater. SEPA was performed in accordance with applicable requirements. See Item 1 SEPA and Item 5 HG Review.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 11:57:13 AM -07'00'

The canyon is more than 1/4 mile outside of the application area and not part of the SSLAP review.

Mr. Rosman continues to allow local municipal wastes from B&B Septic to be applied to his land without concern for appropriateness of the site or time of year (see B&B's logs of application times and rates, attached as files titled 2015 annual report.pdf and BB Septic 2014 Annual Biosolids Report.pdf). In the 2015 report related entries are highlighted. In the 2014 report please note on page 7, application dates of 3/22 and 3/24 at Angel Springs. This was less than 3 weeks after the massive flooding of 3/5/14.

When asked about B&B's biosolids applications, he informed all assembled of its occurrence as being once and few. However, the general permit for T26R37 sections 34, 35, 24,13 goes back to 2007. The application for Fire Mountain Farms to apply biosolids should be denied because it does not consider that septage has already been applied in this location. We further suspect illegal dumping of B&B septage in Section 12 of which no parcel listing is included or site specific under the General permitting.

I have seen no record through public disclosure of an actual SEPA or SSLAP pertaining to B&B's use of the Rosman Site for disposing of septage from 2007 to present. Ecology did however show that an application had been approved under the General permit in an official letter dated March 18th requesting comments to be submitted to a Martyn Quinn at the Department of Ecology Spokane office. As well, record of a newspaper clipping showing a Notice of Application to Land Apply Biosolids and Determination of Non-Significance from 2007 was procured at our request.

Further, as it has been shown that a current application and SEPA update is in progress regarding B&B's permitting of their Harrington Site (see Severtson's emailed comments in attachment: 8-16-16 Severtson email.pdf), regarding the Rosman site, I ask that any Application or SEPA be opened for a new public comment period and departmental review. If so, this should include an actual

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 12:00:39 PM -07'00'
Approval is necessary for each application for both B&B Septic and Fire Mountain Farms. Testing of biosolids and soils and monitoring will ensure over application will not occur.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 12:01:21 PM -07'00'
There is no evidence of illegal application at this site.

landowner consent form signed by Mr. Rosman concerning the Olson Hills and Angel Springs locale and their associated parcels.[1]

The fact that there is no mention of previous application of biosolids in the FMF SSLAP is reason to question Mr. Rosman's and Mr. Thode's concern of agronomic rates of fields in which parcel designations overlap and that may lead to excessive biosolids application, and thus higher levels of known contaminates.[2]

Lack of scrutiny and shoddy paperwork can be viewed as conspicuous ignorance, as has been cited regarding FMF SSLAP of the Rosman Farm Unit (see Don Hansen's critique submitted at October 11th Public Hearing); as well as, B&B's renewal application revealed through public disclosure (see Severtson's comments on steep slopes and windborne pollution regarding B&B's Sepa Checklist for Harrington Site/attached as a file labeled B&B Septic SEPA.pdf) This flies in the face of good governance and gatekeeping if approved. If this application is approved by our Eastern Washington Department of Ecology Spokane Office, I ask that strict oversight and review be exercised further through other state or federal agencies as we move forward in the appeal process. It seems that the burden of proof falls upon the individual to prove negligence, and the appeal process is an exorbitant expense. It is not without mention that rural communities of lower incomes are being marginalized by this practice.

As well and if a future application is permitted, I ask that those adjacent fields above neighboring properties be removed in their entirety safeguarding our canyon and watershed from future biosolids application and the threat of contamination by water or wind.[3]

Another concern is the likelihood of being exposed to airborne particulates which filter down into our canyon from above. In that any permit is issued regarding upland application of biosolids a substantial buffer must be established that will sufficiently guard against contamination of neighboring landowners'

Page: 3

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 1:29:26 PM -07'00'

SEPA for B&B Septic was finalized on October 13, 2015. The application for B&B Septic includes a landowner consent agreement. The Harrington site for B&B Septic is not a component of the SSLAP for Rosman Farms.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 1/30/2017 1:41:37 PM

The SSLAP section 2 Past Biosolids Use states " A portion of the farm is permitted for and has received septage"

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 1:18:03 PM -07'00'

Buffers at the site meet or exceed regulatory requirements. Water and wind and erosion are addressed in Item 3 Erosion and Item 5 HG Review.

property and by those same means and standards one comes to expect from air quality control buffers outside of airports or even large cities. The treatment of biosolids application on HEL lands is not an easy endeavor because if biosolids are simply disked into a fallow field of which they are applied to, due to the dry conditions that are prevalent in our region (less than 16" annual rainfall) airborne particulates will certainly filter down into our canyon. If the biosolids are injected into the fields in which depth is known to vary due to soil type and geology associated to HEL (Highly Erodible Lands) conditions; or that which is distinguished in the Reardan Pond Table, contamination of groundwater is also very likely. Truly it is a wonder at all that application even be considered appropriate considering current HEL land mapping as made available by the NRCS and referenced in our earlier critique of FMF SSLAP of the Rosman Site.[1]

Additionally, I would suggest that a current and rigorous hydrology and soil analysis be undertaken by a third and neutral party. This should include appropriate monitoring of the applicator responsible for providing the material for sampling. This sampling should also include soil near springs, seeps or streams which are on properties adjacent to and downgradient from Rosman Farms and may have been affected by previous application of biosolids; or as a baseline for such areas that are threatened by the possibility of contamination of biosolids when run off occurs and if drift is likely by wind. Further, the omission of hydrology and soil analysis from the application (see Hanson's critique for further review) as it stands now makes it impossible for the applicant to comply with the state Water Pollution Control Act, RCW 90.48 and associated water quality standards, WAC Chs.173-200 and 201A. See also WAC 173-308-90003, App 3, Section 9(k).[2] Also, referencing the Groundwater Protection Plan and its accuracy in the Rosman SSLAP, p. 13. Section 11 asserts there is no groundwater within 3 feet of surface. It would be good to understand why 3 ft. is assumed sufficient to protect

Page: 4

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 1/30/2017 1:46:32 PM

See Item 2 HEL and response to Hanson document.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 1:25:45 PM -07'00'

Protecting groundwater is a fundamental objective of Chapter 173-308, Biosolids Management. Conformance with the rule ensures compliance with Chapter 90.48 RCW.

groundwater[1] this is the before mentioned Reardan Ponds area where there are potholes and the like of which may contribute to high groundwater and not hold true for eastern WA soils and basalt geology.[2]

Also, claims of insignificance or generalities as mentioned in the Rosman Site Specific Application and pertaining to wildlife habitat need further comparative review of SEPA checklists or EIS inquiry (see Belsby's comments and SEPA study). This should include considered, threatened and endangered species such as Pygmy Rabbit, Spalding's Catchfly, Yellow-billed Cuckoo, Washington ground squirrel, Greater sage-grouse and Bull Trout. There by establishing a more accurate account of the environment and the land we share we also safeguard our own sustainability.[3]

Previously, it was my hope that exclusion of adjacent field and parcels as presented to Garry Rosman in our revision of the Landowner Consent Form (see attached file labeled Rosman Farm-Land... pdf) would be in all best interests. I believed our revision of the landowner consent form had considered the before mentioned precautions regarding the unsuitability of highly erodible lands for use of biosolids application which is now lacking in FMF-Rosman SSLAP and Erosion Control Plan (See Hanson's Comments, pp 2-3 para .4 and Appendix C).[4] As well, in advocating for wise use by removal of adjacent parcels, future litigation and financial loss due to cleanup efforts of contaminated water sources filtering into Lake Roosevelt and now underway by the EPA, would be less likely. Garry's agreement to sign this form could assuage many of our concerns over his application of biosolids.

Further, having noted the current cleanup efforts by the EPA of Lake Roosevelt, the specific site permitting of the Rosman Site raises further federal issues requiring consultation with BLM, the Colville and Spokane Tribes, as well as Lake Roosevelt National Park. This needs to be addressed in an informed and timely

Page: 5

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 1:35:41 PM -07'00'

Biosolids are applied at an agronomic rate therefore restricting the amount of material applied to the soil. Biosolids are applied to the soil, and soils are tested to ensure that nutrients are contained within three feet of the surface. Groundwater beyond three feet from the surface is protected.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 1/30/2017 1:48:10 PM

See Item 5 HG Review

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 1/30/2017 1:48:56 PM

See Item 1 SEPA

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 1/30/2017 1:50:17 PM

See Item 2 HEL

fashion utilizing current soil studies as provided by the NRCS such as HEL (Highly Erodible Lands) maps (see community critique submitted by Hanson), as well as, further review using updated SEPA studies (Tolstoy 2014 creek restoration project through Belsby Enginneering) and Environmental Impact Statements/Checklists.

Further to be noted is of the lack of correspondence, punctuality and transparency of FMF in maintaining informed parties lists, as well as disclosure of all necessary files and records requested for our critique. Not until a neighbor Bob Whitmore received notice of the Rosman Site coming up for renewal did we become aware of this application, which we had been told had been withdrawn. Mr. Rosman placed a phone call to my wife, Corrina Barrett, on April 16th of 2015 and reassuringly told her this. In conjunction with Fire Mountain Farms "accidentally" not sending us the notification of the permit application (we are on their interested parties list) this seems like deliberate deception to avoid negative public commentary. The phone call from Rosman is documented through email correspondence with other community members (attachment: 4-16-15 email re withdrawing application.pdf). Note this is the day after Wayne Krafft signed the site application (see attachment SSLAP signed 4-15-15.jpg).

Further, that the fact that the biosolids industry has the means to offer cash rewards to large scale landowners such as Mr. Rosman is an unethical practice. This is not the case however with subsidies payed to farmers for lands kept in CRP which return to native grasses. Though CRP management through the Department of Agriculture has shown little leniency with lands that have grown forested being harvested for added income, nothing prevents biosolids applicators from offering such bribes to willing landowners.[1]

Mr. Rosman himself in our conversations regarding crop rotations to minimize loss of organic matter or future import of nutrients through alternative

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 2:03:53 PM -07'00'
No CRP lands are proposed for land application of biosolids at this site.

farming methods, seems interested in the possibility of organic farming. But bottom line costs and subsidies which he is more familiar with and makes his business by; and is in my opinion is his real crutch, makes me believe his true desire to apply biosolids is a form of temporary stewardship more conducive to his pocket book rather than the actual health of the soil.

In closing I wish to appeal to the heart and soul of those whose job it is to determine whether the marginalization of a community of about 100 people who live in the canyons downgradient and adjacent to Rosman Farms, is a worthy sacrifice for one man's desire to apply a controversial toxic brew to his fields above our canyon and watershed. (please note that biosolids can also contain other industrial pollutants, as has been the case surrounding Emerald Kalawa Chemical and FMF's enforcement action in March of 2016 by Ecology- see the file attachment: P16-050 Notice of Appeal.pdf)

Thereby, that I wish to remain in my neighbors' good graces is something that I didn't just come by. Many times, we have had to work out our differences amongst one another. We are not impervious to the world at large but take comfort in this little bit of paradise offered in these canyons. Further, in my opinion, the objective of living rurally to become self- reliant juxtaposes our interdependence and good neighborliness. Humanity is becoming a lost art.

The stories I revered most as a kid and have in my own way put to task living at Tolstoy, are those of my mothers of how growing up on her family farm north of Edmonton, Alberta, neighbors helped neighbors in all seasons and hard times. This is my intention but whether it will remain is obviously reciprocal upon those we live amongst. The average age today of a farmer is 65 years. Where will it be ten or twenty years from now. And what will our children say of our legacy if we continue to poison our land, water and air.

In our short expanse of time allotted each one of us, my wife and I currently have lived in Mill Canyon for 12 years and more. We were married here in 2004 and both our children were born in Mill Canyon and spend countless hours exploring our canyon's watershed. It is a beautiful and unique place and should be respected as such. Alder and Tyler are 11 and 8 years old and are living a dream having been brought up breathing clean fresh air and drinking pure healthy spring water. They, as well as their lifestyle, is cherished by both by their parents and those among us whom appreciate the possibility of their becoming the next generation of stewards and gatekeepers.

Sincerely,

Ernest Barrett
Mill Canyon resident.

Submitted @ hearing

Oct 11, 2016
Statement of Laura Harris
Resident Mill Canyon, Davenport WA

My name is Laura Harris. I live at 32300 Mill Canyon Rd N. I grow vegetables, fruit and nuts using certified organic methods. I use no chemicals and I take great care to assure that the food that I grow is clean of all chemicals.

I eat the food that I grow. People in Davenport, Creston and Spokane eat the food that I grow. I am part of a local food system. The safety of this food system is being threatened by the application to dump "biosolids" in areas above our springs and creeks. I am very worried about pollution from this toxic sludge entering our water supply, entering the water we drink, bathe in and irrigate with.

I am also equally worried about the pollution of our air due to bio-solids becoming windborn. This has caused illness and death to neighbors where biosolids have been dumped. As well, airborne biosolids will land on the soil, poisoning it indefinitely. There are at least 100 people living within a 5 mile radius of where Gary Rosman wants to dump. We don't want to eat, drink or breathe in biosolids.

If America stands for "life, liberty and the pursuit of happiness", what that means to me is that I have a right to breathe in clean air, drink clean water and grow my food in clean soil. That is my pursuit of happiness. Does my neighbor Gary Rosman have the right to pollute these basic elements, which are crucial to the lives of me and my community?

And who will stand up for the wild creatures that wander around freely? Don't they deserve a clean ecosystem?

Biosolids are not clean nor safe. The Dept. of Ecology should be honest and re-define this sewage sludge as the toxic waste that it is. [1]

Shame on you Dept. of Ecology! Instead of protecting the earth's ecosystems, you have become the agents of the waste disposal industry, smoothing out any roadblocks, covering up the scientific facts and spending your budget paying the salaries of full time biosolids pushers.

Biosolids are not fertilizer! They are toxic waste and should be disposed of as such. [2]

We should plan for the future and develop waste disposal systems that separate the toxins from compostable waste, so that actual organic matter could be returned to the soil without toxins. This would be a major change in the infrastructure, but that's what we need to do.

Thank You,

Laura Harris

hare2663@gmail.com

Summary of Comments on Harris-Jakowski2.pdf

Page: 1

Number: 1 Author: AKRA461 Subject: Inserted Text Date: 10/27/2017 2:23:42 PM -07'00'

The land application of biosolids is a beneficial use of the material and are protective of public health and the environment when performed in accordance with regulatory requirements.

Number: 2 Author: AKRA461 Subject: Inserted Text Date: 10/27/2017 2:25:50 PM -07'00'

Toxic, or dangerous wastes are designated under Chapter 173-303 WAC, Dangerous Waste Regulations. Dangerous wastes are not permitted for land application.

Bickner, Betty Ann (ECY)

From: Krafft, Wayne (ECY)
Sent: Monday, October 31, 2016 4:29 PM
To: Bickner, Betty Ann (ECY)
Subject: FW: Rosman Biosolids Application Comments

From: Laura Hare [mailto:hare2063@gmail.com]
Sent: Sunday, October 30, 2016 7:55 PM
To: Krafft, Wayne (ECY) <AKRA461@ECY.WA.GOV>
Subject: Rosman Biosolids Application Comments

Oct 30, 2016

This statement is on behalf of Stanley J Jackowski, at 32300 Mill Canyon Rd. N, Davenport Wa, 99122. He does not use email.

I am Stanley Jackowski, I have lived at Tolstoy farms since 1965. I have been growing vegetables all of my live, long before the term organic existed.

Of all the places to put sewage sludge, next to a canyon is one of the worst. HEL (highly erodible land). That sludge is very likely to leave the HEL through water or the wind. The wind comes from that direction depositing potential sludge on our planting area or on an area that water may bring to the planting area later. We get terrible floods sometimes that bring soil from miles and miles away, (see video and pictures).

If the contamination does not come from water bringing the sludge down directly it can come from the wind and then from the water bringing it down further. It is just not safe to deposit sewage sludge on highly erodible land. Please do not put our organic business or our health at risk! [1]

Stanley Jackowski

Page: 2

Number: 1 Author: COCA461 Subject: Inserted Text Date: 10/27/2017 2:27:08 PM -07'00'

See Items 2 HEL, 3 Erosion, and 5 HG Review.

Case:

Transcript of: Hearing 10/11/16

Case Number:
Date: October 11, 2016

127 E. Augusta, Suite 200
Spokane, WA 99207
Phone: 509-315-4980
Fax: 509-315-4241
Email: schedule@crumbreporting.com
Internet: <<www.crumbreporting.com>>

DEPARTMENT OF ECOLOGY

HEARING HELD OCTOBER 11, 2016

LINCOLN COUNTY COURTHOUSE

DAVENPORT, WASHINGTON

ROSMAN FARMS PERMIT FOR BIOSOLIDS MANAGEMENT

(Audio Recorded Hearing)

AUDIO TRANSCRIBED BY:
CINDY J. CHATTERTON, CCR, RPR
NO. 2951

2

(COMMENCING TRANSCRIPTION OF AUDIO RECORDING)

PROCEEDINGS

HEARINGS OFFICER: I'm Erika Bronson, the Hearings Officer for this hearing on the proposed coverage under the general permit for biosolids management for Fire Mountain Farms on lands owned by Rosman Farms in Lincoln County.

Let the record show that it is 6:46 p.m., on October 11th, 2016. And this hearing is being held at the Lincoln County Courthouse, 450 Logan, Davenport, Washington, 99122.

Legal notice of the public comment period and this hearing was published in the Davenport Times on September 8th, 2016. The public comment period for this hearing will be extended from October 18th, 2016, to October 31st, 2016.

Fire Mountain Farms placed information about their application on their website, and Ecology also placed information about the application on their website. And those web addresses are available on handouts at the back of the room, in addition to copies of the permit.

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I am now opening the formal hearing for anyone who would like to comment. I will be calling you to testify in the order in which you signed in. When I call your name, please come up to the seat, speak into the recorder, state your name and the company or organization you represent, if any.

I apologize in advance if I mispronounce your name. Please correct me when you state your name for the record. Please remember to limit your comments to about three minutes. And, audience, please no extra noise. When you have 30 seconds left to complete your testimony, Betty Ann will hold up a card letting you know. And when your time is up, I will call the next person to testify.

So we will begin with Donald Hansen, who will be followed by Ernest Barrett.

MR. HANSEN: Thank you, everyone. I really appreciate this opportunity to come this evening.

I am a member of the community. I have land there in Section 19. So I know a number of you. I met Mr. Rosman for the first time this evening.

My training is agricultural and biological engineering. And in my profession, I do similar work with respect to land application of waste

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materials and storage of waste materials.

So I put together, with several members of the community, which included Morton, Ernie, Paige, and Bob, and myself. We met one evening. We formed a committee that may or may not represent others that we call the community -- or, yeah, Committee of Concerned Residents and Landowners in Green Canyon and Mill Canyon regarding the Rosman biosolids application.

In the analyses that I have done to help us better understand, our purpose is to prevent pollution. And that's, I think, pretty common within the room. We want to prevent it. Because we all understand that once it gets out, it's very hard to clean up and very expensive and it costs everybody.

But, at the same time, we've talked about it. The whole idea of there being municipal waste, it's common. Everybody has them. Even your one-house place here or there is going to have some. So we're going to have to deal with this. We deal with it in many different ways. This is a large scale. There can be beneficial uses and there can be problems.

So what I did basically is put together a number of concerns that I was able to identify using

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the Department of Ecology general permit of biosolids management in comparison to the permit that was submitted before 9/23. So I haven't looked at the more updated version. I don't know if there's any changes.

But there were a number of concerns that led me to believe, and I got the support of those committee members, that we support that the permit 1 should be denied at this point until there is better evidence as to what can be done. Because with our good design, specific adequate monitoring that meets the regulations.

We can understand, of course, landowners need to understand this, too. And, of course, you mentioned, Mr. Thode, the municipality responsible for the waste material may also want to understand it better. And, of course, monitoring and hopefully openness of the results to the community such that we can also do some of our own, let's say, scouting and trying to understand what's going on. Because it's for the better situation to everybody. That's really what it's all about. 2

So I'll be available for questions, comments, and just general discussion as well later. So I appreciate the time.

Summary of Comments on Hearing 10_11_16 COND.pdf

Page: 3

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 2:40:37 PM -07'00'

The General Permit for Biosolids Management was issued September 4, 2015 after a 30 day comment period. The hearing is not about the General Permit for Biosolids Management or Fire Mountain Farms' coverage under the general permit. It concerns the Site Specific Land Application Plan (SSLAP) for FMF's Rosman Farm sites.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 2:42:13 PM -07'00'

Monitoring is in place through inspection, testing, and reporting.

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And I have prepared a report submitted. I think Morton or Ernie submitted it to Betty Ann, is that correct, via e-mail?

MR. ALEXANDER: We submitted it to the State.

MR. HANSEN: Okay.

MR. ALEXANDER: During the general hearing.

MR. HANSEN: I have no problem with leaving this copy here for the Department of Ecology. 2

HEARINGS OFFICER: Thank you, Mr. Hansen. Could we please have Ernest Barrett next, who will be followed by Robert Whitmore.

MR. ALEXANDER: I didn't prepare for three minutes. I think that that's news. So I object to the three-minute limit.

MR. BARRETT: So I have been talking a lot with Gary about the fields adjacent to Sections 19 and Sections 13, Sections 12, primarily. We had some trouble making some designations of – actual Fire Mountain designations and with parcel numbers. A lot of confusion with the application itself.

I thought Gary and I came to some conclusions that were very rational. And I was looking forward

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to incorporating those ideas into the permit. Granted, it seemed that the permitting process was going to be -- either having to be reworked in a way that was too costly for yourself, which it sounds like you've spent quite a bit of money. But you must make some good money doing this, too.

Anyways, we're looking out -- between us, I think we're very, very concerned about any of the fields carrying, through runoff or through groundwater, getting into any of our springs, which people happen to utilize down there and have for years. 7

But -- so trying to move on to getting a landowner consent form revised with actual parcel numbers and field designations, which I think safeguard these aspects of contamination, we weren't able to get Gary to sign this as of yet. 8

With that in mind, we've also been working with other people fluent in hydrology, 10 ould say, water law. So I wrote a little bit of this. And I'll just read this. Some of it incorporates comments that are -- I should say, vernacular that's more scientific.

So I would say, at this point, with respect to our neighbor, Gary Rosman, I wish to enter in the

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comment period, expressing concerns regarding his intent to apply biosolids.

I would suggest, because of lack of access to the full application and its incompleteness, that it be revised and we incorporate the field designations, as we've talked about, in a new permit that would be part of this five-year period.

That's it. 1

HEARINGS OFFICER: Okay. Thank you, Mr. Barrett.

Next, we'll have Robert Whitmore, who will be followed by Paige Kinney.

UNIDENTIFIED SPEAKER: Please sit down instead of standing up like that.

HEARINGS OFFICER: Sitting down would get you closer to the recorder, which would be nice.

MR. WHITMORE: I'm Bob Whitmore. I just have a little something small here to read, and it basically states our position. I am here with my mother, Mary Pollard, Patricia Pollard.

And I'm here to be another voice in what I hope and anticipate will be a choir of concerned citizens seeking truth and questioning the past, present, and future use of possible toxic biosolids 3 in Harker, Mill Canyon, and Green Canyon areas.

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I'm speaking on behalf of my mother, Patricia Pollard, who is a property owner that is below Angel Spring site and a concerned party that may have been affected by continuous dumping of raw sewage by B&B Septic of Lincoln County, 4 well as the application of these fertilizers, biosolids, above the rim of the canyon on the east side of Section 12. 5

We join the others who have raised their concern about these practices and the impact that they have possibly had on not only their land and the water, but their health as well. 6 hese practices seem to have been carried out without proper quality control, testing, and monitoring, without concern for the public safety, and keeping them informed about the possible exposure to these substance while being engaged in family activity at Harker Canyon and the surrounding areas. 9

I think -- I'm speaking. She definitely could speak, but I'm trying to express our concern to not have anything that will continue to come down into that canyon. And we would like to know what has -- what is the condition at this present time, after the thousands of gallons of raw sewage that have been dumped out onto the property. We have had trouble getting some of the information, but we do

Page: 4

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 2:53:14 PM -07'00'
The SSLAP was submitted as a complete document and in it's entirety to Ecology. The field designations were in the first draft and have not changed. The permit and SSLAP were posted on the ecology web page for review on September 29, 2016 allowing 32 days to review and respond to comments.
The SSLAP, and not the permit, is topic of discussion at this hearing.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 2:44:10 PM -07'00'
Mr. Hansen's comments were also submitted by email and will be addressed as a separate document.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 2:56:02 PM -07'00'
Toxic sewage sludge cannot be managed as biosolids under the rule.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 3:01:45 PM -07'00'
B&B Septic is a permitted septage management facility that land applies treated domestic septage which has been screened and lime stabilize.

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 1/9/2017 2:57:02 PM
Angel Springs is more than 1100 feet NE and 1400 feet SE of Rosman's farms. The recommended buffer for water quality is 100 feet.

Number: 6 Author: BBIC461 Subject: Inserted Text Date: 1/11/2017 3:26:58 PM
See Item 4 Health.

Number: 7 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 2:46:23 PM -07'00'
See Item 3 Erosion, Item 5 HG Review, and Item 6 Water Rights.

Number: 8 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 2:50:18 PM -07'00'
The field designations assigned to this application are and always have been appropriately identified in the SSLAP to include field names, acreage, and maps outlining the application fields.

Number: 9 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 3:05:05 PM -07'00'
No evidence on non-compliance by B&B Septic is provided. B&B Septic submits annual reports to ecology and monitoring records which show where they have land applied, the timing necessary for PH pathogen reduction, and independent soil analysis reports.

Number: 10 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 2:51:33 PM -07'00'
The site has been reviewed by a licensed hydrogeologist. See Item 5 HG.

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have the list for 2015, which amounted to over -- just over a hundred thousand gallons. 1

So I'm concerned and my mother is concerned, as a property owner, as to what effect, what is the present condition after these years of application, and then what is -- what is the possible risk of future exposure being present at the land. 2

So we are definitely against not having the biosolids put anywhere where it's -- where it has the potential to affect other property owners and their health and their wellbeing as well. 3

HEARINGS OFFICER: Thank you, Mr. Whitmore.

Next, we'll have Paige Kinney, who will be followed by Morton Alexander.

MS. KINNEY: That's not on. This is it.

Okay. My name is Paige Kinney. I'm married to Morton Alexander. And we own 38 acres just down below, I believe it's Section 19, Section 20, where we have a small amateur organic orchard.

We get our organic certification from being next door to Tolstoy Farms. And I'm putting air quotes around that, because we don't have any certification. But we say, Hey, this fruit we're giving you, it's organic. It's from -- we have this

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orchard right next to Tolstoy Farms. So it's very special and important to us.

We also have big fantasies about making this Grandma and Grandpa's Orchard Camp for our grandchildren. We have two, and one on the way. And we've had the two that are around there. And we want all of our dreams around this property centered around the water being pure. And we feel very confident that the quality of it is very good now.

And so all I want to talk about is what I want, you know. It's easy to get caught up in how frustrated the bureaucratic process is and how you can't do this and you can't do that, and you have to do this and you have to do that. But what I want is to see that watershed protected.

Because my understanding is, and I have not read the SSLAP, is it called? I've not read it, but my understanding of it is that the descriptions of the surface waters along our Mill Canyon are very inadequate. And that there's no mention of the seepages, the alluvial fan, the springwater. And, for that reason, I feel like the permit is inadequate to protect us. 5

And, you know, we've -- you know, Gary has been really good about wanting to negotiate with us.

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But, once again, there's these issues that come up with the bureaucracy. And if we try to change this, then everything has to be done over. It's expensive and it's difficult. When, really, I am not here to address the general permit. I am not here to address the overall toxicity or nontoxicity of biosolids. I'm here to protect my part of the watershed.

And I feel like without greater detail and greater description of how the water is moving in that area, based on not the general permit, but the site specific permit, and without some legal solid agreement that there will be an adequate buffer. Not some of the buffers that we heard about, like a three-foot buffer or something. 4 here were some really like very small, small increments that were considered a buffer that I thought, That's not what I'm thinking, you know.

So that is what I want to see. And I don't know if that means that we have to say -- here, I'm going to read this. Can I read these two sentences? Literally.

HEARINGS OFFICER: Two sentences. Please wrap it up.

MS. KINNEY: Okay. These are the two

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sentences. Yes. I ask that this permit either be denied or be redone. One sentence.

Thank you.

HEARINGS OFFICER: Thank you, Mrs. Kinney.

Next, we have Morton Alexander, followed by Keith Scott.

And, Mr. Alexander, I recognize that you didn't prepare for three minutes. I apologize for that. But if you could please try to fit in your key points and then you can submit your written comments.

MR. ALEXANDER: What I'll do instead is, I will omit a lot of the stuff that many of us believe the toxicity of the material, after it's approved and presented. I'll omit that, because you'll have it.

HEARINGS OFFICER: Perfect.

MR. ALEXANDER: I'm Morton Alexander. I own land and a home in Mill Canyon down below Gary's home and acreage. My home and my organic fruit trees are gravity fed with the water from my spring. The rights to the Turnley Spring on my land are owned by me and my neighbor, Deanne Burdine. Another neighbor has an organic herb business, which

Page: 5

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 1/11/2017 3:55:24 PM
Per the 2016 report for 2015 application only 17,000 gallons were land applied at Angel Springs. Septage is calculated about 2% solids so in 2015 less than 1.5 dry tons treated septage was land applied at Angel Springs.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 3:07:43 PM -07'00'
B&B septic submitted soil samples in their Annual Report for 2015 application year. Risk management includes but is not limited to: testing of soil and septage, reporting, monitoring and inspections.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 3:09:39 PM -07'00'
Existing buffers are in place to prevent exposure to biosolids beyond the site boundary. See Item 4 Health.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 3:15:27 PM -07'00'
The smallest buffer proposed at the site is 33 feet.

Number: 5 Author: AKRA461 Subject: Inserted Text Date: 10/27/2017 3:13:58 PM -07'00'
See Item 5 HG Report.

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depends on this water. Many neighbors appreciate being able to collect clean drinking water from this source.

One of Gary's parcels on the application is parcel number such and such. It's directly uphill from my spring and of utmost concern to me.

Many scientific sources, ranging from the Sierra Club to Cornell University, give us cause for great concern about the potential for contamination of our water and soil and even the air, from the application of sewage sludge on the land above us.

Following a -- well, I'll skip that one. You can read it.

Many of my neighbors at Tolstoy Farms are worker/owners in a community-supported agriculture business called Tolstoy Farms that successfully markets certified organic produce throughout the region. They are concerned about the increased danger of contamination to their produce and damage to their business reputation by the introduction of these toxins in our area. This is their livelihood, not just some extra income as the case may be for others involved in this dispute.

Tolstoy Farms has hundreds of customers in the region who depend on them for a weekly supply of

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certified organic produce.

This case is also being watched by the community of people who are concerned about the health and safety of the Spokane River, which is fed by tributary watersheds such as ours.

A few years ago, there was a catastrophic flood of the main creek in our canyon. It flooded fields and homes, and permanently diverted the creek from its long-established path. Much debris was brought down to the canyon from the fields above. It prompted creek restoration engineer, Brian Belsby, to identify our canyon as a floodplain and alluvial fan vulnerable to whatever material is conveyed down from above. 4

So I guess I'll just let you read the rest of it. Oh. I do want to mention the study done by my neighbor, Donald Hansen, who works for the Natural Resources Conservation Service, is really important and challenges the study done by Mr. Thode. And that's why, I think, the three-minute limit is not a good one. Because he has lots of good information to present that would be useful for people in the community to see presented, rather than just meeting the eyes of the Department of Ecology.

HEARINGS OFFICER: Well, people's written

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comments will be published, as well as our responses. So they will be able to see that information.

MR. ALEXANDER: Okay. So here's this. Here's -- I lost the paperclip.

HEARINGS OFFICER: That's okay. Thank you.

Next, we'll have Keith Scott, who is followed by Laura Harris.

MR. SCOTT: Hi, everyone.

I'm with Tolstoy Farms, but I'm kind of speaking on my own tonight. It's true that there were actually many irregularities 1 th the permit. And when we saw it, there was some parcels that were on there that shouldn't be on there at all, 2 Clerical errors have been called. And also the SEPA application is riddled with errors, 3 wls aren't even mentioned as birds here. So someone didn't study the area.

But what I really wanted to say here is that there's a saying: A man who has his health has a hundred goals. A man who doesn't have his health has one goal. And another saying: Better living through chemistry is completely outdated.

The stuff is making us sick. It's killing

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us. Cancer, 1,685,000 people a year; 595,000 will die this year. 599,000. It's related to the environment.

Diabetes is linked to environmental pollution. 1.4 million people diagnosed every year to join the 30 million people that are diabetic. Diabetes, from the American Diabetic Association, is linked to environmental pollution, linked to things like endocrine disruptors. Which biosolids is full of, by the way. 9.3 percent of the population of the U.S. is diabetic because of environmental pollution.

And then you've got birth defects. One in 33 babies is going to have a birth defect. Leading cause of infant death is definitely related to environmental pollution.

So I don't know where we're going with these chemicals, but we're going to do ourselves in with them. This isn't the way of the future. And you got to ask yourself, Are we leaving this a better place for who is next?

And about environmental stewardship, also. All of these animals that are from a microorganism all the way up to an eagle that will be affected by any addition of chemicals.

Page: 6

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 3:25:01 PM -07'00'
There was no evidence of irregularities in the comments provided.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 1/20/2017 10:07:53 AM
From the first draft to the document submitted for public review, no parcel numbers were changed and were correct. Two sections were removed from the first draft and no parcels were identified in either section. The sections in question had been removed and were not listed in the document submitted for public review.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 3:26:50 PM -07'00'
There is no evidence of SEPA errors. See Item 1 SEPA

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 3:18:39 PM -07'00'
The areas identified for land application in the SSLAP are not in or near the canyons. The closest property is 750 feet from Harked Canyon Rd. to a Rosman field identified for land application.

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When they tell us that Gary's land is so far under some federal standard, does that mean you need -- I mean, should you add lead, mercury, and cadmium until it matches the federal level? Our levels here are grossly higher than European standards on chemicals. There's chemicals being sold here. Pesticides and herbicides have been banned in Europe since the 1990s, some of which we don't use in Lincoln County. As a matter of fact, Roundup is related to diabetes and autism.

HEARINGS OFFICER: Could you summarize your comments?

MR. SCOTT: Uh-huh.

And, anyway, I think I speak for everyone that's here that came tonight when I say, we don't want the chemicals. We want to live healthy lives, not the alternative, which a lot of people are experiencing with their conventional methods.

HEARINGS OFFICER: Thank you, Mr. Scott.

Next, we'll have Laura Harris, who will be followed by Paolo Hamel.

MS. HARRIS: My name is Laura Harris. I live at 32300 Mill Canyon Road North. I drink water from Martin Spring. I grow vegetables, fruit, and nuts using certified organic methods. I use no

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chemicals, and I take great care to assure that the food that I grow is clean of all chemicals.

Growing organic food has been my life's work for the past 20 years. I eat the food that I grow. People in Davenport, Creston, and Spokane eat the food that I grow. I'm part of a local food system.

The safety of this food system is being threatened by the application to dump biosolids in our areas above our springs and our creeks. I'm very worried about pollution from this toxic sludge entering our water supply, entering the water we drink, bathe in, and irrigate with. 3

I'm also equally worried about the pollution of our air, due to biosolids becoming windborne. We already have a lot of chemicals in our air from the chemical spring of our neighbors who use chemicals in their farming methods. 4

I've read about biosolids causing illness and death to people who live nearby where it's being dumped, due to airborne particles entering into people's noses and causing sinus infections and children dying. As well, airborne solids will land on the soil poisoning it indefinitely. 5

There are at least a hundred people living within a five-mile radius of where Gary wants to

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dump this stuff. We don't want to eat, drink, or breathe biosolids.

If America stands for life, liberty, and the pursuit of happiness, what that means to me is that I have a right to breathe in clean air, drink clean water, and grow my food in clean soil. That is my pursuit of happiness. Does my neighbor have the right to pollute these basic elements which are crucial to the lives of me and my community? Who will stand up for the wild creatures that wander around freely? Don't they deserve a clean ecosystem?

Biosolids are not clean, nor safe. The Department of Ecology should be honest and redefine the sewage sludge as the toxic waste that it is. 1 Shame on you, Department of Ecology. Instead of protecting the earth ecosystems, you have become agents of the waste disposal industry, smoothing out any roadblocks, covering up the scientific facts, and spending your budget paying the salaries of full-time biosolids pushers. 2

Biosolids are not fertilizer. They are toxic waste and should be disposed of as such. We should plan for the future and develop waste disposal systems that separate toxins from compostable waste,

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so an actual organic matter could be returned to the soil without toxins. This would be a major change in our infrastructure, but that's what we need to do.

MS. BICKNER: Time.

MS. HARRIS: I'm sorry, Betty. You got ten minutes, so I'm going to take four.

After listening to the question-and-answer period, I fear that I cannot trust Mr. Thode, Mrs. Bickner, or Mr. Krafft, to protect our water, air, and soil. Their answers to our important questions have been vague and evasive.

Mr. Thode stated that his biggest expense is dealing with the bureaucratic process. And when Morton asked his questions about why two sections on the application were not even Gary's property, he claimed, about the farms, that it went to the lowest bidder and wasn't done very well. Well, how can we trust a man who does such an inadequate job of filing his paperwork, which is the way we all participate in this process? I don't trust him to regulate his application. And I would ask that his permit be denied.

Thank you.

HEARINGS OFFICER: Thank you, Ms. Harris.

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Number: 1 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 3:42:03 PM -07'00'
Toxic or dangerous wastes are designated under Chapter 173-303 WAC, Dangerous Waste Regulations. Toxic sewage sludge may not be land applied as biosolids under Chapter 173-308, Biosolids Management.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 1/20/2017 9:51:58 AM
The Dept. of Ecology Biosolids Program is tasked to implement RCW 70.95J Biosolids Management and WAC 173-308 Municipal Sewage Sludge-Biosolids

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 1/20/2017 9:34:57 AM
See Item 5 HG Review.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 1/20/2017 9:35:27 AM
See Item 3 Erosion.

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 3:38:11 PM -07'00'
The land application of biosolids in accordance with regulatory requirements is protective of public health and the environment, including soils at the site.

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I did call Paolo Hamel next. But I did notice that he didn't actually indicate that he wanted to testify.

So the next person will be David Crow, followed by Walt Tanner.

UNIDENTIFIED SPEAKER: Is David not here?

HEARINGS OFFICER: Do we not have David Crow? Going once, going twice. Okay.

Walt Tanner, please.

MR. TANNER: My name is Walt Tanner. I am a legal intern at the law office of Rachel Osborn, and a second year law student at Gonzaga University.

We appreciate the extension that Ecology has afforded us in the public comment process. We also appreciate Mr. Thode coming this evening to tell us a little bit more about this, and Ms. Bickner telling us a little bit more about this, too.

The biggest concerns that we have at the moment are that we lack access to the entire application for the SSLAP application. It contains, currently, Appendices 1 through 6, but references other appendices and attached documents that we haven't been able to get our hands on to be able to make effective comments. And that has a serious

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implication, as far as the Department of Ecology's ability to make a decision with a complete and total public comment period available to everyone.

If we aren't able to comment on the entire -- all of the information, then Ecology is not able to make a proper assessment of what's happened and a decision on a permitting situation. 3

On the SSLAP itself, there's a number of things that we feel are inaccurate or incomplete. And we're writing public comments on that at the moment. The biggest things that we have, as far as our concerns are concerned, is that there's no crop data that's involved -- that's included in the SSLAP at this time. And so we aren't able to actually determine what the agronomical rates are going to be. 4 There's nothing as far as the groundwater protection plan in the SSLAP. Section 11 asserts that there's potholes around, but we aren't really sure how high this is going to contribute to the groundwater or how high the groundwater actually needs to be. 6

How am I doing on my time?

MS. BICKNER: You have two minutes.

MR. TANNER: Thank you.

And there's a very small erosion control

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plan. And there's not a whole lot of analysis in the SSLAP as to how the hydrologic cycle in these fields that are on top of a canyon are going to affect the springs and the groundwater that those fields necessarily run into. 1

And with that, I believe that I can probably be done. We just need to make sure that it's in the record that Ecology has an obligation to uphold the water quality standards in the state of Washington. And it has an obligation to protect vested water rights and how they – and the quality of those rights for the way that they are used, be it domestic or agricultural. 2

Thank you.

HEARINGS OFFICER: Thank you, Mr. Tanner.

Okay. So we have gotten through the people who indicated that they wanted to provide testimony. Is there anyone else who wishes to?

MR. PELLOW: I had actually indicated on my card that I wanted to testify.

HEARINGS OFFICER: Oh, you did? Well, please, come on up.

MR. PELLOW: My name is Timothy Pellow. I'm a resident of Mill Canyon. I work on an organic farm there. I would like to state, for the record,

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that I'm not opposed to the usage of manures in agriculture. I'm not even opposed to the idea of using human manures, bodily wastes of humans incorporated safely into manure -- into agriculture.

I am concerned about the making a similarity between manure and sewage sludge, which are two very different things. Because sewage sludge, municipal sewage sludge, incorporates things beyond just animal biological wastes. It includes road runoff. It includes factory wastes within a municipal area. It includes anything that people put down their drains. It's not the same as a farmer, with animals, shoveling out a stall and composting the wastes.

I worry about the tendency of these sorts of things that utilize municipal wastes being dumped into rural areas. A lot of municipalities view rural areas as dead zones, areas where there are not very many people, where it's okay to dump toxic 5 wastes. They see places where we live as areas of depopulated areas ripe for waste dumping. And I would hope that this is not happening here. That this isn't something which allows the stealth dumping of waste, which this was initially defined as until it was changed into soil amendment.

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Number: 1 Author: BBIC461 Subject: Inserted Text Date: 1/10/2017 8:06:54 AM
See Item 5 HG Review.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 1/20/2017 9:59:43 AM
See Item 6 Water Rights.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 3:58:48 PM -07'00'
The SSLAP was complete, the table of contents for the appendices was not correct. All appendices referenced in the SSLAP were in the document.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 1/10/2017 8:01:58 AM
Agronomic Rates are determined at the time of the land application request.

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 1/10/2017 8:08:58 AM
Biosolids are not classified as toxic waste.

Number: 6 Author: BBIC461 Subject: Inserted Text Date: 1/10/2017 8:04:22 AM
Ground water needs to be a minimum of 3 feet below the surface as stated in the SSLAP section 11.

As well as Ms. Harris mentioned, I would say that beyond just the water issue, anyone who lives in this area on a windy day has seen the air turn brown. The dust moves around through the air, and things such as lead, mercury, arsonic, and cadmium, which end up in municipal waste systems, end up in the air when you dump that waste into rural areas. 1

That's all I have to say for the record. Thank you.

HEARINGS OFFICER: Thank you.

Is there anyone else?

Okay. So you can still submit written comments. Please send them in by 5:00 p.m., on October 31st, 2016. You may submit comments by mail to Wayne Krafft at the Washington State Department of Ecology, Waste to Resources Program, 4601 North Monroe Street, Spokane, Washington, 99205. They can also be e-mailed to akra461@ecy.wa.gov. And they can also be faxed to 509-329-3572. These addresses, along with the websites where you can find more information, are also available on a handout at the back of the room.

All the testimony received at this hearing, as well as e-mails and hard copy comments received by 5:00 p.m., October 31st, 2016, will be part of

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Number: 1 Author: BBIC461 Subject: Inserted Text Date: 1/10/2017 8:10:06 AM
See Item 3 Erosion

the official record for the proposed coverage.

After the public comment period closes, Ecology will respond to the comments and publish that document. And it will be available at a web address that's also on the printout at the back of the room.

The next step is to review and respond to the comments and then issue a final decision for the Rosman unit. Ecology expects to issue a decision no earlier than December 30, 2016 -- or, excuse me, November 30th, 2016.

If we can be of further help to you, please do not hesitate to ask. On behalf of the Department of Ecology, thank you for coming tonight. Let the record show that this hearing was adjourned at 7:24 p.m.

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C E R T I F I C A T E

STATE OF WASHINGTON)
) ss.
COUNTY OF GRANT)

THIS IS TO CERTIFY that I, Cindy J. Chatterton, residing in Moses Lake, Washington, transcribed the within and foregoing audio recorded hearing of October 11, 2016; that I am a licensed Washington State Court Reporter; and that same is a full, true and correct record of the hearing, to the best of my ability.

I further certify that I am not a relative, employee, attorney, counsel of any of the parties; nor am I financially interested in the outcome of the cause.

Transcribed notes will be destroyed three years from the affixed date unless requested by counsel to retain them.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal this day of December, 2016.

Cindy J. Chatterton, RPR, CCR
CCR NO. 2951

Bickner, Betty Ann (ECY)

From: Krafft, Wayne (ECY)
Sent: Monday, October 31, 2016 4:33 PM
To: Bickner, Betty Ann (ECY)
Subject: FW: Biosolids SSLAP for the Rosman property comment period.

From: Paige Kenney [mailto:paigekenney@hotmail.com]
Sent: Sunday, October 30, 2016 9:14 AM
To: Krafft, Wayne (ECY) <AKRA461@ECY.WA.GOV>
Cc: bbic451@ecy.wa.gov
Subject: Biosolids SSLAP for the Rosman property comment period.

My name is Paige Kenney. My husband and I own 38 acres in Mill Canyon. The proposed biosolids site on Gary Rosman's farm is above our land in the canyon.
Our 2 parcels in Township 26, Range 38 are:
Parcel # 2638020700013 is PT N2SWNE; N2SENW
Parcel # 2638020700016 is PT SENENW; PT SWNWNE MAP 211 .20 RD/A
There is a spring on our property that we use for drinking water and irrigation of a small orchard. Many neighbors like to get water from the spring as well. I attended the hearing on the site specific permit to apply biosolids to Rosman Farms above the Mill Creek canyon. I was frustrated at the hearing for a number of reasons I will address at the end of my comments, but in brief, I did not feel my concerns could be heard. This is one of the reasons I am submitting my comments in writing as well.
I understand that the D.O.E. has a mandate to disposed of biosolids as safely as possible. This is a product we all produce and must take some responsibility for. Under the General Permit, the application to apply biosolids and to sell biosolids has been deemed safe with the specific parameters of the law as written. Even so, there are requirements for a site specific permit that are important. These seem to have been neglected. During the informal meeting at Garry Rosman's house, I heard Mr. Thode of Fire Mountain say that on the west side an application like this would require hydrology studies, but here in Eastern Washington's dryer climate that would be unnecessary. Perhaps it is this bias that allowed so many lapses in the information that are required by the permit. It seems to me that fact that rain is more intermittent in this area makes it more important to be clear in the permit about when the biosolids can and will be applied. Like so many other things this is not clear in the site permit.[1]
Just because we have a dryer climate does not allow for the omission in the application for the impact to various springs, streams, large potholes, and intermittent ponds in the area. This seems like a serious lapse. Shouldn't the permit contain the working maps the allow for protection of these areas especially? We have these biosolids because we want to keep them out of the water. When I look at this permit it seems that after all that expense we have committed to to clean up our waters we are just going to use this General Permit to put them back in again. Our spring and the many other seepages, springs, and streams all feed into Mill creek which feeds into the Spokane river.
According to the site specific permit the ground water in this area is protected because there is no groundwater within 3 feet of the surface.[3] Given the inadequate mapping,[2] this looks like an overgeneralization. There are ponds in the nearby area that suggest that the water is closer to the surface at least during some times of year. It's not reassuring that the SSLAP provides no detail about the timing of when the biosolids will

Summary of Comments on Kenney Letter2.pdf

Page: 1

Number: 1 Author: COCA461 Subject: Inserted Text Date: 10/27/2017 4:11:25 PM -07'00'

Mr. Thode's comment is generally correct. However, the requirement for a hydrology study is based on site-specific conditions. Sites in Western Washington are more likely to have the shallow groundwater and saturated soils that would trigger such a review. Ecology performed a study for this site. See Item 5 HG Review.

Number: 2 Author: COCA461 Subject: Inserted Text Date: 3/27/2017 11:48:49 AM -07'00'

Adequate maps are in the SSLAP under maps in Appendix 2.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 5/10/2017 11:15:13 AM -07'00'

The SSLAP states no land application of biosolids if ground water is rising or 3 feet or less to the surface.

be applied. For that matter, there are no maps and no commitments to where exactly the biosolids will be used. 1 With the initial outreach invitation to the meeting at Gary's, Ms. Bickner suggested that neighbors would have an opportunity to walk the farmland to see where the biosolids would be applied. The meeting went on so long that this tour never actually happened. When I mentioned that I was disappointed to Mr. Thode he graciously offered to show me a typical spot where he would not apply. He brought me over to the side of the house and pointed out a gully where crops would not be grown because of erosion and run-off concerns. Sadly, I came away from this demonstration with the impression that Mr. Thode would apply anywhere not requiring an all terrain vehicle. 2 As neighbors we can't feel truly protected without the details that are mandated for a specific site in writing in the application.

At the meeting the phrase "agronomic rate" was used to reassure us that uptake by crops and vegetation would prevent the material from moving through the soil. My understanding is that the agronomic rate is affected by septage, but there is no plan to change the use of biosolids where there has been septage applied. We also believe there has been more septage applied, based on the observation and research of neighbors. If the agronomic rate is to have any protective effect, the septage usage needs to be carefully mapped.

Other important details are not included in the site specific plan. There should in the maps include erodable soils, CRP land, timberlands, badlands and other areas that should be excluded. 3

Some key information is contained in appendices that are not available in the permit. 4

The reason that I was a little frustrated at the hearing was that the comments (even comments I agree with) tended to be polarizing. I agree with my neighbors. - I don't believe that science shows that biosolids are safe. But since the General Permit has been passed, the important thing to focus on is to minimize any damage, especially to watersheds. 5 The science has not caught up with all the effects of these chemicals on people or the environment. Because of this many people in Mill Canyon feel like unwilling guinea pigs. Fortunately, the requirements of the SLAPP can mitigate the exposure to neighbors if it is diligent in fulfilling the intent of the law.

The situation does feel quite polarized. There are those like myself who would like to live in a world less saturated with industrial by-products, pharmaceuticals, micro-plastics and other chemicals with the potential to harm ecosystems and humans. On the other side there are those like Mr. Thode who believe that these concerns are groundless and spreads these "recoverables" all over his own land. To me requiring mapping of the sensitive areas and committing to avoid applying the biosolids in areas that could potentially damage our water in the canyon is a reasonable compromise. Sure, the landowner has the right to do what he wants with his farmland within the law, as long as he keeps it to his own property. If it contaminates our various springs or wells or soil, that is not right. We can disagree about the science, but it still comes down to an issue of fairness under the law. 6

I also strongly object to this site specific permit because of the proximity of Tolstoy Farm. The approximately 60 people who live there are committed to a lifestyle of living lightly on the earth. This life requires pioneer - like industry and frugality. Many of them are vegans. They tend their fields by hand. They "walk the talk" of living simply to minimize the chemical impact on the land. How appropriate for a canyon valley with a stream that leads into the Spokane river. I think of Tolstoy as an asset to the entire region. Contamination of their water source not only threatens their business, but their way of life. We share our fruit with these neighbors and they are very generous with us as well. Over the years we enjoyed a Community Supported Agriculture subscription from nearby Tolstoy Farms. I have heard Tolstoy Farms referred to as a "beloved institution" in the city of Spokane. Over the years, a number of articles about it have appeared in The Spokesman-Review, The Pacific Northwest Inlander, and other publications. Their produce is of amazing quality, gourmet as well as organic. The shoddy site permit shows a real disrespect to their concerns and the concerns of their clients and supporters. It makes this issue a social justice issue, as well as an environmental one.

Like our neighbor Garry Rosman, we think of this land as a family legacy, a stewardship for our children and grandchildren. The economic impact of Mill Canyon is small in comparison, but our love for our land is large. I have heard it said that a if a person loses money they can potentially get it back the same way, but if a way of

Page: 2

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 5/10/2017 11:21:14 AM -07'00'
Appendix 2 of the SSLAP contains outlined field maps where the biosolids may be applied.

Number: 2 Author: COCA461 Subject: Inserted Text Date: 10/27/2017 4:17:59 PM -07'00'
The Department of Ecology not Fire Mountain Farms determines the areas of the site that are appropriate for biosolids application. Biosolids may only be land applied to approved areas.

Number: 3 Author: COCA461 Subject: Inserted Text Date: 10/27/2017 4:21:54 PM -07'00'
All the locations you describe except The HEL maps are included in the maps in the SSLAP, Appendix 2, 3.2 field maps. The HEL maps are a component of the erosion control plan. Also see Item 2 HEL

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 5/10/2017 11:55:25 AM -07'00'
The Appendices are components of the SSLAP which is a component of the Permit Coverage

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 5/10/2017 11:54:25 AM -07'00'
See Item 5 HG Review

Number: 6 Author: COCA461 Subject: Inserted Text Date: 3/27/2017 11:51:14 AM -07'00'
See Item 5 HG Review.

life is lost it cannot be so easily regained. Our soil and water are the work of millenia. I think that even under this General Permit the Department of Ecology needs to be diligent in protecting them.

Bickner, Betty Ann (ECY)

From: perianth herbs <perianthherbs@yahoo.com>
Sent: Monday, October 31, 2016 5:17 PM
To: Bickner, Betty Ann (ECY)
Cc: donald.hanson@wa.usda.gov
Subject: RE: Roseman Bio-solid comments
Attachments: Biosolids letter.docx

Hello,

Attached is my comments on the bio-solids issue. The internet, cell phones and landlines all went out in Davenport and surrounding areas today. I hope for this reason you will still accept my comments.

Thank you,

Carla Martinez
Perianth Herbs

10/31/16

To Whom It May Concern:

I am writing with my concerns and objections to the proposed dumping of bio-solids by Fire Mountain on Gary Rosemans' property near Davenport, WA. For a myriad of reasons, I am very opposed to the dumping of bio-solids in general, which I will go into. With this particular site proposal, I am especially concerned because of the proximity to my herbal farm where I grow herbs for my tea business Perianth Herbs.

My third of an acre herb garden is located just on Deanne Burdine's property and is watered throughout the season by the spring located Morton Alexander's land. I have also been wildcrafting (collecting wild plants, upper and lower parts) for the last eleven years on both Deanne and Morton's property, for additions to my teas, oils and salves. Many people buy these products from me at local Spokane Farmers' markets for herbal supplemental health benefits. I chose to start my business and grow and collect my herbs in this part of Mill Canyon because of the purity of a place that has never directly been touched by pesticides, growth hormones or other toxic chemicals. I promote this fact when talking to my customers and tout the fact that everything is spring watered. My biggest fear is that if bio-solids are dumped on Gary Roseman's land, it will reach Mill Canyon via windstorms and spring and fall runoff. I have just started making this business into something more than just a hobby. In the next couple of years, I will be expanding into the herbal tincture business (herbal alcoholic extractions). In order to do this, I will need to go through testing to make sure my products are safe for their proposed use and in order to apply for agricultural grants from such agencies as the USDA. If my product ends up getting contaminated by toxins such as PBDE's, it will put me out of business and put me out of work for the summer months. I will not be able to promote by products for health benefits, if they could in fact cause adverse effects.

I feel that my product is especially sensitive due the how many perennials I grow and wildcraft. Many of the perennials such as *Echinecea sp.*, *Lomatium disectum* and *Balsamarihzza sagitatta,* have deep tap roots and take many years to develop to a harvestable state. Many of these roots can develop to two and three feet deep and I have at times come across the water table when digging them up.

Additionally, I have great concern about the dust storms that occur in the area. I am quite certain. As I said before, I have been gardening and wildcrafting in this canyon for the last eleven years. This year and last year, I have had to wash off a lot of dust of my mints and other leaves. If the dust is too thick, I just need to prune it and discard it. I'm certain that during big windstorms, a lot of the dust comes from the wheat fields up above. In the summer, there are big dust devils that look like small tornadoes that at times blow a large amount of dust into this canyon.

Fire Mountain and the EPA have not done enough research on the spread of bio-solids contamination to convince me that what is proposed to me dumped on Roseman's farm, won't spread down here eventually. Taking water samples is not enough. After all, the solution to bad pollution results is dilution. In addition to the many studies showing the ill effects of PBDE's to the endocrine systems of both humans and wildlife, there needs to be more relevant studies, there

Summary of Comments on Martinez2.pdf

Page: 3

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 5/10/2017 1:04:17 PM -07'00'
See Item 6 Water Rights

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 4:27:20 PM -07'00'
See Item 3 Erosion and Item 5 HG Review.

needs to be more studies on the spread of bio-solids into nearby areas. Additional testing in nearby creeks of the macroinvertibrates present (water quality indicators) and bacteria samples from the silt need to be taken in areas near where bio-solids have already been dumped to get an accurate reading of how far spread these toxins are getting. A1

Thank you for your consideration. Please feel free to contact me.

Sincerely,

Carla Martinez

Perianth Herbs

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 10/27/2017 4:29:13 PM -07'00'

Measures are in place to control erosion and there is no evidence that the practice of applying biosolids on the Rosman Farm fields identified in the SSLAP will contaminate surrounding fields.

Bickner, Betty Ann (ECY)

From: Maxwell Smarter <beemrmax2002@yahoo.com>
Sent: Monday, October 31, 2016 8:29 PM
To: Bickner, Betty Ann (ECY)
Subject: Rosman Farms Site Application

Dear Betty Ann Bickner,

In regards to the Rosman Site Application, I/we the residents of Mill and Harker Canyons have asked repeatedly that the parcels off Angel Springs Rd that sit on top of the huge draws carrying spring runoff down through many other landowner's properties be taken off. To our knowledge they are not being taken off, even though the landowner himself has said that he only wants to put Biosolids aka Sewage Sludge on Section 34 off of Olson Rd where it will not run right down into other people's properties during the spring runoff.

As well the wind blows very strongly year around through these farmlands, predominantly from the southwest. It is very common to have dirt storms during periods of high winds, when soil from recently plowed fields becomes airborne. Unfortunately the location of Rosman's site application on Angel Springs Rd and the prevailing winds puts everyone living in Mill Canyon all the way down to Moccasin Bay at risk of exposure from airborne contaminants. [1]

There are many people living in these canyons that drink, wash and irrigate their crops with water from the springs/creeks on their lands, as well as there is much livestock. [2]

These canyons are also a well known wildlife refuge and should be designated as such. There is a tremendous amount of wildlife as well as some animals possibly on the endangered list. Garry Rosman himself told me that on the game cam they have at their house at the lake just three miles down the road, they have counted fourteen separate bears, this was just a few weeks ago. [3]

This points to the fact that the SEPA study associated with this site application is totally inadequate, and that is a huge reason why the Site Application must be rejected. There are no owls mentioned, or bears for that matter. Had anyone actually done a real SEPA study, they would know there are many bears, as well as at least three kinds of owls; Great Horned Owls, Screech Owls, and migratory Northern Pygmy Owls. [4]

The SEPA reflects badly on Ecology, and even worse the fact that the SEPA study was done by FMF, because there is a very clear conflict of interest here... [5]

If the parcels that will severely impact both Mill and Harker canyons cannot be taken off the site application, I/we the many residents of both Mill and Harker canyons ask that you not allow the site application on Rosman's farm.

I want to stress that we are in no way trying to interfere with FMF's business or Ecology's job of allocating Biosolids across the state in a way that makes sense for everyone, but this is just not the right place for a site application.

There are literally tens of thousands of acres all over Lincoln Co that don't border these kinds of sensitive watersheds, as well as having this much human habitation immediately downwind and downstream, in such a flood plain as we have seen millions of tons of earth and rock deposited here while recent record spring floods ravaged the landscape here, destroying roads, washing out bridges, and flooding houses. Elderly people with medical emergencies were trapped for days on end and without phone for three weeks. The last thing anyone would want at such a time would be dealing with toxic waste and associated pathogens.

There is no doubt in anyones's mind who survived those floods that the Biosolids applied on Rosman's land will end up on other people's land, as well as the very real danger of lasting potable water pollution, and incalculable harm to wildlife. [6]

Thank you for your help and consideration in these matters.

Summary of Comments on Maxwell Smarter -Scott2.pdf

Page: 1

Number: 1 Author: COCA461 Subject: Inserted Text Date: 3/27/2017 11:57:33 AM -07'00'
See Item 3 Erosion.

Number: 2 Author: COCA461 Subject: Inserted Text Date: 3/27/2017 11:57:59 AM -07'00'
See Item 5 HG Review.

Number: 3 Author: COCA461 Subject: Inserted Text Date: 3/27/2017 11:58:26 AM -07'00'
These areas are outside the designated buffer zones and not evaluated.

Number: 4 Author: AKRA461 Subject: Inserted Text Date: 10/31/2017 10:00:38 AM -07'00'
See Item 1 SEPA.

Number: 5 Author: COCA461 Subject: Inserted Text Date: 10/31/2017 9:54:27 AM -07'00'
The SEPA Checklist is submitted by FMF but is then reviewed by staff in the Shorelines & Environmental Assistance Program in Ecology, there is no conflict of interest. See Item 1 SEPA.

Number: 6 Author: COCA461 Subject: Inserted Text Date: 10/31/2017 10:04:09 AM -07'00'
See Item 3 Erosion.

Keith Scott, Laura Harris, Shawna & Nate Dunigan, Bill Schleef, Justin McGrew, Troy Thurman, Eric Truit, Lee Ost, Ann Burnham.

Dear Wayne Krafft,

This Rosman Site Application, which is causing so much stress here... where people are still trying to live healthy lives in the middle of a county already severely impacted by chemicals, has very little practical value considering that the potential for HARM is HUGE, and the harm would be irreparable.

You're a scientist, and the evidence is overwhelming, this is NOT THE RIGHT PLACE for a site application.

We have asked that the parcels that sit on top of the huge draws carrying spring runoff down through many other landowner's properties be taken off - and to our knowledge they are not being taken off - even though the landowner himself, Garry Rosman has said that he only wants to put Biosolids aka Sewage Sludge on Section 34 off of Olson Rd where it will not run right down into other people's properties during the spring runoff.[1]

As well the wind blows very strongly year around through these farmlands, predominantly from the southwest. It is very common to have dirt storms during periods of high winds, when soil from recently

Page: 3

Number: 1 Author: COCA461 Subject: Inserted Text Date: 10/31/2017 10:27:28 AM -07'00'
See Item 3 Erosion and Item 5 HG Review.

plowed fields becomes airborne. Unfortunately the location of Rosman's site application on Angel Springs Rd and the prevailing winds puts everyone living in Mill Canyon all the way down to Moccasin Bay at risk of exposure from airborne contaminants. 1

if the parcels that will severely impact both Mill and Harker canyons cannot be taken off the site application, i/we the many residents of both Mill and Harker canyons ask that you not allow the site application on Rosman's farm. 2

These are also two majestic Eastern Washington canyons, one of which has it's headwaters right at the edge of Rosman's ground. There are many wetlands in both canyons as well as a tremendous amount of wildlife including some endangered species. Mill Canyon was also identified as an "alluvial fan" during the 2014 floods and their aftermath. These canyons are waterways that flow into the Spokane river at Lake Roosevelt, which is already very polluted from decades of irresponsible industrial pollution.

I have to point out that these few canyons are precious wildlife refuge in the sea of wheat fields that is Lincoln Co... Is it not enough to have taken so much of the natural habitat away from wildlife for

Page: 4

Number: 1 Author: COCA461 Subject: Inserted Text Date: 3/27/2017 12:02:29 PM -07'00'
See Item 3 Erosion.

Number: 2 Author: COCA461 Subject: Inserted Text Date: 10/31/2017 10:33:01 AM -07'00'
There will not be negative impacts to parcels beyond the property boundary from the beneficial use of biosolids at the site.

food production, must we also pollute the surrounding areas for the sake of that food production?

There are also many people living in these canyons that drink, wash and irrigate their crops with water from the springs/creeks on their lands, as well as there is much livestock. No one should have the right to pollute another's land and water from above by putting poisonous chemicals atop a drainage. To do so would be unconscionable and could lead to serious repercussions with people affected.

There are literally tens of thousands of acres all over Lincoln Co that don't border these kinds of sensitive watersheds, as well as having this much human habitation immediately downwind and downstream, in such a flood plain as we have seen millions of tons of earth and rock deposited here while record spring floods (2014) ravaged the landscape here, destroying roads, washing out bridges, and flooding houses.

The only thing I can think of possibly worse than dealing with the mess of having your house flooded is to have Biosolids pathogens in the water, making it toxic to even deal with…

Page: 5

Number: 1 Author: COCA461 Subject: Inserted Text Date: 10/31/2017 10:34:43 AM -07'00'

Adequate buffers are in place to protect waters of the state. See Item 5 HG Review.

Our concerns are very real, the potential for human harm and environmental damage is very real, and reading through FMF's compliance record received from your office concerning FMF's mixing up of Emerald's toxic industrial waste with other Biosolids in an attempt to get rid of it just really confirms it for everyone.

" Under RCRA, Emerald and FMF are co-generators of the mixed dangerous waste material stored at Bumt Ridge, Newaukum Prairie, and Big Hanaford. Emerald is the original generator of the sludge that, along with FMF's act of mixing the dangerous waste sludge with biosolids, caused the mixed material at FMF to become a dangerous waste. "

And from the same notes this statement from Ecology;

"Ecology also examines potential risks and pathways of exposure to evaluate whether contingent management of the contaminated media is necessary to protect human health and the environment. "

I want to stress that we are in no way trying to interfere with FMF's business or Ecology's job of allocating biosolids across the state in a way that makes sense for everyone.

Wayne, I really empathize with you and your co-workers at Ecology, who have a HUGE RESPONSIBILITY, both to the people of the state, and to protect the environment of the state. I think the Biosolids program has a ways to go, as we adapt to the future, somehow capturing the metals, and the pills, etc... the lead alone, if captured could not only save the environment but be recycled, creating jobs, etc.

The way it stands, "Biosolids" are wildly toxic sewer sludge that has had the water extracted from it with the emphasis on getting the water as clean as possible to comply with the Clean Water Act. To release the same junk back into the environment (minus some of the pathogens that have been mitigated but are still present), where it ends up in the water anyway makes no sense at all, and it if becomes airborne then it probably violates the Clean Air Act, because we are talking about many known toxic compounds, Lead, Mercury, Cadmium, Arsenic, etc...

To take Biosolids the way they are today, which includes toxic industrial waste and "up to 90,000 chemicals compounds", and put it on land is basically a form of pollution. This waste must be

cleaned up in order to protect human health and the environment we depend on to survive as a species. It stands to reason that if they can build a Waste To Energy plant in Airway Heights and make electricity from burning garbage, then there's no doubt you can do the same with Biosolids, and then all of the poisonous compounds could be burned, the pollution trapped through scrubbers, etc.

Again, creating jobs, as this will be an ongoing problem until it is resolved.

As far as land application goes, it seems obvious that unless you remove the toxic compounds, it is not a "beneficial land application".

So the program still has a ways to go to really protect the environment, all of us, and most of all future generations!

I'm reinserting this paragraph here at the end so it doesn't get lost in the shuffle.

If the parcels that will severely impact both Mill and Harker canyons cannot be taken off the site application, I/we the many residents of both Mill and Harker canyons ask that you not allow the site application on Rosman's farm.

Number: 1 Author: COCA461 Subject: Inserted Text Date: 10/31/2017 10:36:00 AM -07'00'
There will not be negative impacts to parcels beyond the property boundary from the beneficial use of biosolids at the site.

It's just not the right place for a site application.

Thank you very much for your time, and help in this matter. We are truly grateful.

Sincerely,

Keith Scott

Bickner, Betty Ann (ECY)

From: Justin McGrewser <mcgrewrsr@gmail.com>
Sent: Sunday, October 30, 2016 8:27 PM
To: Bickner, Betty Ann (ECY)
Subject: Comments to DoE about Roseman Farm application for Biosolids Dumping.

To Betty Bickner;

Comments to DoE about Roseman Farm application for Biosolids Dumping.

I am writing to explain why the Rosman Farm Biosolids Application should be denied.

My name is Justin Mcgrew and I live and work in this canyon farming organic and healthy produce is is my livelihood and my passion. I do not want biosolids poisoning my community or the land surrounding it, it threatens not only my way of life but my very life itself not to mention all the wildlife that also lives here. I dedicate my life to living and practicing healthy and organic standards to provide people with real healthy food to eat so they can have a clean healthy lifestyle as well. I put my heart and soul, my blood, sweat and tears into this place day in and day out itis everything I have and I take pride in living this way. Dumping toxic waste here will destroy everything we have and this should not be allowed to happen ever!!! Please, please do not allow this to happen us, do not poison our community.

Sincerely Justin M. McGrew 1

Summary of Comments on McGrewser-Hannon-Muat emails2.pdf

Page: 1

Number: 1 Author: COCA461 Subject: Inserted Text Date: 10/31/2017 10:38:18 AM -07'00'

There will not be negative impacts beyond the property boundary from the beneficial use of biosolids at the site.

Bickner, Betty Ann (ECY)

From: Than <than.hannon@gmail.com>
Sent: Monday, October 31, 2016 4:04 PM
To: Krafft, Wayne (ECY)
Cc: Bickner, Betty Ann (ECY)
Subject: comments on Rosman bio solid dump

The bio-solids dump on Garry Rosmans' land is criminally insane.
There is no remediation available when the land, our most precious natural resource, is polluted and abused. Air and water are protected and the earth is a valuable part of this cycle we continue to neglect.
Nathaniel Hannon
32295 Mill Canyon Rd[1]

--
play more, live richer

Number: 1 Author: COCA461 Subject: Inserted Text Date: 10/31/2017 10:42:09 AM -07'00'
The conditions in the permit placed on the beneficial use of biosolids at this site will prevent pollution.

Bickner, Betty Ann (ECY)

From: Krafft, Wayne (ECY)
Sent: Monday, October 31, 2016 4:10 PM
To: Bickner, Betty Ann (ECY)
Subject: FW: Biosolids application in Mill Canyon

From: Maggie Muat [mailto:muatmaggie@gmail.com]
Sent: Monday, October 31, 2016 7:22 AM
To: Krafft, Wayne (ECY) <AKRA461@ECY.WA.GOV>
Cc: bbic46@ecy.wa.gov
Subject: Biosolids application in Mill Canyon

Hello,

I am very concerned about the likely problems associated with the application of biosolids on land in the Mill Canyon area per the Rosman Site Application, leading to possible water contamination into local springs and ponds not included in the mapping with permit request.[1]

Please consider carefully all the ramifications on surrounding neighbors before going ahead with the permitting process.

Thank you.

Maggie Muat

Page: 3

Number: 1 Author: COCA461 Subject: Inserted Text Date: 3/27/2017 12:08:43 PM -07'00'
Adequate buffers are in place to prevent water pollution. See Item 5 HG Review.

S. Leigh Ost

P. O. Box 10719
Spokane, WA 99209
Home (509) 725-3007

October 31, 2016

Betty Ann Bickner, Biosolids Coordinator
Department of Ecology
4601 N. Monroe Street
Spokane, WA 99205

RE: Application of Biosolids to Land at Rosman Farms, Lincoln County, Permit No. BT 9902

Dear Ms. Bickner:

This is my second letter regarding the above-referenced land application. I wish to add to the concerns I listed in that first letter.

My primary concern in that my private well is directly below land that may receive these biosolids. It is my extreme concern that the municipal biosolids, being accepted from industrial and municipal sources of unknown origin,[1] probably contain heavy metals, hormones, and viable pathogens harmful to humans, animals, wildlife, and plant life downstream of their application. They are, in essence, poisons, and testimony given in this matter only confirms[2] my fears that this is a significant hazard to my personal health and the health of my land, animals, and neighbors. We have since found out that the soils intended for this application are probably not conducive to receiving biosolids.[3]

As previously stated, my and my neighbors' concerns are for build-up of various chemicals in drinking water aquifers and soils below Mr. Rosman's land, and the deleterious effects of those chemicals on humans consuming the water and on their crops watered from the aquifers. Contents of these municipal biosolids do NOT totally break down into harmless components.[4]

I have since discovered that the owners of Fire Mountain Farms are personal friends of Mr. Rosman, and I believe that this fact is clouding Mr. Rosman's judgment of the efficacy of this application. I believe that this case is far too important to leave in the hands of someone personally involved with the applicator and in the hands of someone whose mandate it is to get rid of this biosolids nuisance.

Again, I question why this application is occurring on land above canyons riddled with natural drainages and heavily peopled downslope with land owners? Topographically, this farm is a poor choice for land application of human waste because of the heavy metals, hormonal contents, and viable pathogens contained in this type of waste. If the farm was on flat land, not located above people's homes and water supplies, there might be less concern. But water supplies and land ***are in jeopardy*** in this situation.[5]

I respectfully request that you take seriously the concerns and testimony presented at the public hearing earlier this month. We are very concerned that Fire Mountain Farms has ***not met the intent of the law***. We believe that they must be required to do so, and that this application be denied.

Sincerely,
Leigh Ost, (509) 725-3007
Cc: Wayne Krafft, DOE

Leigh Ost

Summary of Comments on Ost.pdf

Page: 1

Number: 1 Author: AKRA461 Subject: Inserted Text Date: 10/31/2017 10:46:21 AM -07'00'
The origin of biosolids is not relevant. All biosolids are required to meet the same quality standards before they can be beneficially used.

Number: 2 Author: COCA461 Subject: Inserted Text Date: 10/31/2017 10:50:14 AM -07'00'
See Item 4 Health.

Number: 3 Author: COCA461 Subject: Inserted Text Date: 5/10/2017 1:26:03 PM -07'00'
The maps in the SSLAP Appendix 2 show the exact fields identified for land application and these fields are appropriate for biosolids application.

Number: 4 Author: COCA461 Subject: Inserted Text Date: 10/31/2017 10:52:28 AM -07'00'
Testing identifies if pollutant ceiling concentration limits have been reached. See WAC 173-308-160. Also see Item 5 HG Review.

Number: 5 Author: COCA461 Subject: Inserted Text Date: 3/27/2017 12:13:17 PM -07'00'
See Item 5 HG Review.

Date: June 8 2016

To: Betty Ann Bickner

From: Mary P. Pollard

Having be given notice of the renewal for the permit to place Biosolids on land that is next to our property, the west half portion of section 12 T26N R37 in Lincoln County. I have several concerns and missunderstandings about where they (Biosolids) are being placed and just what are the dangers to our lives due to this placement. How is the process carried out? If it is a place that needs to be quarantined off. These are a few questions that I have but I still have more and would like to ask to be included in any and all public meetings to discus this matter with all involved. Thank you.

Mary P. Pollard

Mary P. Pollard

Summary of Comments on Pollard2.pdf

Page: 1

Number: 1 Author: COCA461 Subject: Inserted Text Date: 10/31/2017 10:54:52 AM -07'00'

A public meeting and hearing was held on October 11, 2016.

Rachael Paschal Osborn attorney at law
P.O. Box 9743, Spokane WA 99209
509-954-5641 / rdpaschal@earthlink.net

October 31, 2016

Wayne Krafft, Section Manager
Waste 2 Resources Program
Department of Ecology, Eastern Regional Office
4601 N. Monroe St.
Spokane, WA 99205

Via e-mail to akra461@ecy.wa.gov and bbic461@ecy.wa.gov

Re: Fire Mountain Farms - Rosman Farms Site Specific Land Application Plan proposal

Mr. Krafft:

This letter is submitted on behalf of Morton Alexander and Ernest Barrett. Mr. Alexander and Mr. Barrett are property owners in the Mill Canyon area of Lincoln County, near the Rosman Farms properties for which biosolids use is proposed. Mr. Alexander maintains an organic orchard. Both are deeply concerned that escape of biosolids materials from the Rosman property will contaminate their lands, water supply, and food. They are joined in their concerns by dozens of others who live in the canyon, many of whom have provided comments on the Fire Mountain Farms-Rosman Farms proposal at the October 11 hearing, or will do so during the written comment period.

It is difficult to understand why, with 2 million acres of rolling wheat fields in eastern Washington, Fire Mountain Farms (FMF) would propose Rosman Farms as a site to apply biosolids. Rosman Farms sits atop a highly erosive rim of the Columbia Plateau where water, soil, and rock routinely course into steep canyons that surround his property, eventually discharging into the Spokane River drainage. This is not a place where the landowner can exercise control over the often harsh elements that act on his property. It *is* a place where activities that occur on the rim above can and do affect people, water, vegetation and wildlife in the incised arroyos below.

Biosolids and their use are heavily regulated. The Department of Ecology has a duty to ensure that entities that wish to alter the environment through application of materials that are known to contain pollutants, even requiring warning signs to keep the public away, do so in a manner that does not harm third parties. This letter is submitted to assist the Department in understanding the issues and threats associated with the FMF-Rosman Farms proposal, and the Department's authorities in addressing those issues and threats. We conclude with a set of requests and recommendations relating to the decision on the proposed permit.

I. Overview of Issues.

As set forth below, Mr. Barrett and Mr. Alexander have numerous concerns. First, the FMF-Rosman Farms biosolids application and associated SEPA checklist lack critical information that is needed to both inform the public and assist the Department, as decision maker, in determining whether it is appropriate

to issue a letter of coverage and if so, what special conditions need to be added to protect the neighboring community. [1]

Second, Rosman Farms contains steep slopes, highly erodible soils and drainage patterns that promote surface water runoff and make the property largely unsuitable to receive biosolids. Crop fallowing and tillage practices combined with the wind erosion that characterizes eastern Washington dryland agriculture will lead to windborne release of biosolids particles into Mill Canyon and beyond. Recent catastrophic flood events in Mill Creek Canyon are evidence of the erosive potential of the farmlands above the canyon. [2]

Third, the escape of biosolids and constituent pollutants off of the Rosman Farms property could cause substantial damage to my clients. At risk are human health, water supplies, organically grown food and organic food certifications, and general ecological health of the Mill Creek and Harker Canyon areas. [3]

Fourth, both Fire Mountain Farms and Rosman Farms have negative track records with respect to compliance with biosolids law. FMF has been the subject of several regulatory orders, issued by the Department, for mixing dangerous waste with biosolids, and was recently denied coverage for some of its application sites in western Washington. B&B Septic has been applying septage to Rosman Farms for several years, and we believe has over-applied that product to fields that drain to Angel Springs. This poor compliance record indicates a need, at minimum, to impose stringent monitoring conditions on any approval of FMF biosolids use, if not outright denial of the request for coverage. Because neither the SSLAP application nor SEPA checklist acknowledged the historic and continuing use of septage on Rosman fields, we are concerned about double application of biosolids. [4]

Fifth, Mr. Alexander and Mr. Barrett have legitimate concerns about the content of biosolids and the dangers they pose to public health and the environment. This concern is exacerbated by the fact that FMF does not know where the biosolids will originate that will be spread on Rosman Farms, or how they will be treated. [5]

Finally, it is important to note that Mr. Alexander and Mr. Barrett attempted to negotiate a new landowner consent form with Mr. Garry Rosman which would have removed certain unsuitable lands from biosolids use and establish buffers to protect neighboring properties. Eventually Mr. Rosman broke off discussions. Had he agreed to my clients' reasonable proposal, we would have avoided the resource expenditures and stress to Mill Canyon residents required to respond to the SSLAP proposal.

II. Procedural Issues.

The biosolids rule requires that all facilities submit a complete and factually correct permit application, and that the site specific land application plan contain all information necessary to determine if the site is appropriate for land application, along with description of how the site will be managed. WAC 173-308-310 (6) and (8)(d), citing Appendices 1 and 3. Minimum content for a permit application includes land application plans, and "any information required to determine the appropriate standards for permitting under this chapter." WAC 173-308-90001(9) and (11). An applicant must supply reasonably adequate information as part of the SEPA checklist. WAC 197-11-100.

Summary of Comments on RO, Alexander-Barrett Comments on FMF-Rosman SSLAP (10-31-16) FINAL.pdf

Page: 2

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 12/29/2016 10:43:57 AM
SEPA and the DNS have been reviewed and it has been determined they were done correctly. See Item 1 SEPA

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 12/29/2016 10:46:19 AM
A major component of the canyon flooding is frozen ground. Biosolids are restricted from being applied to frozen ground. See Item 2 HEL, See Item 3 Erosion.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 11:03:43 AM -07'00'
There is no evidence canyon residences are at risk of loosing Organic Certification. Biosolids will not impact human health or the environment if managed per WAC 173 308. See Item 4 Health

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 11:06:32 AM -07'00'
There is no evidence provided that Rosman Farms has ever been out of compliance with biosolids law. There is no evidence provided that B&B Septic has over-applied septage. Monitoring is in place and FMF will be required to comply with biosolids rule or will be subject to corrective actions.
A request for land application of biosolids must be submitted for approval prior to application. Past biosolids use is a component of the evaluation.
The SSLAP for FMF states under 2.0 Past Biosolids Use "A portion of the farm is permitted for and has received septage".

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 5/15/2017 1:48:04 PM -07'00'
Biosolids have been through treatment prior to testing for land application. Where biosolids come from are not considered an issue as all biosolids are tested for nutrients, pathogens, and pollutants and must meet minimum standards weather Class A or B. If the minimum standards are not met the material is not biosolids and cannot be land applied.

1. Incomplete Documents.

The FMF-Rosman Farms SSLAP[1] and SEPA checklist are incomplete and contain inaccurate information. The SSLAP list of appendices (at p. 15) do not correlate to the provided appendices, some of which are missing. More importantly, the SSLAP application and SEPA checklist are missing important information that is required by the biosolids regulation, general permit and guidance provided on Ecology's Biosolids website. A full list of missing information is described in Appendix A to these comments, and in the two comment letters submitted by Don Hanson.[2]

Important examples of missing information include:

- Lack of any data regarding surface water systems on and adjacent to Rosman Farms property, including seeps and springs downgradient of the property susceptible to contamination from biosolids. 1
- No analysis of historic and continuing application of septage biosolids to the Rosman Farms fields. 2
- Failure to include complete maps regarding local soils, including NRCS maps that indicate that lands in this area are highly erodible. 3
- Lack of information about cropping and tillage practices, including seasonal fallowing that could cause wind erosion of applied biosolids. 4

As required by the biosolids rule, this information should be available to the public to comment on before the permit is approved, not some time in the future after Ecology has approved the SSLAP. This missing and incomplete information makes it impossible to fully review and understand the FMF-Rosman Farms proposals, including elements of vital concern to Mr. Alexander and Mr. Barrett. It also undermines confidence that the applicant is able to engage in the detailed monitoring and recordkeeping requirements of the biosolids rule.

2. Procedural Irregularities.

The existence of multiple versions of the FMF-Rosman Farms SSLAP has been a matter of confusion to my clients and the interested public, and has effectively deprived them of the ability to review and comment on a complete application and checklist, as biosolids and SEPA regulations require.

---

[1] All references to the Rosman Farms property are to Site A. Unless otherwise explicitly stated, all references to the SSLAP are to the 9-23-16 version.

[2] Mr. Hanson submitted two letters on behalf of the Community Committee of Concerned Residents and Landowners in Green Canyon and Mill Canyon. The first letter is dated 9/23/16 and is referred to in these comments as Hanson 1. The second letter is dated 10/25/16 and is referred to herein at Hanson 2. Mr. Hanson's area of expertise is agricultural and biological engineering, he has experience designing waste containment, waste transfer, and waste utilization systems, has carried out and published hydrologic research pertinent to land use and runoff mechanisms, and is familiar with farming practices and soils in the Palouse.

Page: 3

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 11:10:02 AM -07'00'

The seeps and springs down gradient of the property are not on or within 100 feet of the Rosman property. Maps have been updated to show more clearly 100 foot buffers for wells and surface water.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 11:11:01 AM -07'00'

B&B Septic applies septage to two fields on the Rosman Farm. Testing and analysis will be done prior to approval of land application by Fire Mountain Farms. Should pollutant or nutrient levels be in excess, land application of septage or biosolids will be denied.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 5/24/2017 8:41:06 AM -07'00'

Soil maps were included in the SSLAP under 3.0 Maps. Much of Eastern Washington has HEL and an erosion control plan is required. See Item 2 HEL

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 11:17:14 AM -07'00'

Using biosolids has the benefit of improving the water-holding capacity of soil by increasing the organic material, therefore reducing erosion.
Wheat stubble is left in fallow fields as a component of erosion control.
Rosman Farms is contracted with NRCS Conservation Security Program and Conservation Security Program Forrest of which erosion control is a benefit .
Through the FSA Conservation Reserve Program Rosman Farms has in place riparian buffers to preserve water quality and prevent erosion.
Due to HEL identification, biosolids will not be placed on slopes greater than seven percent (7%) without a plan approved by the Dept. of AG.

On October 27, 2016, at an in-person meeting between myself, Morton Alexander, Betty Ann Bickner and Wayne Krafft at Ecology's Spokane office, Ms. Bickner stated that Fire Mountain Farms applied and submitted a SSLAP for the Rosman Farms property in 2014, but that later in the year, received a phone call from the applicant indicating they wished to withdraw or put the application on hold pending the general permit process. This is semi-consistent with a phone call received by Corrina Barrett from Garry Rosman, indicating he was withdrawing the application "as he does not wish to adversely affect his neighbors" (see Ernest Barrett comment letter dated 10/27/16, and attachment), and with Ms. Bickner's statement to Mr. Barrett that his comments on the 2013 SLAPP would be disregarded as irrelevant.[1]

Notwithstanding that FMF and/or Rosman Farms halted the application process via phone call to Ms. Bickner, Ecology did not notify interested parties and continued to process the SEPA checklist and issued a Determination of Nonsignificance (DNS). The DNS was improperly issued given that the application process had been halted.[2]

FMF submitted a new SSLAP dated February 12, 2016 which, as described above, contains numerous inaccuracies and omissions. A particularly significant error was the inclusion of two sections of land, Sections 17 and 20, in the description of property where biosolids were to be applied. Neither FMF nor Mr. Rosman own these two sections, rather they are the sections where Mr. Alexander and Mr. Barrett's properties are located. Needless to say, this inaccurate description of property boundaries was a matter of substantial concern to my clients.[3]

Upon discovery of this error, Ecology apparently directed FMF to submit a new SSLAP. The Sept. 23, 2016 revised SSLAP was posted to the Ecology website and circulated to some of the people on the Interested Parties list. It also contains omissions and errors.

At the October 27 meeting in Ecology's offices, Mr. Alexander and I expressed concerns about the inaccuracies contained in the Sept. 23, 2016 version of the SSLAP. Ms. Bickner responded that she had an April 23, 2016 version of the SSLAP and that both the April and September 2016 versions of the SSLAP comprised the application file.

To recap, the original SSLAP appears to be the version dated 7/16/13. The SSLAP originally posted on the FMF website and circulated to the community on June 23, 2016 as the complete SSLAP is dated 2/12/16. Ms. Bickner has been working from a SSLAP dated 4/23/16. And a revised SSLAP dated 9/23/16 was circulated as a corrected SSLAP and is posted on the Ecology website and identified there as part of the "Documents for public review and comment."[4]

The chaotic and confusing nature of the SSLAP submittals, the stop-and-start nature of the approval process, the lack of public notification as to which SSLAP was appropriate for public comment,[5] and Ecology's use of multiple versions of the FMF-Rosman SSLAPs to find compliance with regulatory requirements (including versions not posted on the website as "documents for public review and comment") is highly irregular. This problem can only be remedied by a re-initiation of an ordered process that apprises all parties of what documents are actually to be reviewed, and ensures that such documents are in fact complete.[6]

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Number: 1 Author: BBIC461 Subject: Inserted Text Date: 2/23/2017 10:56:13 AM
Mr. Barrett's written comments were not disregarded as irrelevant. Mr. Barrett's comments on the 2013 SSLAP were responded to by FMF and Ecology has keep record of both Mr. Barrett's letter and FMF's response.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 3/27/2017 11:56:39 AM -07'00'
Issuing a permit is dependent on issuing a DNS but issuing a DNS is not dependent on a permit.
The SEPA checklist describes a proposed project for which the DNS was issued.
The application process was never halted just temporarily delayed.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 11:25:43 AM -07'00'
During the public meeting on July 11, 2016, a member of the meeting stated the sections 17 & 20 were not Gary Rosmans property. Mr. Rosman confirmed this was correct and said he did not know how the mistake was made. I stated at that time during the meeting the sections would be removed from the land identification portion of the SSLAP. Note: In sections 17 & 20 no fields had ever been proposed for land application. See the map portion of the SSLAP. The section, township, range land description is not a description of property boundaries but a location identifier on a map. Property boundaries for Rosman Farms are identified in the SSLAP with parcel numbers. Field boundaries for land application are identified in the map section of the SSLAP.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 11:44:16 AM -07'00'
When an applicant submits a permit application, Ecology reviews the documents for conformance to requirements. If problems are found we will notify the applicant. A SSLAP can be updated multiple times prior to final approval provided there are no significant environmental changes.

Number: 5 Author: AKRA461 Subject: Inserted Text Date: 10/31/2017 11:46:34 AM -07'00'
The SSLAP dated September 23, 2016 was posted on Ecology's website and identified as part of the documents for public review and comment.

Number: 6 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 11:48:18 AM -07'00'
Ecology posted only one SSLAP for public review on 9/23/2016 with a comment period extended to 10/31/2016.

3. Draft "Permit."

WAC 173-308-310(13)(d) requires public notice "at the time when a draft permit is provided for formal review by the department." It your response to comments, you are to "briefly described any changes that resulted . . . to a permit." WAC 173-308-310(15)(d). There is a "Draft Final Coverage Letter" posted on the Ecology website, but oddly it contains no conditions or special provisions for the Rosman Farms site. Because this draft "permit" is essentially a boilerplate document, we request that, should Ecology decide to extend coverage, a fact sheet be prepared and explicit conditions included to protect the neighboring community from the migration of biosolids onto their properties (as discussed below).[1]

III. Site Specific (Rosman Farms) Concerns

1. Rosman Farm Soils and Erosion Control.

Ecology's website, Biosolids Land Application Site Management discusses the problem of "highly erodible" or HEL soils, as does Ecology's Biosolids Management Guidance, p. 6-2.[3]

According to NRCS maps, most if not all of the Rosman Farms fields consist of Highly Erodible (HEL) soils, however, there is no mention of this in the SSLAP nor mention of the mandatory NRCS farmland conservation plan for Rosman Farms, nor analysis of how application of biosolids will ensure compliance with the conservation plan.

Much of Rosman Farms is unsuitable for application of municipal sewage sludge products. These soils are also susceptible to soil restrictive layers. See Hanson 1, Appendices B, C and D. HEL fields should be excluded from the permit for biosolids use, and an appropriate site specific soils investigation should be undertaken.[2]

Further, the practice of applying nutrients to soils during autumn months is controversial. Rosman Farms soils are particularly susceptible to erosion due to minimal vegetative cover, high soil-water saturation, rain on snow events, soil crusting leading to impermeability, and etc. See Hanson 2, ¶ 2.[3]

The SSLAP gives no clue as to when or how biosolids are to be applied, leading to concern about the pollution potential associated with these seasonal conditions. The SSLAP contains minimal data and no analysis about the erodibility of soils present on Rosman Farms.[4] The SEPA checklist is likewise silent. The "Erosion Control Plan" in Section 12 of the SSLAP, provides one paragraph of boilerplate that is completely inadequate to inform the public and decision makers about the condition of the property. To our knowledge, Mr. Rosman has not consulted with NRCS offices about soil conditions and erosion control.[5]

2. Wind Erosion Potential.

Given the low precipitation rates and need for fallowing associated with dryland wheat cropping in this region, large portions of the Rosman Farms properties will present bare, dry soils for much of the year.

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[3] http://www.ecy.wa.gov/programs/swfa/biosolids/management.html

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Number: 1 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 1:31:35 PM -07'00'

The function of a SSLAP is to contain the facts pertinent to that site. The additional conditions are added to the coverage letter once the application is approved. The conditions in the coverage letter identify items not specified in the application or rule.

Number: 2 Author: AKRA461 Subject: Inserted Text Date: 10/31/2017 1:54:59 PM -07'00'

Only a small portion of one of the fields identified for biosolids application are recommended to not receive municipal sewage sludge without further measures to reduce erosion. Ecology will enforce provisions in the permit on areas that need specific erosion control measures. See Item 2 HEL

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 3/27/2017 12:00:52 PM -07'00'

FMF is not allowed to apply biosolids during frozen ground, snow, or rising waters. Rosman farms leaves stubble in fallow fields to assist in erosion control.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 1:57:04 PM -07'00'

See Item 3 Erosion.

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 1:57:42 PM -07'00'

Rosman Farms follows a Best Management Practice (BMP) which is a signed agreement with the US Dept. of AG. BMP, components include an erosion control plan and periodic inspections.
Rosman Farms is also inspected by the Conservation Security Program where erosion control is a component of the inspection.
Through the Conservation Reserve Program, Rosman Farms has in place riparian buffers to preserve water quality and prevent erosion.

These types of lands are notoriously susceptible to wind erosion. Yet the SSLAP contains no discussion of how cropping and tillage practices will be amended to prevent release of biosolids to the atmosphere, where they will blow onto neighboring properties. Nor does the SSLAP discuss water management to control wind erosion. [1]

3. Surface Water Contamination Potential.

Biosolids application sites must comply with the state Water Pollution Control Act, RCW Ch. 90.48 and the state surface water quality standards, WAC Ch. 173-201A. WAC 173-308-030(4). Fresh water designated uses require protection of both aquatic life, recreation, and human uses of water for water supply, agricultural and stockwater uses. WAC 173-201A-200(1), (2) and (3).

The SSLAP and SEPA checklist contain no information about seasonal and permanent surface and groundwater present on the Rosman Farms property. Standing water during winter and spring months is common on fields in this region, as are seeps and springs. Moreover, headwaters of streams that flow down to Mill and Harker Canyons originate on or flow through the Rosman Farms property (Site A). See Hanson 2, App. A (text and maps). Absent this information it is not possible to design buffers and otherwise condition the permit to apply biosolids to prevent contamination on the property and flowing from the property. [2]

4. Groundwater Contamination Potential.

Biosolids application sites must also comply with the state groundwater quality standards, WAC Ch. 173-200, including the anti-degradation standard. WAC 173-200-030(2)(c). WAC 173-308-030(4). Ecology's Biosolids Land Application Site Management web page states that "Groundwater should be at least two feet below the soil surface, and static or receding before biosolids are applied."[4] [3]

The SSLAP and SEPA checklist assert that there is no groundwater within three feet of the surface of Rosman Farms fields. However, there are numerous surface water seeps, standing water and intermittent streams, as is common in this area. See Hanson 2, ¶6 and App. A (maps). These water bodies can be associated with a seasonally high water table, and should be investigated. This information was not provided in the SLAPP or checklist. [4]

Further, there are numerous seeps and springs on properties downgradient from Rosman Farms, none of which were identified in the SLAPP or checklist. [5]

Wrongly timed application of biosolids has significant potential to contaminate groundwater associated springs, and adversely impact drinking water supply for neighboring residents. [6]

5. Agronomic Rate of Application.

The biosolids rule devotes a section to discussion of agronomic rates, noting its goal in the title as "protecting waters of the state." WAC 173-308-190. Federal rules require that the agronomic rate be

[4] http://www.ecy.wa.gov/programs/swfa/biosolids/management.html.

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Number: 1 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 1:58:19 PM -07'00'

Prior to seeding, Class B biosolids are applied at an agronomic rate (limiting the amount of biosolids applied to the field). Water management is not a component of the SSLAP. See Item 3 Erosion

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 2:05:45 PM -07'00'

Biosolids are applied at an agronomic rate which means at a rate which the plant will uptake nutrients therefore limiting excess nutrients. Buffers are a mechanical barrier which prevent erosion to surface waters. None of the fields identified in the SSLAP will land apply biosolids within the 100' buffer zones for surface waters of the state. Buffers will be placed in areas that will receive biosolids..

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 12/21/2016 1:33:33 PM

The SSLAP states under 11.0 Groundwater Protection Plan "Land application will not occur on any area if groundwater depth is less than three feet from the surface or rising. Test holes will be dug if there is concern that ground water is not greater than three feet."

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 12/29/2016 10:05:29 AM

Surface waters are outside of buffer zones. Seasonally high water tables are addressed in the SSLAP section 11.0

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 2:10:37 PM -07'00'

The seeps and springs are beyond the 100 foot buffer zones and/or off Rosman Property.

Number: 6 Author: BBIC461 Subject: Inserted Text Date: 10/31/2017 2:11:30 PM -07'00'

Biosolids are applied at an agronomic rate limiting the amount of material applied. Biosolids have permit restrictions limiting when they can be applied.

specified for the crops grown and that excess nitrogen not be able to penetrate below the root level of the specified crop in order to ensure that the aquifers are protected. 40 CFR § 503.11.

As an initial matter, we have concerns with the SLAPP proposal (at p. 10) that, if Ecology fails to respond to agronomic rate recommendations within 14 days, they are approved. How does this protect the public interest and accommodate Ecology's chronic understaffing problem? [1]

Of great concern to my clients is that parts of Rosman Farms have already been subject of biosolids application in the form of septage. "Agronomic rate determinations must take into account nitrogen supplied from other sources such as . . . biosolids." WAC 173-308-190(2). Further, the history of biosolids application has to be known and accounted for in order to ensure cumulative limits are not exceeded. 40 CFR § 503.12(b)(1-3). The SSLAP, Section 2, acknowledges septage has been applied, but provides no details. The SEPA checklist contains no information about prior septage use or the pending approval process for continuing septage use. [2] [3]

B&B Septage has been applying septage (a form of biosolids) to Rosman Farms properties since 2007, but Ecology does not know the precise extent of the application by BB Septic. Further, as the errors with the SSLAP property description reveal, discrepancies exist as to where the FMF biosolids would be applied. [4] What safeguards are in place to ensure that there will be inadvertent double application by one or the other of the applicators? [5]

6. Fire Mountain Farms and B&B Septic Track Record

FMF has been the subject of several regulatory orders, issued by your agency, for spreading dangerous waste on farm properties, and has been denied coverage to apply biosolids at properties in eastern Washington (Cowlitz County and PCHB appeals pending). See Att 5. This poor compliance record indicates a need, at minimum, to impose stringent monitoring conditions on any approval of FMF biosolids use, if not outright denial of the request for coverage. WAC 173-308-310(19). [6]

Further, as per Mr. Barrett's comment letter, we believe there has been over-application of septage on steep slopes in an unpermitted section of the Rosman Farms property, leading to polluted runoff in the Angel Springs area, possibly with Mr. Rosman's knowldge. See Ernest Barret comment at pp. 2-3 (10-27-16). [7]

IV. Neighboring Lands Concerns.

"The legislature declares that a program shall be established to . . . ensure that municipal sewage sludge . . . is managed in a manner that minimizes risk to public health and the environment." RCW 70.95J.005(2). "Biosolids must not be applied or allowed to run onto non-permitted areas. . . . Properly designed surface and groundwater buffers protect water quality off-site. . . . When designing property buffers, your objective will be to reduce any nuisance to neighbors and the public." Ecology Biosolids Management Guidelines, Publ. No. 93-80, p. 4-21, -22. "Facilities and sites where biosolids are applied to the land must comply with other applicable federal, state and local laws, regulations, and ordinances . . ." WAC 173-308-030(6). The intentional deposit of microscopic particles could give rise to action for trespass as well of claim of nuisance. Bradley v. American Smelting, 104 Wash.2d 677 (1985).

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Number: 1 Author: AKRA461 Subject: Inserted Text Date: 10/31/2017 2:30:34 PM -07'00'
Ecology enforces the agronomic rate provisions in the permit. A lack of response from Ecology to a agronomic rate recommendation does not relieve Fire Mountain Farms from the provision.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 1:49:02 PM
A different permit, SEPA Checklist was submitted by B&B Septic and a DNS was issued for the septage application.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 6/20/2017 8:29:23 AM -07'00'
Results of soil testing prior to approval of land application is in place to prevent over application of nutrients and pollutants.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 1:50:59 PM
The SSLAP clearly states under Section 6 fields "crop fields include R1-R17 and R2-1". Also the fields are outlined in the Maps Appendix. This information has been consistent. There are no discrepancies.

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 1/6/2017 10:53:21 AM
The field maps identify the proposed fields for land application and the maps have remained the same throughout the application process. The safeguard in place is testing of the soil, a necessary step prior to any land application approval thus preventing over-application.

Number: 6 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 1:53:59 PM
Ecology is not empowered with the authority to deny a request for coverage because of past activity on a different site. Each permit application is judged on it's own merit.

Number: 7 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 1:55:02 PM
The commenter does not provide evidence to support this statement.

1. **Topographic Relationships.**

Rosman Farms wheat fields lie directly above and drain to Green and Mill Canyon, where Mr. Alexander and Mr. Barrett's properties lie, as well as to Harker Canyon. See Hanson 2, App. A (map showing surface water channels). Although the SLAPP contains some maps that show the topographic relationships to the canyons, and the locations of surface waters, the SLAPP and SEPA documents contain no discussion of the potential impacts to neighboring properties that could arise as a result of the forces of weather and gravity. [1]

2. **Water Quality Impacts to Springs.**

Numerous seeps and springs are located downgradient from Rosman Farms, including Turnley Spring, owned by Mr. Alexander, which is located directly below Parcel No. 2638019700000. Mr. Alexander owns a water right on this spring, has installed diversion works, and uses the spring for domestic supply and orchard irrigation. Att. 4. He shares ownership with Deanne Burdine, who also uses the spring for domestic supply and irrigation. These beneficial uses are protected as a matter of both water resources and water quality law. [2] As noted above, the SLAPP and SEPA documents contain no identification or discussion of canyon hydrologic resources that are likely connected to Rosman Farms. [3]

The Turnley Spring has been utilized for drinking water for many decades. Among the comment letters are found discussions of the use of these springs. In addition to Mr. Alexander's personal use, Laura Harris uses the spring for drinking water, and Carla Martinez irrigates her organic herb farm from the spring. Mr. Alexander makes spring water available, at no cost, to a large number of neighboring residents who cannot access a municipal system at their homes and cannot afford to drill a well. Turnley Spring is an important source of clean water in Mill Canyon. [4]

To prevent contamination of drinking water sources Ecology should require as a condition of coverage a hydrogeologic study of groundwater/springs/seeps in the vicinity of and downgradient from Rosman Farms. [5]

3. **Surface Runoff and Flooding.**

The runoff mechanisms that exacerbate the potential for surface water pollution from Rosman Farms are due to farmland having steep slopes, [6] il-surface-freezing that creates a nearly impermeable layer, rain on snow which is frequently combined with Chinook winds that cause flash flooding, potential soil-surface crusting that reduces infiltration capacity, and soils classified as highly erodible leading to tons of sediment yield per acre per year where erosion is not properly controlled. [7] ee Hanson 2, ¶ 2. The headwaters of both Mill Creek and Harker Creek are located on or flow through Rosman Farms property, and are the locus of eroded soils from Rosman Farms. See Hanson 2, App. A (surface water channels originating on and flowing through Rosman Farms property). [8]

The problem is not theoretical. Mill Canyon has been subject to catastrophic flooding, bringing many tons of rock and soil from wheat fields above into the canyon below. In 2014, two 50-year floods washed through the canyon, washing out Mill Canyon Road in numerous places along a 4-mile stretch, and flooding Tolstoy Farm. See Ernest Barrett comments (10-27-16), Laura Harris statement and photographs (10-27-16) (Att. 1), Corrina Barrett comments and photographs (10-27-16).

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Number: 1 Author: BBIC461 Subject: Inserted Text Date: 2/7/2017 2:02:03 PM
Buffers and timing restrictions are in place to protect the canyons which are more than 1/4 mile from any land application site.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 1/6/2017 11:10:25 AM
No water right has been granted on Turnly Springs, a claim has been submitted subject to adjudication. The claim is for domestic use and irrigation of the most western acreage (approximately 3 acres combined) of both the Alexander and Burdine properties which appears to be timber.. There is no provision for community domestic use.
The orchard on the east side of the properties and is not located in the area described in the claim. See Item 6 Water Rights

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 12/21/2016 3:43:51 PM
The distance between the proposed biosolids application areas and Turnly Springs is greater that 1,000ft and well exceeds the 100 foot buffer imposed by the permit.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 1/6/2017 11:11:01 AM
Stated in a previous comment: No water right has been granted on Turnly Springs, a claim has been submitted for domestic use and irrigation of the most western acreage (approximately 3 acres combined) of both the Alexander and Burdine properties which appears to be timber.. There is no provision for community domestic use.
The orchard is not located in the area described in the claim and is
on the east side of the property. See Item 6 Water Rights

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 1/5/2017 10:36:16 AM
See Item 5 HG Review

Number: 6 Author: BBIC461 Subject: Inserted Text Date: 1/6/2017 11:15:50 AM
The majority of the fields sited for land application have less than 7% slopes. And none exceeds 15% slopes.

Number: 7 Author: BBIC461 Subject: Inserted Text Date: 2/7/2017 2:08:22 PM
Rosman Farms has erosion control plans in place.

Number: 8 Author: BBIC461 Subject: Inserted Text Date: 2/7/2017 2:07:37 PM
Waters of the State are on property owned by Mr. Rosman but are outside of the fields identified in the SSLAP for land application with timing restrictions and buffers identified.

Video of the March 5, 2014 flood can be viewed at https://www.youtube.com/watch?v=FEeeXQHBfWk.

Ms. Barrett puts it succinctly: "Flooding is most intense in the canyon when the ground is frozen and the water cannot soak in. It rushes across the surface in sheets, taking topsoil and rolling boulders. Any biosolids near the surface in fields that drain to the canyon would surely be carried down into the canyon waterways during flooding." The statement of Laura Harris (Att. 1) confirm these conditions were present during the March 2014 flood. The Barrett and Harris photographs show the tremendous damage done to Mill Canyon, the road, the creek system and their property as a result.

Catastrophic flooding and erosion from Rosman's property holds great potential to transfer biosolids into Mill and Harker Canyons. Yet the SLAPP and SEPA documents are silent on this matter. The potential for migration and deposition of biosolids into Mill and Harker Canyons must be evaluated and provided for in the decision on the SLAPP.[1]

4. Aerial Deposition.

It is common knowledge that in this region windy conditions lead to erosion of soils and airborne deposition of those soils and any products contained within them on sites beyond the farms where they originate. The problem is documented on Ecology's "Outdoor Dust" website, noting that "Most dust storms happen in the spring or fall, because of a combination of high winds, dry weather conditions, and uncovered fields," and that windblown dust is the result of "tilled, harvested and fallowed farm fields."[5]

Windblown dust is a public health issue because of the danger of inhaling small particulate matter.[6] As Ecology's website notes, groups at the highest risk include "infants, children, teens, the elderly, and pregnant women" and "healthy adults working or exercising outdoors (for example, agricultural workers . . .)."[7] This problem will only be exacerbated when the windblown particulates include biosolids containing § 503 and other pollutants.

This is a particular concern when Rosman Farms discs and fallows its fields during high-wind seasons.[2] As discussed above, most of Rosman Farms fields consist of highly erodible (HEL) soils. Rosman cultivates wheat that requires seasonal fallowing, periodically completely exposing HEL soils that contribute to windblown dust in the locality.[3]

As set forth in the statements of Mill Canyon residents, dust and soil from the fields above Mill Canyon, including Rosman Farms, falls into Mills Canyon. As noted in the statement of Timothy Pellow of Tolstoy Farms, "There are many days every summer when the weather prediction is "blowing dust" and the air

[5] WA Department of Ecology, "Outdoor Dust," website at www.ecy.wa.gov/programs/air/other/Windblown_dust_information.htm. Dust storms can be extreme, as occurred on August 12, 2014 near Harrington, WA. See Seattle Times, "Dramatic Dust Storm Precedes Rain in Eastern Washington" (Aug.13, 2014) http://blogs.seattletimes.com/today/2014/08/dramatic-dust-storm-precedes-rain-in-eastern-washington/.

[6] WA Department of Ecology, "Windblown Dust" FAQ, Publ. No. 04-02-009 (Rev. April 2012) at https://fortress.wa.gov/ecy/publications/documents/0402009.pdf;

[7] "Outdoor Dust," supra.

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Number: 1 Author: BBIC461 Subject: Inserted Text Date: 2/7/2017 2:11:26 PM
Biosolids cannot be land applied during snow, rising ground water or on frozen ground. See Item 3 Erosion

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 1/5/2017 10:46:22 AM
Mr. Rosman leaves stubble in fallow fields per BMP.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 2/7/2017 2:13:30 PM
See Item 2 HEL

is thick with dust from the cultivated fields of the farms surrounding us." Att. 2. As noted by Carla Martinez of Perianth Herbs, blowing dust is deposited on the plants and soils which are being cultivated pursuant to organic certification requirements. Tolstoy Farms depends on its organic certification to maintain its business. Biosolids in the air and floodwaters threatens their ability to maintain their livelihood and feed their families. [1]

Further, canyon residents must breathe the dust coming from Rosman Farms, and even absent pollutant concentrations, breathing particulates is not healthy. Dust that contains biosolids particles poses exceptional risks to people who are forced to breathe it during uncontrollable wind events. [2]

5. Impacts to the Community

Mill Canyon is home to a number of organic farmers and farms, including Tolstoy Farms and Perianth Herbs. Several representatives of the community testified at the October 11 hearing. Timothy Pellow and Stash Jackowski, representing certified organic grower Tolstoy Farms, describe their business concerns relating to the impacts of biosolids migration from Rosman Farms. Att. 2 and 3. Carla Martinez discusses her concerns relating to Perianth Herbs, for which she is currently seeking organic certification.

The U.S. Department of Agriculture's National Organic Program informs certified farms that "As an organic farmer, you are responsible for all materials applied to your fields, *even when you do not apply those materials yourself.* Organic crops can be contaminated through residues in spray equipment, drift from nearby fields, accidental sprays, or mistakes made by employees."[8]

Mr. Pellow explains the importance of maintaining a healthy, uncontaminated environment:

> For decades before certification the community in which our farm resided eschewed the use of agricultural chemicals, utilizing methods to build up the health of the soils, increasing their biomass and microfauna activity, while minimizing chemical exposure and toxic buildup. This focused attention and commitment to healthy organic land stewardship is what draws our customers to us, what makes our business thrive. Our hundreds of families in Spokane area and dozens in the Davenport area who consume our produce do so for the security this knowledge provides. It is important to them, and it is personally important to us, that our soils and food not be contaminated by us, and, as much as we have control over it, by the actions of others.

Ecology has statutory duties to ensure that biosolids and their constituent pollutants do not flow, erode, drift or blow into Mill Canyon and thereby threaten the commercial success of the farms located there. Given the difficulty in controlling wind and flood borne contamination, it is appropriate for FMF-Rosman Farms permit coverage to be denied. [3]

[8] US Dept. of Agriculture, Guide for Organic Crop Producers (Nov. 2012) (emphasis added) at https://www.ams.usda.gov/sites/default/files/media/GuideForOrganicCropProducers.pdf.

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Number: 1 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 3:35:32 PM
Ecology finds no evidence the canyon residents are in danger of losing the Organic Certification due to Rosman Farms biosolids application.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 3:37:14 PM
Ecology finds no evidence the beneficial use of biosolids at this site poses a health threat to the public. See Item 4 Health, See Item 3 Erosion.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 3:42:10 PM
Dept. of Ag stated the area is safe from being denied Organic Certification due to biosolids being used on Rosman Farms.

6. Ecological Concerns.

Mill Canyon is home to a diverse ecological community, and is considered a birders paradise.[9] The importation of toxic chemicals can be as or more damaging to the animals that depend on canyon vegetation. In fact, the SEPA checklist appears to contemplate wildlife feeding on biosolids-tainted grains where it states that "the application of biosolids to farm land will increase feed availability for wildlife." SEPA Checklist at p. 10. At what point does the accumulation of toxic chemicals and pollutants in the environment achieve a threshold that the Department considers unacceptable? 1

Hundreds of millions of dollars are being spent to remove pollutants from wastewater entering the Spokane River. Rosman Farms drains to the Spokane River, and biosolids runoff will end up contributing to the problem of municipal wastewater contamination, rather than the solution. 2

V. Biosolids General Concerns

1. Untreated Pollutants.

Biosolids consist of processed municipal sewage sludge, which contains industrial products that are minimally treated before discharge into sewer systems. While municipal sewage treatment technologies have improved, they are not perfect. A number of contaminants are known to escape monitoring, filtration and treatment in the municipal sewage process. These include persistent bioaccumulative toxins (such as PCBs), emerging contaminants (such as pharmaceuticals and personal care products), pathogens (such as MRSA), and most recently discovered, micro-plastics. In addition, thousands of chemicals are available for consumer use that are not regulated or tested for in municipal sludge.

We concur in the comments regarding the dangers posed by biosolids provided by Sierra Club Washington State Chapter and reiterate a statement made by Prof. Carolyn Snyder, set forth in the attachment to the Sierra Club comments:

> Land application of sludge is wrought with uncertainties. Experts estimate that sludge generated in industrialized urban centers -- and most land-applied sludge is generated in these areas -- contains not only pathogens and toxic metals, but thousands of anthropogenic chemical compounds for which there are not even basic toxicity data. ... Pathogens are evolving and becoming more virulent.
>
> Land-applied municipal sewage sludge (bio-solids) is a highly complex and unpredictable mixture of biological and chemical pollutants. Most of the 90,000 man-made chemical compounds in commerce today--with 1,000 new ones added annually--end up in sewage, and many of those, concentrate in the resulting bio-solids. They include carcinogens, mutagens, neurotoxins, endocrine disrupters, solvents, pharmaceuticals, radioactive waste, leachates from landfills and superfund sites, as well

[9] Mill Canyon bird sitings are listed here:
https://www.birdingbuddies.com/birds/location/united_states/washington/mill_canyon_lincoln_county/

Page: 11

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 3:45:20 PM
Pollutant limits are in WAC 173-308-160. Land application of biosolids will be denied should the proposed application exceed the limits.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 3:46:14 PM
Buffers are in place and biosolids will not reach the Spokane River. See Item 5 HG.

> as disease causing and antibiotic resistant pathogens. Upgrading and building improved treatment plants that will remove more pollutants from sewage, will cause sludge to become even more contaminated. Bio-solids generated in our large industrialized urban centers -- and 84% of land applied sludge originates in those centers -- is very likely the most pollutant rich waste mixture of the 21st century. [1]

As noted in Tim Pellow's statement (Att. 2), biosolids may not be used for organic crops. Mr. Pellow explains:

> Organic regulations under the National Organic Program (NOP) preclude the use of sewage sludge (biosolids) in any form. This is due to the admixture which makes up municipal sludge, which includes: actual human waste products, which are oftentimes contaminated with synthetic drug residues; whatever else gets dumped down residential drains, including household chemicals, synthetic drugs, and many other unsafe products; industrial waste; and road runoff, which includes oil, antifreeze, gasoline dripped or spilled from automobiles and home mechanics; chemicals released through asphalt degradation; animal wastes and carcasses; and yard, garden, and farm agricultural chemical runoff. The chemical residues and other toxic contaminants in sewage sludge (biosolids) caused the NOP to ban its usage in organic certified systems.

As reported by Puget Consumer Co-op's Sound Consumer:[10]

> In 2008 scientists from the U.S. Geological Survey and Colorado State University found that earthworms in soil plots amended with biosolids had bioaccumulated multiple human-manufactured compounds, including: disinfectants, anti-foaming agents and flame retardants, antibiotics, synthetic fragrances, detergents and pesticides, as well as other chemicals "reflecting a wide range of physicochemical properties" (Environmental Science & Technology, Feb. 20, 2008). Some of the same compounds were found in earthworms living in soils treated with animal manure.
>
> In 2006 scientists from Eastern Washington University and the U.S. Geological Survey's National Water Quality Laboratory found a total of 87 different human-manufactured compounds in biosolids originating from wastewater treatment plants in seven U.S. states. The researchers described biosolids as a "potentially ubiquitous nonpoint source" of "contaminants" in the environment (Environmental Science and Technology, Sept. 13, 2006).
>
> "A minimum of 30 and a maximum of 45 [wastewater contaminants] were detected in any one biosolid," the scientists noted.
>
> EPA's 2009 Targeted National Sewage Sludge Survey Report found 28 metals in every biosolids sample from 74 randomly selected water treatment plants in 35 states. The

[10] Joel Preston Smith, Sound Consumer, "Biosolids Hit the Fan," (March 2012) at http://www.pccnaturalmarkets.com/sc/1203/biosolids_hit_the_fan.html.

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Number: 1 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 3:50:54 PM

There is existing and ongoing research for emerging contaminants and the the data consistently shows the contaminant levels in biosolids do not pose a threat to public health. See Item 4 Health

samples, collected in 2006 and 2007, also contained 72 pharmaceuticals, 25 steroids and hormones, flame retardants, and a variety of "semi-volatile organics and polycyclic aromatic hydrocarbons."

It is wrong to assert or assume with any degree of certainty that biosolids are safe and will not contaminate the environment and harm people and wildlife. [1]

2. Unknowns of Biosolids.

FMF is not forthcoming in how, if at all the Class B biosolids will be treated. Under 40 CFR § 503.12, FMF is required to know the history of application, the totals of § 503 pollutants that have accumulated in Rosman Farms soils, and how their application of biosolids will increase those pollutants. [2] This information deficit impedes the public's ability to effectively comment and Ecology's ability to effectively review the permit application. How will third parties who are potentially affected be able to know of, comment on and react to future data regarding biosolids proposed for application to Rosman Farms? [3]

This concern is compounded by the imbalance between the number of wastewater plants seeking to divest themselves of their biosolids versus the number of farms willing to accept biosolids. In reality, biosolids are not being accepted in the food-growing sector. [4] e uncertainties and risks are too high. This places enormous pressure on Ecology's Waste 2 Resources program to allow application of biosolids even where and when conditions are inappropriate. See Att. 2 (Pellow statement, p. 2). [5]

3. Impacts on Grain Markets.

There is widespread concern about the use of biosolids on food crops. The Department of Ecology recognizes this problem at the generic level. "Some food processors have refused to accept crops grown on land amended with biosolids." Ecology Biosolids Management Guidelines, p. 4-23. How will the mixing of Rosman Farms' biosolids-tainted crops in regional grain storage facilities affect the market for those crops? The SLAPP and SEPA documents are silent about this important potential consequence of biosolids use on Rosman Farms. [6]

VI. Request for Relief.

1. **Permit Denial is Appropriate.** We ask that the Department of Ecology disapprove the FMF-Rosman Farms SSLAP and deny a permit for coverage because both the SSLAP and the associated SEPA checklist provide incomplete and inaccurate information, in violation of WAC 173-308-310(8)(d), Appendix 3, which specify minimum content for the site specific land application plans. [7] We request that the SEPA DNS be withdrawn due to procedural irregularities in the timing and public notification involved with processing of the FMF-Rosman Farms application. [8] We further request that Ecology disapprove the SSLAP and deny permit coverage because of the inappropriate nature of the proposed application site, and the danger posed to neighboring properties and commercial interests. [9]

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Number: 1 Author: AKRA461 Subject: Inserted Text Date: 11/15/2017 3:53:50 PM
See Item 4 Health.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 5/15/2017 2:38:00 PM -07'00'
The history, sampling and test results are reviewed at the time of the land application request and prior to approval.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 4:00:06 PM
Land is posted for each land application event. Soil and biosolids are tested prior to land application. This information is part of the public record and available for review by request from The Dept. of Ecology.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 4:03:13 PM
Biosolids are frequently land applied on fields used to grow food crops. The rule provides conditions for the beneficial use of biosolids where food crops are involved.

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 4:09:39 PM
Sewage sludge not meeting the regulatory criteria are not classified as biosolids and must be sent for further treatment or be disposed of in a landfill or incinerator. WAC 173-308 and the General Permit for Biosolids Management prohibit the application of biosolids where and when conditions are inappropriate.

Number: 6 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 4:20:31 PM
Potential market impacts of the grain grown on the site are not under Ecology's jurisdiction and not a component of the permit process.

Number: 7 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 4:24:03 PM
Ecology has reviewed the SEPA checklist and SSLAP for completeness and conformance with WAC 173-308.

Number: 8 Author: BBIC461 Subject: Inserted Text Date: 12/28/2016 11:54:35 AM

Author: BBIC461 Subject: Sticky Note Date: 11/15/2017 4:25:24 PM
The DNS is independent from the review of the Biosolids application. The SEPA Checklist has been review by the states attorney and he deemed the checklist appropriate for the location. No procedural irregularities have been identified for the SEPA process. See Item 1 SEPA.

Number: 9 Author: BBIC461 Subject: Inserted Text Date: 12/28/2016 11:52:29 AM

Author: BBIC461 Subject: Sticky Note Date: 11/15/2017 4:35:56 PM
Ecology finds the proposed sites are appropriate in nature and do not pose a threat to neighboring properties or commercial interest.

2. **Issuance of a Fact Sheet.** If Ecology chooses to approve the Rosman Farms application, we request that Ecology prepare a fact sheet on the basis that this permit "is the subject of widespread public interest" and "raises major issues." We request that the fact sheet be sent to myself, Mr. Alexander, Mr. Barrett and all other persons on the interested parties list. WAC 173-308-310(17).[1]

3. **Request for Special Conditions.** If Ecology chooses to approve the Rosman Farms application, we request that the following additional and more stringent conditions be imposed on the approval. Special conditions are appropriate to protect the public health and environment. Special conditions are also appropriate when an applier or landowner fails to conform to applicable requirements of the biosolids rule and general permit. WAC 173-308-310(19).[2]

   a. Site specific soils investigation and continuing soils evaluation, including of sediment deposits and baseline pollutant concentrations. See Hansen 2, ¶¶ 9-10.[3]
   b. Baseline inventory of current status of natural resources on-site and in surrounding area that could be affected, including soils and ground and surface (spring) water testing.[4]
   c. Biosolids pollutant monitoring, including appropriate independent testing and monitoring.[5]
   d. Groundwater quality evaluation program and monitoring program. See WAC 173-200-080 and WAC 173-308-190(6).[6]
   e. Notification regarding biosolids use, including enforceable stipulation regarding conflicts with neighbor activities.[7]
   f. Public access to monitoring and testing records and data.[8]
   g. Conditions to ensure protection during extreme weather events and prevent water and windborne erosion of soils and sediments that may contain biosolids.[9]

Sincerely,

Rachael P Osborn

Rachael Paschal Osborn
Attorney for Morton Alexander and Ernest Barrett

CC: Rob Duff, Office of Governor Jay Inslee
Dan Opalski, Director, Office of Water & Watersheds, U.S. EPA, Region 10

Appendices

Appendix A SSLAP application deficiencies

Attachments

Att. 1 Laura Harris statement and photographs of March 2014 flood (10-31-16)
Att. 2 Statement of Timothy Pellow, Tolstoy Farms (10-30-16)
Att. 3 Statement of Stash Jackowski, Tolstoy Farms (10-30-16)
Att. 4 Morton Alexander Water Right Claim No. 038829 (10-30-73)
Att. 5 Fire Mountain Farms Enforcement Documents

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Number: 1 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 4:39:09 PM
Ecology does not plan to prepare a fact sheet. All interested parties will be informed when the SSLAP is approved and posted.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 1/6/2017 12:52:11 PM

Author: BBIC461 Subject: Sticky Note Date: 1/6/2017 1:04:38 PM
If a condition has already been addressed the SSLAP it will not be addressed as a special condition in the coverage letter.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 12/28/2016 11:38:58 AM
Soil sampling is outlined in the SSLAP and will include baseline pollutant sampling. Also soil samples are to be taken prior to subsequent applications.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 4:43:29 PM
Surface (spring) water is well outside of the buffer areas where biosolids are to be applied.

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 4:44:41 PM
All biosolid pollutant testing is conducted by an independent lab accredited for testing biosolids. Monitoring is performed by Ecology.

Number: 6 Author: BBIC461 Subject: Inserted Text Date: 2/7/2017 2:43:37 PM
There are no indicators to require ground water testing and monitoring.
See Item 5 HG Review.

Number: 7 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 4:46:39 PM
A notice is posted on the land where biosolids are to be applied and will remain for a minimum of 30 days after the last application. No enforceable stipulation will be included regarding neighbor activities.

Number: 8 Author: BBIC461 Subject: Inserted Text Date: 12/29/2016 10:17:12 AM
Any and all information received from an outside source or created by ecology is available to anyone through the public disclosure process.

Number: 9 Author: BBIC461 Subject: Inserted Text Date: 11/15/2017 4:47:52 PM
A stipulation in the SSLAP prevents biosolids from being applied during frozen ground, snow, rising water or high wind events.

Appendix A –Deficiencies in FMF-Rosman Farms SSLAP and SEPA Checklist

1. Lack of Access to Full Application. The 9-23-16 version of the SSLAP application lacks several of the appendices cited in the list of appendices at p.15. [1]

2. Application Form. The application form is blank with respect to discussion of pathogen reduction. [2]

3. Permit and SSLAP Incomplete and Inaccurate Information
   a. Biosolids monitoring data as per WAC 173-308-90001(7) and (10), [3] and WAC 173-308-90003(1), [4] (relating to B&B septage application to properties identified for FMF biosolids application).
   b. Surface Waters. The largest omission in the application is the failure to map and discuss potential impacts to local seeps, springs and streams that are on properties adjacent to and downgradient from Rosman Farms, and that have high potential to be impacted when runoff occurs. This omission makes it impossible for the applicant to comply with the state Water Pollution Control Act, RCW 90.48 and associated water quality standards, WAC Chs. 173-200 and 201A. See also WAC 173-308-90003, App. 3, Section 9(k). [5]
   c. Septage. At p. 3, SSLAP states no septage has been applied to the "Level Road" lands, i.e., the parcels of concern to the neighbors. [6] We believe this is incorrect. SSLAP, p. 4, Section 2.0 states that a portion of the farm has received septage, but not biosolids, but does not provide further detail. Per WAC 173-308-005, septage and biosolids are to be treated the same in site specific land applications. The SSLAP fails to provide specific information about past septage usage required in WAC 173-308-90003(1). [7]
   d. Crop data. Incomplete information about crops to be grown and end use. See 173-308-90003(2). [8]
   e. Seasonal/Daily Timing of Biosolids Use. Section 4.0 (p. 5) of the SSLAP explicitly declines to provide detail as to when biosolids will be applied and requests "no limitations" [9] on timing. WAC 173-308-90003(5).
   f. Groundwater Protection Plan. Section 11 of the SSLAP (p. 13) asserts that there is no groundwater within 3 feet of surface. We believe this is inaccurate description of the property. WAC 173-308-90003(10). [10] See Hanson 2d Comments, App. A, Permanent and Intermittent Surface Water Channels.
   g. Erosion Control Plan. Section 12 of the SSLAP (p. 13) fails to mention Highly Erodible Soils (HEL) maps indicating much of the property is not suitable for biosolids application. [11] See Hanson comments, p. 2, paragraph 3 and Appendix B.
   h. Municipal Sewage Sludge Maps. The SSLAP fails to reference or discuss NRCS map showing that most of the lands proposed for biosolids application are unsuitable. [12] See Hanson Comments, pp. 2-3, para. 4 and Appendix C.
   i. Appendix 3, Maps. Overall, the maps do not provide sufficient detail to understand precisely where biosolids are proposed for use. More specific topographic maps should be utilized, particularly given the topography of the area, in which Rosman Farms fields sit atop steep slopes that drain to seeps, springs, wetlands and canyon streams. [13] See Hanson comments,

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Number: 1 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 1:22:55 PM
The table of contents for the Appendices was incorrect but all Appendix were included.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 3:39:53 PM
This statement has been added to the SSLAP. "Documenting that biosolids meet the standards for land application in WAC 173-308 is performed by the biosolids generator and analyzed by a state certified lab. A sampling and analysis plan detailing the procedures for the collection of biosolids samples and the analyses must be approved by Ecology prior to land application. The pathogen reduction requirement for biosolids received at the site shall be met by one of the alternatives listed in WAC 173-308-170 (5) through (7)."

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 4:20:38 PM
This information is found in the B&B Septic Reports and Operations file.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 4:20:02 PM
No data was provided because no biosolids containing pollutants in excess of of the values in WAC 173-308-160 Table 3 have been identified.

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 10:23:35 AM
See Item 5 HG Review

Number: 6 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 11:47:51 AM
This statement has been removed from the SSLAP.

Number: 7 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 4:19:38 PM
No data was provided because no biosolids containing pollutants in excess of of the values in WAC 173-308-160 Table 3 have been identified.

Number: 8 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 2:15:32 PM
Crops are identified as wheat or small grains in the table titled Field Acreage found on page 5 of the SSLAP. End use has been added to the SSLAP.

Number: 9 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 2:19:11 PM
Section 4.0 has been updated and "no limitations" has been removed.

Number: 10 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 3:15:31 PM
Section 11 has been updated to read Land application will not occur on any area if groundwater depth is less than 3 feet.

Number: 11 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 12:20:18 PM
Rosman Farms has an erosion control plan with NRCS and FSA for all the fields proposed. A signed contract for HELC is on file with US Dept. of Agriculture. See Item 2 HEL and Item 3 Erosion

Number: 12 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 3:32:35 PM
All fields proposed for land application are existing tillable farm fields with slopes less than 15% and most less than 7%.

Number: 13 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 3:29:10 PM
The field maps in Appendix 2 are named listing acres and outlined showing areas intended for biosolids application and topographic maps have been updated

Appendix A, for examples of appropriate maps. WAC 173-308-90003(9) (requiring maps of appropriate scale and detail).

j. Appendix 1, Landowner Agreement, SSLAP p. 17. The Landowner Consent Form does not indicate exclusion from biosolids use of designated CRP, Timberlands, and Badlands on the Rosman Farms site. [1]

k. Listed species and critical habitat. SSLAP, p. 3 indicates Lincoln County species are listed in Appendix 7, but that Appendix is not included with the application. ESA candidate and listed species in the area include Greater sage-grouse, Washington ground squirrel, Yellow-billed Cuckoo, Bull Trout, Spalding's Catchfly and Pygmy Rabbit. [2]

4. SEPA Checklist and DNS (dated 4-15-15) has several inaccuracies. [3]
   a. Failure to acknowledge that provisional coverage for septage and a new application are pending for same Rosman Farms fields as proposed in the SSLAP application.
   b. Potential for wind erosion to cause biosolids to spread to neighboring properties and pollute waterways.
   c. Potential for high precipitation and rain-on-snow events to cause biosolids to spread to neighboring properties and pollute waterways, including via catastrophic floods.
   d. Impact of inclusion of biosolids crops on wheat storage and marketing.

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Number: 1 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 3:21:45 PM
Section 6 identifies the fields proposed for land application which are R-1 to R-17 and R2-1. CRP, Badlands, and Timber are not proposed for land application in this SSLAP.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 3:25:55 PM
This information has been removed from the SSLAP and was addressed in the SEPA Checklist. See Item 1 SEPA.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 11/16/2017 3:36:11 PM
See SEPA Item 1.

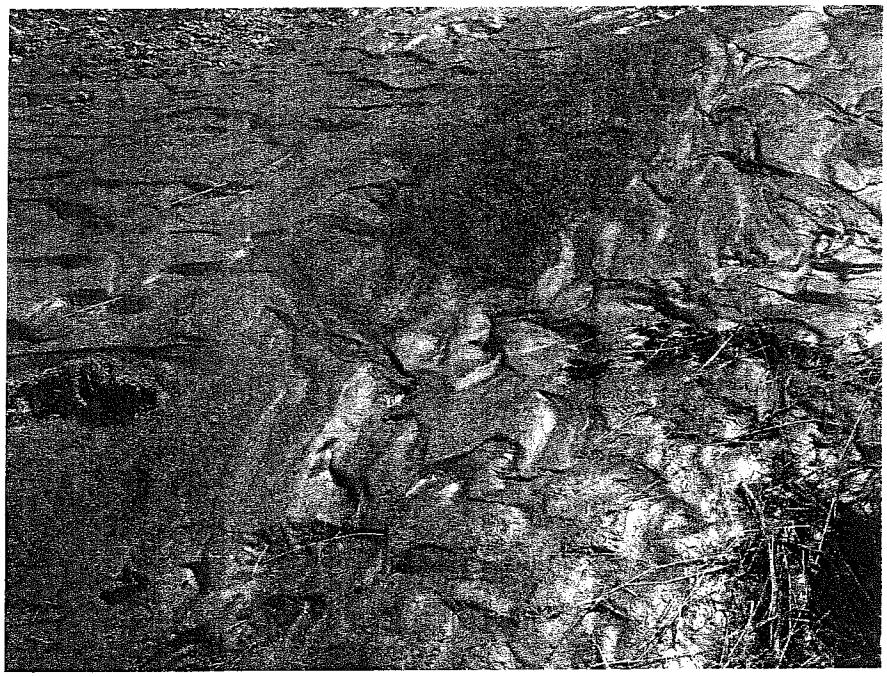
Statement of Laura Harris re March 2014 Mill Canyon Flood
October 27, 2016

We had a meeting with the Lincoln County Road Works about the flood. They did admit that it was a 50 year cycle, but no one could remember one that bad.

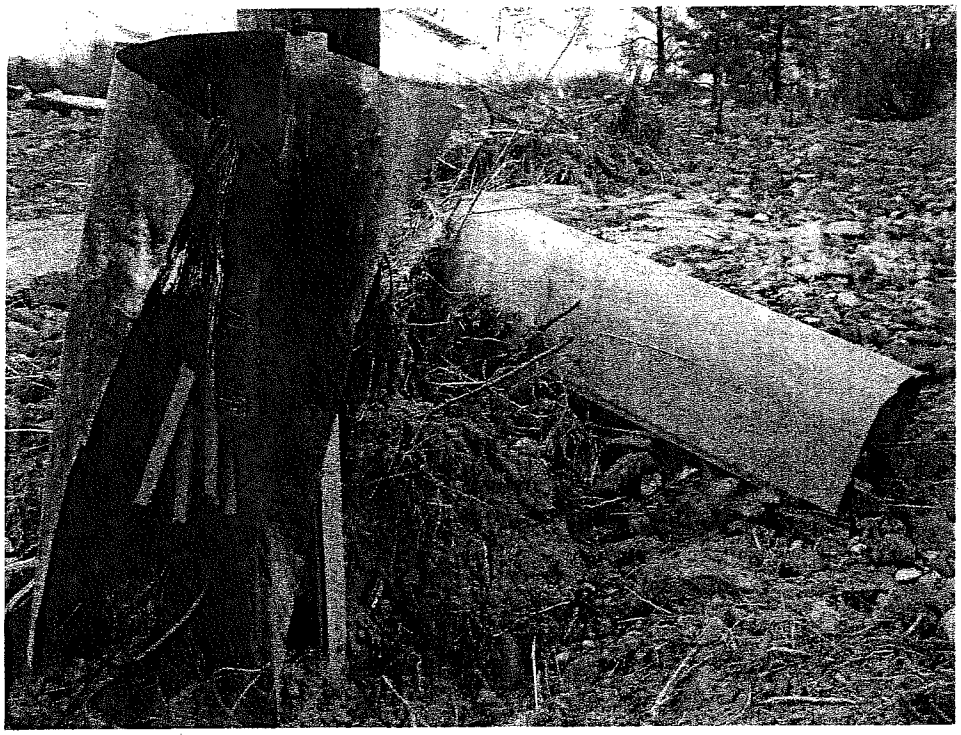
The actual conditions precipitating the flood was a winter with little snow fall and the ground frozen down deep. Then a sudden snow fall of 6" that melted immediately in the warm morning and all of it ran off, the ground being totally unable to absorb it. As the snow melted it started raining, and continued to rain causing the flood to increase. It flooded on and off for several days as the temps changed and snow pockets melted.

The following are photos I took during and after the flood to document the movement of water and sediment in and around my farm.

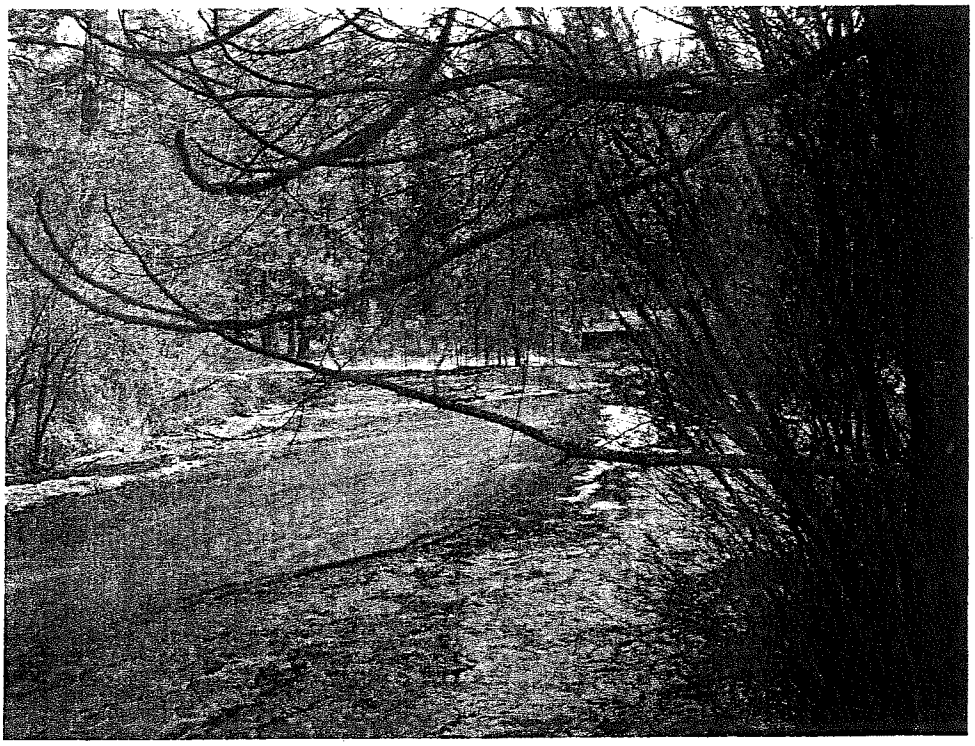
Creek flowing over Mill Canyon Rd.



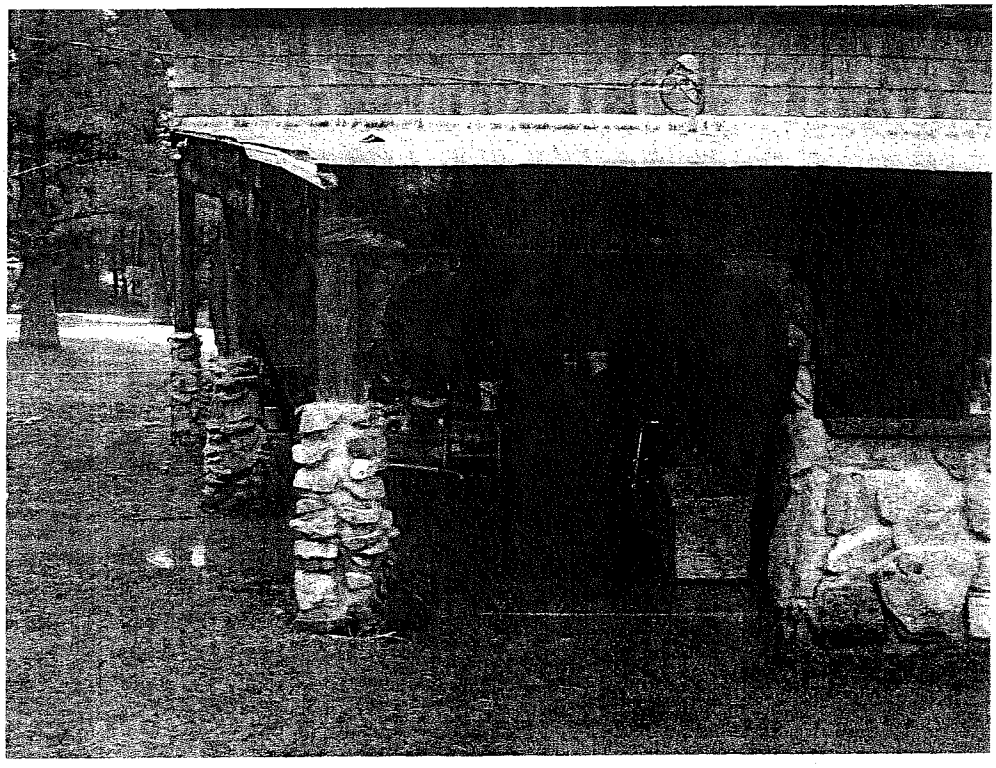
Sediment deposit after the flood.



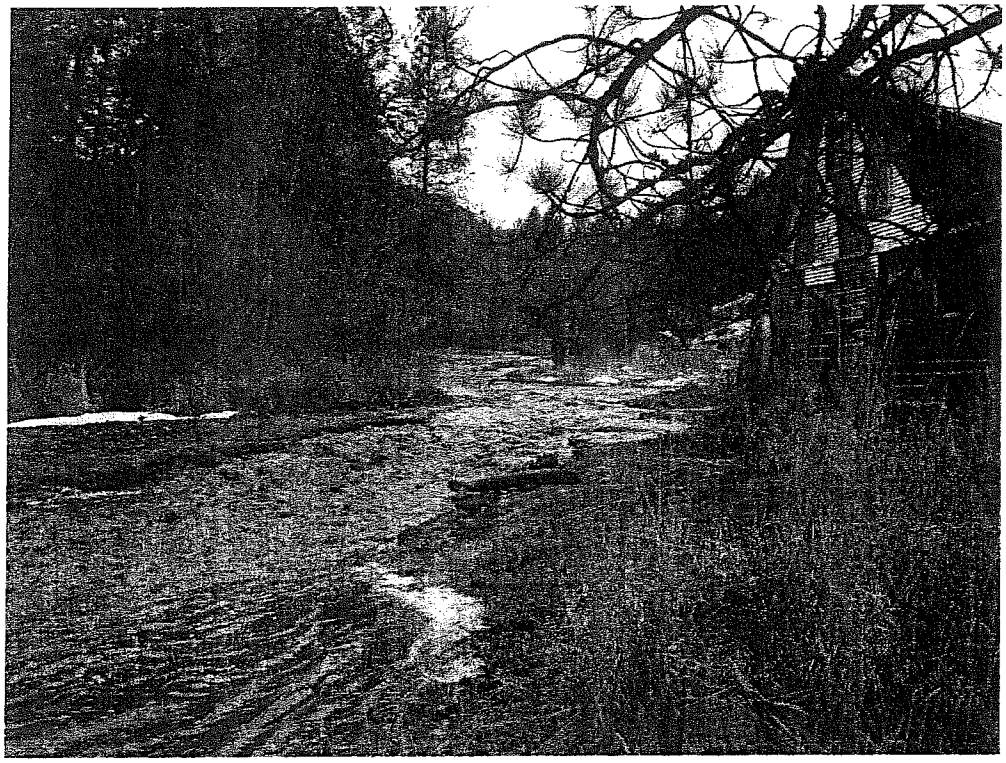
Three miles down Mill Canyon Rd. Flooded phone box.



Culvert breach beyond second breach.

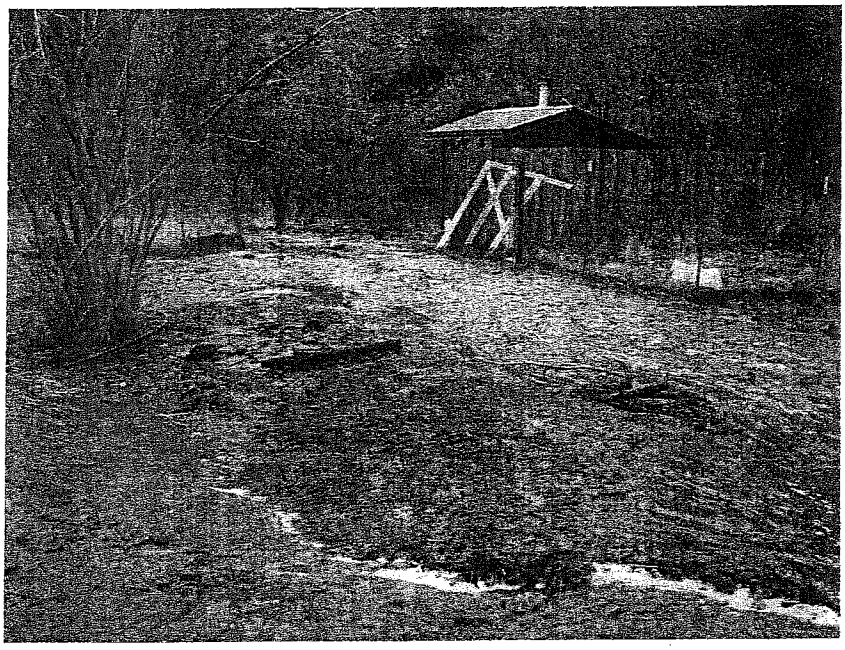


Deanne Burdine's house, post-flood sediment in yard.

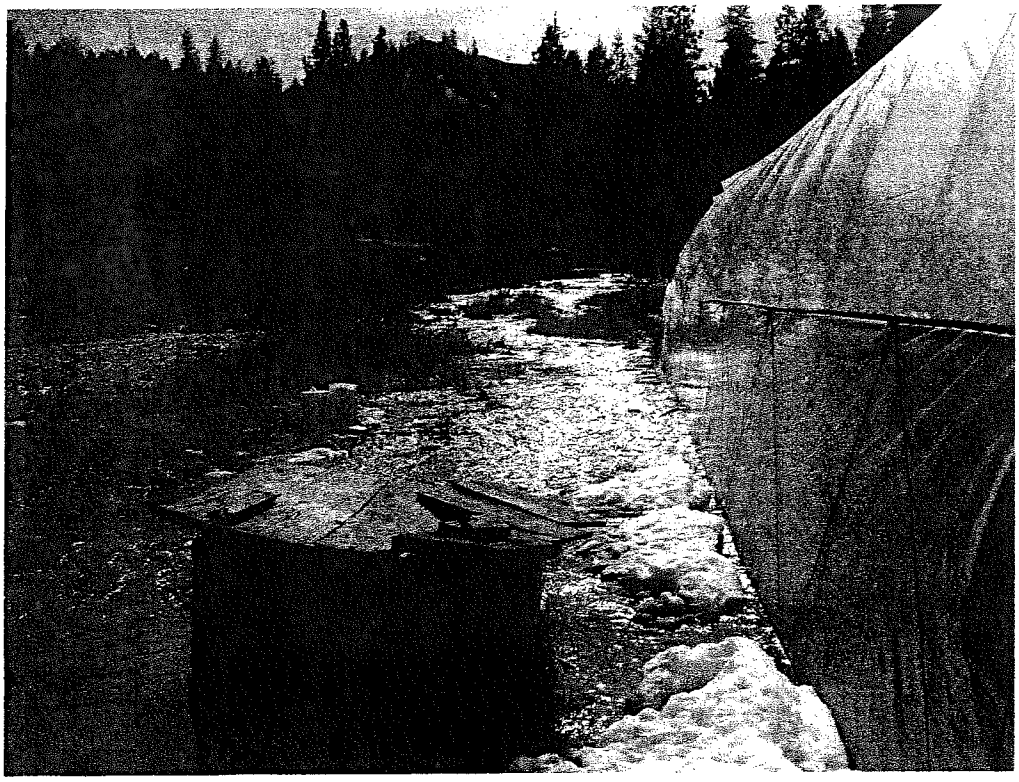


Shop and yard during flood.

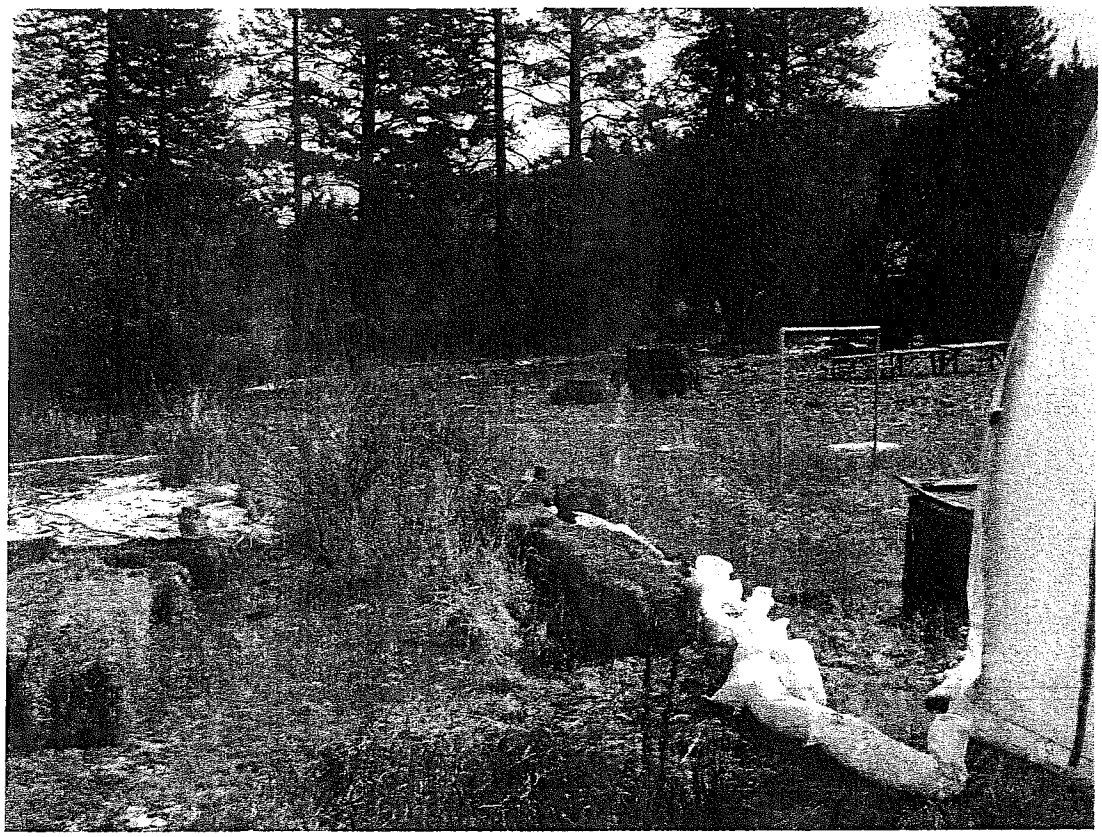
Driveway washout.



End of driveway.

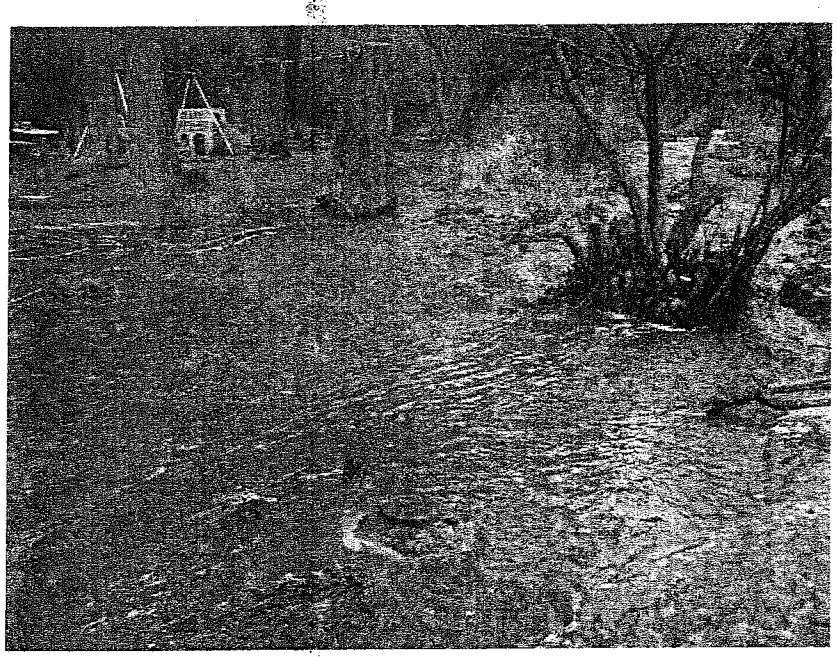


Field flooded up to greenhouse.



Flooded field.

Sediment in flooded house.



Yard south of house.

Water flowing into house.

Statement of Timothy Pellow
Tolstoy Farms, Mill Canyon, Washington
October 30, 2016

My name is Timothy Pellow and I am a certified organic vegetable farmer growing and residing in Mill Canyon, outside of Davenport, WA.

Organic regulations under the National Organic Program (NOP) preclude the use of sewage sludge (biosolids) in any form. This is due to the admixture which makes up municipal sludge, which includes: actual human waste products, which are oftentimes contaminated with synthetic drug residues; whatever else gets dumped down residential drains, including household chemicals, synthetic drugs, and many other unsafe products; industrial waste; and road runoff, which includes oil, antifreeze, gasoline dripped or spilled from automobiles and home mechanics; chemicals released through asphalt degradation; animal wastes and carcasses; and yard, garden, and farm agricultural chemical runoff. The chemical residues and other toxic contaminants in sewage sludge (biosolids) caused the NOP to ban its usage in organic certified systems.

No farm exists in a bubble, and so the NOP designated buffer zones for how far applications of non-allowable products must be applied from an organic operation without threatening the operations certification. Though Rosman's proposed application would be well outside the general buffer zone, it is still worrisome due to the threat of windborne or waterborne contaminants. The NOP regulations state:

> As an organic farmer, you are responsible for all materials applied to your fields, even when you do not apply those materials yourself. Organic crops can be contaminated through residues in spray equipment, drift from nearby fields, accidental sprays, or mistakes made by employees.
>
> The USDA organic regulations have very little to say about irrigation and irrigation water quality. However, since it is the general intent of these regulations that crops and soils not be contaminated with prohibited substances, producers should take precautions to ensure that irrigation water is not loaded with agricultural pesticides or other polluting chemicals.

Thus, even were I not the one applying prohibited substances, certification can be threatened by exposure to such substances from other farms or landowners. There are many days every summer when the weather prediction is "blowing dust" and the air is thick with dust from the cultivated fields of the farms surrounding us. Also, people in alluvial fan canyon lands, such as we are, naturally worry about water contaminants from those along the edge of the canyon. Windborne and waterborne contamination by the myriad of chemical and heavy metal contaminants of sewage sludge (biosolids) is a very real concern to me and my neighbors both in terms of our personal health, the health of our environ and soils, and the viability of our business.

Our farm has been certified organic for about a quarter century, certified by Washington State Department of Agriculture before a national standard even existed. For decades before certification the community in which our farm resided eschewed the use of agricultural chemicals, utilizing methods to build up the health of the soils, increasing their biomass and microfauna activity, while minimizing chemical exposure and toxic buildup. This focused attention and commitment to healthy organic land

stewardship is what draws our customers to us, what makes our business thrive. Our hundreds of families in Spokane area and dozens in the Davenport area who consume our produce do so for the security this knowledge provides. It is important to them, and it is personally important to us, that our soils and food not be contaminated by us, and, as much as we have control over it, by the actions of others.

As an aside, I would mention that at the recent biosolids hearing in Davenport regarding the Rosman application, Ms. Bickner said that she had, if memory serves, about 120 biosolids applications she supervised, but that the vast majority of them are those wishing to dispose of municipal wastes, whereas (again if memory serves) only nine sites throughout Eastern Washington were those who wished to received such waste products through land application. The huge imbalance between disposers and recipients would to me imply a strong pressure to dump as much as one could on as many willing recipients as one could find.

Due to the concerns I have outlined, I would hope the upper rim of the canyon where I live would not become such a destination point. Knowing that Rosman has applied septic wastes to the same lands in the past without any regulation, and seeing the record of complaints towards Mr. Thode's operation (including that, for 19 years, under Department of Ecology supervision, he was mixing hazardous waste from a plastics factory with municipal sewage waste and applying it to people's land) does little to assuage such concerns. Rather, the fact that a man such as Thode can continue to be an Ecology licensed biosolids applicator after flagrantly and intentionally violating Ecology's own regulations, illegally spreading hazardous waste under the guise of biosolid application without regard to the health or safety of those in the recipient areas for nearly two decades, reinforces my sense that this is an ill conceived and poorly regulated program which is more about economy of cheap waste disposal than ecology.

I would ask that the biosolids application for Rosman lands be denied.

Timothy Pellow, Farmer
Tolstoy Farms
32280 Mill Canyon Rd.
Davenport WA 99122
(509)725-3276
tolstoyfarms1@gmail.com
www.tolstoyfarm.org

Statement of Stash Jackowski, Tolstoy Farms
October 30, 2016

Our intentional community called Tolstoy Farm started in 1963. Organic sales of vegetables started in the early 1980's. We grew on what is now Morton Alexander's land and on land just past the North 80. Then in 1993, we moved to where we are now, 3 acres on the South 180. We have been certified organic since the 1980's. The name has changed. Originally it was called "Eden Gardens" by Tom Weinert. Tom had land just past the North 80 where we grew for several years until 1993.

Our customers are mostly in Spokane, although we have several customers in the Davenport area. Besides selling vegetables directly at the market, we sell boxes of vegetables to be paid in advance, the C.S.A's. C.S.A. means Community Supported Agriculture. And we sell to stores who sell organic vegetables.

On certification, it started out we were certified by a private organization and then it switched to State and then to **Federal** with the state administering the program. We are inspected once a year. The inspector walks around and asks a lot of questions and fills out forms. The fee for inspection is high. For a long time, we were subsidized by a government program, but we might be paying the full fee now.

Concerns of contamination:

We don't want sewage sludge anywhere near us. It cannot be proven safe. There is always the possibility that the sludge was not tested properly before being applied.

Of all the places to put sludge, next to a canyon is one of the worst. HEL Highly Erodible Land.

That sludge is very likely to leave the HEL through water or the wind. The wind comes from that direction, depositing potential sludge on our planting area or on an area that water may bring to the planting area later.

We have been growing delicious and healthy organic vegetables for over 30 years. We have worked hard to improve the soil and keep it free of contamination.

We get terrible floods sometimes that brings soil from miles and miles away. See the video of our terrible flood in the spring of 2014.

If the contamination does not come from water bringing the sludge down directly, it can come from the wind and then from the water bringing it down further.

It is just not safe to deposit sewage sludge on HEL, highly erodible land. Please do not put our organic business or our health at risk!

Summary written by me, Stash Jackowski.

I have lived at Tolstoy Farm since March, 1965.

phone: 509-725-0635
address: 32303 Mill Canyon
Davenport, WA 99122

FMF-Rosman Farms SLAPP Comments
October 31, 2016

ATTACHMENT 3

DEPARTMENT OF ECOLOGY
WATER RIGHT CLAIMS REGISTRATION

WATER RIGHT CLAIM

RECEIVED
DEPARTMENT OF ECOLOGY
SEP 10 73 049972
CASH OTHER NONE

1. NAME ROBERT L. GREEN
ADDRESS 19524 95 AVE. NE.
BOTHELL WASH ZIP CODE 98011

2. SOURCE FROM WHICH THE RIGHT TO TAKE AND MAKE USE OF WATER IS CLAIMED: SURFACE (SURFACE OR GROUND WATER)
W.R.I.A. 54 (LEAVE BLANK)

A. IF GROUND WATER, THE SOURCE IS

B. IF SURFACE WATER, THE SOURCE IS SPRING (THE TURNLY SPRING)

3. THE QUANTITIES OF WATER AND TIMES OF USE CLAIMED:

A. QUANTITY OF WATER CLAIMED .02 CFS PRESENTLY USED .02 CFS (CUBIC FEET PER SECOND OR GALLONS PER MINUTE)

B. ANNUAL QUANTITY CLAIMED 4 AC PRESENTLY USED 4 AC (ACRE FEET PER YEAR)

C. IF FOR IRRIGATION, ACRES CLAIMED 3 PRESENTLY IRRIGATED 3

D. TIME(S) DURING EACH YEAR WHEN WATER IS USED: CONTINUOUSLY

4. DATE OF FIRST PUTTING WATER TO USE: MONTH YEAR 1911

5. LOCATION OF THE POINT(S) OF DIVERSION/WITHDRAWAL: 1000 FEET N AND 1000 FEET W FROM THE SE ¼ OF NW ¼ CORNER OF SECTION 20
BEING WITHIN SE ¼ NW ¼ OF SECTION 20 T. 26 N., R. 38 (E~~or W~~) W.M.
IF THIS IS WITHIN THE LIMITS OF A RECORDED PLATTED PROPERTY, LOT BLOCK OF
(GIVE NAME OF PLAT OR ADDITION)

6. LEGAL DESCRIPTION OF LANDS ON WHICH THE WATER IS USED: SE ¼ NW ¼ OF SECTION 20 TOWNSHIP 26 NORTH RANGE 38 EAST W.M.

COUNTY LINCOLN

7. PURPOSE(S) FOR WHICH WATER IS USED: DOMESTIC SUPPLY STOCK WATER IRRIGATION

8. THE LEGAL DOCTRINE(S) UPON WHICH THE RIGHT OF CLAIM IS BASED: WESTERN RIPARIAN

DO NOT USE THIS SPACE
THE FILING OF A STATEMENT OF CLAIM DOES NOT CONSTITUTE AN ADJUDICATION OF ANY CLAIM TO THE RIGHT TO USE OF WATERS AS BETWEEN THE WATER USE CLAIMANT AND THE STATE OR AS BETWEEN ONE OR MORE WATER USE CLAIMANTS AND ANOTHER OR OTHERS. THIS ACKNOWLEDGEMENT CONSTITUTES RECEIPT FOR THE FILING FEE.
DATE RETURNED THIS HAS BEEN ASSIGNED WATER RIGHT CLAIM REGISTRY NO.
OCT 3 0 1973 053829
DIRECTOR, DEPARTMENT OF ECOLOGY

I HEREBY SWEAR THAT THE ABOVE INFORMATION IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.
X Robert L Green
DATE 9/7/73
IF CLAIM FILED BY DESIGNATED REPRESENTATIVE, PRINT OR TYPE FULL NAME AND MAILING ADDRESS OF AGENT BELOW

☐ ADDITIONAL INFORMATION RELATING TO WATER QUALITY AND/OR WELL CONSTRUCTION IS AVAILABLE.

A FEE OF $2.00 MUST ACCOMPANY THIS WATER RIGHT CLAIM
ORIGINAL DWR

RETURN ALL THREE COPIES WITH CARBONS INTACT, ALONG WITH YOUR FEE TO:
DEPARTMENT OF ECOLOGY
WATER RIGHT CLAIMS REGISTRATION
P.O. BOX 829 OLYMPIA, WASHINGTON 98504

FMF-Rosman Farms SLAPP Comments
October 31, 2016

ATTACHMENT 4

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

P.O. Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

RECEIVED

JAN 28 2014

WA State Department of Ecology (SWRO)

January 24, 2014

Mr. Robert Thode, Owner
Fire Mountain Farms, Inc.
349 SR 508
Chehalis, WA 98532

RE: Agreed Order #10448 for Fire Mountain Farms, Inc. Biosolids Operations at Burnt Ridge and Homestead Units

Dear Mr. Thode:

Enclosed is Agreed Order #10448, requiring you to cease placing all materials into the surface impoundment at Burnt Ridge (except runoff as described in the order), provide measures for the removal of all materials from the impoundment, and develop requirements for the adherence to proper, prescribed, biosolids management. The Agreed Order requires you to develop and implement permit components and operational practices to achieve compliance with agronomic rate requirements, at both the Burnt Ridge and Homestead units, as provided under Chapter 173-308 WAC and the Statewide General Permit for Biosolids Management.

If you choose to sign this order, it needs to be signed and placed in the mail to Ecology by Friday, January 31, 2014 (an envelope is provided for your convenience). The order will become effective on the date it is signed and executed by Ecology. After all signatures are complete, a copy will then be returned to you for your records.

All correspondence relating to these orders should be directed to:
Jamie Olivarez
Department of Ecology - Southwest Regional Office
P.O. Box 47775
Olympia, WA 98504

If you have any questions concerning the content of the document, please contact Jamie Olivarez at (360) 407-6393 or jamie.olivarez@ecy.wa.gov.

Sincerely,

Peter Y. Lyon
Regional Section Manager
Waste 2 Resources Program

Enclosure

FMF-Rosman Farms SLAPP Comments
October 31, 2016

ATTACHMENT 5

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN AGREED ORDER RE: **Fire Mountain Farms, Inc.**	)))	AGREED ORDER No. 10448

To: Mr. Robert Thode
Owner
Fire Mountain Farms, Inc.
856 Burnt Ridge Rd.
Onalaska, WA 98570

RCW 70.95J.040 authorizes the Department of Ecology (Ecology) to issue Administrative Orders requiring compliance whenever it determines there has been a violation of any provision of the state biosolids program.

This is an Agreed Order between **Fire Mountain Farms, Inc.** (FMF) and Ecology, for the receiving, treatment, and land application site known as **Burnt Ridge** and the receiving and land application site known as **Homestead**, located respectively at 856 Burnt Ridge Rd. and 1074 Burnt Ridge Rd., Onalaska, Washington, in **Lewis County.**

FMF agrees to comply with Chapter 70.95J of the Revised Code of Washington, Chapter 173-308 of the Washington Administrative Code, and permits issued there under, by taking certain actions which are described below.

By entering into this Agreed Order (Order), FMF acknowledges that it is waiving any right to appeal this Order under Chapter 43.21B RCW, and waives the ability to contest the violations that gave rise to this Order.

Background: Ecology makes the following findings of fact, without any express or implied admissions of such facts by Fire Mountain Farms, Inc.

FMF operates biosolids receiving, storage/treatment, and land application facilities in **Lewis County** for which it submitted applications for permit coverage to Ecology in 2002, 2005, and 2010. It is an obligation under the state biosolids program that all persons who apply non-exceptional quality biosolids to the land must obtain necessary information to determine appropriate management requirements for those biosolids.

An important component of a biosolids land application and storage/treatment program is the protection of water resources. At the Burnt Ridge site, FMF operates a surface impoundment that acts to store and treat biosolids. It is FMF's responsibility to ensure that biosolids are not stored in a manner that could result in the contamination of surface or groundwater. Another fundamental obligation of FMF's biosolids land application program involves determining agronomic rates of application, and adhering to those determined rates. A principle reason to adhere to a prescribed agronomic rate of application is the protection of groundwater resources. These obligations noted above require:

- The operation and monitoring of surface impoundments so as to ensure that ground and surface waters, land, and air resources are not contaminated as a resulting condition of the impoundment.

- Correct characterization of biosolids which are prepared for land application.
- Correct assessment of crop requirements including individual site features and management methods which may influence the agronomic rate.
- Evaluation of crop response.
- Correct characterization and analysis of site soils following land application.
- Periodic adjustments to management practices based on information collected.

FMF has to some extent and at various times failed to meet its regulatory obligations for surface impoundment compliance at the Burnt Ridge site and agronomic management, as described above, at both Burnt Ridge (BR) and Homestead (HS) land application sites. This failure is evidenced by increasing concentrations of groundwater nitrate in resource protection wells associated with the surface impoundment at BR and excessive residual soil nitrate as determined by soil sampling results at both sites. FMF is responsible for assuring compliance of its operations. The actions described below are designed to address matters of non-compliance with regard to the management of both the surface impoundment and the determination of agronomic rates of application. For the purposes of this Order, the term "field" applies to a discrete unit or parcel of land identified for the Burnt Ridge and Homestead land application sites.

I. Corrective Actions. For the reasons stated above, Fire Mountain Farms, Inc. agrees to take the following actions:

1) FMF must immediately cease placement of all materials into the surface impoundment located at the Burnt Ridge site with one notable exception; runoff diverted from an existing livestock operation.
   a) The purpose of this requirement is to address the increase in groundwater nitrate concentration, as evidenced in downgradient resource protection well (BR-MW185) associated with the surface impoundment.
   b) All materials must be removed from the surface impoundment by October 31, 2014, or at a later date as approved by Ecology. Prior to a later date of approval, Ecology must receive progress reports beginning on May 1, 2014, and continuing on July 1, 2014, and September 1, 2014 addressing:
      i. The initial quantity of biosolids in the surface impoundment.
      ii. The quantity of biosolids removed to date and an estimation of the complete evacuation of biosolids from the surface impoundment.
      iii. A list of the destinations and uses of the removed biosolids.
   c) To assist in the protection of surface and ground waters, runoff from an onsite livestock operation may continue to be diverted to the surface impoundment under the following conditions:
      i. FMF must provide Ecology with an estimated amount of runoff that will enter the surface impoundment and at what approximate frequency.
      ii. FMF must demonstrate, to Ecology's satisfaction and approval, that the addition of any livestock runoff will not delay the timeline requirements in item 1(b) above.

iii. As described in the meeting held on January 13, 2014, all material added to the surface impoundment become comingled with biosolids, and therefore, become biosolids and will be regulated as such.

d) All removed surface impoundment material must be applied to, or received at, a facility permitted by Ecology to accept it.

e) Groundwater monitoring must continue on a biannual basis.

f) Future use of any surface impoundment must comply with the requirements listed in *WAC 173-308-280 – Requirements for Facilities Storing Biosolids or Sewage Sludge* and the applicable requirements in WAC 173-350-330 – Surface Impoundments and Tanks.

2) If FMF wishes to engage in any biosolids activities at **Burnt Ridge and Homestead** units, a new complete permit application must be submitted for its **Burnt Ridge and Homestead** receiving and land application sites.

a) The purpose of this requirement is adherence to the permit modification procedures as outlined in *WAC 173-308-310 (23) and (24)*.

b) No land application of biosolids may occur until all requirements for coverage under the General Permit for Biosolids Management are complete as approved by Ecology. This includes SEPA review and public notice requirements attendant to application for coverage and, if necessary, public meeting and hearing requirements.

c) FMF must respond in good faith to any Ecology directive or response regarding revision of its application within 14 days of notice, or a later date if agreed to by Ecology.

3) A proposed agronomic rate for each field at the **Burnt Ridge and Homestead** sites must be submitted to Ecology 30 days in advance of applying biosolids to the field.

a) If Ecology does not respond in the indicated time frame, the rate will be considered approved until a response is provided.

b) A completed version of the most recent edition of the Cogger-Sullivan spreadsheet must be submitted for each agronomic rate proposal.

c) Each proposal must consider the previous year's yields, soil sampling results, and surface and groundwater results.

d) Consideration must be given to the effects and method of application, crop removal, and grazing.

e) Justification or rationale for all considerations and assumptions made in items b. through d. above, including the projected base agronomic need of the crop must be stated in a brief cover letter accompanying the proposed rate of application.

4) Following Ecology's approval of the updated permit application, FMF must collect soil samples for nitrate-nitrogen and other constituent analysis per the approved sampling plan. At least initially collection must occur in the top two feet, in one foot increments, and continue on an annual basis until Ecology determines that the rate of application, balanced against residual soil nitrate, indicates that applications comply with agronomic rates. Soil samples will be collected in each field as part of the FMF post-harvest fall report card.

a) The goal for residual soil nitrate-nitrogen in the top two feet of soil will be 60 lbs. per acre. A conversion factor of three will be used to convert parts per million to lbs/acre.

b) In general, two consecutive seasons of results with acceptable residual nitrate will be required to confirm compliance on each field where biosolids are applied.

c) Continued sampling to two feet may be required for some fields indefinitely, depending on the outcome of data evaluation. The goal of 60 lbs. nitrate/acre/2-ft will be used as guidance for the evaluation of agronomic rates on a per field basis.

d) Once agronomic rate compliance has been achieved, Ecology may approve subsequent sampling to a depth of only 1 foot on a field by field basis. If such sampling is approved, the goal of 45 lbs. nitrate/acre/1-ft will be used as guidance for the evaluation of agronomic rates on a per field basis. Once again a conversion factor of three will be used to convert parts per million to lbs/acre.

5) Use of Third Party Consultants.

For the duration of this order, unless otherwise approved by Ecology, Fire Mountain Farms, Inc. must continue the use of a third party, licensed hydrogeologist consultant for the purposes of evaluating environmental compliance with regard to surface water and groundwater. The consultant reports must address any potential causes for lack of environmental compliance.

6) The terms and conditions of this Order are intended to enhance existing permit conditions. In any case where there is a conflict, the more stringent requirement must apply, or the requirements of both the Order and permit must be met.

II. Sampling and Analysis Plan. In order to ensure compliance with Chapter 173-308 WAC, the updated permit application submitted by FMF must include a sampling and analysis plan covering all of the following soil, biosolids, and water sampling requirements:

1) Soil sampling and analysis.

a) Soil sampling and analysis elements of the revised permit application must be modeled around University of Idaho guidance Bulletin 704 (revised), by Mahler and Tindall, unless otherwise approved by Ecology. The following publications will be used during development of the sampling and analysis strategy: Ecology publication #93-80 – *Biosolids Management Guidelines for Washington State*, revised July 2000 and Oregon State Extension publication EM 8832-E – *Post Harvest Soil Nitrate Testing for Manured Cropping Systems West of the Cascades* (Sullivan and Cogger) May 2003.

b) Soil sampling must occur as soon as practical after crop harvest but not later than October 15th unless otherwise approved by Ecology.

c) Sampling depths must be consistent as required with Corrective Action item No. 4 as listed above.

d) Ecology must be notified in advance of sampling events and may choose to be present for part of, or all of the collections.

e) FMF must submit complete analytical results from all sampling events to Ecology within 45 days of the sampling event.

f) A report summarizing the previous year's results and identifying any long term trends must be submitted by March 1 of each year, for the preceding calendar year. This can be included with

the standard annual report form, but represents a specific obligation beyond the basic annual report.

2) Biosolids sampling.
   a) All sampling and analysis must be representative of the material used.
   b) Biosolids must be sampled and analyzed for constituents on a frequency and in accordance with the approved sampling and analysis plan.
   c) FMF must submit analytical results from all sampling events to Ecology within 45 days of the sampling event.
   d) A certification form detailing the notice and necessary information from each generator whose biosolids are land applied must be obtained. The frequency for obtaining this form will be as required in WAC 173-308-150. The form must include:
      (i) The method of pathogen reduction
      (ii) The method for vector attraction reduction
      (iii) Signature of the responsible official
   e) Revisions to the sampling and analysis plan as a result of permit review may result in changes to the monitoring program.

3) Surface water and groundwater monitoring.
   a) Monitoring must continue on a biannual basis in accordance with the approved sampling and analysis plan.
   b) FMF must submit analytical results from all sampling events to Ecology within 45 days of the sampling event.
   c) Revisions to the sampling and analysis plan as a result of permit review may result in changes to the monitoring program.

III. Conduct of the Parties

1) During the completion of the work in Sections I & II above, Fire Mountain Farms, Inc. and Ecology agree to confer in good faith on matters relating to the design, implementation, and evaluation of the corrective actions and sampling and analysis plan.

2) On condition that Fire Mountain Farms, Inc. remains in compliance with this Order, Ecology agrees to exercise its enforcement discretion for agronomic rate management through the completion and implementation of this Order, and the revised permit applications and elements thereof, as specified above.

   This exercise of enforcement discretion will not preclude Ecology from taking any action provided under any law to respond to any imminent threat to health or the environment in relation to Fire Mountain Farms' operations, or to any violation of law or regulation, known or unknown. Failure to comply with this Order may result in the issuance of civil penalties or other actions, whether administrative or judicial, to enforce the terms of this Order.

3) If a dispute arises between the parties regarding any noncompliance with this Order, the parties will attempt to resolve the dispute by informal resolution. Every disagreement is not a dispute. A dispute will be considered to have arisen when one party notifies the other, in writing, that there is a dispute.

   If the parties cannot resolve the dispute informally within thirty (30) days of first notification, Fire Mountain Farms, Inc. will deliver to Ecology a written *statement of position*. Within thirty (30) days thereafter, Ecology will respond to FMF with a final decision. The final decision of Ecology will be considered binding.

IV. Effective Date

1) This Order will take effect on the date it is executed and signed by Ecology. This Order will remain in effect until the terms and conditions are incorporated in revised permit approvals for Fire Mountain Farms, Inc, or until such time as Ecology determines that the conditions of the Order have been satisfied.

IN WITNESS WHEREOF, the parties sign this Agreed Order:

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

1/29/14
Date

Peter Y. Lyon
Regional Section Manager
Waste 2 Resources Program

FIRE MOUNTAIN FARMS, INC.

Jan. 28, 2014
Date

Robert Thode
President

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

January 24, 2014

Mr. Robert Thode, Owner
Fire Mountain Farms, Inc.
349 SR 508
Chehalis, WA 98532

RE: Agreed Order #10449 for Fire Mountain Farms, Inc. Biosolids Operations at Newaukum Prairie Unit

Dear Mr. Thode:

Enclosed is Agreed Order #10449, requiring you to develop and implement permit components and operational practices to achieve compliance with agronomic rate requirements, at the Newaukum Prairie unit, as provided under Chapter 173-308 WAC and the Statewide General Permit for Biosolids Management.

If you choose to sign this order, it needs to be signed and placed in the mail to Ecology by Friday, January 31, 2014 (an envelope is provided for your convenience). The order will become effective on the date it is signed and executed by Ecology. After all signatures are complete, a copy will then be returned to you for your records.

All correspondence relating to these orders should be directed to:
Jamie Olivarez
Department of Ecology - Southwest Regional Office
P.O. Box 47775
Olympia, WA 98504

If you have any questions concerning the content of the document, please contact Jamie Olivarez at (360) 407-6393 or jamie.olivarez@ecy.wa.gov.

Sincerely,

Peter Y. Lyon
Regional Section Manager
Waste 2 Resources Program

Enclosure

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN AGREED ORDER RE: **Fire Mountain Farms, Inc.**	)))	AGREED ORDER No. 10449

To: Mr. Robert Thode
Owner
Fire Mountain Farms, Inc.
856 Burnt Ridge Rd.
Onalaska, WA 98570

RCW 70.95J.040 authorizes the Department of Ecology (Ecology) to issue Administrative Orders requiring compliance whenever it determines there has been a violation of any provision of the state biosolids program.

This is an Agreed Order between **Fire Mountain Farms, Inc.** (FMF) and Ecology, for the receiving, treatment, and land application site known as **Newaukum Prairie** located 349 SR 508, Chehalis, Washington, in **Lewis County.**

FMF agrees to comply with Chapter 70.95J of the Revised Code of Washington, Chapter 173-308 of the Washington Administrative Code, and permits issued there under, by taking certain actions which are described below.

By entering into this Agreed Order (Order), FMF acknowledges that it is waiving any right to appeal this Order under Chapter 43.21B RCW, and waives the ability to contest the violations that give rise to this Order.

Background: Ecology makes the following findings of fact, without any express or implied admissions of such facts by Fire Mountain Farms, Inc.

FMF operates biosolids receiving, storage/treatment, and land application facilities in Lewis County for which it submitted applications for permit coverage to Ecology in 2002, 2005, and 2010. It is an obligation under the state biosolids program that all persons who apply non-exceptional quality biosolids to the land must obtain necessary information to determine appropriate management requirements for those biosolids.

An important component of a biosolids land application and storage/treatment program is the protection of water resources. At the Newaukum Prairie site, FMF operates a surface impoundment that acts to store and treat biosolids. It is FMFs responsibility to ensure that biosolids are not stored in a manner that could result in the contamination of surface or groundwater. Another fundamental obligation of FMFs biosolids land application program involves determining agronomic rates of application, and adhering to those determined rates. A principle reason to adhere to a prescribed agronomic rate of application is the protection of groundwater resources. These obligations noted above require:

- The operation and monitoring of surface impoundments so as to ensure that ground and surface waters, land, and air resources are not contaminated as a resulting condition of the impoundment.
- Correct characterization of biosolids which are prepared for land application.

- Correct assessment of crop requirements including individual site features and management methods which may influence the agronomic rate.
- Evaluation of crop response.
- Correct characterization and analysis of site soils following land application.
- Periodic adjustments to management practices based on information collected.

FMF has to some extent and at various times failed to meet its regulatory obligations for agronomic management, as described above, at the Newaukum Prairie land application site. This failure is evidenced by excessive residual soil nitrate as determined by soil sampling results. FMF is responsible for assuring compliance of its operations. The actions described below are designed to address matters of non-compliance with regard to the management and the determination of agronomic rates of application. For the purposes of this Order, the term "field" applies to a discrete unit or parcel of land identified for the Newaukum Prairie land application site.

I. Corrective Actions. For the reasons stated above, Fire Mountain Farms, Inc. agrees to take the following actions:

1) If FMF wishes to engage in any biosolids activities at the **Newaukum Prairie** unit, a new complete permit application must be submitted for its **Newaukum Prairie** receiving and land application sites.
   a) The purpose of this requirement is adherence to the permit modification procedures as outlined in *WAC 173-308-310 (23) and (24).*
   b) No land application of biosolids may occur until all requirements for coverage under the General Permit for Biosolids Management are complete as approved by Ecology except as noted below. This includes SEPA review and public notice requirements attendant to application for coverage and, if necessary, public meeting and hearing requirements.
      i) In the event that the requirements of this order are incomplete when land application is approved to begin, fields NP-7, NP-8, and NP-9 as described in the Newaukum Prairie Site Specific Land Application Plan (SSLAP) dated December 19, 2013, and received by Ecology on December 31, 2013, may be used.
      ii) The uses of the fields noted above are subject to the requirements of this Agreed Order. This includes requirements in the updated SSLAP for Newaukum Prairie as noted above.
   c) FMF must respond in good faith to any Ecology directive or response regarding revision of its application within 14 days of notice, or a later date if agreed to by Ecology.

2) A proposed agronomic rate for each field at the **Newaukum Prairie** site must be submitted to Ecology 30 days in advance of applying biosolids to the field.
   a) If Ecology does not respond in the indicated time frame, the rate will be considered approved until a response is provided.
   b) A completed version of the most recent edition of the Cogger-Sullivan spreadsheet must be submitted for each agronomic rate proposal.

c) Each proposal must consider the previous year's yields, soil sampling results, and surface and groundwater results.

d) Consideration must be given to the effects and method of application, crop removal, and grazing.

e) Justification or rationale for all considerations and assumptions made in items b. through d. above, including the projected base agronomic need of the crop must be stated in a brief cover letter accompanying the proposed rate of application.

3) Following Ecology's approval of the updated permit application, FMF must collect soil samples for nitrate-nitrogen and other constituent analysis per the approved sampling plan. At least initially collection must occur in the top two feet, in one foot increments, and continue on an annual basis until Ecology determines that the rate of application, balanced against residual soil nitrate, indicates that applications comply with agronomic rates. Soil samples will be collected in each field as part of the FMF post-harvest fall report card.

a) The goal for residual soil nitrate-nitrogen in the top two feet of soil will be 60 lbs per acre. A conversion factor of three will be used to convert parts per million to lbs/acre.

b) In general, two consecutive seasons of results with acceptable residual nitrate will be required to confirm compliance on each field where biosolids are applied.

c) Continued sampling to two feet may be required for some fields indefinitely, depending on the outcome of data evaluation. The goal of 60 lbs. nitrate/acre/2-ft will be used as guidance for the evaluation of agronomic rates on a per field basis.

d) Once agronomic rate compliance has been achieved, Ecology may approve subsequent sampling to a depth of only 1 foot on a field by field basis. If such sampling is approved, the goal of 45 lbs. nitrate/acre/1-ft will be used as guidance for the evaluation of agronomic rates on a per field basis. Once again a conversion factor of three will be used to convert parts per million to lbs/acre.

4) Use of Third Party Consultants.

For the duration of this order, unless otherwise approved by Ecology, Fire Mountain Farms, Inc. must continue the use of a third party licensed hydrogeologist consultant for the purposes of evaluating environmental compliance with regard to surface water and groundwater. The consultant reports must address any potential causes for a lack of environmental compliance.

5) The terms and conditions of this Order are intended to enhance existing permit conditions. In any case where there is a conflict, the more stringent requirement must apply, or the requirements of both the Order and permit must be met.

II. Sampling and Analysis Plan. In order to ensure compliance with Chapter 173-308 WAC, the updated permit application submitted by FMF must include a sampling and analysis plan covering all of the following soil, biosolids, and water sampling requirements:

1) Soil sampling and analysis.

a) Soil sampling and analysis elements of the revised permit application must be modeled around University of Idaho guidance Bulletin 704 (revised), by Mahler and Tindall, unless otherwise approved by Ecology. The following publications will be used during development of the sampling and analysis strategy: Ecology publication #93-80 – *Biosolids Management Guidelines*

for Washington State, revised July 2000 and Oregon State Extension publication EM 8832-E – *Post Harvest Soil Nitrate Testing for Manured Cropping Systems West of the Cascades* (Sullivan and Cogger) May 2003.

b) Soil sampling must occur as soon as practical after crop harvest but not later than October 15th unless otherwise approved by Ecology.

c) Sampling depths must be consistent as required with Corrective Action item No. 3 as listed above.

d) Ecology must be notified in advance of sampling event and may choose to be present for part of, or all of the collections.

e) FMF must submit complete analytical results from all sampling events to Ecology within 45 days of the sampling event.

f) A report summarizing the previous year's results and identifying any long term trends must be submitted by March 1 of each year, for the preceding calendar year. This can be included with the standard annual report form, but represents a specific obligation beyond the basic annual report.

2) Biosolids sampling.

a) All sampling and analysis must be representative of the material used.

b) Biosolids must be sampled and analyzed for constituents on a frequency and in accordance with the approved sampling and analysis plan.

c) FMF must submit analytical results from all sampling events to Ecology within 45 days of the sampling event.

d) A certification form detailing the necessary information from each generator whose biosolids are land applied must be obtained on a yearly basis. The form must include:

(i) The method of pathogen reduction

(ii) The method for vector attraction reduction

(iii) Signature of the responsible official

e) Revisions to the sampling and analysis plan as a result of permit review may result in changes to the monitoring program.

3) Surface water and groundwater monitoring.

a) Monitoring must continue on a biannual basis in accordance with the approved sampling and analysis plan.

b) FMF must submit analytical results from all sampling events to Ecology within 45 days of the sampling event.

c) Revisions to the sampling and analysis plan as a result of permit review may result in changes to the monitoring program.

III. Conduct of the Parties

1) During the completion of the work in Sections I & II above, Fire Mountain Farms, Inc. and Ecology agree to confer in good faith on matters relating to the design, implementation, and evaluation of the corrective actions and sampling and analysis plan.

2) On condition that Fire Mountain Farms, Inc. remains in compliance with this Order, Ecology agrees to exercise its enforcement discretion for agronomic rate management through the completion and implementation of this Order, and the revised permit applications and elements thereof, as specified above.

   This exercise of enforcement discretion will not preclude Ecology from taking any action provided under any law to respond to any imminent threat to health or the environment in relation to Fire Mountain Farms' operations, or to any violation of law or regulation, known or unknown. Failure to comply with this Order may result in the issuance of civil penalties or other actions, whether administrative or judicial, to enforce the terms of this Order.

3) If a dispute arises between the parties regarding any noncompliance with this Order, the parties will attempt to resolve the dispute by informal resolution. Every disagreement is not a dispute. A dispute will be considered to have arisen when one party notifies the other, in writing, that there is a dispute.

   If the parties cannot resolve the dispute informally within thirty (30) days of first notification, Fire Mountain Farms, Inc. will deliver to Ecology a written *statement of position*. Within thirty (30) days thereafter, Ecology will respond to FMF with a final decision. The final decision of Ecology will be considered binding.

IV. Effective Date

1) This Order will take effect on the date it is executed and signed by Ecology. This Order will remain in effect until the terms and conditions are incorporated in revised permit approvals for Fire Mountain Farms, Inc, or until such time as Ecology determines that the conditions of the Order have been satisfied.

IN WITNESS WHEREOF, the parties sign this Agreed Order:

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

Peter Y. Lyon 1/29/14

Peter Y. Lyon — Date
Regional Section Manager
Waste 2 Resources Program

FIRE MOUNTAIN FARMS, INC.

Jan. 28, 2014

Robert Thode — Date
President

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

P.O. Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

June 2, 2014

Mr. Robert Thode
Fire Mountain Farms, Inc.
856 Burnt Ridge Rd
Onalaska, WA 98570

Order Docket #	10721
Site Location	Newaukum Prairie/Big Hanaford

Re: Administrative Order Modifying Permit Coverage

Dear Mr. Thode:

The Department of Ecology (Ecology) has issued the enclosed Administrative Order Modifying Fire Mountain Farms, Inc.'s coverage under the Biosolids General Permit to comply with:

- Chapter 70.95J Revised Code of Washington (RCW) – Municipal Sewage Sludge - Biosolids
- Chapter 173-308 Washington Administrative Code (WAC) – Biosolids Management
- General Permit for Biosolids Management

If you have questions please contact Jamie Olivarez at (360) 407-6393 or jaol461@ecy.wa.gov.

Sincerely,

Peter Y. Lyon, Regional Section Manager
Waste 2 Resources Program

Enclosures: Administrative Order Docket #10721

By certified mail: 91 7199 9991 7030 0875 9313

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER MODIFYING PERMIT COVERAGE FOR Fire Mountain Farms, Inc.	))))	ORDER DOCKET # 10721

To: Mr. Robert Thode
Fire Mountain Farms, Inc.
856 Burnt Ridge Rd
Onalaska, WA 98570

Order Docket #	10721
Site Location	Newaukum Prairie/Big Hanaford

The Department of Ecology (Ecology) has issued this Administrative Order Modifying Permit Coverage for Fire Mountain Farms, Inc. to comply with:

- Chapter 70.95J Revised Code of Washington (RCW) – Municipal Sewage Sludge - Biosolids
- Chapter 173-308 Washington Administrative Code (WAC) – Biosolids Management
- General Permit for Biosolids Management

RCW 70.95J.040 authorizes Ecology to issue this Order requiring Fire Mountain Farms, Inc. to take certain actions which are described below.

FINDING OF CAUSE FOR PERMIT MODIFICATION AND ORDER TO COMPLY

Findings of Cause for Permit Modification

Ecology has received information that Fire Mountain Farms, Inc., has been receiving substantial quantities of clarifier solids from Emerald Kalama Chemical's biological wastewater treatment plant and mixing that material with biosolids being managed pursuant to RCW 70.95J, WAC 173-308, and the General Permit for Biosolids in Fire Mountain Farm's Newaukum Prairie surface impoundment located at 349 State Route 508, Chehalis, WA and in Fire Mountain Farm's Big Hanaford solids bunker located at 307 Big Hanaford Rd, Centralia, WA. Although this or a similar material from Emerald Kalama Chemical was registered through the year 2003 with the Washington State Department of Agriculture for use as a waste-derived commercial fertilizer product, the material currently being received by Fire Mountain Farms is not currently registered, nor has it been subject to the laboratory testing for various constituents that would be required for registration. Without registration, this material may designate as a listed (U-220 and F003) dangerous waste under Chapter 173-303 and federal hazardous waste rules.

Ecology is conducting an investigation into the designation, characteristics and handling practices of the materials received from Emerald Kalama Chemical. Until this investigation is complete, this new information is cause for modification of Fire Mountain Farm's biosolids permit coverage under WAC 173-308-310(23)(b)(ii). Alternatively or in addition, this information constitutes a change in condition that requires either a temporary or a permanent reduction or elimination of an activity controlled by Fire Mountain Farm's permit coverage under WAC 173-308-310(24)(d).

Permit Modification and Corrective Actions

For these reasons and in accordance with RCW 70.95J.040 Fire Mountain Farms, Inc. is ordered to take the following actions. These actions are required at the locations known as Newaukum Prairie located at 349 State Route 508, Chehalis, WA, Big Hanaford located at 307 Big Hanaford Rd, Centralia, WA, and any other locations of storage and land application.

Immediately upon receipt of this Order Fire Mountain Farms, Inc. must:

a. Cease placement of *any* additional materials into the biosolids surface impoundment located at the Newaukum Prairie site and the storage bunker located at the Big Hanaford site.

b. Cease land application of any material presently in place in the surface impoundment located at Newaukum Prairie and the storage bunker located at the Big Hanaford site.

c. Cease the placement of the material received from Emerald Kalama Chemical into any short or long-term storage structure located at biosolids application sites, including in-field temporary storage locations.

d. Cease any present or planned land application of the material received from Emerald Kalama Chemical onto biosolids sites.

e. Cease acceptance and storage of any non-biosolids material(s) for the purpose of land application at biosolids sites.

On or before Tuesday, June 9th, 2014, Fire Mountain Farms, Inc. must:

a. Notify Ecology of the location(s) where material received from Emerald Kalama Chemical is being stored, both independently and/or comingled with other materials as pertains to biosolids sites.

b. Notify Ecology of biosolids site(s) where material received from Emerald Kalama Chemical has been land applied, either as a mixture with other materials or separately.

c. Identify for Ecology the source of the biosolids materials (e.g., specific wastewater treatment facilities) with which the material from Emerald Kalama Chemical is currently mixed.

d. Identify all other wastes or materials, by source, that have been stored and/or applied at any of your permitted biosolids sites.

Assuming, but not conceding, that it is legally permissible for a mixed material consisting of Emerald Kalama Chemical sludge and biosolids to be regulated as biosolids (see 40 C.F.R. Sec. 503.6), the following items must be completed by Monday, June 23, 2014:

a. Hire a qualified third party to perform sample collection to appropriately characterize the comingled materials at both the Newaukum Prairie and Burnt Ridge surface impoundments and the Big Hanaford solids bunker.

b. All sample collection must follow an Ecology approve Quality Assurance Project Plan (QAPP). The QAPP shall specify a rigorous method of sampling (gridding, randomized sampling, compositing, etc.) to address the heterogeneity of the materials stored at the sample locations.

c. At a minimum, collect three comprehensive composites from each sampling location listed above. One of which must be analyzed for EPA Priority Pollutants. In addition to the Priority Pollutants, molybdenum, cobalt, pH, TKN, ammonia-nitrogen, nitrate-nitrogen, and percent total solids must also be analyzed. Two samples must be minimally analyzed for EPA methods 8620, 8270 and metals.

d. Fecal coliform samples must be collected from each location listed above for analysis and verification of pathogen reduction as described in WAC 173-308-170(5).

e. Ecology must be notified of the vector attraction reduction (VAR) option to be used at each sample location listed above. The options for VAR are described in WAC 173-308-180 and WAC 173-308-210.

f. All samples to be analyzed must follow the methods, preservation, and holding times described in Section 9.6 – Table 3 of the Washington State General Permit for Biosolids Management.

ELIGIBILITY FOR PAPERWORK VIOLATION WAIVER AND OPPORTUNITY TO CORRECT

Under RCW 34.05.110, small businesses are eligible for a waiver of a first-time paperwork violation and an opportunity to correct other violations.

1. Ecology has determined the violation(s) described in this Order are not paperwork violations under RCW 34.05.110 and therefore you are not eligible for a waiver for a first-time paperwork violation.

2. Ecology has determined that you are not eligible for an opportunity to correct under RCW 34.05.110 because

- No correction is possible.

FAILURE TO COMPLY WITH THIS ORDER

Continued failure to correct the violations listed in this Order and comply with the corrective actions required may result in penalties.

YOUR RIGHT TO APPEAL

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do both of the following within 30 days of the date of receipt of this Order:

- File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person. See addresses below. E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel Road SW STE 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

CONTACT INFORMATION

Please direct all questions about this Administrative Order to:

Peter Lyon
Department of Ecology
Regional Section Manager, Waste 2 Resources Program
P.O. Box 47775, Olympia, WA 98504

Phone: (360) 407-6381
Email: peter.lyon@ecy.wa.gov

MORE INFORMATION

- **Pollution Control Hearings Board**
  www.eho.wa.gov/Boards_PCHB.aspx
- Chapter 43.21B RCW - Environmental and Land Use Hearings Office – Pollution Control Hearings Board
  http://apps.leg.wa.gov/RCW/default.aspx?cite=43.21B
- **Chapter 371-08 WAC – Practice and Procedure**
  http://apps.leg.wa.gov/WAC/default.aspx?cite=371-08
- **Chapter 34.05 RCW, Administrative Procedure Act**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=34.05
- **Chapter 70.95J. RCW - Municipal Sewage Sludge – Biosolids**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=70.95J
- **Chapter 173-308 WAC - Biosolids Management**
  http://www.ecy.wa.gov/biblio/wac173308.html

SIGNATURE

Peter Y. Lyon, Regional Section Manager
Waste 2 Resources Program

5/30/14
Date

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
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September 11, 2014

Mr. Robert Thode
Fire Mountain Farms, Inc.
856 Burnt Ridge Road
Onalaska, WA 98570

Order No.	10938
Site Locations	Burnt Ridge, Newaukum Prairie, and Big Hanaford

Re: Administrative Order

Dear Mr. Thode:

The Washington Department of Ecology has issued the enclosed Administrative Order requiring Fire Mountain Farms, Inc. and Emerald Kalama Chemical, LLC to comply with:

- Chapter 70.105 Revised Code of Washington (RCW), Hazardous Waste Management Act
- Chapter 173-303 Washington Administrative Code (WAC), Dangerous Waste Regulations
- Chapter 90.48 RCW, Water Pollution Control Act

If you have questions, please contact Peter Lyon at (360) 407-6381 or peter.lyon@ecy.wa.gov.

Sincerely,

Laurie G. Davies

Laurie G. Davies
Waste 2 Resources Program Manager

Enclosure

By Certified Mail # 91 7199 9991 7032 9431 7129

cc: Jonathan Thompson, Attorney General's Office

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER AGAINST Emerald Kalama Chemical, LLC AND Fire Mountain Farms, Inc.	))))))	ADMINISTRATIVE ORDER No. 10938

To: Mr. Jarrod Kocin
Emerald Kalama Chemical, LLC
1296 Third Street NW
Kalama, WA 98625

Mr. Robert Thode
Fire Mountain Farms, Inc.
856 Burnt Ridge Road
Onalaska, WA 98570

Order No.	10938
Site Locations	Burnt Ridge, Newaukum Prairie, and Big Hanaford

The Department of Ecology (Ecology) has issued this Administrative Order (Order) requiring Emerald Kalama Chemical, LLC (Emerald) and Fire Mountain Farms, Inc. (FMF) to comply with:

- Chapter 70.105 Revised Code of Washington (RCW), Hazardous Waste Management Act
- Chapter 173-303 Washington Administrative Code (WAC), Dangerous Waste Regulations
- Chapter 90.48 RCW, Water Pollution Control Act

RCW 70.105.095 authorizes Ecology to issue Administrative Orders requiring compliance whenever it determines that a person has violated or is about to violate any provision of Chapter 70.105 RCW. In addition, RCW 90.48.120(2) authorizes Ecology to issue Administrative Orders whenever Ecology deems immediate action is necessary to accomplish the purposes of Chapter 90.48 RCW, including requiring preventive action to abate a substantial potential to pollute the waters of the state of Washington.

BACKGROUND

Emerald operates an organic chemical manufacturing plant located in Kalama, Washington. Emerald uses toluene as a raw material to produce chemicals used in food, beverage, paint, and pharmaceutical industries to make flavorings, fragrances, preservatives, plasticizers, and other products.

Wastewater generated at the site includes process wastewater, storm water, contaminated groundwater, and laboratory wastewater. The contaminated groundwater and laboratory wastewater are listed dangerous wastes with the waste codes U220 and F003 per WAC 173-303-081(1) and 173-303-082(1). These two wastewater streams are treated onsite in a biological wastewater treatment system (BIOX) plant.

The BIOX plant consists of two aeration tanks, three clarifiers, and a digester unit. Clarifier solids from the BIOX plant are routed to a sludge holding tank and then to a dewatering unit. The solids are dewatered to approximately nine percent solids. Approximately 40 tons of biological solids are generated at the wastewater treatment system per week. The biological solids carry the dangerous waste listings U220 and F003 per WAC 173-303-081(3) and 173-303-082(3). Biological solids from an industrial wastewater treatment plant are considered sludge under the Washington State Dangerous Waste Regulations per WAC 173-303-040.

Records show that Emerald has contracted with FMF to land apply their sludge since October 1995. Emerald's sludge was mixed with biosolids from other locations, and land applied or stored at several FMF facilities. A specific registration requirement for waste-derived fertilizers was added to WSDA's fertilizer law in 1998. Emerald's sludge was registered by FMF as a waste-derived fertilizer with the Washington State Department of Agriculture (WSDA) in 2001. Fertilizers that contain recyclable materials are not subject to regulation under the Washington State Dangerous Waste Regulations per WAC 173-303-505(1)(b)(iii) provided 1) they are registered with the WSDA, 2) they meet the applicable treatment standards in subpart D of Part 268, and 3) they are legitimately used as a valuable commercial product instead of simply disposed of on land to avoid disposal costs.

FMF operates biosolids receiving, storage, treatment, and land application facilities in Lewis County, Washington. Biosolids is defined as municipal sewage sludge resulting from the wastewater treatment process per WAC 173-308-080. FMF is permitted under the Washington State General Permit for Biosolids Management to land apply biosolids during drier months and store biosolids year round. This permit does not allow the acceptance, storage, or land application of industrial sludge or dangerous waste. Municipal wastewater treatment facilities throughout Washington send their biosolids to FMF for management.

In January 2014, Ecology issued two agreed orders (Order No.10448 and Order No.10449) to FMF to address elevated nitrate concentrations in soil and groundwater at their Burnt Ridge and Newaukum Prairie land application sites. The orders required FMF to cease adding any additional material to the Burnt Ridge impoundment with the exception of livestock runoff and cease land application of materials at the entire Burnt Ridge site and the majority of Newaukum Prairie until all requirements for coverage under a new General Permit for Biosolids Management were met.

On April 18, 2014, Ecology notified Emerald that FMF could no longer accept their sludge. In working with Emerald to identify other options for their sludge, Ecology discovered that the WSDA fertilizer registration had lapsed in 2003. Therefore, even if the sludge was legitimately being used as a valuable product and applied directly to the land consistent with the application rate indicated on the required label (and not simply mixed with biosolids to avoid disposal costs), the sludge would have reverted back to its status as a dangerous waste and become subject to the Washington State Dangerous Waste Regulations, Chapter 173-303 WAC.

In June 2014, Ecology issued Order No.10721 to FMF. This order required FMF to cease accepting and land applying Emerald's sludge. The order further required FMF to notify Ecology of the location(s) where material received from Emerald was being stored, where the material from Emerald had been land applied, and to identify the source of the biosolids that had been mixed with Emerald's sludge.

In a letter dated June 3, 2014, Ecology requested that Emerald cease sending their sludge to FMF or any other land application facility until the regulatory status of the sludge was clarified. Ecology also notified Emerald that the sludge must be managed in accordance with Chapter 173-303 WAC.

Information received from FMF pursuant to Order No.10721 showed that Emerald's sludge is currently stored at three FMF facilities: Burnt Ridge located at 856 Burnt Ridge Road, Onalaska, WA; Newaukum Prairie located at 349 State Route 508, Chehalis, WA; and Big Hanaford located at 307 Big Hanaford Road, Centralia, WA.

Ecology last inspected the three facilities on August 6, 2014. The portion of Emerald's sludge that had not already been land applied had been mixed with biosolids and was being stored in surface impoundments located at Burnt Ridge and Newaukum Prairie, and in a roofed concrete bunker at Big Hanaford. The surface impoundment at Burnt Ridge is at risk of overtopping from rainfall this coming winter. There is approximately one foot of freeboard remaining in the impoundment. The Big Hanaford storage bunker was completely full. Material had seeped from between the concrete panels in several areas of the bunker onto bare soil. There are homes, surface water bodies, and drinking water wells down gradient of all three facilities.

Ecology believes that immediate action is necessary at the Burnt Ridge facility to prevent pollution of waters of the state.

Regulations promulgated pursuant to the Resource Conservation and Recovery Act (RCRA), establish a "cradle to grave" system governing hazardous waste from the point of generation to disposal. Under RCRA, Emerald and FMF are co-generators of the mixed dangerous waste material stored at Burnt Ridge, Newaukum Prairie, and Big Hanaford. Emerald is the original generator of the sludge that, along with FMF's act of mixing the dangerous waste sludge with biosolids, caused the mixed material at FMF to become a dangerous waste. When more than one

party plays a role in the generation of hazardous waste at a site, each party is "jointly and severally liable as generators" per WAC 173-303-040 (definition of "generator") and 45 Federal Register 72024 at 72026 (October 30, 1980). When FMF mixed Emerald's listed dangerous waste sludge with biosolids, the mixture became a listed dangerous waste and FMF became a co-generator of the mixed material.

DETERMINATION OF VIOLATION(S) AND ORDER TO COMPLY

Ecology has determined that one or more violations have occurred, or are about to occur, based on the facts provided in the background section of this Order.

Violations:

1. WAC 173-303-141(1): Failure to send dangerous waste to a permitted treatment, storage, and disposal (TSD) facility.
2. WAC 173-303-140(2)(a) and by reference 40 CFR Part 268: Failure to comply with land disposal restrictions as set forth in 40 CFR Part 268.
3. WAC 173-303-145(3): Failure to take appropriate mitigation or control actions after a spill or discharge. Failure to clean up spills of dangerous waste.

For these reasons and in accordance with RCW 70.105.095 and RCW 90.48.120, it is ordered that Emerald and FMF take the corrective actions listed below. Unless otherwise indicated, these corrective actions are required at the sites known as Burnt Ridge located at 856 Burnt Ridge Road, Onalaska, WA; Newaukum Prairie located at 349 State Route 508, Chehalis, WA; and Big Hanaford located at 307 Big Hanaford Road, Centralia, WA.

Corrective Actions:

1. To prevent possible overtopping and release of pollutants to waters of the state, FMF must immediately cease diverting runoff from livestock operations into the surface impoundment located at Burnt Ridge.

2. Within 10 days of receipt of this Order, FMF must submit to Ecology all analytical results from the sampling of the comingled material at Burnt Ridge, Newaukum Prairie, and Big Hanaford; and the groundwater wells at Burnt Ridge and Newaukum Prairie as required by Administrative Order No. 10721 issued on June 2, 2014 and in other discussions with Ecology.

3. Within 21 days of receipt of this Order, submit to Ecology a plan to prevent overtopping of the surface impoundment at Burnt Ridge and to address releases from this impoundment if they occur. The plan shall include:

a. The actions that will be taken to prevent overtopping of the surface impoundment at Burnt Ridge due to rainfall.
b. The actions that will be taken to clean up spills that may occur despite the actions taken to prevent overtopping, including any environmental media affected by the spill.
c. The schedule for implementing the actions described in a. and b. above.

Ecology will review the plan. If Ecology finds the plan deficient or if changes to the plan are necessary to comply with applicable state and federal requirements, Ecology will provide written comments. Ecology's comments must be addressed and the plan resubmitted within 7 days of Emerald's and FMF's receipt of the comments. Implementation of the plan must begin immediately upon Ecology's written approval and be carried out according to the schedule contained in the approved plan.

4. Within 60 days of receipt of this Order, submit to Ecology a plan to manage the material stored at Burnt Ridge, Newaukum Prairie, and Big Hanaford. The plan shall include:
   a. Proper designation of the material as provided in WAC 173-303-070 through 173-303-100.
   b. Obtaining an EPA identification number for each of the sites listed above [WAC 173-303-170(2)].
   c. Information to address the other generator requirements of WAC 173-303-170.
   d. An estimate of the volumes of material that will be removed.
   e. Management and disposal of the material in accordance with state and federal regulations.
   f. The actions that will be taken to clean close the three storage units in accordance with *Guidance for Clean Closure of Dangerous Waste Units and Facilities* (Ecology Publication #94-111, Revised May 2005).
   g. The actions that will be taken to clean up spills, including any environmental media affected by the spills, at the Big Hanaford facility.
   h. A schedule for removing and properly managing the material and clean closing the three storage units.

Ecology will review the plan. If Ecology finds the plan deficient or if changes to the plan are necessary to comply with applicable state and federal requirements, Ecology will provide written comments. Ecology's comments must be addressed and the plan resubmitted within 30 days of Emerald's and FMF's receipt of the comments.

Implementation of the plan must begin immediately upon Ecology's written approval and be carried out according to the schedule contained in the approved plan.

ELIGIBILITY FOR PAPERWORK VIOLATION WAIVER AND OPPORTUNITY TO CORRECT

Under RCW 34.05.110, small businesses are eligible for a waiver of a first-time paperwork violation and an opportunity to correct other violations.

Ecology has determined the violation(s) described in this Order are not paperwork violations under RCW 34.05.110 and therefore you are not eligible for a waiver for a first-time paperwork violation.

Ecology has determined that you are not eligible for an opportunity to correct under RCW 34.05.110 because the effect of the violation poses a potentially significant threat to human health or the environment, or causes serious harm to the public interest.

FAILURE TO COMPLY WITH THIS ORDER

Failure to comply with this Order may result in the issuance of civil penalties or other actions, administrative and/or judicial, to enforce the terms of this Order.

YOUR RIGHT TO APPEAL

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do both of the following within 30 days of the date of receipt of this Order:

- File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person (see addresses below). E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive, SE Lacey, WA 98503 **Pollution Control Hearings Board** 1111 Israel Road, SW STE 301 Tumwater, WA 98501	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608 **Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

CONTACT INFORMATION

Please direct all questions about this Order to:

Greg Gould
Department of Ecology
Industrial Section
P.O. Box 47600, Olympia, WA 98504
(360) 407-6934
greg.gould@ecy.wa.gov

and

Peter Lyon
Department of Ecology
Southwest Regional Office
P.O. Box 47775, Olympia, WA 98504
(360) 407-6381
peter.lyon@ecy.wa.gov

MORE INFORMATION

- **Pollution Control Hearings Board Website**
  www.eho.wa.gov/Boards_PCHB.aspx
- **Chapter 43.21B RCW – Environmental and Land Use Hearings Office – Pollution Control Hearings Board**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=43.21B

- **Chapter 43.21B RCW – Environmental and Land Use Hearings Office – Pollution Control Hearings Board**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=43.21B
- **Chapter 371-08 WAC – Practice and Procedure**
  http://apps.leg.wa.gov/WAC/default.aspx?cite=371-08
- **Chapter 34.05 RCW - Administrative Procedure Act**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=34.05
- **Chapter 70.105 RCW – Hazardous Waste Management**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=70.105
- **Chapter 173-303 WAC – Dangerous Waste Regulations**
  www.ecy.wa.gov/biblio/wac173303.html
- **Laws:** www.ecy.wa.gov/laws-rules/ecyrcw.html
- **Rules:** www.ecy.wa.gov/laws-rules/ecywac.html

SIGNATURE

Laurie G. Davies

Laurie G. Davies
Waste 2 Resources Program Manager

9/11/14

Date

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

November 5, 2014

Mr. Robert Thode
Fire Mountain Farms, Inc.
856 Burnt Ridge Road
Onalaska, WA 98570

Order No.	11050
Site Locations	Burnt Ridge Surface Impoundment

Re: Administrative Order

Dear Mr. Thode:

The Washington Department of Ecology has issued the enclosed Administrative Order requiring Fire Mountain Farms, Inc. and Emerald Kalama Chemical, LLC to comply with:

- Chapter 70.105 Revised Code of Washington (RCW), Hazardous Waste Management Act
- Chapter 173-303 Washington Administrative Code (WAC), Dangerous Waste Regulations
- Chapter 90.48 RCW, Water Pollution Control Act

If you have questions, please contact Peter Lyon at (360) 407-6381 or peter.lyon@ecy.wa.gov.

Sincerely,

Laurie G. Davies
Waste 2 Resources Program Manager

Enclosure

By Certified Mail #91 7199 9991 7032 9431 7211

cc: Jonathan Thompson, Attorney General's Office

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER AGAINST Emerald Kalama Chemical, LLC AND Fire Mountain Farms, Inc.	))))))	ADMINISTRATIVE ORDER No. 11050

To: Mr. Jarrod Kocin
Emerald Kalama Chemical, LLC
1296 Third Street NW
Kalama, WA 98625

Mr. Robert Thode
Fire Mountain Farms, Inc.
856 Burnt Ridge Road
Onalaska, WA 98570

Order No.	11050
Site Location	Burnt Ridge Surface Impoundment

The Department of Ecology (Ecology) has issued this Administrative Order (Order) requiring Emerald Kalama Chemical, LLC (Emerald) and Fire Mountain Farms, Inc. (FMF) to comply with:

- Chapter 70.105 Revised Code of Washington (RCW), Hazardous Waste Management Act
- Chapter 173-303 Washington Administrative Code (WAC), Dangerous Waste Regulations
- Chapter 90.48 RCW, Water Pollution Control Act

RCW 70.105.095 authorizes Ecology to issue Administrative Orders requiring compliance whenever it determines that a person has violated or is about to violate any provision of Chapter 70.105 RCW. In addition, RCW 90.48.120(2) authorizes Ecology to issue Administrative Orders whenever Ecology deems immediate action is necessary to accomplish the purposes of Chapter 90.48 RCW, including requiring preventive action to abate a substantial potential to pollute the waters of the state of Washington.

BACKGROUND

Ecology has determined that sludge from Emerald's wastewater treatment plant was mixed with biosolids and stored at FMF's Burnt Ridge surface impoundment. This mixed material is listed dangerous waste. The surface impoundment at Burnt Ridge is at risk of overtopping from rainfall this coming winter. Ecology issued Order No. 10938 to Emerald and FMF requiring

submittal of a plan to prevent overtopping of the surface impoundment at Burnt Ridge and to address releases from this impoundment if they occur.

In response to Order No. 10938, Emerald submitted a plan titled *Plan to Prevent Surface Impoundment Overtopping* dated October 2, 2014 and subsequent letter dated October 7, 2014. Ecology reviewed the submittals and provided comments to Emerald in a letter dated October 10, 2014, with a copy to FMF. In an email sent to Ecology on October 17, 2014, FMF committed to work cooperatively with Emerald on the proposed plan. Emerald submitted a letter dated October 21, 2014 addressing Ecology's comments. Ecology reviewed this letter and provided additional comments to Emerald in a letter dated October 24, 2014. Emerald submitted a final plan titled *Revised Plan to Prevent Surface Impoundment Overtopping* dated November 4, 2014 (Revised Plan).

ORDER TO COMPLY

Due to the emergency nature of the situation, Ecology is temporarily authorizing the activities described in this Order under the authority of Chapter 70.105 RCW and Chapter 90.48 RCW. Emerald will not be deemed in violation of its existing hazardous waste permit for implementing the terms of this Order. This temporary authorization is granted for a term of 180 days from the date of this order and only for the supernatant water located at the Burnt Ridge impoundment when managed in accordance with terms of this Order.

This Order authorizes Emerald and FMF to implement the portions of the Revised Plan regarding 1) the transportation of water from the Burnt Ridge impoundment and treatment of the water in Emerald's wastewater treatment plant and 2) addressing the potential releases of water from the surface impoundment. Specifically, the portions of the Revised Plan that Emerald and FMF must implement are as follows: paragraphs six, seven, eight, nine, and ten of the section titled "Removing Water for Onsite Discharge or Offsite Treatment and Disposal" and the section titled "Recommended Actions to Address Releases from the FMF Burnt Ridge Surface Impoundment."

Mobilization for removal of the water from the impoundment must begin immediately upon receipt of this Order with removal of the water commencing as soon as possible thereafter. Based on WAC 173-303-145(3)(b)(i)(A), Ecology authorizes removal of the water may be without a manifest, and by transporters who do not have EPA/state identification numbers. Water must be removed to maintain a minimum 24-inch freeboard.

Inspections of the impoundment must be performed at least twice weekly to determine the available freeboard. The freeboard must be determined based on the vertical distance between the surface of the water in the impoundment and the lowest point along the crest of the original compacted surface of the berm. The soil recently added by FMF to the top of the berm should be disregarded for purposes of measuring freeboard. Each inspection must be recorded and inspection results must be provided to Ecology upon request.

Any modification of the Burnt Ridge impoundment, including installation of the floating cover described in the Revised Plan requires Ecology's prior review and approval.

Emerald must meet all requirements of their National Pollutant Discharge Elimination System Permit No. WA0000281 in processing the water from Burnt Ridge in their wastewater treatment plant.

The sludge from Emerald's wastewater treatment plant must be sent to a Resource Conservation and Recovery Act permitted treatment, storage, and disposal facility.

ELIGIBILITY FOR PAPERWORK VIOLATION WAIVER AND OPPORTUNITY TO CORRECT

Under RCW 34.05.110, small businesses are eligible for a waiver of a first-time paperwork violation and an opportunity to correct other violations.

Ecology has determined the violation(s) described in this Order are not paperwork violations under RCW 34.05.110 and therefore you are not eligible for a waiver for a first-time paperwork violation.

Ecology has determined that you are not eligible for an opportunity to correct under RCW 34.05.110 because the effect of the violation poses a potentially significant threat to human health or the environment, or causes serious harm to the public interest.

FAILURE TO COMPLY WITH THIS ORDER

Failure to comply with this Order may result in the issuance of civil penalties or other actions, administrative and/or judicial, to enforce the terms of this Order.

YOUR RIGHT TO APPEAL

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do both of the following within 30 days of the date of receipt of this Order:

- File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person (see addresses below). E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive, SE Lacey, WA 98503 **Pollution Control Hearings Board** 1111 Israel Road, SW STE 301 Tumwater, WA 98501	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608 **Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

CONTACT INFORMATION

Please direct all questions about this Order to:

Greg Gould
Department of Ecology
Industrial Section
P.O. Box 47600, Olympia, WA 98504
(360) 407-6934
greg.gould@ecy.wa.gov

and

Peter Lyon
Department of Ecology
Southwest Regional Office
P.O. Box 47775, Olympia, WA 98504
(360) 407-6381
peter.lyon@ecy.wa.gov

MORE INFORMATION

- **Pollution Control Hearings Board Website**
  www.eho.wa.gov/Boards_PCHB.aspx

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- **Chapter 34.05 RCW - Administrative Procedure Act**
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- **Chapter 70.105 RCW – Hazardous Waste Management**
  http://apps.leg.wa.gov/RCW/default.aspx?cite=70.105
- **Chapter 173-303 WAC – Dangerous Waste Regulations**
  www.ecy.wa.gov/biblio/wac173303.html
- **Laws:** www.ecy.wa.gov/laws-rules/ecyrcw.html
- **Rules:** www.ecy.wa.gov/laws-rules/ecywac.html

SIGNATURE

Laurie G. Davies

Laurie G. Davies
Waste 2 Resources Program Manager

11/5/14
Date

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

November 21, 2014

Mr. Robert Thode
Fire Mountain Farms, Inc.
856 Burnt Ridge Road
Onalaska, WA 98570

Order No.	11084
Site Locations	Burnt Ridge Surface Impoundment

Re: Administrative Order

Dear Mr. Thode:

The Washington Department of Ecology has issued the enclosed Administrative Order requiring Fire Mountain Farms, Inc. and Emerald Kalama Chemical, LLC to comply with:

- Chapter 70.105 Revised Code of Washington (RCW), Hazardous Waste Management Act
- Chapter 173-303 Washington Administrative Code (WAC), Dangerous Waste Regulations
- Chapter 90.48 RCW, Water Pollution Control Act

If you have questions, please contact Peter Lyon at (360) 407-6381 or peter.lyon@ecy.wa.gov.

Sincerely,

Laurie G. Davies

Laurie G. Davies
Waste 2 Resources Program Manager

Enclosure

By Certified Mail #91 7199 9991 7032 9431 7303

cc: Jonathan Thompson, Attorney General's Office

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER AGAINST Emerald Kalama Chemical, LLC AND Fire Mountain Farms, Inc.	))))))	ADMINISTRATIVE ORDER No. 11084

To: Mr. Jarrod Kocin
Emerald Kalama Chemical, LLC
1296 Third Street NW
Kalama, WA 98625

Mr. Robert Thode
Fire Mountain Farms, Inc.
856 Burnt Ridge Road
Onalaska, WA 98570

Order No.	11084
Site Location	Burnt Ridge Surface Impoundment

The Department of Ecology (Ecology) previously issued Administrative Order No. 10938 and Administrative Order No. 11050 requiring Emerald Kalama Chemical, LLC (Emerald) and Fire Mountain Farms, Inc. (FMF) to comply with:

- Chapter 70.105 Revised Code of Washington (RCW), Hazardous Waste Management Act
- Chapter 173-303 Washington Administrative Code (WAC), Dangerous Waste Regulations
- Chapter 90.48 RCW, Water Pollution Control Act

RCW 70.105.095 authorizes Ecology to issue Administrative Orders requiring compliance whenever it determines that a person has violated or is about to violate any provision of Chapter 70.105 RCW. In addition, RCW 90.48.120(2) authorizes Ecology to issue Administrative Orders whenever Ecology deems immediate action is necessary to accomplish the purposes of Chapter 90.48 RCW, including requiring preventive action to abate a substantial potential to pollute the waters of the state of Washington.

Ecology now issues this Administrative Order (Order), to facilitate and specify Emerald and FMF's proposed method of compliance with Corrective Action 3 of Administrative Order No. 10938 (requiring development and implementation of a plan to prevent overtopping of Burnt Ridge surface impoundment). This Order rescinds Administrative Order No. 11050 and, at the request of Emerald, makes a "contained-in" determination that the stormwater environmental media that has accumulated above the sludge in the Burnt Ridge impoundment is no longer

required to be considered a dangerous waste, provided that it is handled in accordance with the treatment and disposal conditions required by this Order.

BACKGROUND

Ecology has determined that sludge from Emerald's wastewater treatment plant was mixed with biosolids and stored at FMF's Burnt Ridge surface impoundment. This mixed material is listed dangerous waste. The surface impoundment at Burnt Ridge is at risk of overtopping from rainfall this coming winter. Ecology issued Order No. 10938 to Emerald and FMF requiring, in Corrective Action 3, submittal of a plan to prevent overtopping of the surface impoundment at Burnt Ridge.

In response to Order No. 10938, Emerald submitted a plan titled *Revised Plan to Prevent Surface Impoundment Overtopping* dated November 4, 2014 (Revised Plan).

On November 5, 2014, Ecology issued Order No. 11050 to Emerald and FMF requiring the transportation of water from the Burnt Ridge impoundment and treatment of the water in Emerald's wastewater treatment plant. Order No. 11050 authorized Emerald and FMF to implement specific portions of the Revised Plan. Emerald and FMF began pumping water from the Burnt Ridge impoundment on November 10, 2014.

During a conference call on November 13, 2014, Emerald, FMF, and Ecology discussed the option of applying the contained-in policy to the accumulated stormwater in the Burnt Ridge impoundment. Under the contained-in policy, Ecology may determine that soil, groundwater, surface water, or other environmental media into which a listed hazardous waste has been released no longer "contains" that listed hazardous waste, for purposes of Ecology's dangerous waste rules and the federal hazardous waste rules, when the hazardous constituents in the media are below risk-based levels.

The applicable risk-based levels are cleanup levels calculated using unrestricted use assumptions from the Model Toxics Control Act (MTCA) Cleanup Regulation, Chapter 173-340 WAC. These cleanup levels are calculated according to MTCA Method B default exposure scenarios and risk assumptions. Contaminate levels are also compared to Universal Treatment Standards, 40 Code of Federal Regulations Part 268.48, for all hazardous constituents in the contaminated media. Once it is determined that the media no longer contains a listed waste, the media is generally no longer subject to the Resource Conservation and Recovery Act (RCRA).

Ecology also examines potential risks and pathways of exposure to evaluate whether contingent management of the contaminated media is necessary to protect human health and the environment.

On November 21, 2014, Emerald submitted a request for a contained-in determination (Contained-in Request) for contaminated stormwater in the Burnt Ridge impoundment. In the

request, Emerald proposes to treat the contaminated stormwater and discharge it to FMF-owned land near the impoundment. After reviewing Emerald's request, Ecology has determined that the stormwater in the Burnt Ridge impoundment no longer contains a listed hazardous waste when managed in accordance with the terms of this Order.

ORDER TO COMPLY

Emerald and FMF must land apply the stormwater from the Burnt Ridge surface impoundment as described in the Contained-in Request.

Emerald and FMF must continue to transport the water from the Burnt Ridge impoundment and treat it in Emerald's wastewater treatment plant until land application operations commence.

The water filtration system that will be used to treat the FMF Burnt Ridge impoundment water must be comprised of two stages. The water must first be passed through a pre-filter to remove suspended solids. The second stage must consist of multiple activated carbon filters arranged in series to provide reasonable treatment for any residual volatile organic compounds.

The treated stormwater must not be applied at rates that will cause surface pooling or runoff.

Water must be removed from the impoundment to maintain a minimum 24-inch freeboard.

Inspections of the impoundment must be performed at least weekly to determine the approximate freeboard. The freeboard must be estimated based on the vertical distance between the surface of the water in the impoundment and the lowest point along the crest of the original compacted surface of the berm. Inspection results must be provided to Ecology upon request. If, at any time, the freeboard is less than 24 inches, Emerald and FMF must remove additional stormwater and land apply it as described in the Contained-in Request or transport the water and treat it in Emerald's wastewater treatment plant.

If the stormwater from the Burnt Ridge surface impoundment is to be transported to and treated in Emerald's wastewater treatment plant, Emerald and FMF must implement paragraphs six, seven, eight, nine, and ten of the section titled "Removing Water for Onsite Discharge or Offsite Treatment and Disposal" and the section titled "Recommended Actions to Address Releases from the FMF Burnt Ridge Surface Impoundment" of the Revised Plan.

Emerald must meet all requirements of their NPDES Permit No. WA0000281 in processing the water from Burnt Ridge in their wastewater treatment plant.

The sludge from Emerald's wastewater treatment plant must be sent to a RCRA permitted treatment, storage, and disposal facility.

ELIGIBILITY FOR PAPERWORK VIOLATION WAIVER AND OPPORTUNITY TO CORRECT

Under RCW 34.05.110, small businesses are eligible for a waiver of a first-time paperwork violation and an opportunity to correct other violations.

Ecology has determined the violation(s) described in this Order are not paperwork violations under RCW 34.05.110 and therefore you are not eligible for a waiver for a first-time paperwork violation.

Ecology has determined that you are not eligible for an opportunity to correct under RCW 34.05.110 because the effect of the violation poses a potentially significant threat to human health or the environment, or causes serious harm to the public interest.

FAILURE TO COMPLY WITH THIS ORDER

Failure to comply with this Order may result in the issuance of civil penalties or other actions, administrative and/or judicial, to enforce the terms of this Order.

YOUR RIGHT TO APPEAL

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do both of the following within 30 days of the date of receipt of this Order:

- File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person (see addresses below). E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

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CONTACT INFORMATION

Please direct all questions about this Order to:

Greg Gould
Department of Ecology
Industrial Section
P.O. Box 47600, Olympia, WA 98504
(360) 407-6934
greg.gould@ecy.wa.gov

and

Peter Lyon
Department of Ecology
Southwest Regional Office
P.O. Box 47775, Olympia, WA 98504
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MORE INFORMATION

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  http://apps.leg.wa.gov/RCW/default.aspx?cite=70.105
- **Chapter 173-303 WAC – Dangerous Waste Regulations**
  www.ecy.wa.gov/biblio/wac173303.html
- **Laws:** www.ecy.wa.gov/laws-rules/ecyrcw.html
- **Rules:** www.ecy.wa.gov/laws-rules/ecywac.html

SIGNATURE

Laurie G. Davies
Waste 2 Resources Program Manager

11-21-14
Date

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
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December 17, 2015

Mr. Robert Thode
Fire Mountain Farms, Inc.
856 Burnt Ridge Road
Onalaska, WA 98570

Order No.	13063
Site Location	Newaukum Prairie Surface Impoundment

Re: Administrative Order

Dear Mr. Thode:

The Washington Department of Ecology has issued the enclosed Administrative Order requiring Fire Mountain Farms, Inc. and Emerald Kalama Chemical, LLC to comply with:

- Chapter 70.105 Revised Code of Washington (RCW), Hazardous Waste Management Act
- Chapter 173-303 Washington Administrative Code (WAC), Dangerous Waste Regulations
- Chapter 90.48 RCW, Water Pollution Control Act

If you have questions, please contact Peter Lyon at (360) 407-6381 or peter.lyon@ecy.wa.gov.

Sincerely,

Laurie G. Davies

Laurie G. Davies
Waste 2 Resources Program Manager

Enclosure

By Certified Mail #91 7108 2133 3939 6866 7600

cc: Jonathan Thompson, Attorney General's Office

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

IN THE MATTER OF AN ADMINISTRATIVE ORDER AGAINST Emerald Kalama Chemical, LLC AND Fire Mountain Farms, Inc.	))))))	ADMINISTRATIVE ORDER DOCKET #13063

To: Mr. Jarrod Kocin
Emerald Kalama Chemical, LLC
1296 Third Street NW
Kalama, WA 98625

Mr. Robert Thode
Fire Mountain Farms, Inc.
856 Burnt Ridge Road
Onalaska, WA 98570

Order Docket #	13063
Site Location	Newaukum Prairie Surface Impoundment 349 State Route 508 Chehalis, WA 98532

The Department of Ecology (Ecology) previously issued Administrative Order No. 10938 requiring Emerald Kalama Chemical, LLC (Emerald) and Fire Mountain Farms, Inc. (FMF) to comply with:

- Chapter 70.105 Revised Code of Washington (RCW), Hazardous Waste Management Act
- Chapter 173-303 Washington Administrative Code (WAC), Dangerous Waste Regulations
- Chapter 90.48 RCW, Water Pollution Control Act

RCW 70.105.095 authorizes Ecology to issue Administrative Orders requiring compliance whenever it determines that a person has violated or is about to violate any provision of Chapter 70.105 RCW. In addition, RCW 90.48.120(2) authorizes Ecology to issue Administrative Orders whenever Ecology deems immediate action is necessary to accomplish the purposes of Chapter 90.48 RCW, including requiring preventive action to abate a substantial potential to pollute the waters of the state of Washington.

Ecology now issues this Administrative Order (Order), to facilitate and specify Emerald and FMF's proposed method of preventing overtopping of the Newaukum Prairie surface impoundment. Emerald and FMF's plan to prevent overtopping includes submitting to Ecology for review a "contained-in" request that would request stormwater that has accumulated above the sludge in the Newaukum Prairie surface impoundment no longer be considered a dangerous waste. The contained-in request will propose that the stormwater be transported to and treated in Emerald's wastewater treatment plant.

BACKGROUND

In Administrative Order No. 10938, Ecology determined that sludge from Emerald's wastewater treatment plant was mixed with biosolids and stored at FMF's Newaukum Prairie surface impoundment. Ecology also determined that this mixed material is listed dangerous waste. The Newaukum Prairie surface impoundment is at risk of overtopping from rainfall this coming winter.

In order to prevent overtopping, Emerald submitted a plan titled *Revised Plan to Manage the Surface Water and Biosolids at Fire Mountain Farms Newaukum Prairie Impoundment* dated December 11, 2015 (Revised Plan).

During a conference call on November 23, 2015, Emerald, FMF, and Ecology discussed the option of applying the contained-in policy to the accumulated stormwater in the Newaukum Prairie impoundment. Under the contained-in policy, Ecology may determine that soil, groundwater, surface water, or other environmental media into which a listed hazardous waste has been released no longer "contains" that listed hazardous waste, for purposes of Ecology's dangerous waste rules and the federal hazardous waste rules, when the hazardous constituents in the media are below risk-based levels.

The applicable risk-based levels are cleanup levels calculated using unrestricted use assumptions from the Model Toxics Control Act (MTCA) Cleanup Regulation, Chapter 173-340 WAC. These cleanup levels are calculated according to MTCA Method B default exposure scenarios and risk assumptions. Contaminant levels are also compared to Universal Treatment Standards (UTS), 40 Code of Federal Regulations Part 268.48, for all hazardous constituents in the contaminated media. Once it is determined that the media no longer contains a listed waste, the media is generally no longer subject to management as a dangerous/hazardous waste.

Ecology also examines potential risks and pathways of exposure to evaluate whether contingent management of the contaminated media is necessary to protect human health and the environment.

The Revised Plan states that after stormwater sample results are available and below risk levels, Emerald will submit a request for a contained-in determination for the contaminated stormwater in the Newaukum Prairie surface impoundment. Ecology will review the request and determine if stormwater in the Newaukum Prairie surface impoundment no longer contains a listed hazardous waste when managed in accordance with the Revised Plan and this Order. Ecology's determination will be by letter. Once Ecology makes a contained-in determination, Emerald and FMF will continue to follow the Revised Plan and this Order to remove the stormwater.

ORDER TO COMPLY

Emerald and FMF must implement the Revised Plan.

Emerald and FMF must sample and measure the depth of the stormwater cap according to the Revised Plan by December 22, 2015.

In submitting the contained-in request, Emerald must use the most stringent of the UTS and MTCA Method B levels to compare to the stormwater cap concentrations.

Emerald and FMF must begin removal of stormwater from the Newaukum Prairie surface impoundment according to the Revised Plan and this Order within 7 business days of receiving Ecology's contained-in determination letter.

At Ecology's discretion, Emerald and FMF must stop pumping stormwater from the Newaukum Prairie surface impoundment whenever the COD results show significant increases above previous results. Ecology and Emerald will discuss the potential causes of the COD concentration increases and determine appropriate modifications, if any, to the pumping operations. Pumping stormwater from the impoundment must resume within 3 business days of Ecology's approval to restart pumping operations. This approval will be by email or letter.

The Newaukum Prairie surface impoundment must be maintained to have a minimum 24-inch freeboard. If, at any time, the freeboard is less than 24 inches, Emerald and FMF must remove additional stormwater as described in the Revised Plan and this Order.

Inspections of the Newaukum Prairie surface impoundment must be performed and documented at least weekly to determine the approximate freeboard. The freeboard must be estimated based on the vertical distance between the surface of the water in the impoundment and the lowest point along the crest of the containment berm.

The approximate freeboard from inspections of the Newaukum Prairie surface impoundment, individual COD results, and the total weekly volume of stormwater transported to Emerald's wastewater treatment plant for the previous week must be sent to Greg Gould (according to the contact information below) by email every Monday by 11:00 a.m., unless Ecology specifies by letter a different reporting frequency.

Emerald must meet all requirements of their NPDES Permit No. WA0000281 in processing the stormwater from the Newaukum Prairie impoundment in their wastewater treatment plant.

The sludge from Emerald's wastewater treatment plant must be sent to a RCRA Subtitle C permitted treatment, storage, and disposal facility.

FAILURE TO COMPLY WITH THIS ORDER

Failure to comply with this Order may result in the issuance of civil penalties or other actions, administrative and/or judicial, to enforce the terms of this Order.

YOUR RIGHT TO APPEAL

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do both of the following within 30 days of the date of receipt of this Order:

- File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person. (See addresses below). E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

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CONTACT INFORMATION

Please direct all questions about this Order to:

Greg Gould
Department of Ecology
Industrial Section
P.O. Box 47600, Olympia, WA 98504
(360) 407-6934
greg.gould@ecy.wa.gov

and

Peter Lyon
Department of Ecology
Southwest Regional Office
P.O. Box 47775, Olympia, WA 98504
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MORE INFORMATION

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  www.ecy.wa.gov/biblio/wac173303.html
- **Laws:** www.ecy.wa.gov/laws-rules/ecyrcw.html
- **Rules:** www.ecy.wa.gov/laws-rules/ecywac.html

SIGNATURE

Laurie G. Davies

Laurie G. Davies
Waste 2 Resources Program Manager

12/17/15

Date

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

March 30, 2016

Mr. Robert Thode
President
Fire Mountain Farms
856 Burnt Ridge Rd
Onalaska, WA 98570

RE: Notification of Partial Denial of Fire Mountain Farms' Application for Coverage under the Biosolids General Permit and Notice of Opportunity to Supplement Incomplete Application

Dear Mr. Thode:

This letter is to notify you that we have reviewed the application for Fire Mountain Farms' biosolids beneficial use facility (BUF), permit number BT9902, submitted on February 22, 2016, and have made the following determinations.

Denial of Coverage at Certain Units Pending Compliance with Dangerous Waste Regulations:

WAC 173-308-310(24)(d) provides that Ecology may deny a permit application when there has been a "change in any condition that requires either a temporary or permanent reduction or elimination of an activity controlled by the permit."

By your admission, Fire Mountain Farms (FMF) land applied Emerald Kalama Chemical (EKC) industrial wastewater treatment sludge at the following locations:

- Newaukum Prairie Unit
- Burnt Ridge Unit
- Homestead Unit
- Big Hanaford Unit
- Bunker Creek Unit
- Lincoln Creek Unit

Ecology determined that Emerald Kalama Chemical's industrial wastewater treatment sludge is a listed dangerous waste, and this determination was upheld on appeal by the Pollution Control Hearings Board. In order to comply with state dangerous waste regulations, it will be necessary

preference, we will review your example plan and provide comment during the final coverage process in order to aid in efficient approval of subsequently submitted plans.

7. **General Land Application Plan (GLAP):** The GLAP that you submitted with your application lists every county in Washington. Per the definition of a "Significant change in biosolids management" (WAC 173-308-080), Ecology would consider this expansion of counties covered in the GLAP a significant change. As such, FMF would be required to comply with public notice requirement in all counties covered by the GLAP (per WAC 173-308-310 (13) (ii)). If this was not your intent, we recommend that you resubmit the GLAP to reflect counties where public notices will be published and submit updated GLAPs when applying to add sites in new counties.

8. **Site Specific Land Application Plans (SSLAP):**
   a. **Landowner Agreements:** Parcel (016828007000) of the North Fork Unit needs a correct and current landowner agreement associated with it.
   b. **Storage Plan:** This is a new required component of SSLAPs. It is a short form found here: https://fortress.wa.gov/ecy/publications/SummaryPages/ECY070541.html

9. **SEPA:** As part of the application packet, FMF submitted an updated SEPA checklist addressing the units in Lewis County, with the expectation that, as the SEPA lead agency, Ecology would provide confirmation of compliance with SEPA for the units in Pierce, Grays Harbor and Pacific counties.
   a. **Eatonville Unit:** Enclosed is a confirmation of compliance with SEPA.
   b. **Lewis County Units:** The will be signed, and a copy provided, once a date for public notice is determined.
   c. **Elma Unit:** Enclosed is a confirmation of compliance with SEPA.
   d. **Willapa Unit:** Upon receipt of further information confirmation of compliance with SEPA can be provided.

Updated information and documentation should be provided to Kelsey Dunne (Kelsey.Dunne@ecy.wa.gov) no later than April 30, 2016, at which time Kelsey will review and provide any further comments. Presuming the above concerns are satisfactorily addressed, it is hoped that a meeting with Kelsey can be arranged for April to discuss the process towards final coverage and possible final coverage conditions.

Feel free to contact me if you have any questions regarding this matter.

Sincerely,

Peter Y. Lyon

Peter Y. Lyon
Regional Section Manager
Waste 2 Resources Program

Enclosures:

Pierce County Public Notice w/Ecology comments
Lewis County Public Notice w/Ecology comments
Grays Harbor Public Notice w/Ecology comments
Pacific County Public Notice w/Ecology comments
Interested Party Contact Information
Eatonville Unit SEPA note-to-file
Elma Unit SEPA note-to-file

By certified mail [91 7108 2133 3939 7125 2251]

cc: Ryan Thode, V.P. Operations, Fire Mountain Farms
Bill Teitzel, Lewis County Health Department
Megan McNelly, Pacific County Health Department
Jeff Nelson, Grays Harbor County Health Department
Dave Bosch, Tacoma Pierce County Health Department
Kelsey Dunne, Department of Ecology
Betty Ann Bickner, Department of Ecology

SIERRA CLUB
FOUNDED 1892

October 24, 2016

Wayne Krafft
Waste 2 Resources Eastern Regional Office Section Manager
4601 N Monroe Street, WA 99205
Email: akra461@ecy.wa.gov

RE: Permit BT 9902. Fire Mountain Farms (FMF) Application to spread sewage sludge on the Lincoln County Gary Rosman Farm. (1)

To Mr. Krafft:

The Washington State Chapter of Sierra Club takes this opportunity to comment on the Environmental Assessment and other pertinent documents relative to the Fire Mountain Farms (FMF) application to spread sewage sludge, a.k.a. biosolids, on the Rosman wheat and forested farm [1] Lincoln County WA. We have attached a science-based document with over 160 citations prepared for testimony in Pennsylvania by Professor Emeritus Caroline Snyder, one of the nation's experts on the subject of land applying sewage sludge (Attachment 1) as well as additional citations (Attachment 2).

The Sierra Club based on years of careful study and scientific evidence, adopted this language in its most recent Food and Agriculture policy:

The Sierra Club opposes the use of contaminated toxics-containing or pathogen-containing waste as a compost ingredient and the application of municipal sewage sludge as a fertilizer. (2)

We have the following concerns:

- ***Potential impacts to neighboring certified organic growers' fields.*** The Tolstoy Organic Farms and those of Morton and Paige Alexander stand to lose their ability to claim their farm products are organic if sewage sludge particulates or runoff from the Rosman farm reaches those farms, or if the aquifer they share is polluted with the land applied sewage sludge contaminants. [2]

Summary of Comments on Sierra Oct.2016 Spokane LASS Comments FINAL (Oct 24, 2016).pdf

Page: 1

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 9:49:48 AM
No forested land is proposed for land application on Rosman land.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 9:51:01 AM
Appropriate buffers reduce the risk of runoff. Applying biosolids at an agronomic rate prevents ground water contamination. There is no evidence that biosolids land application at the Rosman Farm fields will impact the organic certification of any of the adjacent farms.

- ***Toxic chemicals and pathogens may be contained in the proposed sewage sludge to be spread.*** Sewage sludge or liquid contains many thousands of contaminants and a range of pathogens, including MRSA. Sewage treatment plants were not designed to treat many contaminants that are in their effluent and often toxic chemicals and other contaminants become adsorbed to or contained in the sewage sludge. Treatment plants can create other synergistic contaminants and antibiotic resistant bacteria and genes. We are concerned that the sludge material will adversely impact farm workers, humans who live nearby, surface water and groundwater, and wildlife. Life downstream of runoff, or humans downwind, can suffer health impacts. [1]

- ***The site owners and adjacent landowners and resource managers may not be fully aware of the impacts of sludge.*** Has Mr. Rosman been fully informed of the soil, aquifer, and crop risks of this sewage sludge? Are the other landowners in the area dependent on the aquifer shared by Mr. Rosman? And since FMF admits to [2] sewage runoff into streams that empty into Lake Roosevelt, are managers of this lake aware of this potential pollutant source? Specifically, we believe that the Bureau of Land Management, the Lake Roosevelt National Park, and the Colville and the Spokane Tribes should be informed of this project, consulted with and asked to comment. [3]

- ***Onsite storage of sludge could lead to air drift and surface water runoff impacts***. The Site Specific Land Application Plan http://www.ecy.wa.gov/programs/swfa/biosolids/pdf/FMFRosmanSSLAP.pdf (Page 6, 5.0) states that there will be *possible storage of the sewage sludge on site.* Onsite storage can lead to drift and runoff problems. [4]

- ***Sampling is inadequate.*** The Plan (Page 76) states that *monitoring only includes nutrients (nitrogen), 9 metals (See Table 3), and total and volatile solids and fecal coliform.* This monitoring plan needs to also include toxic chemicals and pathogens that might be expected at the site. [5]

- ***Industrial wastes will also be allowed to be spread.*** The State's General Permit for Biosolids Management (August 3, 2015) states that *Although the state program does not regulate surface disposal or incineration, the transfer of biosolids from a wastewater treatment plant to an incineration facility or surface disposal site is an activity covered under this permit.* Thus it is not clear where FMF will be getting its wastes. As the documents now read, FMF is allowed to spread industrial wastes in addition to municipal wastes, and maybe other wastes. [6]

- ***There may be serious odor problems for neighbors.*** FMF states that odor dissipates quickly. Down winders will verify this is not so; that the smell

Page: 2

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 1/30/2017 11:28:17 AM
See Item 3 Erosion, Item 4 Health and Item 5 HG Review.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 1:49:22 PM
Ecology has no information supporting the allegation of the statement by FMF regarding runoff to Lake Roosevelt.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 5/10/2017 1:35:39 PM -07'00'
A function of SEPA review informs the tribe before the DNS is issued. See Item 1 SEPA. Also a 30 day comment period is posted in the newspaper.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 1:51:49 PM
This application does not include a request for storage. Should storage be requested in the future, ecology will make a determination to include necessary controls to prevent drift and runoff.

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 9:55:21 AM
The sample plan is addressed in the SSLAP section 10, It includes pathogen reduction, pollutants, and vector attraction reduction per WAC 173-308-160, 170, 180.

Number: 6 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 11:17:12 AM
Where biosolids come from is not a factor because all biosolids approved for land application are tested to a minimum standard and are by definition municipal sewage sludge resulting from the waste water treatment process, WAC 173-308-080. Industrial waste is a product of pretreatment which is not regulated under the biosolids permit and requires a separate permit for surface disposal or incineration.

lingers and is horrible. The particulates of sewage sludge are known to be harmful to health. This concern is further detailed in Attachment 1.[1]

- ***The buffer is inadequate.*** The project documents describe a 10-meter buffer. That is a very narrow buffer from streams or abutting properties.[2]

Thank you for consideration of our comments.

Sincerely,

Josh Osborne-Klein
Conservation Chair
Washington State Chapter of Sierra Club

Page: 3

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 11:17:37 AM

Vector Attraction Reduction (VAR) is how odors are reduced. VAR is verified by testing per WAC 173-308-180. Should testing prove reduction has not been met the biosolids must be incorporated into the soil thus reducing odors. There is no evidence land applied biosolids are harmful to human health See Attachment 5 Health.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 2/6/2017 12:16:12 PM

The closest property line from the proposed fields is over 700 feet. All streams and wells are required to be minimum of 100 feet from the application site.

Attachment 1: Written testimony prepared by Caroline Snyder to the Pennsylvania House Democratic Policy Committee regarding HR60 (biosolids policy) *http://www.sludgefacts.org/testimony_to_pa.pdf*

To: PA House Democratic Policy Committee

Re: Public Hearing on sewage sludge

From: Caroline Snyder

Date: August 29, 2016

My name is Caroline Snyder. I am emeritus professor at the Rochester Institute of Technology where I designed, administered, and taught interdisciplinary environmental science courses and chaired the Department of Science, Technology, and Society. In 2001 I founded the nonprofit group, Citizens for Sludge-Free Land.

I appreciate the opportunity to submit written testimony at this public hearing. A re-evaluation of the Commonwealth's biosolids policies is long overdue. HR 60 is a good first step.

Land-applied municipal sewage sludge (biosolids) is a highly complex and unpredictable mixture of biological and chemical pollutants. Most of the 90,000 man-made chemical compounds in commerce today--with 1000 new ones added annually-- end up in sewage, and many of those, concentrate in the resulting biosolids.[107] They include carcinogens, mutagens, neurotoxins, endocrine disrupters, solvents, pharmaceuticals, radioactive waste, leachates from landfills and superfund sites, as well as disease causing and antibiotic resistant pathogens.[52,61,86,70,87, 97,104,] Upgrading and building improved treatment plants that will remove more pollutants from sewage, will cause sludge to become even more contaminated. Biosolids generated in our large industrialized urban centers -- and 84% of land-applied sludge originates in those centers-- is very likely the most pollutant- rich waste mixture of the 21st century.

The US EPA Office of Water (OW) regulates biosolids. The regulations, 40 CFR Part 503, are usually referred to as the 503s. Despite the agency's claim to the contrary, OW also promotes land application. This is a gross conflict of interest. Government agencies should not be in bed with the industries they are supposed to regulate.[82] As a consequence of this industry-government alliance, the 503s are full of loopholes. The most damaging loop hole of all is the so-called "Domestic Sewage Exclusion" which permits every industry connected to a sewer to pipe its hazardous waste into POTWs. A partial list of those pollutants is posted on our webpage.[105] When these hazardous chemicals are mixed with sewage, they become exempt from RCRA's solid and hazardous waste laws. Industries and municipalities benefit from the Domestic Sewage Exclusion in several ways: they can avoid the expense of properly treating pollutants or refrain from piping hazardous waste into POTWs in the first place; and once these two waste streams mix, industries are no longer liable for any damages that might result from this toxic mixture., especially when it is processed and land applied. In an unpublished and un-dated document, titled Gatekeepers: *Who are They? What They think about Us? And What can we do about it?* Bill Toffey, a spokesperson for the biosolids industry and advocate of land application, tells his audience in no uncertain terms how important it is for industries to support the Domestic Sewage Exclusion:

You may have missed the proposed rulemaking to change the reporting requirements for lead as a "persistent and bioaccumulative toxic." The proposal would reduce from 10,000 to 10 the number of pounds annually that an entity can dispose without reporting, and the de minimis lead concentration for reporting would be eliminated. At first reading, it seemed to me that this reporting rule would capture most of Philadelphia's recycling programs. But apparently all other POTWs and we are saved by the fact that the rule doesn't apply to POTWs . This is one case where being a POTW making a fertilizer is preferred to being a manufacture (sic) making a fertilizer; we are in the right SIC code. But this is cold comfort. Some folks in Congress, in the environmental community and in EPA itself believe it is in the public's and environment's best interest to track the lead that is spread on land. Someday they will get us, and we need to be prepared. Fighting changes to the Domestic Sewage Exclusion may haunt us as an example to the environmental community that our claim to being concerned for the environment is a sham.

After ocean dumping was banned, land application increased, as did the reports of serious health, livestock, and environmental damage. The first comprehensive scientific appraisal of the 503s was published in 1999 by internationally renowned soil scientists at the Cornell Waste Management Institute (CWMI) —whose teams have been researching biosolids since the 1970s. Aptly titled *The Case For Caution* the report warns that the 503s do not protect human health, agriculture, or the environment.[23] Around the same time a team assembled by David Lewis-- formerly a senior level EPA research microbiologist-- documented human and animal sicknesses and deaths linked to land application under the 503 rule, the first scientist to do so.[35,36,37,84] Because of increasing concerns about health impacts, the National Academy of Sciences (NAS) was asked to examine the scientific basis of the 503s. Its 2002 report, *Biosolids Applied to Land*, questioned the science and risk assessment models of the rule and urged EPA to implement health studies of neighbors who lived adjacent to sites that had been treated with sludge. NAS panel members had available not only the work of Lewis' team and that of the CWMI, but also a 382 page document put together by sludge activist Helane Shields listing sludge "incidents" that had occurred in virtually every state of the union.[54] Particularly worrisome where the many reports of sicknesses and several deaths.[90] To include published papers that documented these incidents in the scientific literature would hurt the land application program. So industry-friendly NAS panel members deleted all references to David Lewis' papers in the published report, which includes the statement that there is "no documented evidence" that anyone was ever harmed by sludge. In the absence of any credible science that supports land application, industry and government agencies continue to cite the "no documented evidence" claim, making sure the evidence is not documented, or, if it is, to ignore or discredit it. [92]

Yet people are not easily fooled. Every week there are reports of sludge battles, especially in the heavily populated areas of the country where most sludge is produced and spread. Residents who believe they have been or will be harmed are pitted against government and industry officials who assure them that the practice is beneficial and safe. For example during a 2014 Town Meeting in Bell

County Township, Clearfield County PA angry residents demanded an end to sludge spreading in their community because it was making some of them sick. Despite the usual misleading assurances by state officials that biosolids will enrich the soil and improve the overall health of land and animals, residents

wanted the practice stopped. One neighbor who lives close to the permitted site was hospitalized with bronchial spasms when the spreading began. Her doctor said that such spasms, which resemble a heart attack, can be caused by air borne irritants. Other people attending the meeting complained of headaches and nausea.[96]

Government and industry representatives at these meetings usually assure affected residents that their health problems or their contaminated wells were caused by something else. For example, a few years ago, when an astute NH property owner learned that his neighbor uphill was about to use sludge, he decided to have his well water tested before and after the spreading. Not surprisingly, test results taken after the application showed high levels of pathogenic bacteria. After he complained a representative of the sludge company visited his home, looked around, and stated that the well must have become contaminated by his bird feeder!

However when deaths are linked to sludge-exposure, bird feeder explanations do no longer work. Two of those deaths occurred right here in the Commonwealth. The PA DEP and the company that spread the sludge went through extraordinary lengths to cover up the cause of these deaths. For a summary see ***Appendix A.***

Evidence keeps piling up that there is something seriously wrong with the 503s. Why, many people ask, are EPA and USDA--agencies whose mission it is to protect human health, promote sustainable and productive agriculture, and protect the environment—why are these agencies not substantially tightening the current land application rules, or better yet, why are they continuing to spend our tax dollars on a million- dollar Public Acceptance Campaign, when, instead, they should be using those funds to invest in safer and more sustainable alternatives?

One part of the answer is simple. Top managers at EPA's Office of Water and a highly influential agronomist at the USDA wrote the 503s. They decided that it would be acceptable for biosolids to contain hazardous waste, reasoning that small amounts do not matter, that the waste stream is getting cleaner, and that pretreatment of industrial waste is working. None of those assumptions proved to be true. Even very small amounts—parts per trillion-- of some pollutants can harm developing organisms, and instead of getting cleaner, the waste stream is getting more complex and more polluted. Several recent EPA Inspector General Reports, indicate that hundreds of priority pollutants discharged by industry are showing up in effluent and sludge. But the individuals who wrote the rules are still in charge of the nation's biosolids policy and have staked their reputation on the adequacy of the 503s. Apparently no amount of evidence will persuade them that they were wrong.[32]

The other part of the answer is also simple. Not only the sludge brokers who are paid for every ton of sludge they remove from sewage treatment plants, but also --as we explained earlier-- industrial users and municipalities save substantial sums by continuing this inexpensive method of sludge disposal. Communities are learning more about what biosolids are, and what they do when land applied. They are experiencing first- hand the resulting harm to their health,[51,55,68,75,108,109] their drinking water,[12,71,77,99,101] and their animals.[36,79,83,94,105] To counter this new awareness, government agencies and the sludge industry are spending millions to rev up their PR campaign to convince farmers, the media,

legislators, and the public that spreading this incredibly complex contaminated mixture on land is sustainable., beneficial and safe.

A key flaw of the 503s is that they depend on Quantitative Chemical-by-Chemical Risk Assessment (QRA) to assess health and environmental impacts. QRA works for calculating how strong a bridge must be to withstand the weight of daily traffic on a particular highway, but QRA cannot be used to assess the health and environmental impacts of such a complex and unpredictable mixture as land applied sewage sludge. See Appendix ***B***

Instead of calculating health and environmental risks using QRA models, the NAS panel recommended a different approach:

Even if a summary index of an adverse response to mixtures was available, it would not necessarily reflect the total hazards of exposure to biosolids because of the inability to identify all of its hazardous constituents and their potential for interaction in vivo . . . thus it is not possible to conduct a risk assessment for biosolids at this time (or perhaps ever) that will lead to risk-management strategies that will provide adequate health protection without some form of ongoing monitoring and surveillance . . . the degree of uncertainty requires some form of active health and environmental tracking."

A number of the biosolids incidents might have been prevented had there been exposure studies and health and environmental tracking.

Many serious health impacts have been linked to Class B sludge exposure, especially when this material is stockpiled and top dressed rather than incorporated into the soil. Sludge advocates are now promoting a material that is deceptively referred to as Exceptional Quality (EQ) Class A sludge. Many people do not realize that Class A EQ sludge contains just as many persistent toxic chemicals as Class B. When sludge is further processed to reduce indicator pathogens, it turns into Class A. However as the more vulnerable indicators are deactivated, much more robust pathogens survive and evolve. In the absence of microbial competition, they multiply and thrive, especially in in cool and moist climates. Some of the treatment methods prescribed to reduce the level of indicators are not working, so Class A sludge is often Class B sludge or turns into Class B sludge after it is spread or stockpiled. Further processing also appears to encourage the growth of superbugs which explains why many neighbors exposed to sludge contract MRSA infections. The question arises, why, if all of this is true, are industry and government agencies encouraging the production and use of Class A materials?

Again, the answer is simple. Under the current rules, Class A is virtually unregulated. As long as it contains some nitrogen, it can be spread anywhere—including on home vegetable gardens--during any weather, at any time during the year, in any amounts, and does not require public notices, public hearings, or the expense of getting a permit. Also Class A products can be sold in garden centers, often misleadingly labeled. But are they really safe? Consider two incidents. One took place in the summer of 2007 in Milwaukee, where sludge is used to make the Class A product Milorganite. Sewer workers dislodged large amounts of PCBs during a routine sewer cleaning operation. This resulted in thousands of tons of contaminated sludge-- some containing superfund high levels of PCBs—to be spread on dozens of school playgrounds and parks. When the problem finally was discovered, the contaminated

material had to be removed and shipped to out-of-state hazardous waste landfills. The entire incident cost the city millions. [104]

Consider another incident that happened in Shirley MA . In January of 2014 a farmer spread *Earthlife* on his frozen snow-covered field. *Earthlife* is a Class A product made by Casella Organics and fully approved and registered for use in MA, CT, and VT. Three weeks later, after a thaw, residents living next to the field on 15 and 20 Bumpus Road turned on their faucets and out came diluted sewage. Both families got their water from shallow wells. *Earthlife* apparently had leached into the water table and contaminated their wells. I was invited to attend a February 28 meeting of concerned neighbors and provided information and hand-outs. Appealing to the town for help was useless because what the farmer had done was legal under the 503s. Despite conclusive test results that the contamination was caused by *Earthlife* , the homeowners could not afford litigation. A month went by and I did not hear from the affected home owners. So I contacted them to see how they were doing. During that interval Casella had paid for drilling a bedrock well at one home and had paid for a filtration system for the other family. In return, the home owners were put on a gag order and told never to discuss the case or share test results. Settlements like these explain why many sludge incidents remain unknown or are underreported.

The practice cannot be banned overnight. Something needs to be done with the millions of tons of sludge produced every year. Until more sustainable waste-to-energy technologies are in place to handle this volume, states might want to encourage increasing disposal in well sited subtitle 2 landfills with methane capture for energy and heat. Reclamation of contaminated land may also be an option as long as the site is securely fenced and signed, to prevent another Tony Behun tragedy. It is absolutely crucial that we preserve our dwindling productive farm land for future generations. We must not apply sewage sludge and other industrial waste on the land where we grow our food and forage.

Meanwhile, states, counties, and towns can put in place more protective inexpensive management practices that will at least reduce some of the risks. These would include permanently prohibiting land application on grazing fields to prevent contamination of meat and dairy products; immediate incorporation of sludge into the soil to prevent pollutants from moving off site; prohibiting stockpiling; permanent pH management to prevent metals and other contaminants from becoming bioavailable; much more protective horizontal and vertical buffers from occupied buildings; and limiting the acreage and frequency of application.

The number of individuals and organizations that oppose land application is growing. There isn't a community in the country that welcomes the arrival of sludge trucks. Many farmers are no longer taken in by the brochures and videos that promise instant savings and high yields from this free mislabeled "natural organic" fertilizer. Over a hundred environmental organizations-- many supporting sustainable farming practices—oppose growing food and forage on biosolids-treated land. Among them are the Sierra Club, the Natural Resources Defense Council, the Rodale Institute, the Institute for Agriculture and Trade Policy, Western Growers, the National Farmers Union, the Food Rights Network, and the

Organic Consumers Association. All of these organizations depend on impartial scientific information to form their policy positions.

In conclusion PA legislators might be interested in the recommendations of Professor Jordan Peccia, Associate Professor of Engineering at Yale University and Professor Paul Westerhoff, Professor at the School of Sustainable Engineering at Arizona State University in their paper titled, ***We Should Expect More out of Our Sewage Sludge:***

The culmination of previous incremental technologies and regulations aimed at solving a current treatment problem, rather than developing the practice for the higher goals of sustainability have resulted in sludge becoming an economic and social liability. Sludge management practice must shift from treatment of a liability toward recovery of the embedded energy and chemical assets, while continuing to protect the environment and human health. This shift will require new research, treatment technologies and infrastructure and must be guided by the application of green engineering principles to ensure economic, social and environmental sustainability.[103]

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Appendix A

For land application to continue under the current policies, it was essential for the Pennsylvania Department of Environmental Protection (PA DEP) to deny that sludge might have caused the death of a Pennsylvania child. Len Martin compiled a chronological and detailed account of how, for almost two years, the PA DEP went to extraordinary lengths to hide the circumstances of Tony Behun's death.

In October 1994, 11-year old Tony had ridden his dirt bike through sludge that had been applied to a reclaimed mining site. The child developed headache, sore throat, furuncles on one leg and arm, difficulty breathing, and a high fever. On October 21, a week after he had been exposed to sludge, Tony died of staphylococcal septicemia. In 1999, Tony's mother, who had heard that sludge was causing health problems in other parts of the country, sought answers from the state about her son's mysterious death. The PA DEP repeatedly and publicly denied that there was any connection between sludge exposure and her son's death. According to public statements made by the agency and the company that had spread the sludge, Tony's death resulted from a bacterial infection caused by a bee sting, and sewage sludge had not been applied on the mining site. In May 2000, PA DEP secretary, James Seif, drafted a report claiming that both the National Institute of Occupational Safety and Health (NIOSH) and the state health department had investigated the case thoroughly and ruled out sludge as the cause or contributing factor of Tony's death. Every one of the above-cited claims proved to be false. The DEP was forced to retract the fabricated bee-sting story; truck weigh slips indicated that about 5,600 wet tons of sludge had been spread on the site next to the child's home; and on August 7, 2000, the PA Department of Health sent a letter to State Representative Camille George confirming that the department "in fact, did not conduct an investigation into Tony Behun's death." NIOSH also stated that it "had no involvement [in the case] because "our agency only investigates workers' health complaints." Subsequent public testimony by EPA's Robert Bastian about this case illustrates how EPA and the state agencies responsible for land-application policies work together to misrepresent facts to cover up incidents. On March 13, 2001, Bastian presented Seif's false report to the NAS panel that was seeking input about alleged health incidents linked to sludge-exposure. Bastian assured the panel that "the findings of [PA] state and local health officials have indicated that the Pennsylvania death was not attributable to biosolids".

Appendix B

Quantitative Risk Assessment Risk models are one tool used by industry and agencies to help determine whether or not a product or practice is reasonably safe. It is not a very reliable tool, because it is based on assumptions that can vary from assessor to assessor. For example, when a group of assessments for one chemical in one medium can yield such different results, how can it be a reliable tool to identify the various environmental and health risks from such a complex and unpredictable mixture as sewage sludge, spread on complex terrestrial ecosystems, affecting a variety of living organisms with varying susceptibility to infections? With so many unknowns, with stressors that have not even been identified, much less characterized, for which we do not yet know all the modes of action, and all the various potential synergistic interactions between chemicals and chemicals and pathogens, which we are just beginning to identify, any quantitative risk assessment will be an exercise in futility. The more complex a system, the more the uncertainties and the variables, the more unreliable are mathematical models used to assess risks.

Land application of sludge is wrought with uncertainties. Experts estimate that sludge generated in industrialized urban centers and most land applied sludge is generated in these areas—contains not only pathogens and toxic metals, but thousands of anthropogenic chemical compounds for which there are not even basic toxicity data. Many known unregulated sludge pollutants are carcinogenic, persistent, and/ or toxic; endocrine disrupting chemicals can damage living organisms in parts per trillion. Pathogens are evolving and becoming more virulent. Only a very few E.coli 0157:H7 bacteria, as little as ten, can cause life threateningdisease.Makingitimpossibletodeterminewhatpathogenlevelinsludgeissafe, especially since people's susceptibilities to infectious agents differ and they are exposed to other stressors from other sources. QRA is not suitable for mixture toxicity, for interactions between EPA scientists used four accepted models to calculate the cancer risk posed by trichloethylene in components in a complex mixture. With sludge, this cannot be done. Depending on risk assessment alone will never explain why sludge exposed people are getting sick.

Snyder

Attachment 2: Partial List of Toxic Chemicals Industries Can Legally Discharge Into Sewage Treatment Plants *from http: www.sludgefacts.org125.pdf*

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Bickner, Betty Ann (ECY)

From: Troy Thurman <baristadestroy@gmail.com>
Sent: Sunday, October 30, 2016 8:14 PM
To: wayne.crafft@ecy.wa.gov; Bickner, Betty Ann (ECY)
Subject: Rosman Biosolids

To whom it may concern,

My name is Troy Thurman. I have been living at Tolstoy Farm (Mill Canyon) since May of this year. My experience here has changed my life for the better. I live a much healthier lifestyle because of what I have learned on the farm. I am much more conscious of what I put into my body and it is because of this that I am firmly AGAINST the dumping of biosolids on or near this beautiful place. Thank you for your time.

Sincerely,

Troy M. Thurman

Summary of Comments on Strehlau-Thurman2.pdf

Page: 1

Number: 1 Author: COCA461 Subject: Inserted Text Date: 3/27/2017 12:20:19 PM -07'00'

No biosolids will be deposited on or adjacent to Tolstoy Farms.

Bickner, Betty Ann (ECY)

From: Krafft, Wayne (ECY)
Sent: Monday, October 31, 2016 4:07 PM
To: Bickner, Betty Ann (ECY)
Subject: FW: Mill Creek area biosolids dispersal permit

From: Joanne & Richard [mailto:jandrs2@verizon.net]
Sent: Monday, October 31, 2016 3:37 PM
To: Krafft, Wayne (ECY) <AKRA461@ECY.WA.GOV>
Subject: re: Mill Creek area biosolids dispersal permit

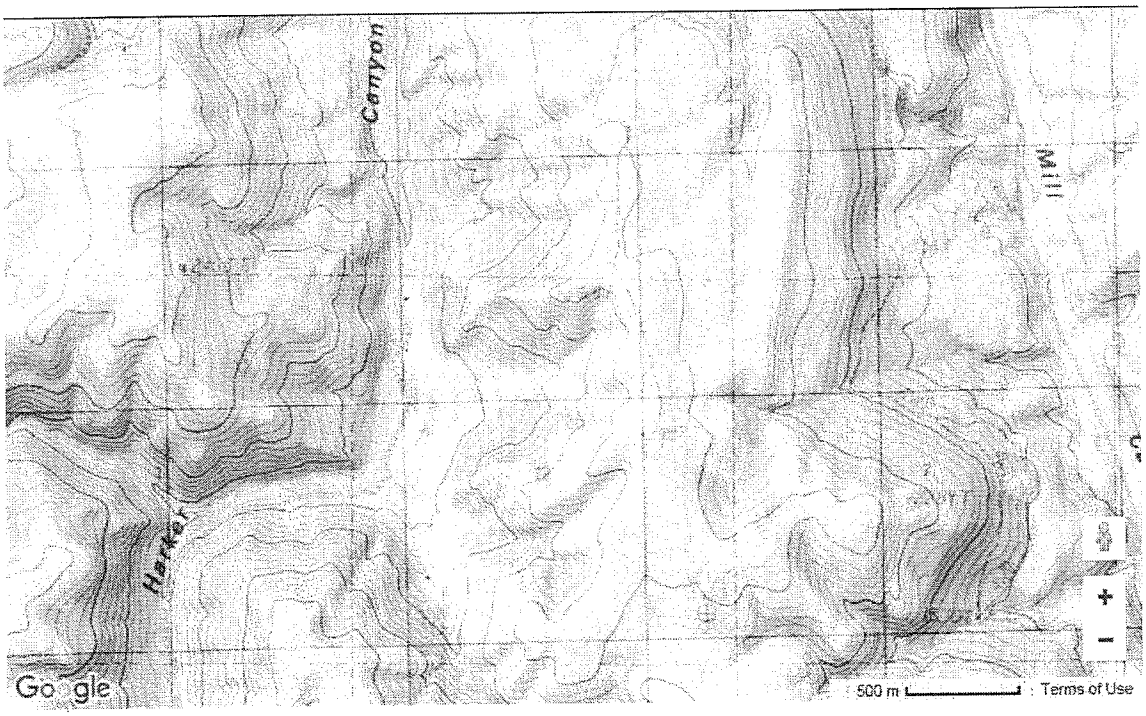
Good morning, Mr. Krafft. My name is Richard Strehlau. My wife Joanne and I are writing you to express our concerns over the issuance of a permit to disperse biosolids at Rosman Farms near Reardan (Lincoln County). As you know this is a very sensitive area, hydrologically, being at or near the source waters of several different watersheds of the Columbia and Spokane Rivers (sp. Crab Creek and Deep Creek). And then there are a number of farms depending on well water from Mill Creek Canyon (including a CSA site, Tolstoy Farm) -- and the joint Northwest Inland Conservancy/Audubon/Crab Creek Conservancy area -- right in this neighborhood. The area where the dumping permit is being issued sits right atop (barely) all of this. Please consider doing a full hydrologic study[1] and a detailed environmental impact study prior to allowing the spreading of biosolids over these lands.[2]

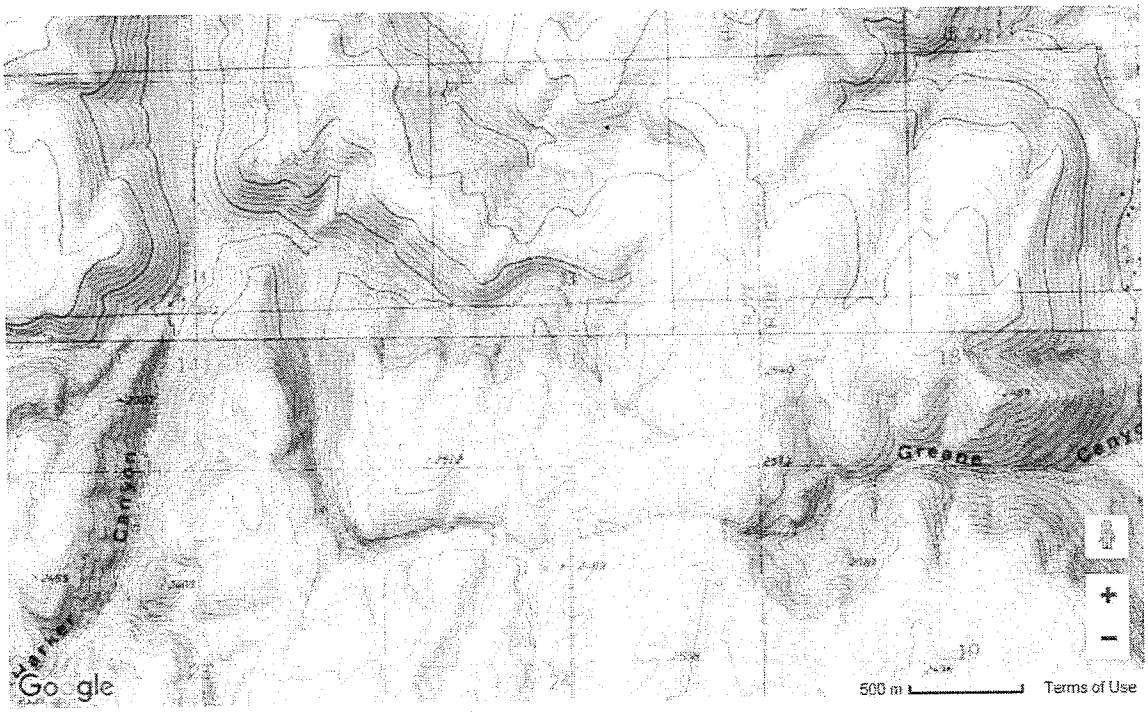
Please allow me one more comment here: as backpackers we are instructed as to the longer time period required for dry soils, with their lesser content of organic matter to absorb & digest human waste. And the extreme likelihood of occasional floods transporting waste from these soils directly into streams. The rules for east-side lands should be just as stringent as those for our coast-lands on Puget Sound! Joanne Swierzy & Richard Strehlau

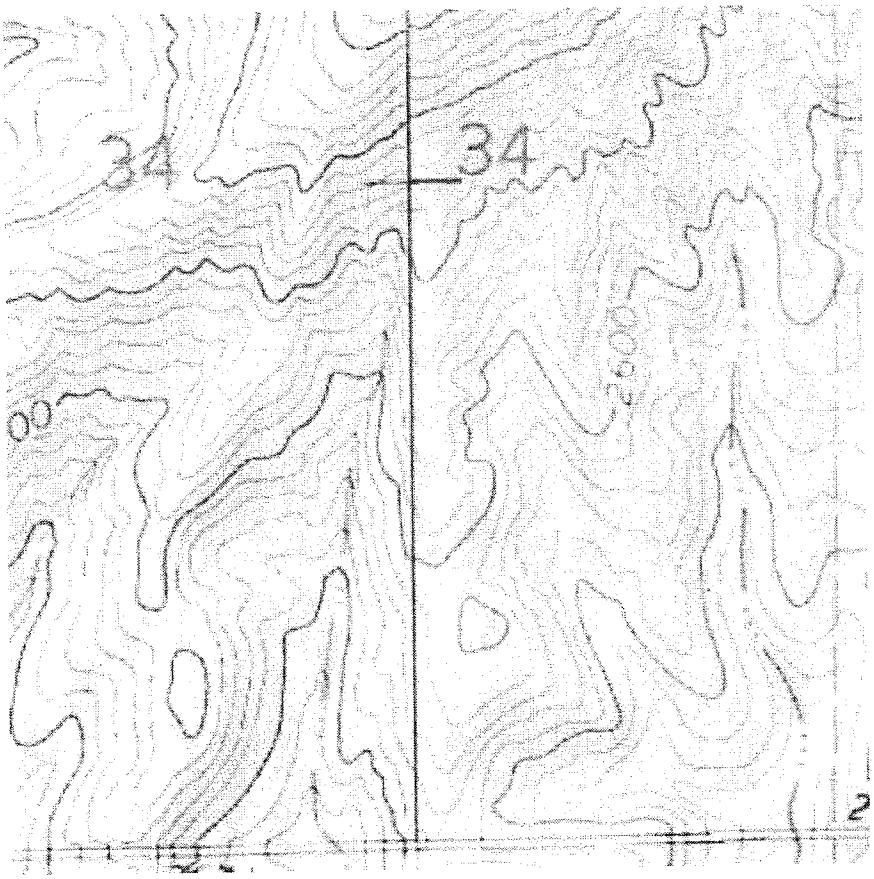
Number: 1 Author: BBIC461 Subject: Inserted Text Date: 5/10/2017 1:45:24 PM -07'00'
See Item 5 HG Review

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 11:29:55 AM
The Determination of Nonsignificance was reviewed and found adequate. See Item 1 SEPA and Item 5 HG Review.

Appendix A – Suggested topographic map quality / we recommend including proper scales and outlining the individual fields selected for application of biosolids also.






34
34

Appendix B – NRCS Maps of HEL and CRP

Producer Farm Data Report
Crop Year: 2016

Date: 9/19/16 1:29 PM
Page: 1

DISCLAIMER: This is data extracted from the web farm database. Because of potential messaging failures in MIDAS, this data is not guaranteed to be an accurate and complete representation of data contained in the MIDAS system, which is the system of record for Farm Records.

Producer Name and Address

ROSMAN ENTERPRISES INC
% GARRY ROSMAN
32529 LEVEL RD N
DAVENPORT WA 99122-8594
Telephone: None

Recording County Office Name

Lincoln, Washington

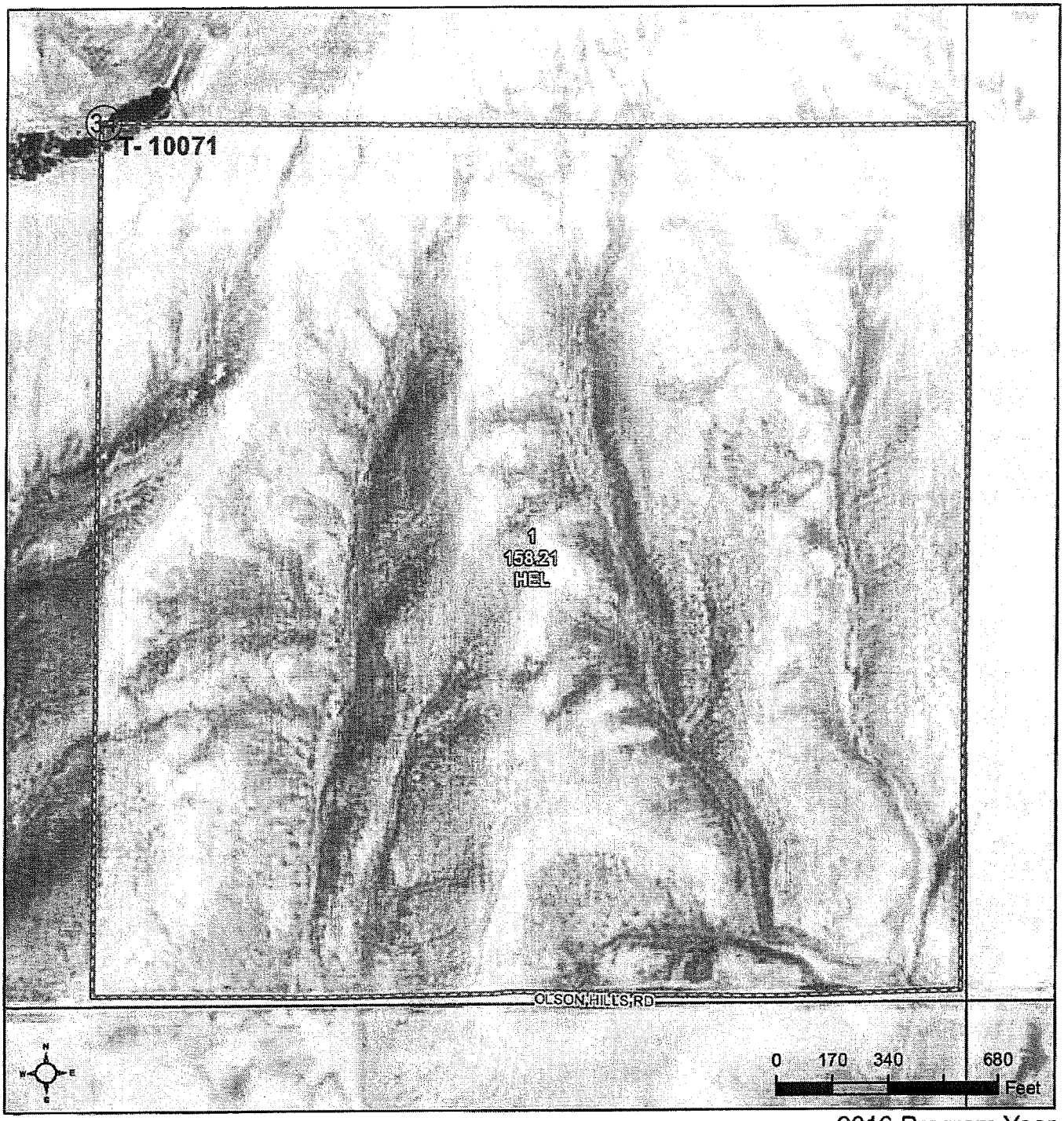
Number of Farms	Number of Tracts	Farmland	Cropland	DCP Cropland	CRP Cropland	Eff DCP Cropland
2	4	2212.43	1335.04	1335.04	265.13	1069.91

State & County	Farm	Tract	Relationship to Farm Tract	Producer	Farmland	Cropland	DCP Cropland	CRP Cropland	Eff DCP Cropland	HEL Code	Wetland Code
Lincoln, WA	2782	10071	Operator	ROSMAN ENTERPRISES INC	158.21	158.21	158.21	0.0	158.21	SA	DNC
			Owner	GARRY ROSMAN							
Lincoln, WA	5325	683	Operator	ROSMAN ENTERPRISES INC	1154.62	655.63	655.63	95.57	560.06	SA	DNC
			Owner	ROSMAN LAND HOLDING INC							
		922	Operator	ROSMAN ENTERPRISES INC	442.25	296.66	296.66	57.15	239.51	SA	DNC
			Owner	ROSMAN LAND HOLDING INC							
		13224	Operator	ROSMAN ENTERPRISES INC	457.35	224.54	224.54	112.41	112.13	SA	DNC
			Owner	ROSMAN LAND HOLDING INC							

HEL Codes	SA = HEL: Sys Applied SNA = HEL: Sys Not Applied	SNR = HEL: Sys Not Required 2YR = HEL: 2-yr Implement	DNC = Determination Not Complete N = Not HEL	**Wetland Codes**	WL = Wetland N = No Wetland	DNC = Determination Not Complete

USDA United States Department of Agriculture

Lincoln County, Washington



Tract Boundary

Common Land Unit

Cropland

Wetland Determination Identifiers

- Restricted Use
- Limited Restrictions
- Exempt from Conservation Compliance Provisions

2016 Program Year

Map Created April 20, 2016

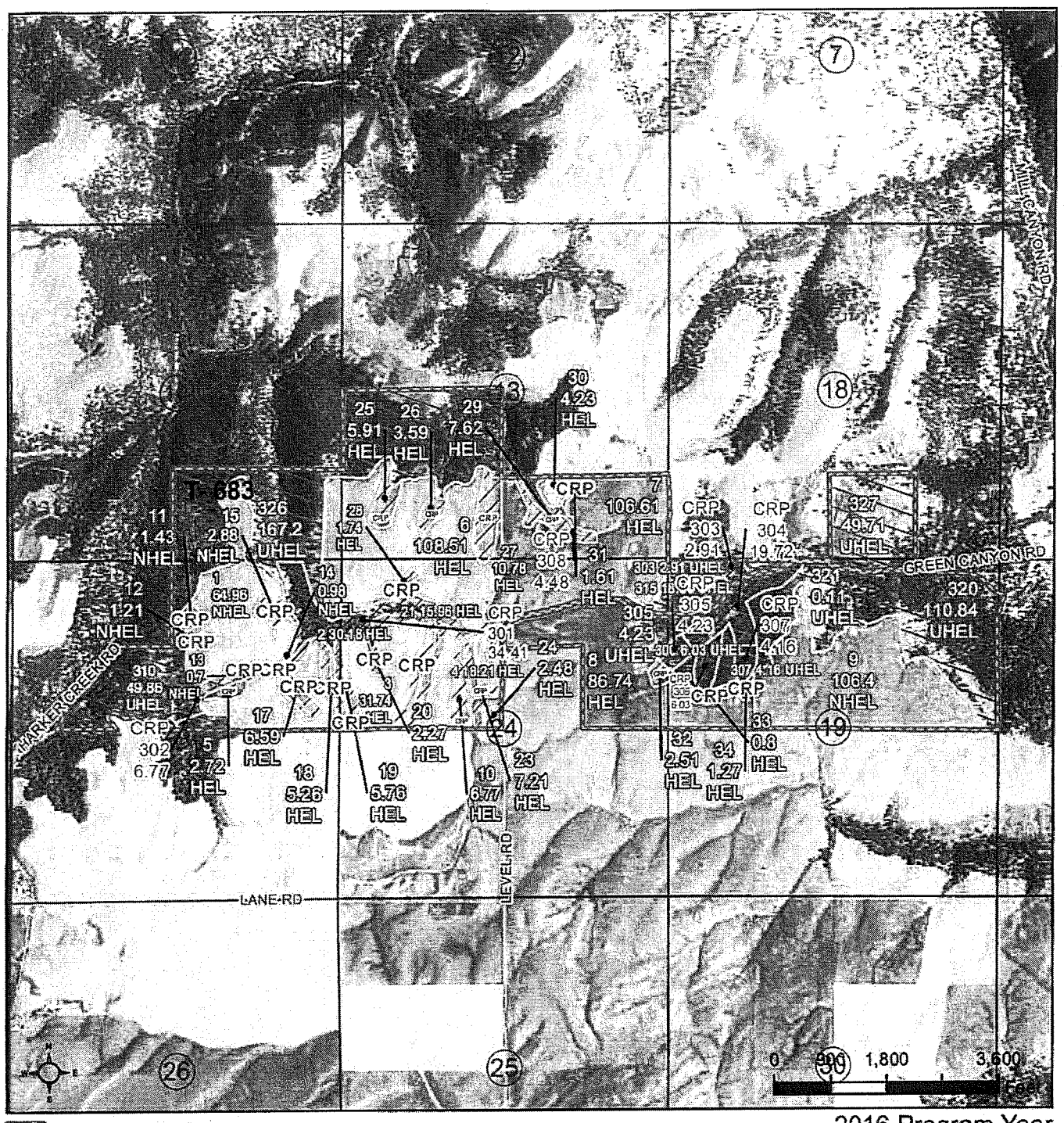
Farm **2782**

Tract **10071**

Tract Cropland Total: 158.21 acres

USDA United States Department of Agriculture

Lincoln County, Washington



Tract Boundary — Rangeland
Common Land Unit — Other Ag
Cropland — CRP

Wetland Determination Identifiers

- Restricted Use
- Limited Restrictions
- Exempt from Conservation Compliance Provisions

2016 Program Year

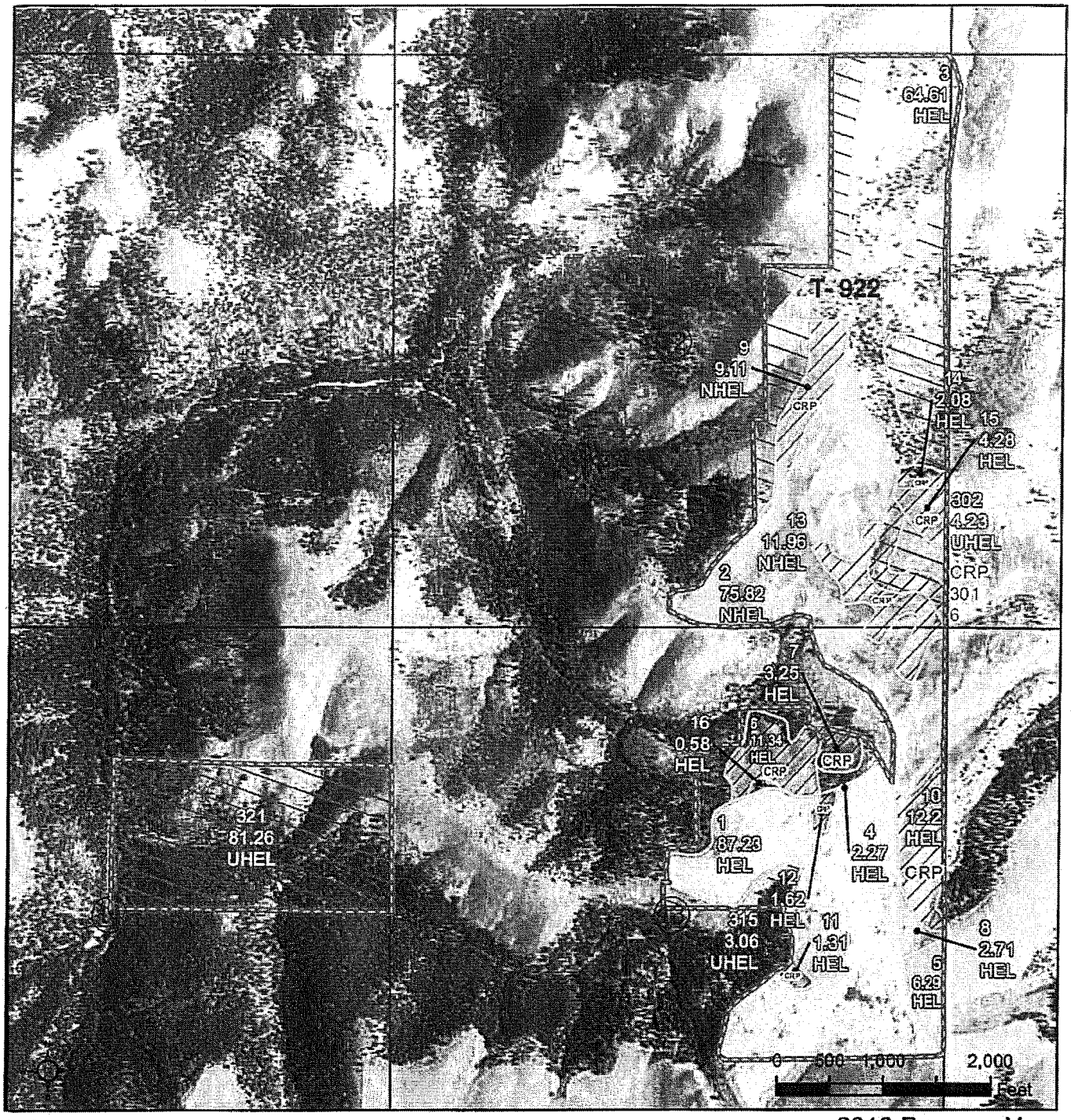
Map Created April 20, 2016

Farm 5325
Tract 683

Tract Cropland Total: 655.63 acres

USDA United States Department of Agriculture

Lincoln County, Washington



Tract Boundary
Common Land Unit
Cropland
Rangeland
CRP

Wetland Determination Identifiers

- Restricted Use
- Limited Restrictions
- Exempt from Conservation Compliance Provisions

2016 Program Year

Map Created April 20, 2016

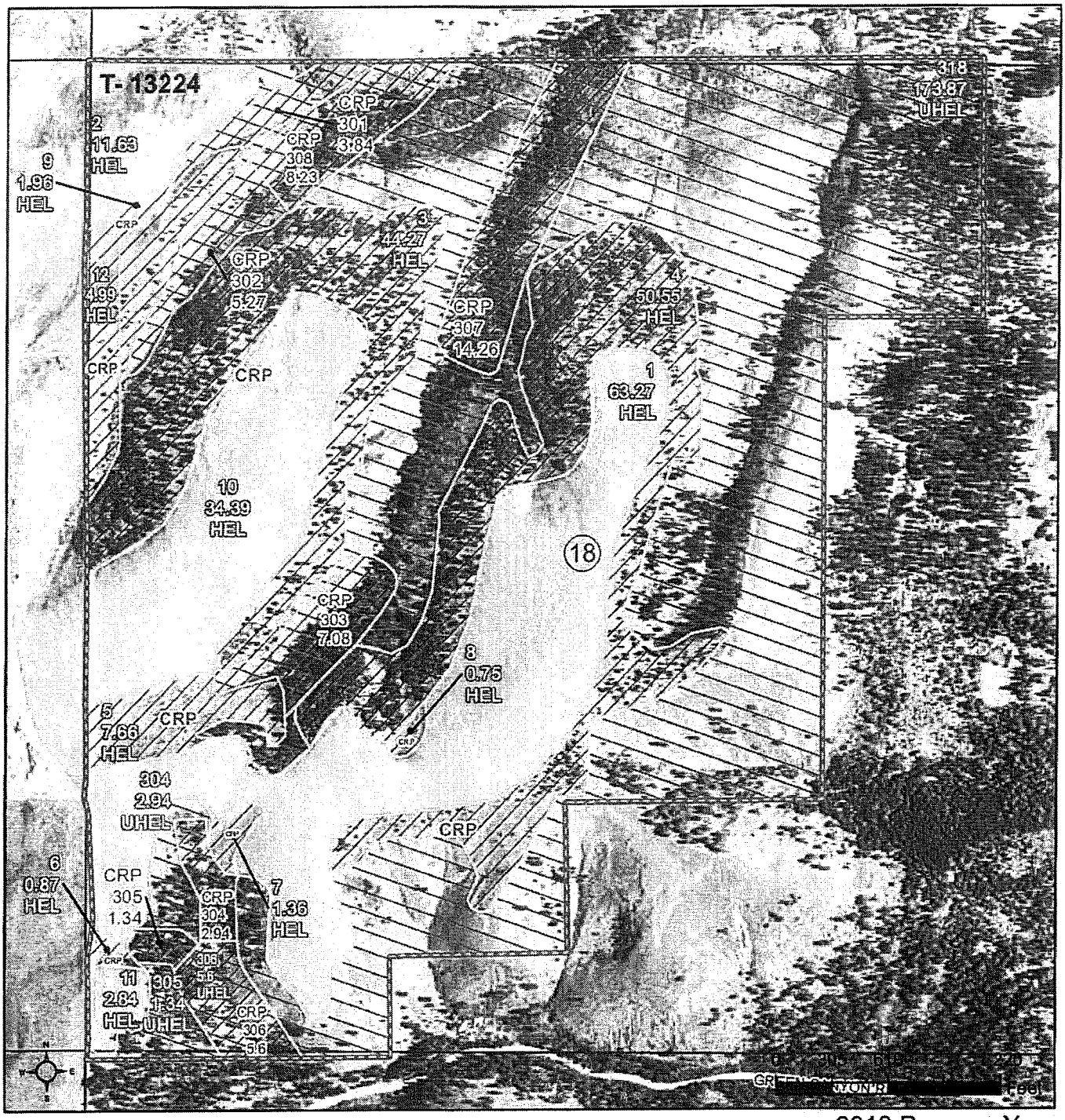
Farm **5325**

Tract **922**

Tract Cropland Total: 296.66 acres

USDA United States Department of Agriculture

Lincoln County, Washington



Tract Boundary — Rangeland
Common Land Unit — CRP
Cropland

Wetland Determination Identifiers

- Restricted Use
- Limited Restrictions
- Exempt from Conservation Compliance Provisions

2016 Program Year

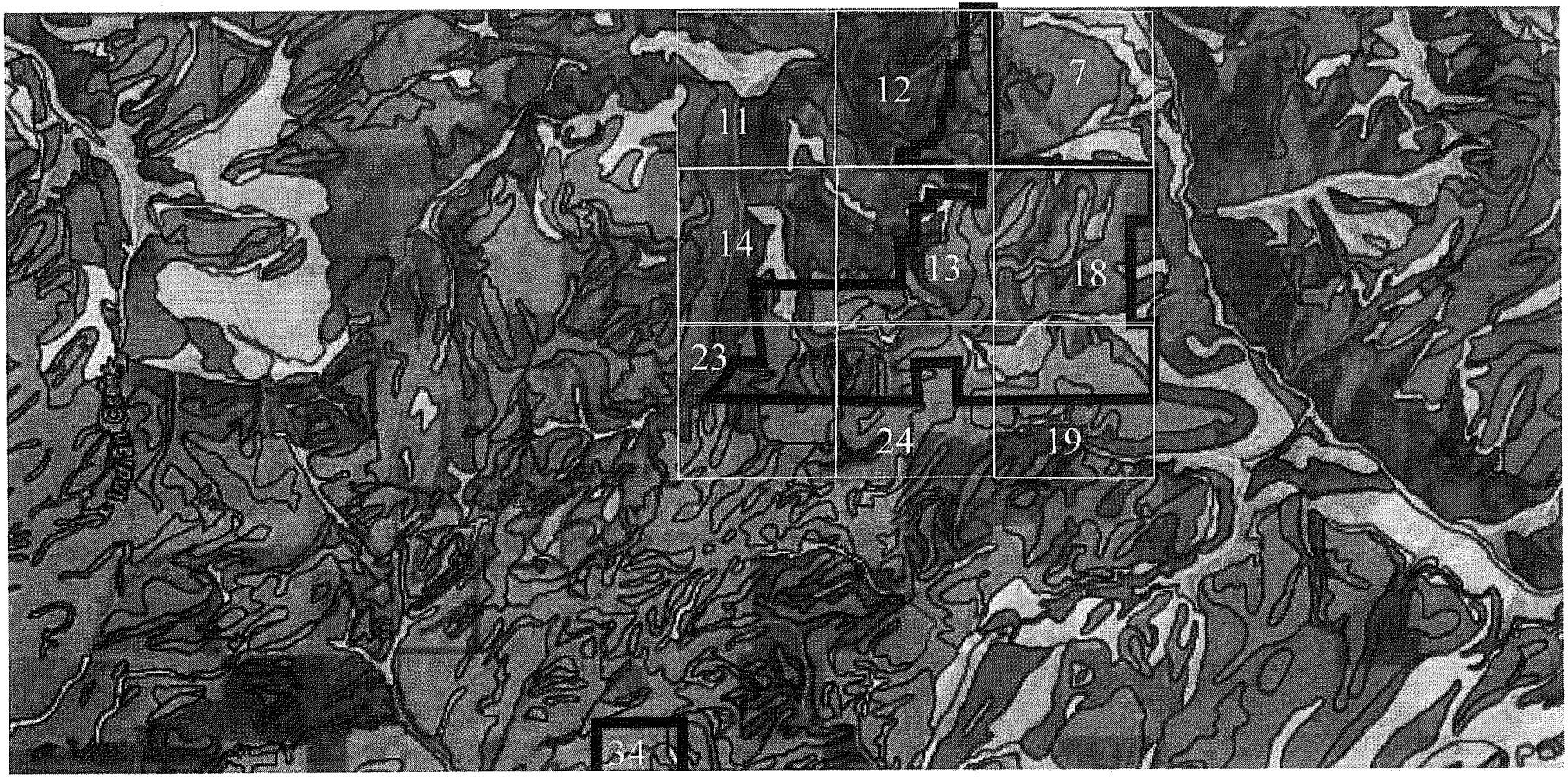
Map Created April 20, 2016

Farm 5325
Tract 13224

Tract Cropland Total: 224.54 acres

Appendix C – NRCS soil survey – municipal waste land application limitations

Rosman Farm areas (black outline), Section numbers (yellew numbers), and areas where application of biosolids is limited according to the soil survey (red).



Land Application of Municipal Sewage Sludge—Lincoln County, Washington

Map Scale: 1:85,900 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 1000 2000 4000 6000

Feet: 0 4000 8000 16000 24000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Background
- Aerial Photography

Soils

Soil Rating Polygons
- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Lines
- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Points
- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lincoln County, Washington
Survey Area Data: Version 11, Sep 25, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 4, 2011—Jul 5, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Land Application of Municipal Sewage Sludge

Land Application of Municipal Sewage Sludge— Summary by Map Unit — Lincoln County, Washington (WA043)						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
4	Badge-Bakeoven-Rock outcrop complex, very steep	Very limited	Badge (40%)	Slope (1.00)	3,977.5	10.7%
				Cobble content (0.87)		
				Large stones on the surface (0.50)		
			Bakeoven (25%)	Depth to bedrock (1.00)		
				Droughty (1.00)		
				Cobble content (0.98)		
				Slope (0.84)		
				Large stones on the surface (0.63)		
11	Bakeoven very cobbly loam, 0 to 7 percent slopes	Very limited	Bakeoven (100%)	Depth to bedrock (1.00)	100.8	0.3%
				Droughty (1.00)		
				Cobble content (0.98)		
				Large stones on the surface (0.63)		
				Slow water movement (0.22)		
14	Benco cobbly silt loam, 0 to 7 percent slopes	Very limited	Benco (100%)	Filtering capacity (1.00)	128.9	0.3%
				Droughty (0.59)		
				Cobble content (0.50)		
16	Broadax silt loam, 0 to 7 percent slopes	Not limited	Broadax (100%)		697.2	1.9%
17	Broadax silt loam, 7 to 25 percent slopes	Very limited	Broadax (100%)	Slope (1.00)	9,968.7	26.9%
18	Broadax silt loam, 25 to 40 percent slopes	Very limited	Broadax (100%)	Slope (1.00)	182.1	0.5%
20	Broadax-Lance silt loams, 7 to	Very limited	Broadax (60%)	Slope (1.00)	617.8	1.7%

Land Application of Municipal Sewage Sludge— Summary by Map Unit — Lincoln County, Washington (WA043)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
	25 percent slopes		Lance (30%)	Slope (1.00)		
				Slow water movement (0.22)		
24	Cheney silt loam, 0 to 5 percent slopes	Very limited	Cheney (90%)	Filtering capacity (1.00)	212.4	0.6%
				Strongly contrasting textural stratification (0.84)		
			Cocolalla (5%)	Limiting adsorption (1.00)		
				Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Flooding (1.00)		
				Slow water movement (0.22)		
			Emdent (5%)	Depth to saturated zone (1.00)		
				Sodium content (1.00)		
				Flooding (1.00)		
				Salinity (0.50)		
25	Cocolalla silt loam	Very limited	Cocolalla (100%)	Ponding (1.00)	31.6	0.1%
				Depth to saturated zone (1.00)		
				Flooding (1.00)		
				Slow water movement (0.22)		
26	Cocolalla silt loam, drained	Very limited	Cocolalla, drained (90%)	Flooding (1.00)	1.1	0.0%
				Slow water movement (0.22)		
			Emdent (5%)	Depth to saturated zone (1.00)		
				Sodium content (1.00)		

Land Application of Municipal Sewage Sludge— Summary by Map Unit — Lincoln County, Washington (WA043)						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Flooding (1.00)		
				Salinity (0.50)		
			Cocolalla, undrained (5%)	Limiting adsorption (1.00)		
				Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Flooding (1.00)		
				Slow water movement (0.22)		
28	Dragoon silt loam, 0 to 7 percent slopes	Somewhat limited	Dragoon (100%)	Depth to bedrock (0.95)	120.3	0.3%
				Droughty (0.41)		
29	Dragoon silt loam, 7 to 25 percent slopes	Very limited	Dragoon (100%)	Slope (1.00)	2,426.7	6.5%
				Depth to bedrock (0.95)		
				Droughty (0.41)		
30	Dragoon silt loam, 25 to 40 percent slopes	Very limited	Dragoon (100%)	Slope (1.00)	485.2	1.3%
				Depth to bedrock (0.95)		
				Droughty (0.41)		
31	Dragoon very stony silt loam, 7 to 25 percent slopes	Very limited	Dragoon (100%)	Large stones on the surface (1.00)	875.5	2.4%
				Slope (1.00)		
				Depth to bedrock (0.95)		
				Droughty (0.41)		
32	Emdent silt loam	Very limited	Emdent (90%)	Depth to saturated zone (1.00)	99.1	0.3%
				Sodium content (1.00)		
				Flooding (1.00)		
				Salinity (0.50)		
			Cocolalla (10%)	Limiting adsorption (1.00)		
				Ponding (1.00)		

Land Application of Municipal Sewage Sludge— Summary by Map Unit — Lincoln County, Washington (WA043)						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Depth to saturated zone (1.00)		
				Flooding (1.00)		
				Slow water movement (0.22)		
37	Ewall loamy sand, 15 to 35 percent slopes	Not rated	Ewall (100%)		107.7	0.3%
38	Ewall loamy sand, 35 to 55 percent slopes	Not rated	Ewall (100%)		62.7	0.2%
41	Hanning silt loam, 0 to 7 percent slopes	Not limited	Hanning (100%)		3,681.4	9.9%
42	Hanning silt loam, 7 to 25 percent slopes	Very limited	Hanning (100%)	Slope (1.00)	3,812.4	10.3%
45	Kuhl cobbly silt loam, 0 to 15 percent slopes	Very limited	Kuhl (100%)	Droughty (1.00)	693.3	1.9%
				Depth to bedrock (1.00)		
				Cobble content (0.13)		
46	Lance silt loam, 7 to 25 percent slopes	Very limited	Lance (100%)	Slope (1.00)	162.6	0.4%
				Slow water movement (0.22)		
47	Mondovi silt loam	Somewhat limited	Mondovi (95%)	Flooding (0.40)	693.0	1.9%
53	Pedigo silt loam	Very limited	Pedigo (100%)	Flooding (1.00)	167.1	0.5%
				Depth to saturated zone (0.02)		
54	Phoebe sandy loam, 0 to 15 percent slopes	Very limited	Phoebe (100%)	Filtering capacity (1.00)	592.3	1.6%
55	Reardan silt loam, 0 to 7 percent slopes	Very limited	Reardan (100%)	Slow water movement (1.00)	96.3	0.3%
56	Reardan silt loam, 7 to 25 percent slopes	Very limited	Reardan (100%)	Slow water movement (1.00)	1,165.3	3.1%
				Slope (1.00)		
57	Reardan silt loam, 25 to 40 percent slopes	Very limited	Reardan (100%)	Slope (1.00)	32.3	0.1%

Land Application of Municipal Sewage Sludge— Summary by Map Unit — Lincoln County, Washington (WA043)						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (1.00)		
62	Riverwash	Not rated	Riverwash (100%)		144.9	0.4%
63	Rock outcrop	Not rated	Rock outcrop (100%)		160.2	0.4%
67	Speigle very stony silt loam, 25 to 55 percent slopes	Not rated	Speigle (100%)		1,529.7	4.1%
69	Spokane loam, 5 to 30 percent slopes	Very limited	Spokane (100%)	Slope (1.00)	43.4	0.1%
				Droughty (0.85)		
				Depth to bedrock (0.07)		
71	Spokane very stony loam, 30 to 55 percent slopes	Very limited	Spokane (100%)	Slope (1.00)	99.4	0.3%
				Droughty (1.00)		
				Large stones on the surface (0.82)		
				Depth to bedrock (0.07)		
72	Spokane-Rock outcrop complex, very steep	Very limited	Spokane (40%)	Slope (1.00)	150.2	0.4%
				Droughty (0.85)		
				Depth to bedrock (0.07)		
78	Tucannon silt loam, 0 to 5 percent slopes	Somewhat limited	Tucannon (90%)	Depth to bedrock (0.46)	2,597.4	7.0%
79	Tucannon-Rock outcrop complex, 0 to 15 percent slopes	Somewhat limited	Tucannon (50%)	Depth to bedrock (0.46)	1,175.3	3.2%
82	Water	Not rated	Water (100%)		22.3	0.1%
Totals for Area of Interest					**37,114.1**	**100.0%**

Land Application of Municipal Sewage Sludge— Summary by Rating Value		
Rating	Acres in AOI	Percent of AOI
Very limited	26,121.9	70.4%
Somewhat limited	4,586.0	12.4%
Not limited	4,378.6	11.8%
Null or Not Rated	2,027.5	5.5%
Totals for Area of Interest	**37,114.1**	**100.0%**

Description

Application of sewage sludge not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant growth, and microbial activity include saturated hydraulic conductivity (Ksat), depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available water capacity, reaction, salinity, and bulk density. The wind erodibility group, soil erosion factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is

shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Appendix D – potential soil restrictive layers that can lead to surface runoff

Soil Features

This table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage, or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Report—Soil Features

Soil Features–Lincoln County, Washington									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
		In	*In*		*In*	*In*			
4—Badge-Bakeoven-Rock outcrop complex, very steep									
Badge		—	—		—	—	Moderate	Moderate	Moderate
Bakeoven	Lithic bedrock	4- 5-10	—	Indurated	0	—	Moderate	Low	Low
Rock outcrop	Lithic bedrock	0	—	Indurated	—	—			
16—Broadax silt loam, 0 to 7 percent slopes									
Broadax		—	—		—	—	High	Moderate	Low
17—Broadax silt loam, 7 to 25 percent slopes									
Broadax		—	—		—	—	High	Moderate	Low
18—Broadax silt loam, 25 to 40 percent slopes									
Broadax		—	—		—	—	High	Moderate	Low

Soil Features–Lincoln County, Washington									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
20—Broadax-Lance silt loams, 7 to 25 percent slopes									
Broadax		—	—		—	—	High	Moderate	Low
Lance		—	—		—	—	High	Moderate	Moderate
29—Dragoon silt loam, 7 to 25 percent slopes									
Dragoon	Paralithic bedrock	20-23-40	—	Moderately cemented	—	—	Moderate	Low	Low
30—Dragoon silt loam, 25 to 40 percent slopes									
Dragoon	Paralithic bedrock	20-23-40	—	Moderately cemented	—	—	Moderate	Low	Low
31—Dragoon very stony silt loam, 7 to 25 percent slopes									
Dragoon	Paralithic bedrock	20-23-38	—	Moderately cemented	—	—	Moderate	Low	Low
37—Ewall loamy sand, 15 to 35 percent slopes									
Ewall		—	—		—	—	Low	Low	Low
38—Ewall loamy sand, 35 to 55 percent slopes									
Ewall		—	—		—	—	Low	Low	Low

Soil Features–Lincoln County, Washington									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
41—Hanning silt loam, 0 to 7 percent slopes									
Hanning		—	—		—	—	High	Moderate	Low
42—Hanning silt loam, 7 to 25 percent slopes									
Hanning		—	—		—	—	High	Moderate	Low
45—Kuhl cobbly silt loam, 0 to 15 percent slopes									
Kuhl	Lithic bedrock	10-12-20	—	Indurated	—	—	Moderate	Low	Low
47—Mondovi silt loam									
Mondovi		—	—		—	—	High	Low	Low
54—Phoebe sandy loam, 0 to 15 percent slopes									
Phoebe		—	—		—	—	Moderate	Low	Low
62—Riverwash									
Riverwash		—	—		0	—			
63—Rock outcrop									
Rock outcrop	Lithic bedrock	0	—	Indurated	—	—			
67—Speigle very stony silt loam, 25 to 55 percent slopes									
Speigle		—	—		—	—	Moderate	Low	Low

Soil Features–Lincoln County, Washington									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
72—Spokane-Rock outcrop complex, very steep									
Spokane	Paralithic bedrock	20-36-40	—	Moderately cemented	—	—	Moderate	Low	Low
Rock outcrop	Lithic bedrock	0	—	Indurated	—	—			
78—Tucannon silt loam, 0 to 5 percent slopes									
Tucannon	Lithic bedrock	20-30-40	—	Indurated	—	—	High	Low	Low

Data Source Information

Soil Survey Area: Lincoln County, Washington
Survey Area Data: Version 11, Sep 25, 2015

Soil Features

This table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage, or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Report—Soil Features

Soil Features–Lincoln County, Washington									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
		In	*In*		*In*	*In*			
16—Broadax silt loam, 0 to 7 percent slopes									
Broadax		—	—		—	—	High	Moderate	Low
17—Broadax silt loam, 7 to 25 percent slopes									
Broadax		—	—		—	—	High	Moderate	Low
29—Dragoon silt loam, 7 to 25 percent slopes									
Dragoon	Paralithic bedrock	20-23-40	—	Moderately cemented	—	—	Moderate	Low	Low
30—Dragoon silt loam, 25 to 40 percent slopes									
Dragoon	Paralithic bedrock	20-23-40	—	Moderately cemented	—	—	Moderate	Low	Low
41—Hanning silt loam, 0 to 7 percent slopes									
Hanning		—	—		—	—	High	Moderate	Low

Soil Features–Lincoln County, Washington									
Map symbol and soil name	Restrictive Layer				Subsidence		Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		Low-RV-High	*Range*		*Low-High*	*Low-High*			
42—Hanning silt loam, 7 to 25 percent slopes									
Hanning		—	—		—	—	High	Moderate	Low
46—Lance silt loam, 7 to 25 percent slopes									
Lance		—	—		—	—	High	Moderate	Moderate
56—Reardan silt loam, 7 to 25 percent slopes									
Reardan		—	—		—	—	Moderate	Moderate	Moderate

Data Source Information

Soil Survey Area: Lincoln County, Washington
Survey Area Data: Version 11, Sep 25, 2015

9/23/2016 Submitted @ hearing Oct. 11/2016

Betty Bickner, Waste 2 Resources Norhteast Regional Office Section Manager

Washington State Department of Ecology

Dear Ms. Bickner,

We, The Community Committee of Concerned Residents and Landowners in Green Canyon and Mill Canyon (Lincoln County, WA), write to express our concerns and suggestions pertinent to the biosolids land-application plans for the Rosman Farms.

Our mission is to make sure that **pollution is prevented** knowing that the true cost of rehabilitating large tracts of land and adjacent affected areas, were pollution to occur, may be infeasible for the responsible party(ies). At a minimum, therefore, it is imperative that the biosolids land application proposal, by Fire Mountain Farms, Inc., is **well designed, specific, adequate to meet regulatory requirements, sufficient with respect to testing and monitoring,** and understood by the landowner(s) and associates as well as the neighboring residents. Furthermore, we wish to serve our interests through time. Thus, we petition to have access to all dates, times, and details for all applications and all tests, analyses, and monitoring results, were the project to reach the stage of actual biosolids applications on the land.[1]

We have examined the "Site Specific Land Application Plan for Rosman Farms Unit (Permit No. BT9902), and we developed here numerous unacceptable features regarding minimum requirements to land apply biosolids as per section 2.6 of the Department of Ecology "General Permit for Biosolids Management."

In summary, we recommend that the permit application by Fire Mountain Farms, Inc. be **denied until revised to meet minimum requirements.**[2]

The remainder of our submittal details our argument for this recommendation.

Summary of Comments on Submitted by Hanson at hearing.pdf

Page: 1

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 5/10/2017 1:47:58 PM -07'00'

All documents are available through the public disclosure process. Informational signs must be posted prior to land application for each land application site.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 5/10/2017 1:52:34 PM -07'00'

The hearing is for the Site Specific Land Application Plan (SSLAP) a component of the Application for Coverage under the General Permit for Biosolids Management. The minimum requirements have been met. The application can be approved for coverage without the approval of the SSLAP for Rosman Farms.

Recommendations for the Fire Mountain Farms, Inc. permit application

We have identified permit application elements in need of additional work. In general, the permit is not specific and would be very difficult for qualified technicians to carry out without significant chance of mistakes that could lead to pollutants escaping the areas of application.

In our critique here follows the items elaborated in the General Permit "Site Specific Land Application Content – Appendix 3 regarding problems with Permit No. BT9902.

1) types of crops grown or expected to be grown and their intended end use – we recommend establishing a crop rotation (not wheat and fallow alone) to increase the viability of the system and its ability to contain the potential pollutants in the biosolids that qualify for application, and we were unable to find language explaining the end use of the crop.
2) seasonal and daily timing of biosolids applications – it is clear that the application is incomplete from the obvious inquiry, highlighted in yellow, as whether or not applications could occur year round (Permit No. BT9902 needs to elaborate in detail the conditions under which application is not advise due to **wet soils, frozen soils, crop stage, fallow periods, high runoff potential, high potential for erosion periods (wind or water induced), snow cover**, etc.)
3) the following stipulation regarding requests from neighbors regarding conflicts with planned activities is unacceptable, "Fire Mountain Farms will consider requests from neighbors if biosolids application procedures pose a likelihood of conflicting with planned activities," since the door remains open for them to proceed with applications that could severely hinder a variety of planned activities that neighbors make and communicate in advance – **we recommend stipulating that "Fire Mountain Farms shall adhere to all requests of this nature,"**
4) with respect to conducting any soils, surface waters, or ground water sampling and any available data collected from the site within the last 2 years, no reference to this requirement was found in Permit No. BT9902 – **the commitee recommends detailing current status of pertinent natural resources at the site and nearby surrounding area to have a base understanding of pre-biosolids-application conditions for comparison over time; will the monitoring plan include groundwater testing, prior to any biosolids applications and with a defined frequency following initiation of biosolids application(s), to assure that requirements in WAC 173-200-040 are met over time** and will the community have access to these reports; what sites are proposed for such monitoring (which wells, etc); why are those site chosen (is there an explanation in the permit application)?
5) as to how biosolids will be stored at the site, the commitee applauds that no storage will be carried out, and we will participate by critiquing any future proposed plans for biosolids storage.
6) as for the specific areas of the site where biosolids may be applied and if there is more than one site or more than one application unit within a site, Permit No. BT9902 is confusing since timbered areas, badland areas, and CRP areas at the site are mentioned but not ruled out as potential land for biosolids application (there are numerous reasons to exclude these

Page: 2

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 1/25/2017 9:27:06 AM
Crops are identified in section 6 of the SSLAP.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 1/25/2017 9:42:32 AM
Biosolids and soils are tested for pollutants as a part of the approval process per WAC 173-308-160. Ecology Biosolids program does not have the authority to direct crop choices. The end use is a business decision and may be sold as food or feed or both.

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 2:04:29 PM
The SSLAP section 4, will have language describing conditions when land application is restricted to include ground water less than or equal to 3 feet, seasonly high (rising) ground water, snow, or frozen ground.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 3/24/2017 11:54:04 AM -07'00'
Applying biosolids as a fertilizer is an act of farming. Ecology does not have the authority to impose strict conditions on farming practices.

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 5/11/2017 1:17:47 PM -07'00'
No evidence has been presented for this type testing nor are there any indicators to warrant surface or ground water testing. Soil testing is one component for land application approval and is outlined in the Soil Sample Plan Section 10.1 of the SSLAP.

Number: 6 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 2:09:53 PM
Storage of biosolids is allowed practice per WAC 173-308-280. Should storage be requested as an addition to the SSLAP it will be considered a modification to the SSLAP and persons on the Interested Parties List will be notified.

lands, steep slopes being one of the major reasons) – **the commitee recommends excluding these areas as potential sites for biosolids application**[1]

7) the locations of wetlands were not addressed in Permit No. BT9902 , and it is common knowledge for the community members that seeps, both intermittent and permanent, exist in many locations near the base of steep slopes throughout the region[2]
8) the topographic maps in the permit are of limited value since too little detail is provided to readily identify steep areas in contrast to less steep areas – the commitee recommends **enhancing the topographic maps** to be at par with those in Appendix A[3]
9) the **surface water map(s) and well locations map(s) are not included** in Permit No. BT9902 (we recognize that the Department of Ecology well logs printouts are in the appendices, but a map is a considerably important document to guide all application technicians and keep biosolids from being applied too close to wells)[4]
10) **buffer zone features such as surface waters, wells, property boundaries, and roadways and the width of the buffer zones, are not elaborated on any maps as required**[5]
11) the location of any critical areas on site, as required to be identified under Chapter 36.70A RCW in the county's growth management plan were not found in Permit No. BT9902[6]
12) **Permit No. BT9902 mentions that seasonal high ground water identification will be carried out but no subsequent documentation exists,** the commitee highlights that this ought to be included in the permit application[7]
13) in addition to how access to the site will be restricted (for example, signs posted around the site or other approved method of access restriction), the commitee deems it important that **communication prior to any biosolids application be distributed no less than 14 days in advance to schedule their economic and other activities** as well as to have the opportunity to appeal for schedule changes owing to potential creation of hardship pertinent to them[8]

Here, our critique addresses other concerns in the application (Permit No. BT9902).

1) Reference to WAC 173-308-160 Table 3 is made, but adherence to WAC 173-308-160 Table 2 is mute; we recommend explaining how testing, monitoring, and reporting of cumulative pollutant loading of 503 metals will be exercised as required by WAC 173-308-160[9]
2) **It is unclear to the community what vehicle(s) will exist to access records for our independent inspection and analyses, receive notice of application scheduling, the level of safety (minimum distance/special equipment and/or clothing, detoxification measures following an event where exposure occurs) we are advised to exercise during periods of application to not be harmed were we near (not on the actual land) a field at the time of application**[10]
3) The NRCS soils survey shows that the Permit No. BT9902 elaboration of soil erosion potential is scant (Appendix B) – **the commitee recommends elaborating details regarding how soil erosion will be adequately arrested on all fields and other areas where biosolids will be applied since much of the area has been identified has highly erodible soils (HEL)**; furthermore, other areas not shown to be HEL but yet included as potential fields for biosolids application are likely to be classified as HEL[11]

Page: 3

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 5/11/2017 1:32:38 PM -07'00'
In the SSLAP Section 6 and Appendix 2, 3.2 fields are identified for land application by name, none of the fields are badlands, CRP or timber.

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 5/11/2017 1:33:49 PM -07'00'
The areas described are not close to the proposed fields and are well in excess of the buffer zones. Also see Item 5 HG Review

Number: 3 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 2:11:48 PM
The topographic maps have been updated.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 5/11/2017 1:08:35 PM -07'00'
In the map legend wells and surface water buffers are identified. See SSLAP Maps in Appendix 2, 3.2 .

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 2:12:56 PM
See Appendix 2 section 3.2 of the SSLAP.

Number: 6 Author: BBIC461 Subject: Inserted Text Date: 5/11/2017 1:36:46 PM -07'00'
The only proposed land application sites are traditionally farmed fields zoned agricultural.

Number: 7 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 12:05:06 PM
Verifying ground water levels are done just prior to land application approval.

Number: 8 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 2:15:28 PM
Applying biosolids as a fertilizer is an act of farming. Ecology does not have the authority to impose strict conditions on farming practices. Site restrictions must comply with requirements in the rule and general permit.

Number: 9 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 12:08:50 PM

Author: AKRA461 Subject: Sticky Note Date: 11/20/2017 2:24:21 PM
The methods for testing, monitoring, and reporting for cumulative pollutant loading are described in WAC 173-308-160.

Number: 10 Author: BBIC461 Subject: Inserted Text Date: 11/20/2017 2:30:08 PM
All records related to the site are available through public disclosure. Buffers are in place to prevent off-site exposure. See Item 4 Health.

Number: 11 Author: BBIC461 Subject: Inserted Text Date: 5/11/2017 1:44:55 PM -07'00'
See Item 2 HEL

4) **The NRCS soils survey also depicts most all of the land proposed for biosolids application in Permit No. BT9902 to be limited with respect to the land application of municipal waste materials (Appendix C), it is unclear to the commitee how this escaped the inspection of the site by Fire Mountain Farms, Inc. in their application and how they propose to adequately design the system to account for the relative high potential for associated probelems.** [1]
5) **Though not natural to the farmed areas proposed in the permit application, soil restrictive layers associated with frost, cementation, and raindrop impact are known to form in these soils due to the most common farming practices carried out for wheat production over the years (Appendix D); only a site specific soils investigation will suffice to rule out the possibility that significant runoff from eroded hilltops occurs during winter and spring seasons, the commitee recommends assessing the soils where erosion has occurred to design appropriate/specific measures to correct for any such conditions in these fields and to also specify methods of cultivation that have proven effective in enhancing soil infiltration of water and soluble nutrients into the soil matrix** as well as temporary storage in the root zone for crops to extract these nutrients. [2]
6) **the community asks that records created and maintained by Fire Mountain be made available to them for analysis and study were the permit granted and biosolids are applied to these lands.** [3]
7) to avoid conflicts of interest, the commitee recommends that **independent testing and monitoring** of the site be required and used to augment the ability to understand the site conditions over time thus providing assurance that pollution levels do not reach dangerous levels. [4]
8) **the community is interested in monitoring site accessibility signage following land applications of biosolids to make sure fair warnings of the hazards are established and maintained as per WAC 173-308-210; is there a process by which the community may be informed regarding the site and dates pertinent to land applications of the biosolids to carry out and report their assessments?** [5]

Page: 4

Number: 1 Author: BBIC461 Subject: Inserted Text Date: 5/11/2017 1:46:35 PM -07'00'
See Item 7 Ag Disposal of Sewage Sludge

Number: 2 Author: BBIC461 Subject: Inserted Text Date: 5/11/2017 1:48:03 PM -07'00'
See Item 3 Erosion

Number: 3 Author: AKRA461 Subject: Inserted Text Date: 11/20/2017 2:39:29 PM
Fire Mountain Farms must comply with reporting requirements. Records received by Ecology are available through public disclosure.

Number: 4 Author: BBIC461 Subject: Inserted Text Date: 5/11/2017 1:50:58 PM -07'00'
All sample analysis is done by a third party, in an Accredited Lab. Monitoring is done by the Dept. of Ecology.

Number: 5 Author: BBIC461 Subject: Inserted Text Date: 5/11/2017 1:52:35 PM -07'00'
FMF is required to post activity prior to land application.

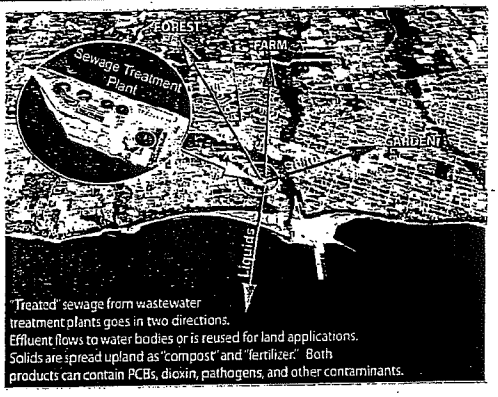
Submitted at hearing

SEWAGE SLUDGE IS $OLD AS COMPOST FOR FOOD & GARDENING

WHAT ARE THE HIDDEN DANGERS?

IT IS YOUR RIGHT TO KNOW!

Everything that goes down the drain ends in a Waste Water Treatment Plant (WWTP). Septage (sewage in a septic tank) may be hauled there, as well as radioactive waste, fracking fluid, superfund leachates and hazardous industrial waste. They contain a complex mix of thousands of contaminants and various pathogens. Yet, sewage plants are not designed to treat all that enters them.



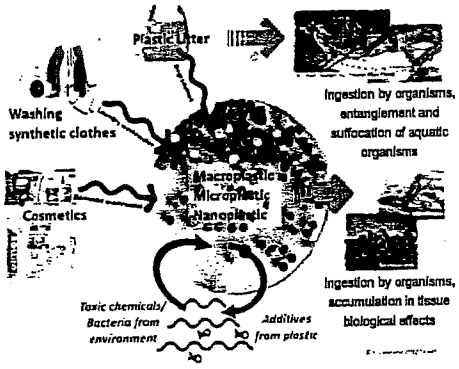
"Treated" sewage from wastewater treatment plants goes in two directions. Effluent flows to water bodies or is reused for land applications. Solids are spread upland as "compost" and "fertilizer." Both products can contain PCBs, dioxin, pathogens, and other contaminants.

- WWTPs create 60% of WA State's Puget Sound pathogen pollution
- WWTPs create superbugs/antibiotic resistant genes and bacteria that transfer to food
- WWTP contaminants can be taken up by crops and sea life humans eat
- WWTP sewage sludge is sold for compost/fertilizer without labeling all contents
- WWTP wastes harm soils, air, water, wildlife, plants, food & human health

YOU HAVE THE RIGHT TO KNOW WHAT IS IN YOUR FOOD!

YOU HAVE THE RIGHT TO KNOW WHAT IS IN YOUR GARDEN COMPOST!

All products taken internally, applied, or put down the drain have the potential to enter sewage systems or become runoff into streams, lakes and the ocean. Everyday products such as pharmaceuticals, personal care products, laundry detergents, and pesticides contain endocrine disrupting compounds, carcinogens and other contaminants. These enter our soils, our waters and our food.



THEREFORE, IT IS YOUR RIGHT TO KNOW!

It is the right of the people to know if their food is grown or otherwise produced in soil to which sewage sludge has been applied as a fertilizer, micronutrient source, soil amendment, soil conditioner or compost. Without disclosure, consumers of food products may unknowingly ingest broad classes of toxic metals, chemicals, biochemicals and microorganisms, many of which accumulate in organisms and through the food chain. *These products should be* ***LABELED!***

ABOUT SEWAGE

With the 1972 Clean Water Act (CWA), the U.S. Environmental Protection Agency (EPA) implemented pollution control programs such as setting wastewater standards for industry and water quality standards for all contaminants in surface waters. The Act made it unlawful to discharge *any* pollutant from point sources into navigable waters unless a permit was obtained.(1) So, with government financial help, municipalities built wastewater treatment plants.

Different municipalities process wastes differently, but they all separate solids (which become "sludge") from liquid (which becomes "effluent"). Treatment plants typically do what is called "secondary treatment." Some do "tertiary treatment," meaning the effluent discharged into water bodies is "cleaner." This results in more toxins and pathogens left in sewage sludge. Regardless, the effluent remains full of harmful contaminants.

Everything that humans discharge or excrete, as well as materials contributed by medical facilities, businesses and industries, are sent to sewage plants. Sewage can contain pharmaceuticals, endocrine disrupting chemicals, chemotherapy drugs, toxic metals, and synthetic hormones - including estrogens and testosterones, personal care products, hospital wastes, industrial wastes, antibiotic resistant bacteria, flame retardants, stormwater runoff, animal wastes, plastic microbeads, plus viruses, fungi, protozoa, parasites, prions associated with a brain wasting disease, plasmids and bacteriophage that enable the horizontal transfer of gene

WWTPs CREATE "SUPERBUGS"

University of Michigan School of Public Health research suggests wastewater treatment processing contributes to the selective increase of antibiotic resistant bacteria and the occurrence of multi-drug resistant bacteria ("superbugs") in aquatic environments.(2)

These strains of bacteria resist several or all antibiotics. Each year drug-resistant bacteria infect more than 2 million people nationwide and kill at least 23,000.(3) These even lurk in hospitals.(4)

- In1981, the EPA reported that out of 300 total coliform (bacteria inhabiting the colon) isolates:
  - ⇒ 82% were resistant to two or more antibiotics.
  - ⇒ 46% of these were capable of transferring antibiotic resistance to a sensitive strain of E. coli.(5)
- Antimicrobials hinder important WWTP processes, compromise sewage treatment and promote drug resistance. (6.a,b)
- WWTP discharges contribute to spreading antibiotic resistant genes in the environment and bacterial communities of a receiving river. (7)
- Canadian researchers discovered one of the deadliest kinds of antibiotic-resistant bacteria in a *raw human food* – raw squid, widening the potential exposure for consumers.(8)

ABOUT SEWAGE SLUDGE

With sewage now discharged to wastewater treatment plants, something needed to be done with the daily tons of sludge generated by every municipality. Options for handling sewage sludge were to landfill it, burn it, or claim it to have beneficial properties and call it "biosolids." Most municipalities chose the latter. This toxic substance, if recycled, could now be deemed safe for human use.

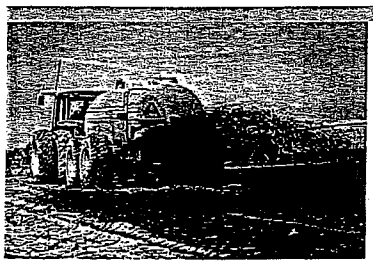
Sludge consists of complex and unpredictable *contaminated waste mixtures* that includes robust pathogens, unregulated metals, and tens of thousands of unregulated synthetic chemical compounds, many of which are toxic, persistent, and can enter the food chain, along with PCBs, dioxins, neurotoxins and mutagens.

The EPA, the U.S. Geological Survey (USGS), state agencies and some universities have analyzed sewage sludge. Findings are typical. For example, the EPA findings of 84 sewage sludge samples collected from 74 randomly selected publicly owned treatment plants producing 1 million gallons/day in 35 states were:

- *27 metals, 3 steroids, 3 pharmaceuticals, 4 anions and all but one flame retardant (BDE-138) in every sample;*
- *9 pharmaceuticals and 6 steroids in 80 samples;*
- *4 semivolatile organics and polycyclic aromatic hydrocarbons (PAH) in 72 samples;*
- *BDE-138 flame retardant in 54 samples.(9)*

Elsewhere, 9 different sewage sludge products from 7 states were analyzed for 87 emerging organic contaminants entering waste water treatment plants:

- 55 were detected in at least one product
- 30 - 45 were detected in any one product (10)



BUYER BEWARE! SEWAGE SLUDGE AS COMPOST !!

State, federal and local governments promote land application of sewage sludge as a nutrient-rich organic natural fertilizer and claim it has agricultural (farmland and forest) beneficial properties. Municipalities sell or give it to farmers for fertilizing their soils on which animals may graze or for other food production purposes, or spread it in forests. Spread on animal feed lots, farm animals can ingest the toxins which recycle back to humans who eat these animals or their byproducts. Forest foragers and those recreating in forests will seldom see posted warning signs that sewage sludge was spread.

Some municipalities bulk their sewage sludge with wood or other materials and sell it to the public by tonnage, or package it for nurseries as "organic" or "natural" compost. Labels only need list arsenic, cadmium, lead, mercury, nickel, selenium, copper, zinc, molybdenum and potassium, nitrogen and phosphorus levels.(11.a,b) There is no requirement to label other contaminants in the compost.

Human food crops and food animal feed crops, or the seed of feed crops, therefore, present opportunity for toxins contained in sewage sludge to enter the nutrient cycle of human consumers. Many of the toxins accumulate in our bodies and Consequences of human exposure to the food may not be realized for years.(12)

Dr. David L. Lewis, author of *Science for Sale*, a career USEPA scientist and the agency's only scientist to ever be lead author on papers published in *Nature* and *Lancet*, received a Science Achievement Award from USEPA Administrator Carol Browner. At the same time, the USEPA planned to terminate him. His "fault?" He denounced sewage sludge as safe for fertilizer and human health.(13) It is ***BUYER BEWARE!***

HEALTH & PROPERTY

Residents living within approximately 1 km of land application sites generally complain of irritation (e.g., skin rashes and burning of the eyes, throat, and lungs) after exposure to winds blowing from treated fields. A prevalence of skin and respiratory tract infections have been documented, including 2 deaths, one from septicaemia and one from pneumonia.(14, 15)

Documented cases exist of food uptake of sewage sludge contaminants, loss of property and property values – including farm land, crops and animals, as well as long term soil damage from sewage sludge in soil. (16.a,b)

Now you understand why consumers and property owners need to *BE AWARE of* how food is grown and what is in commercial compost.

ABOUT WASTEWATER: SEWAGE EFFLUENT & RECLAIMED WATER IMPACTS TO SEA LIFE, SOIL & HEALTH

Because current wastewater treatment systems were designed before [many] contaminants were known to be harmful at such low concentrations, treatment does not effectively remove them, and they persist when emptied into water bodies....These contaminants are difficult to identify before the waste enters ***streams, rivers and lakes.*** *Reuse of treated sewage effluent on landscaping, golf courses, [school and play grounds] and agricultural fields can contribute to the [pollution and health] problems.(17)*

- The USGS found low concentrations of a broad range of chemicals in streams adjacent to cities and agricultural areas. Included were human and veterinary drugs, natural and synthetic hormones, detergent metabolites, plasticizers, insecticides, and fire retardants. One or more of these chemicals were found in 80% of the streams sampled.(18)
- At the 2014 Salish Sea Conference held in Seattle, WA, over 20 scientific papers were presented on sewage treatment plant contaminants of emerging concern impacts on Salish Sea marine life. Each study researched only one or a few of these contaminants. Considered together, the point was made that treatment plant eliminations harm marine systems.(19)

Indeed, both the WA State Departments of Health and Ecology say 60% of the Puget Sound's pathogens are from WWTPs.(20.

More studies drive home the point of problems in our waters from sewage effluents:

- ***Hormones*** *in Land-Applied Biosolids Could Affect Aquatic Organisms*(21)
- ***Intersexed fish*** *is greatest near towns or near heavily farmed land. One major source of these* ***endocrine disruptors*** *is thought to be the post-treatment "cleaned" water from municipal sewage treatment plants.*(22)
- *The quantity of* ***heavy metals*** *from sewage treatment plants deposited in the French Bay of Vidy is considerable and, because of sediment instability, constitutes a potential hazard for biota.* (23)
- *Tiny* ***plastic particles*** *in facial cleansers and soaps end up in fish and shellfish and are spread on land with sewage sludge. A bottle of facial cleanser can have 350,000 microbeads.*(24. a-d)

BIOLOGICAL OXYGEN DEMAND (BOD)

BOD is the amount of oxygen in a body of water needed by organisms to break down organic matter at certain temperatures over a specific time period. In a 2013 Investigate West Story, *Killing the Urine-eating Bugs,* by Robert McClure, Dr. Peter Maier criticizes how sewage is considered treated.

When a BOD test is carried out, carbon-eating bugs present in the waste immediately go to work on solids, demanding oxygen all along. Carbon-eating microbes are in full swing by the fifth day of the test (BOD5).

Nitrogen-eating bugs are slower getting started as there aren't many in the waste to begin with. They may not get up to full speed until maybe the sixth to the eighth day. It can take up to 30 days for those bugs to digest urine-based waste.

The nitrogen-eating bugs continue eating waste and requiring oxygen from streams where effluent waste is dumped, starving the water of oxygen normally available to fish and other aquatic life. The nitrogen that the bacteria haven't eaten acts as a fertilizer and increases algae growth downstream from the sewage plant.

In sum, point source pollution permits (National Pollutant Discharge Elimination System permits) are based on biological oxygen demand of carbon eating bacteria, ignoring nitrogen eating bacteria needs that, after WWTP "treatment," enter water bodies and suck up oxygen critical to marine life.

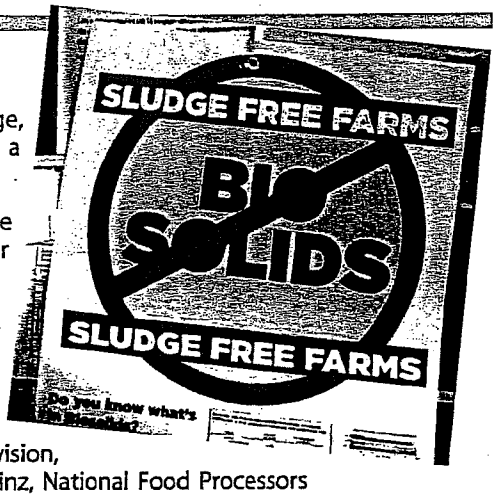
IN SUMMARY, what is sent to WWTPs ends up in sewage sludge to be spread on soils, and winds back up in water systems. What is emitted directly into water bodies negatively impacts marine systems, moves up the food chain to be consumed by humans who expel it back into WWTPs, and round and round it goes.

The practice of spreading and promoting sewage sludge on land undermines the basic physics, chemistry, microbiology, structure and function of soils. Soil ecosystem disruption from spreading sewage sludge alters and diminishes the native soil microbiome and diminishes the soil agronomic characteristics and quality.

The data is replete with impacts of "treated" sewage to water, air, soil, and the health of humans and wildlife. Two excellent sources are:

<http://www.sludgefacts.org>
<http://www.sludgenews.org/resources/>

PROMOTE LABELING TO PROTECT LIVES



Mandatory labeling of both commercially sold human foods exposed to sewage sludge, and composts containing sewage sludge promoted for growing food can provide a critical method for tracking potential adverse health effects.

Identifying seeds produced with or without being grown in or exposed to sewage sludge would protect *farmers' rights to know* what they are purchasing and protect their right to choose what they grow.

Certified organic farmers are prohibited from selling human foods or food animals exposed to sewage sludge.

Numerous US and foreign markets, food processors and distributors refuse foods produced with sewage sludge. These include, but are not limited to, Allen Canning Company, Siloam Springs, Campbell Soup Company, Comstock Michigan Fruit Division, Dean Foods Vegetable Company, Green Bay WI (Birds Eye products), Del Monte, Heinz, National Food Processors Association, Nestle USA, Perez Packing, Firebaugh CA, Progresso (Pillsbury, Green Giant, Totinos, Jenos, Haagen Dazs), Martha White, Old El Paso, Seabrook Farms, Stanislaus County Farm Bureau, Tri Valley Growers, Van Den Berch Food Co, Vermont Family Farms Milk, Western Growers, Whole Foods and others.

DO THIS!

✔ Ask your grocers which products they sell were grown with sewage sludge, and to **LABEL** all foods (whole or those with ingredients) that were!

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Sequim, WA 98382

northwest toxic communities coalition

Olympic Environmental Council

Protect the Peninsula's Future

This product is funded by grants from the

KEEP YOUR SOILS, YOUR SURROUNDING ENVIRONMENT, AND YOUR FAMILY SAFE

BUYER BEWARE... NOT ALL COMPOSTS ARE SAFE!

AVOID PRODUCTS THAT CONTAIN INDUSTRIAL WASTES AND "BIOSOLIDS." READ LABELS CAREFULLY AND RESEARCH THE FERTILIZER YOU PLAN TO BUY.

- Avoid purchasing soil amendments or composts that are made from industrial waste, and sewage sludge called "biosolids."
- Sewage sludge is the byproduct of whatever is put down the drain in hospitals, businesses, households and factories.
- "Biosolids" can contain pathogens and contaminants such as dioxins, PCBs, endocrine disrupting chemicals, arsenic, lead, mercury, cadmium, pharmaceuticals, surfactants and other persistent and toxic pollutants, many of which are neither monitored nor regulated.
- "Biosolids" can pollute groundwater and wells, harm living organisms and degrade agricultural soil. Plants raised in and livestock that feed from such soils take up some of the contaminants.
- Deceptively labeled as "organic" and "natural", retailers are often unaware of the makeup of these composts and soil amendments sold under a number of brand names.

For more information visit:

www.sludgefacts.org

www.sludgenews.org

cwmi.css.cornell.edu/sewagesludge.htm

Dr. David Lewis. ***Science For Sale.*** 2014

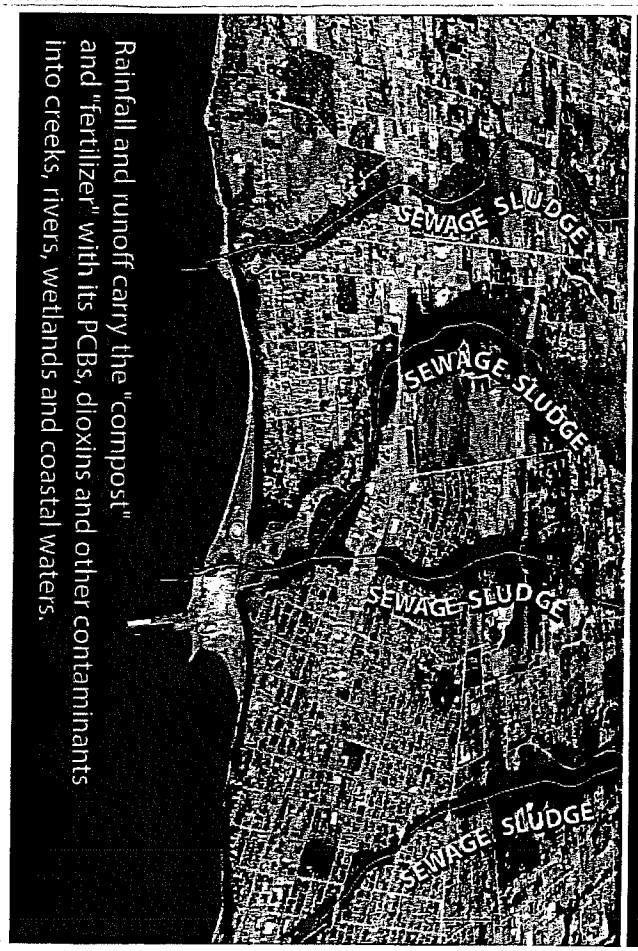
In February, the Washington Post reported that the concentration of intersexed fish is greatest near towns or near heavily farmed land. One major source of these endocrine disruptors is thought to be the post-treatment "cleaned" water from municipal sewage treatment centers that is discharged directly into the Potomac River system and runoff from fields "fertilized" with sludge.

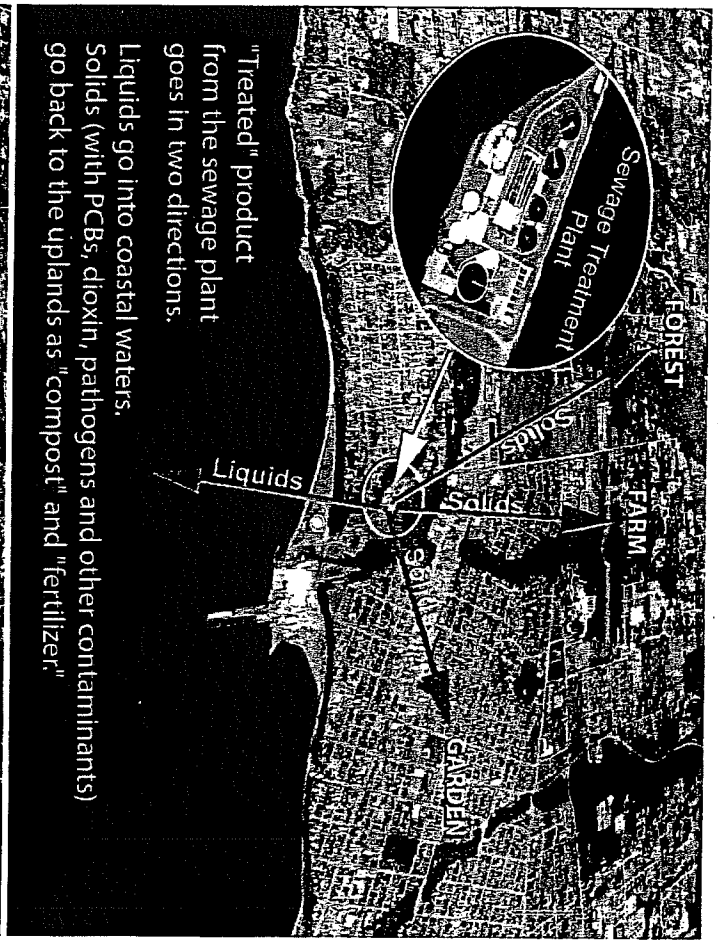
In 2006, U.S. Geological Survey scientists surveyed chemical contaminants found in sludge "destined for land application" and concluded, "Potential concerns about the environmental presence of OWCs [Organic Wastewater Contaminants] include adverse physiological effects, increased rates of cancer, and reproductive impairment in humans and other animals, as well as antibiotic resistance among pathogenic bacteria."

MAY 21, 2008 JOEL BLEIFUSS Piling it High: The sewage sludge industry meets the light of day
www.inthesetimes.com/article/3688

SIERRA CLUB
FOUNDED 1892

Washington Chapter Sierra Club
180 Nickerson Street Suite 202
Seattle, WA 98109





The History of Sludge for Agricultural Application

http://www.motherearthnews.com/nature-and-environment/the-history-of-sludge-for-agricutural-application-zbcz1602.aspx#comments

2/8/2016 11:11:00 AM

By Lidia Epp

Tags: biosolids, pollution, fertilizer, policy, law, Virginia, Lidia Epp

It was a sunny Sunday afternoon in late October 2014. My husband and I were enjoying a soft shell crab sandwich at the Blue Crab Festival in West Point, Va., just a few miles from our home. Local arts and crafts were on the display, the Main Street was filled with people, cotton candy carts, draft beer stands, merry-go-round, the usual.

A lady with the Sierra Club baseball hat and a handful of flyers came over and asked if we know about the problem with biosolids.

"Biosolids?" we both asked in unison. "What's that?"

"It's a municipal sewage sludge and industrial waste that is applied to the farmland as a fertilizer. A company called Synagro applied for a permit to spread industrial waste on 17,000 acres in our area over the next 10 years. This practice is mostly unmonitored and the permit is very likely to be granted," she answered, frowning.

The History of Sludge for Agricultural Application

"WHAT?!" we screamed, in unison again, and looked at each other in horror. This woman is crazy! This just can't be!

Take the Red Pill

Do you remember the first *Matrix* movie, the scene where Neo is given a choice of blue or red pill? On that October day, together with a bite of a soft shell crab and a gulp of draft beer, we swallowed the red pill of biosolids. There is no going back. We had to face the reality and it is scary.

Well, that day seems now a lifetime ago. The lady was not crazy — we were uninformed. The "Sierra Club lady" turned out to be Tyla Matteson, the Chair of Marine Issues at the Virginia Chapter of Sierra Club.

Tyla has been a tireless opponent of land sludge applications. She attends City Hall meetings in central Virginia counties, and General Assembly sessions where new bills are introduced attempting to put on hold the agricultural use of sludge. Together with local residents, Tyla organizes meetings to inform the public of the dangers of this practice. And the public outcry and opposition are growing.

The History of Sludge

But let's start from the beginning:

It all started in 1972 with the passing of Marine Protection, Research and Sanctuaries Act. It is the only pollution law that explicitly requires consideration of land-based alternative disposal.

1972 was also the year that Congress passed the Clean Water Act, with major revisions in 1977, 1981 and 1987. Last revisions, in 1987, resulted in amendments directing the EPA to research and promulgate the land applications of sewage sludge. A year later in 1988, Congress passed the Ocean Dumping Ban Act, thus eliminating all but land disposal method of sludge.

The Act went into effect in 1992, also the year when the PR firm of Powell Tate was hired by the industry to devise a plan for gaining public acceptance of sewage sludge land disposal. And so the names "biosolids," "industrial residuals," "natural fertilizer," and "organic nutrients" were invented.

EPA quietly removed the sewage sludge from the list of HAZMAT and in 1993, sewage sludge federal regulations were published in the Federal Register as the "Part 503 rule," promulgated under the authority on the Clean Water Act, Title 40 of the Code of Federal Regulations, Part 503.

In 1986, Synagro Technologies Inc. was founded, a company currently operating in 34 states, specializing in agricultural disposal of sewage sludge and industrial waste. Or, to be politically correct, "biosolids and industrial residuals management."

The History of Sludge for Agricultural Application

The company is ridden with lawsuits and bankruptcies. The most prominent case, the bribery scandal involving a Detroit councilwoman, prompted Synagro's last wave of restructuring and buy-outs.

Regulatory Failure

The Part 503 rule is a set of federal guidelines for the oversight and monitoring of agricultural use of sludge. The science behind those rules is grossly outdated, based on 1970 understanding of environmental sciences, biology, toxicology and pathology.

The futility of these EPA guidelines to protect public health lays not only in the fact that the regulations include a very narrow scope of pollutants required to be monitored (just nine heavy metals and only two species of bacteria), but they also don't reflect recent scientific findings. They regulate an infinitely small fraction of environmental pollutants, while ignoring a vast majority of dangerous components of sludge.

Sludge's Threat to Public Health

What back then was considered safe, is now classified as carcinogen. In 1993, the phrase "endocrine disruptors" was not even invented yet! Endless lists of chemicals were then deemed safe: flame retardants, flocculent polymers, surfactants, pharmaceuticals, synthetic hormones, pesticides, and plasticizers.

Those pollutants are not broken down by the wastewater treatment processes. They are concentrated a million fold and then applied to agricultural land. They are sold to the public as "natural fertilizer."

Applied to soil in public parks, school playgrounds, farms and forests, they create a risk of human exposure to an increasingly complex combination of dangerous chemical and biological agents. Over 500 synthetic organic chemicals are now reported in sludge. *None* are regulated.

It has been reported that surfactants are present in biosolids in high levels and degradation products are highly toxic. Pharmaceuticals are designed to work at very low concentrations.

As the level of complexity of pollutants rises, the synergistic effect of that complex mixture will have increasingly greater effects on human and animal health.

How to Go Forward?

Soil continues to receive high levels of municipal and industrial sludge and this practice continues to go virtually unmonitored. It's happening in the agricultural areas where "Class B" biosolids are spread, and in the towns and cities all across the country where Class A biosolids are used as a "natural fertilizer."

The History of Sludge for Agricultural Application

It's a major environmental disaster in the making and our society will pay a heavy price for those practices. Each and every one of us is at risk, and the exposure to the environmental pollutants in sludge will have a detrimental effect on the overall health of society and each of us individually.

There is a great need for a new approach to the dilemma and what to do with the inevitable byproduct of our consumer lifestyle – the sludge. Instead of "disposing" it, we will need to find new ways of repurposing it and employ new, emerging technologies to address the growing danger of biosolids land application.

Resources

Virginia Public Hearings

Video: Sewage Sludge on Our Farms

Video: Dr. Mercola Discusses Biosolids

"Dr. Lewis Asks the Important Question: 'Who Regulates the EPA?'", (Aug. 27, 2015). *The Oconee Enterprise* on Focus for Health

Grens, Kerry. "Snyder, Sludge Fighter." (Nov. 1, 2006). *The Scientist.*

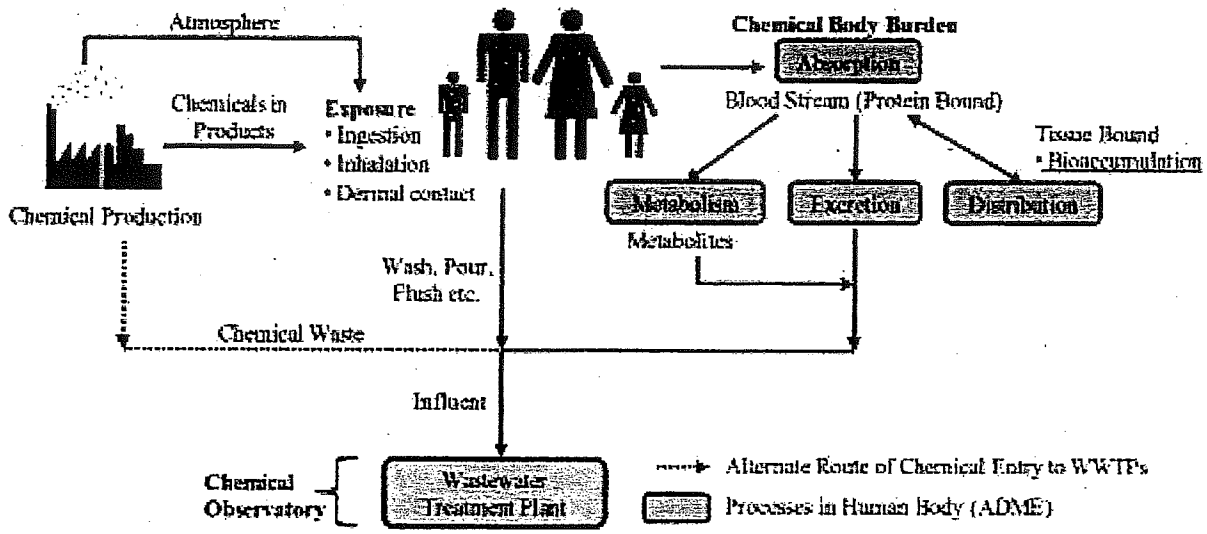
Photo by Thomas Miller

Lidia Epp *is active with a local group of residents concerned about the agricultural application of biosolids, a dangerous practice that devastates farmland. She corroborates with local activists, politicians and scientists to bring public awareness to this issue and advocates for changes in state and federal regulations of biosolids land use.*

http://phys.org/news/2014-01-sludge-sentinel-human-health.html#jCp

Sludge as new sentinel for human health risks

January 16, 2014 by Richard Harth



The schematic outlines the fate of anthropogenic chemicals from initial production through human exposure and wastewater treatment. Credit: Halden/Venkatesan

Thousands of chemicals serving a variety of human needs flood into sewage treatment plants once their use life has ended. Many belong to a class of chemicals known as CECs (for chemicals of emerging concern), which may pose risks to both human and environmental health.

Arjun Venkatesan, a recent doctorate and Rolf Halden, professor and director of the Center for Environmental Security at Arizona State University's Biodesign Institute, have carried out meticulous tracking of many of these chemicals.

In a study appearing today in the Nature Publishing Group journal *Scientific Reports*, both authors outline a new approach to the identification of potentially harmful, mass-produced chemicals, describing the accumulation in sludge of 123 distinct CECs.

Ten of the 11 chemicals found in greatest abundance in treated municipal sludge or biosolids were high-production volume chemicals, including flame-retardants, antimicrobials and surfactants.

The study shows a strong overlap between chemicals found in biological samples taken from the human population and those detected in municipal biosolids. These findings suggest that analysis of sludge may provide a useful surrogate for the assessment of human exposure and bioaccumulation of potentially hazardous substances.

According to Venkatesan, "presence of CECs in sewage suggests that consumers already may get exposed to these chemicals prior to their discharge into sewage, suggesting a need for human biomonitoring and risk assessment of these priority chemicals."

Prioritizing the thousands of CECs and predicting their behavior has been a daunting challenge. Evaluation is costly, tedious and time-consuming. Further, as the new study emphasizes, laboratory modeling of chemical behavior, including rates of environmental breakdown and potential for bioaccumulation often deviate significantly from real-world scenarios.

Conventional chemical screening evaluates the persistence, bioaccumulation and potential toxicity of various chemicals. The method however suffers from two shortcomings: the production rates of chemicals in current use are not incorporated into analysis and the detailed behavior of these chemicals in real-world biological systems—including the human body—is not assessed.

In the current study, a repository of samples from U.S. wastewater treatment plants, created and maintained by Halden at ASU's Biodesign Institute was used to conveniently identify CECs, as well as evaluate their potential for bioaccumulation and their ability to

withstand degradation processes. The working hypothesis proposes that such treatment plants may act as reliable gauges for monitoring chemical prevalence and bioaccumulation potential relevant to human society and the environment.

Specifically, chemicals managing to survive primary and secondary treatment in municipal sewage systems display notable resistance to aerobic and anaerobic digestion processes and are therefore more likely to stubbornly persist in the environment upon their release.

As Halden notes, post-treatment sludge provides a sink for water-avoiding (hydrophobic) organic compounds. Such sludge is often applied to land, where the persisting hydrophobic chemicals (including polychlorinated biphenyls [PCBs], briominated flame retardants [BFRs] and various pharmaceutical and personal care products including antimicrobial agents) can accumulate in considerable quantity.

The analysis identified a total of 123 chemicals in biosolids. Of these, 17 brominated chemicals were detected in U.S. biosolids for the first time. The most abundant chemicals were surfactants, which occur commonly in detergents, emulsifiers, foaming agents and dispersants.

After surfactants, pharmaceutical and personal care products were most abundantly detected, followed by BFRs, which commonly occur in plastics, textiles, electronics, and household flame-retardants. BFRs often persist and bioaccumulate in the environment and under proper conditions are also capable of transforming into other hazardous chemicals, including brominated dioxins and furans. The study notes that the pathways by which BFRs enter wastewater treatment facilities remain speculative, requiring further investigation

The surfactant and antimicrobial chemicals identified fall into the category of high production volume (HPV) compounds, produced in annual quantities of over 450,000 kg (1 million pounds). The study notes that the abundance of some chemicals is traceable to specific societal events, for example the 2001 anthrax scare, which significantly boosted production and consumption of the antibiotic ciprofloxacin. Antibiotic accumulation in the environment is of particular concern, due to a tendency to cause heightened drug resistance in microbial pathogens.

Rolf Halden: Director The Biodesign Institute Center for Environmental Security; Professor, Ira A. Fulton Schools of Engineering, School of Sustainable Engineering and the Built Environment; Senior Sustainability Scientist, Global Institute of Sustainability

The study reveals that 91 percent of the 11 most abundant compounds detected in biosolid samples are HPV chemicals, reinforcing the strong link between the occurrence of hydrophobic chemicals in sludge and their production volume.

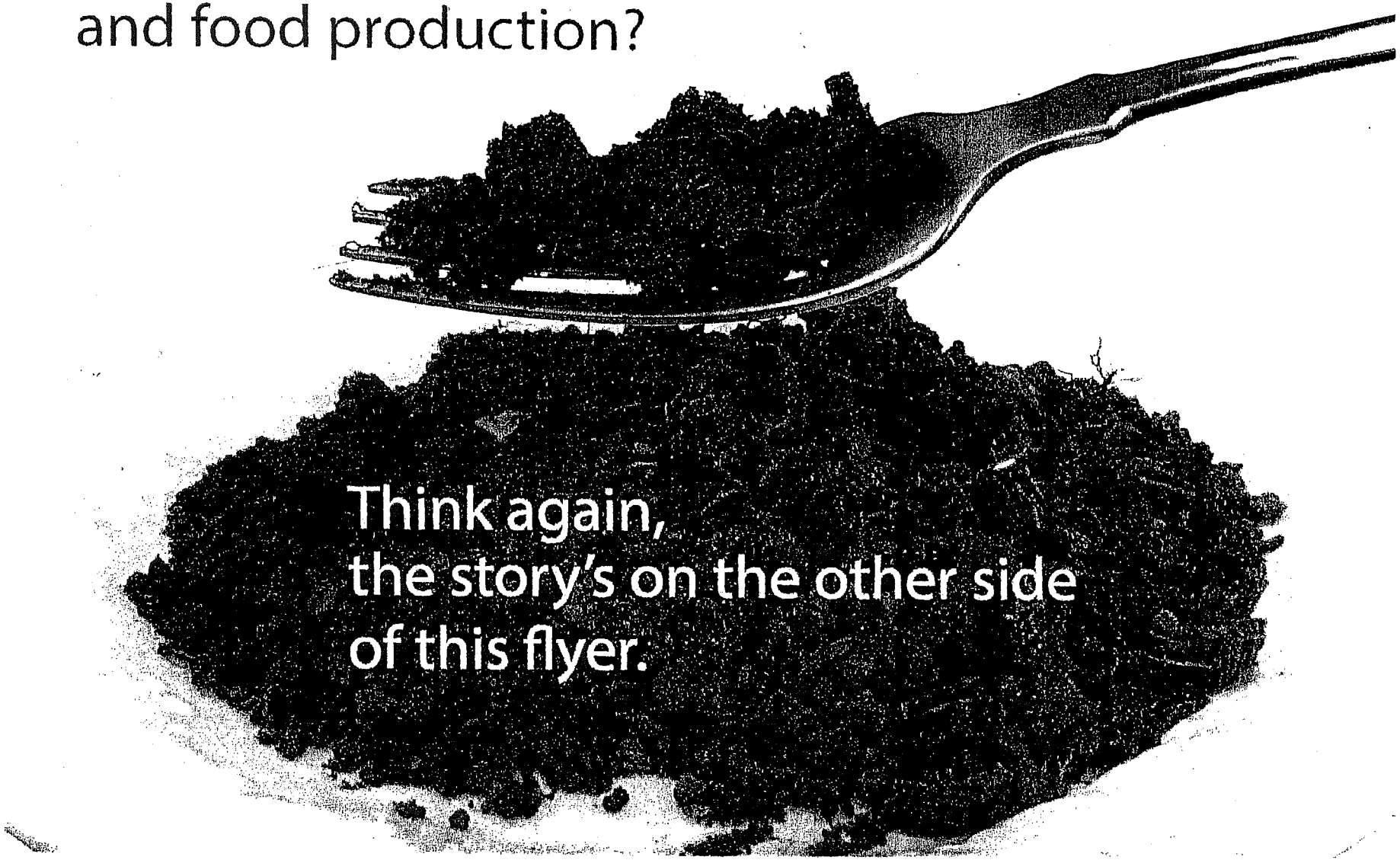
Hydrophobic compounds occurring in the range of parts per trillion are generally of low environmental occurrence or experience significant biodegradability, or both. On the other hand, those chemicals occurring in parts per million quantities are of potential concern, owing to low biodegradability, high usage and the tendency to accumulate in biosolids due to their hydrophobic nature.

When results of the current study were matched against a comprehensive exposure assessment of environmental chemicals conducted by the Center for Disease Control and Prevention, it was observed that roughly 70 percent of chemicals detected in biosolids were also detected in humans.

Chemical abundance in biosolids appears to be a reliable indicator of current rates of chemical usage, resistance to biodegradation and potential for bioaccumulation. Further, by using biosolids as a pre-screening step, researchers may reduce the thousands of potentially hazardous CEC chemicals in circulation to a manageable number of priority substances most in need of further evaluation. Such a list of chemicals could then be scrutinized with respect to their absorption, distribution, metabolism and excretion as well as their potential harmfulness to humans and ecosystems.

"With over 85,000 chemicals in daily use in the U.S., it is a daunting task to pinpoint those that need more monitoring, regulation or replacement with safer alternatives," Halden says. "It turns out that we can use existing infrastructure, our wastewater treatment plants, to take the chemical pulse of the nation, determine chemical inventories, and zero in on risky chemicals prone to harm people, prosperity and the planet."

Think that EPA and DEC regulations are protecting American farmland and food production?



SEWAGE SLUDGE AKA BIOSLUDGE AKA BIOSOLID CLASS A AND CLASS B CONTENTS

Compiled 12-27-10 by the Center of Sludge Information. Federal and state regulations limit concentrations of only 9 heavy metals and one pathogen - in the red font.

Heavy Metals - Aluminum, Antimony, Arsenic, Barium, Beryllium, Bismuth, Boron, Bromine, Cadmium, Cerium, Cesium, Chromium, Copper, Dysprosium, Erbium, Europium, Gadolinium, Germanium, Gold, Hafnium, Holmium, Iron, Lanthanum, Lutetium, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Niobium, Palladium, Praseodymium, Rhodium, Rubidium, Ruthenium, Samarium, Scandium, Selenium, Silver, Strontium, Tantalum, Tellurium, Terbium, Thallium, Thorium, Thulium, Tin, Titanium, Tungsteen, Uranium, Vanadium, Yttrium, Ytterbium, Zinc **Pathogens - Bacteria** - Fecal Coliform, Salmonella 2000 types, Shigella 4 spp., E. coli 0157:H7, Staphylococcus aureus, Enteropathogenic E. coli, Yersinia enterocolitica, Campylobacter jejuni, Vibrio cholera, Leptospira, Listeria, Helicobacter, Mycobacteria, Aeromanonas, Legionella, Burkholderia, Endotoxins, antibiotic resistant bacteria

Viruses - Adenovirus, Astrovirus, Calcivirus, Coronavirus, Enterovirus, Poliovirus, Coxsackie A, Coxackie B, Echovirus, Enterovirus 68 - 72, Hepatitis A virus, Hepatitis E virus, Norwalk Virus, Reovirus, Rotavirus, **Protozoa** - Cryptosporidium, Entamoeba histolytica, Giardia lamblia, Balantidium coli, Toxoplasma gondii

Helminths (Parasites) - Ascaris lumbicaides (roundworm), Ancylostoma duodenale (hookworm), Necator americanus (hookworm), Tainia saginata (tapeworm), Trichuris (whipworm), Toxocara (roundworm) Strongyloides (threadworm), Ascaris suum, Toxocara canis, Taenia solium, Hymenolepis nana

Fungi - Aspergillus fumigatus, Candida albicans, Cryptococcus neoformans, Epidermophyton spp., Trichophyton spp., Trichosporon spp., Phialophora spp.,

Prions (spongiform encephalopathy)

Synthetic Chemicals - Dioxins & Furans Octachlorodibenzo-P-Dioxin, 1,2,3,4,6,7, 8-Heptachlorodibenzo-P-Dioxin, Octachlorodibenzo Furan, 1,2,3,4,6,7,8 Heptachlorodibenzo-Furan (71), 2,3,7,8-Tetrachlorodibenzo-Furan, 1,2,3,6,7,8 Hexachlorodibenzo-P-Dioxin, 1,2,3,4,7,8-Hexachlorodibenzo-Furan, 1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin, 1,2,3,6,7,8-Hexachlorodibenzo-Furan, 2,3,4,6,7,8-Hexachlorodibenzo-Furan, 1,2,3,4,7,8,9-Heptachlorodibenzo-Furan, 2,3,4,7,8-Pentachlorodibenzo-Furan, 1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin, 1,2,3,7,8-Pentachlorodibenzo-Furan, 1,2,3,7,8 Penta-chlorodibenzo-P-Dioxin, 1,2,3,7,8,9-Hexachlorodibenzo-Furan, 2,3,7,8-Tetrachlorodibenzo-P-Dioxin, Polychlorinated Dibenzodioxin/Polychlorinated Dibenzofuran (PCDD/PCDF), Tetrahydrofuran, 2,4-D, 2, 4,5-T, dioxin (TCDD) **Organics (carbon-based)** Acetones, Chloroform, Cyclohexanone, Bis(2-ethylhexyl) Phthalate, Bis(2-ethylhexyl), tetrabromophthalate, Di-n-undecyl phthalate, Alkyl benzyl Phthalate, Di-(2-Ethylhexyl) Phthalate, (DEHP). Butyl Benzyl Phthalate, Toluene, 2-Propanone, Methylene Chloride, Hexanoic Acid, 2-Butanone, Methyl Ethyl Ketone, Alcohol Ethoxylate, Alkylphenolethoxylates, Phenol, Nonylphenol, 2,2'-methylenebis{4-methyl-6-nonyl-Phenol, p-Nonylphenol, 4,4'-butylidenebis{2-(1,1-dimethylethyl)-5-methyl-,4-Methylphenol, Phenol, 4,4'-(1-methylethylidene) bis{2-(1,1-dimeth, Phenol, 4,4'-(1-methylethylidene) bis(2-(1,1-dimeth, 2,4-dicumylphenol, p-Dodecylphenol, 2,4,5-Trichlorophenol, N-Hexacosane, N-Tetracosane, N-Dodecane, N-Tetradecane, N-Triacontane, N-Eicosane, N-Hexadecane, N-Octacosane, Carbon Disulfide, N-Decane, N-Docosane, N-Octadecane, P-Cymene, Benzo(B)fluranthene, Fluoranthene, P-Chloroaniline, Pyrene, Tetrachloromethane, Trichlorofluoromethane, 2-Hexanone, 2-Methylnaphthalene, 4-Chloroaniline, Benzo(a)pyrene

Pesticides &Insecticides Aldrin, Chlordane, Cyclohexane, Heptachlor, Endosulfan, Endosulfan-II, Lindane, Dieldrin, Endrin, DDT, DDD, DDE, 2,4,5-Trichlorophenoxyacetic Acid, Acetic Acid (2,4-Dichlorophenoxy), 2,4,5-Trichlorophenoxypropionic Acid, Pentachloronitrobenzene, Chlorobenzilate, Beta-BHC, Kepone, Mirex, Methoxycholor, **PCBs**- PCB-1016, PCB-1221, PCB-1232, PCB-1242, PCB-1248, PCB-1254, PCB-1260,

PBDEs (PolyBrominated Diphenyl Ethers) BDE-28, BDE-47, BDE-66, BDE-85, BDE-99, BDE-100, BDE-138, BDE-153, BDE-154, BDE-183, BDE-209

Hydrocarbons, Petrochemicals, Organochlorines PCBs, PCT, PBB, PBT, Anthracene, Pentachlorophenol, Benzo(g,h,i)perylene, Benzene, Benzene, C14-C24-branched, Polyethylbenzene residue, Octane, Hexachlorobenzene, Ethylbenzene, Chlorinated Benzenes, Naphtha (petroleum), turpentine-oil, Hydrotreated kerosene, Hydrocarbon oils, Hydrocarbons, C10 and C12, Distillates (petroleum), Fuel oil, Creosols, P-Cresol, O-Cresol, 2-(2H-Benzotriazol-2-yl)-p-cresol, Hexachlorobutadiene, N-Nitrosodimethylamine, Toxaphene, Trichloroethane, Tetrachloroethane, Hexachloroethane, Carbon Tetrachloride, Dichloroethylene, Trichloroethylene, Tetrachloroethylene, Xylene **Pharmaceuticals** 1,7-Dimethylxanthine, 4-Epianhydrochlortetracycline, 4-Epianhydrotetracycline, 4-Epichlortetracycline, 4-Epioxytetracycline, 4-Epitetracycline, Acetaminophen, Albuterol, Anhydrochlortetracycline, Azithromycin, Caffeine, Carbadox, Carbamazepine, Cefotaxime, Chlortetracycline, Cimetidine, Ciprofloxacin, Clarithromycin, Clinafloxacin, Cloxacillin, Codeine, Cotinine, Dehydronifedipine, Demeclocycline, Digoxigenin, Digoxin, Diltiazem, Diphenhydramine, Doxycycline, Enrofloxacin, Erythromycin-Total, Flumequine, Fluoxetine, Gemfibrozil, Ibuprofen, Isochlortetracycline, Lincomycin, Lomefloxacin, Metformin, Miconazole, Minocycline, Naproxen, Norfloxacin, Norgestimate, Ofloxacin, Ormetroprim, Oxacillin, Oxolinic Acid, Oxytetracycline, Penicillin G, Penicillin V, Ranitidine, Roxithromycin, Sarafloxacin, Sulfachloropyridazine, Sulfadiazine, Sulfadimethoxine, Sulfamerazine, Sulfamethazine, Sulfamethizole, Sulfamethoxazole, Sulfanilamide, Sulfathiazole, Tetracycline, Thiabendazole, Triclocarban, Triclosan, Trimethoprim, Tylosin, Virginiamycin, Warfarin

Steriods & Hormones 17 Alpha-Dihydroequilin, 17 Alpha-Estradiol, 17-Alpha-Ethinyl-Estradiol, 17-Beta-Estradiol, Androstenedione, Androsterone, Beta Stigmastanol, Campesterol, Cholestanol, Cholesterol, Desmosterol, Epicoprostanol, Equilenin, Ergosterol, Estriol, Estrone, Ethinylestradiol, Norethindrone, Norgestrel, Progesterone, Stigmasterol, Sitostanol, Beta-Estradiol 3-Benzoate, Beta-Sitosterol, Equilin, Testosterone

Medical Alert – antibiotic resistant bacteria are not only due to over-prescribing

Jun 10, 2013

This report was written by PSR-LA member John Ackerman, MD (johnmackerman@gmail.com).

Introduction

One of the most essential tools of modern medicine is at risk. The discovery and use of antibiotics hailed a new era in the treatment of bacterial illnesses. However, the multiplication of antibiotic resistant bacteria that may include multi-antibiotic resistant pathogens (MAR) and their multi-antibiotic resistant genes might be threatening this life saving tool. Scientists have documented the presence of antibiotic resistant bacteria (ARB) and their antibiotic resistant genes (ARG) in the three byproducts of wastewater treatment plants: 1.) biosolids often used as a fertilizer additive on agricultural land; 2.), recycled water used to irrigate leafy green crops consumed raw as well as grass in public parks and other playing fields; and 3.) effluent that is discharged to lakes, rivers, and oceans. The presence of these contaminants should be a call for federal, state, and local policy makers to take action regarding our wastewater treatment plants to reduce the spread of ARBs, their resistant genes, and their water delivery systems.

As physician advocates, we must make the case for redesigning our existing water treatment systems and their water delivery pipe systems in order to continue to protect public health particularly from water borne antibiotic resistant pathogens and their antibiotic resistant genes. The presence of these contaminants should spur more physicians to become knowledgeable about how antibiotic resistant pathogens multiply in wastewater treatment plants and also within their delivery pipe systems. Given this ever increasing threat to the effectiveness of antibiotics, medical professionals must once again show leadership by pushing for improved potable water, waste water treatment and the waste water treatment plant water delivery systems.

Medical professionals have considerable experience giving direction for public health policy how to decrease ARB in clinical settings by eliminating excessive prescriptions of antibiotics, utilizing adequate hand washing technique plus proper disposal of antibiotics. While private practice, clinics and hospitals have focused on this issue, the inadvertent proliferation of ARB by waste water treatment plants and their distribution to the environment vis-a-vis wastewater treatment byproducts remains unaddressed.

Background

The Medical Hydropathology Working Group, which includes a physician and two other researchers, tested recycled water from two wastewater treatment sewer plants in southern California. That testing verified data found in the scientific literature. There is a growing body of published scientific evidence that ARBs are becoming more virulent, prevalent and resistant. Other published scientific data regarding one of the nation's most modern wastewater treatment facilities documented the presence of ARB and their antibiotic resistant genes in its effluent. Such contaminated effluent puts people living downstream of these facilities at public health risk. Clearly, this is unsatisfactory stewardship of our water resources.

Modern medicine without antibiotics?

Since penicillin was first discovered in 1929, antibiotics have been a critical tool of modern medicine. During WWII, penicillin was widely used to treat bacterial infection. Today, other antibiotics are commonly utilized after surgery as well as for the treatment of various wounds .Prior to the availability of antibiotics, doctors were forced to amputate limbs to prevent the spread of infections. Minor cuts or strep throat were sometimes fatal.

The sewage treatment process inadvertently promotes the lateral transfer of pathogenic antibiotic resistant genes from antibiotic resistant pathogens found within untreated waste water to digestive bacteria purposefully utilized by and necessary in sewage treatment. Such lateral transfer of antibiotic resistant genes continues within our open environment outside of waste water treatment plants between different living types of strains and even various species.

Wastewater is treated to meet minimal federal standards. Although, the three byproducts of the wastewater treatment plants are not intended for direct human consumption, we still might be eating both crops fertilized with biosolids as well as animals that graze on pasture lands (treated with biosolids).We play on public grass irrigated with treated (and still contaminated) recycled water and eat leafy greens, sometimes irrigated with recycled water. In essence, humans are inadvertently, indirectly, and regularly in contact with recycled water and thus exposed to ARB.

As the supply of potable water decreases, public pressure to identify alternative ways to use recycled water increases. Federal, state and local officials and administrators are eager to use recycled water to irrigate both municipal grass and crops consumed raw and for other uses where it is assumed that it will not be consumed– (such as water used to extinguish forest fires and in the process of hydraulic fracturing). Additionally, there is much talk about using even more recycled water as drinking water. It is in the nature of water to move and thus we cannot be assured that these uses will not end in human exposures to ARBs. Wastewater treatment plants are expected to remove harmful bacteria and other micro-organisms. Unfortunately, our current wastewater treatment facilities and technologies are inadequate to this task. Such inadequate treatment of ARB is possibly putting public health at serious risk. (In both lakes and rivers, drinking water is taken from the same areas where presumably treated sewage is discharged.) Therefore, it is essential that we increase our monitoring of ARB in both byproducts (effluent and recycled) of released waste water and also in drinking water. The monitoring should take place both at the end of the wastewater treatment plant and at the end of the water delivery pipes.

Physicians and other health care professions must begin to appreciate and subsequently publicly raise this issue. Health professionals must call for the redesign of sewage treatment plants and their delivery pipe systems and we must plus upgrade monitoring are opportunities for innovation and updating of our infrastructure. Such will also create a great many jobs. Policy changes will be critical to assist in the prevention of illness. Once properly treated, recycled water could be reconverted to potable water, utilized to irrigate crops consumed raw, fight fires, or irrigate parks and playgrounds. It is time that we start monitoring and set public health based standards that will eliminate ARB and their antibiotic resistant genes.

As physicians, we understand the need to treat clinical problems and our broader duty to identify new public health issues so that we can also prevent future illness. The State of California and our elected officials must do the same. They must improve our waste and drinking water treatment facilities and water delivery systems so they can eliminate ARB while simultaneously developing methods to quantify ARB and their resistant antibiotic genes in all of our water resources. It is our job as health care professionals to educate and build political will in order to mobilize public agencies and other reclaimed water advocates to act toward this end.

We are at a critical juncture that could lead to the loss of one of modern medicine's greatest tools. We must take a preventative approach with new strong policy actions. While we posses much of the technology needed to adequately treat waste water, what is lacking is the political will to fund more research (Is the above contamination dangerous to our public health?) and subsequently redesign our water treatment and delivery systems. It is and has been the role of physician advocates to call for action, please join us in our efforts to educate, engage, and mobilize our colleagues. Also please join our Medical Hydropathology Working Group as we will be hosting a series of conference calls to develop a strategy for eliminating ARB and their antibiotic resistant genes in effluent, recycled water, potable water and biosolids.

Please contact John M. Ackerman, M.D. (*johnmackerman@gmail.com*) if you have comments and and/or questions.

http://www.psr-la.org/medical-alert-antibiotic-resistant-bacteria-are-not-only-due-to-over-prescribing/

ScienceDaily, September 15, 2015

World loses trillions of dollars worth of nature's benefits each year due to land degradation

By Christopher Zara

Source: United Nations University *50 million migrants may be created in a decade*

Summary:

Experts estimate the value of ecosystem services worldwide forfeited due to land degradation at US $6.3-10.6 trillion annually, or the equivalent of 10-17 percent of global GDP, a new report suggests. An estimated 50 million people may be forced to seek new homes and livelihoods within 10 years. That many migrants assembled would constitute the world's 28th largest country by population.

To better inform the tradeoffs involved in land use choices around the world, experts have assessed the value of ecosystem services provided by land resources such as food, poverty reduction, clean water, climate and disease regulation and nutrients cycling.

Their report estimates the value of ecosystem services worldwide forfeited due to land degradation at a staggering US $6.3 trillion to $10.6 trillion annually, or the equivalent of 10-17% of global GDP.

Furthermore, the problem threatens to force the migration of millions of people from affected areas. An estimated 50 million people may be forced to seek new homes and livelihoods within 10 years. That many migrants assembled would constitute the world's 28th largest country by population.

Effectively addressing land degradation could help avert that humanitarian crisis and add US $75.6 trillion to annual world income, according to the report, "The Value of Land," produced by The Economics of Land Degradation Initiative.

With guidance by United Nations University's Canadian-based Institute for Water, Environment and Health and the CGIAR's Research Programme on Drylands Systems, the report culminates a four-year collaboration involving 30 international research and policy institutes. The Initiative is funded by the German Federal Ministry for Economic Cooperation and Development, the European Commission and the Korean Forest Service.

Some 52% of world agricultural land is moderately or severely degraded, the report says.

However, "the economics of land degradation is about a lot more than agriculture."

For example, soil is second only to oceans as the planet's largest carbon sink, while agriculture and land use changes represent the second largest source of greenhouse gas emissions. Addressing land degradation and its causes, therefore, represents a double-sided way to reduce greenhouse gas emissions, the report says.

"Adequate management of agricultural and forestry land uses are amongst the lowest-cost actions that can reduce global warming, and most actions are either neutral cost or of positive net profit to society, requiring no substantial capital investment," the report says.

National studies verify that the value of ecosystem services and benefits far outweigh the cost of preventing land degradation or the cost of remediation in most situations.

The report calls on countries to recognize the huge value of improved land management and to enhance institutional capacity and knowledge in the area, together with national policy, economic, legislative and regulatory frameworks.

The authors note that cost-benefit analyses of sustainable land management scenarios "can be done even with limited data availability,"and underscore that, despite an inevitable degree of uncertainty, "it is imperative to take action now, as every day sees the loss of more productive land that will have to be gained back."

Quick facts from the report: (over)

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- Land cover changes since year 2000 are responsible for half to 75% of the lost ecosystem services value
- The value of lost ecosystem services due to land degradation averages US $43,400 to $72,000 per square km, some US $870 to $1,450 per person, globally each year
- Agricultural investments of US $30 billion per year are needed to feed the world's growing population
- The percentage of Earth's land stricken by serious drought doubled from the 1970s to the early 2000s
- One third of the world is vulnerable to land degradation; one third of Africa is threatened by desertification
- A future focused on a shift to sustainability will see the greatest increase in ecosystem service values and GDP.

Comments

Monique Barbut, Executive Secretary, UN Convention to Combat Desertification: "As Oscar Wilde put is once 'people know the price of everything and the value of nothing.' This is certainly true when we look at our land resources – we do not value them. The ELD Initiative proves it should be a no-brainer. **Land degradation eats away at our fertile land. That is our common resource base.** It is time to efficiently and cost-effectively harness the land and land-based ecosystems to provide for our needs and secure our livelihoods."

Karmenu Vella, European Commissioner for Environment, Fisheries and Maritime Affairs: "This study by ELD shows the immediate and global impact of land degradation and highlights that actions to tackle it pay off. **Increased land degradation is also one of the factors that can lead to migration** and it is being exacerbated by climate change. On our planet, the area affected by drought has doubled in 40 years. One third of Africa is threatened by desertification. As President Juncker said in his State of the Union speech last week, **climate refugees will become a new challenge -- if we do not act swiftly**. We need to be as ambitious as possible in the negotiations for COP 21 in Paris."

Report: ELD Initiative (2015). The value of land: Prosperous lands and positive rewards through sustainable land management. Available fromwww.eld-initiative.org

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Story Source:

The above post is reprinted from materials provided by **United Nations University**. *Note: Materials may be edited for content and length.*

PubMed

Abstract

Full text links

ACS Publications

Environ Sci Technol. 2016 Apr 19;50(8):4476-82. doi: 10.1021/acs.est.5b06256. Epub 2016 Apr 7.

Human Exposure to Wastewater-Derived Pharmaceuticals in Fresh Produce: A Randomized Controlled Trial Focusing on Carbamazepine.

Paltiel O[1,2,3], Fedorova G[3,4], Tadmor G[1,3,4], Kleinstern G[1,3], Maor Y[3], Chefetz B[3,4].

Author information

Abstract

Fresh water scarcity has led to increased use of reclaimed wastewater as an alternative and reliable source for crop irrigation. Beyond microbiological safety, concerns have been raised regarding contamination of reclaimed wastewater by xenobiotics including pharmaceuticals. This study focuses on carbamazepine, an anticonvulsant drug which is ubiquitously detected in reclaimed wastewater, highly persistent in soil, and taken up by crops. In a randomized controlled trial we demonstrate that healthy individuals consuming reclaimed wastewater-irrigated produce excreted carbamazepine and its metabolites in their urine, while subjects consuming fresh water-irrigated produce excreted ndetectable or significantly lower levels of carbamazepine. We also report that the carbamazepine metabolite pattern at this low exposure level differed from that observed at therapeutic doses. This "proof of concept" study demonstrates that human exposure to xenobiotics occurs through ingestion of reclaimed wastewater-irrigated produce, providing real world data which could guide risk assessments and policy designed to ensure the safe use of wastewater for crop irrigation.

PMID: 27021726 [PubMed - in process]

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http://www.seattletimes.com/seattle-news/environment/drugs-flooding-into-puget-sound-and-its-salmon/

Cocaine, Prozac, other drugs found in Puget Sound salmon from tainted wastewater

Originally published February 23, 2016 at 7:47 pm Updated February 24, 2016 at 11:38 am

From Prozac to caffeine to cholesterol medicine, from ibuprofen to bug spray, researchers found an alphabet soup of drugs and other personal-care products in sewage-treatment wastewater and in the tissue of juvenile chinook in Puget Sound.

By Lynda V. Mapes
Seattle Times environment reporter

Puget Sound salmon are on drugs — Prozac, Advil, Benadryl, Lipitor, even cocaine.

Those drugs and dozens of others are showing up in the tissues of juvenile chinook, researchers have found, thanks to tainted wastewater discharge.

The estuary waters near the outfalls of sewage-treatment plants, and effluent sampled at the plants, were cocktails of 81 drugs and personal-care products, with levels detected among the highest in the nation.

The medicine chest of common drugs also included Flonase, Aleve and Tylenol. Paxil, Valium and Zoloft. Tagamet, OxyContin and Darvon. Nicotine and caffeine. Fungicides, antiseptics and anticoagulants. And Cipro and other antibiotics galore.

Why are the levels so high? It could be because people here use more of the drugs detected, or it could be related to wastewater-treatment plants' processes, said Jim Meador, an environmental toxicologist at NOAA's Northwest Fisheries Science Center in Seattle and lead author on a paper published this week in the journal Environmental Pollution.

"The concentrations in effluent were higher than we expected," Meador said. "We analyzed samples for 150 compounds and we had 61 percent of them detected in effluent. So we know these are going into the estuaries."

The samples were gathered over two days in September 2014 from Sinclair Inlet off Bremerton and near the mouth of Blair Waterway in Tacoma's Commencement Bay.

The chemicals turned up in both the water and the tissues of migratory juvenile chinook salmon and resident staghorn sculpin. If anything, the study probably underreports the amount of drugs in the water closer to outfall pipes, or in deeper water, researchers found.

Even fish tested in the intended control waters in the Nisqually estuary, which receives no direct municipal treatment-plant discharge, tested positive for an alphabet soup of chemicals in supposedly pristine waters.

"That was supposed to be our clean reference area," Meador said. He also was surprised that levels in many cases were higher than in many of the 50 largest wastewater-treatment plants around the nation. Those plants were sampled in another study by the EPA.

The findings are of concern because most of the chemicals detected are not monitored or regulated in wastewater, and there is little or no established science on the environmental toxicity for the vast majority of the compounds detected.

Meador said he doubted there would be effects from the chemicals on human health, because people don't eat sculpin or juvenile chinook, and levels are probably too low in the water to be active in humans. But

one of the reasons the wastewater pollutants studied as a class are called "chemicals of emerging concern" is because so little is known about them.

However, "You have to wonder what it is doing to the fish," Meador said. His other recent work has shown that juvenile chinook salmon migrating through contaminated estuaries in Puget Sound die at twice the rate of fish elsewhere.

The drugs detected in the study could be part of the reason, as they have the potential to affect fish growth, behavior, reproduction, immune function and antibiotic resistance.

The drugs selected for testing were chosen on the basis of their widespread use by people, the likelihood of their continued use and the potential for higher levels of contamination in the future as the human population in the Puget Sound region continues to grow.

The results represent only a snapshot, and levels could be higher or lower, seasonally, depending on people's use of drugs and volumes of treatment-plant discharge. For instance, levels of DEET (an insect repellent) and antihistamines are probably even higher in summer.

Some regional differences were detected.

Substantially higher concentrations of DEET, caffeine, ibuprofen and female reproductive hormone were found in Bremerton effluent, compared with the Tacoma site, which researchers concluded could be due to differences in usage.

The Puget Sound area contains 106 publicly owned wastewater-treatment plants that discharge to local waters.

The amount of drugs and chemicals from all plants into Puget Sound could be as much as 97,000 pounds every year, the study found.

Unexplored were the presence and effect of drugs in predators that eat the fish, and in other contaminated organisms that the fish eat, such as algae or invertebrates.

The Nisqually estuary was more contaminated than expected with drugs, including cocaine, Cipro and Zantac. The source of the drugs there was unknown, the researchers reported. However, the Nisqually River, Nisqually Reach and McAllister Creek do not meet water-quality standards for fecal coliform. That makes leaking septic systems a possible source of the drugs.

Treatment plants in King County are effective in removingsome drugs in wastewater, but many drugs are recalcitrant and remain. Seizure drugs, for instance, are very hard to remove, and ibuprofen levels are knocked down — but not out — during treatment, said Betsy Cooper, permit administrator for the county's Wastewater Treatment Division.

"You have treatment doing its best to remove these, chemically and biologically, but it's not just the treatment quality, it's also the amount that we use day to day and our assumption that it just goes away," Cooper said. "But not everything goes away."

Jessica Payne, spokeswoman for the state Department of Ecology, said the agency needs more research funding to monitor the presence and examine the impact of chemicals such as those identified in the study.

"Ongoing research is really our best tool to understand these chemicals," Payne said.

The study was not concerned with drinking water. Seattle Public Utilities customers receive first-use water from the high Cascades, above any wastewater discharge and remote from human populations and septic tanks.

Lynda V. Mapes: 206-464-2515 or lmapes@seattletimes.com

ATTACHMENTS

ITEM 1

SEPA

MEMO

Note to File

I, Terri Costello, Ecology's Eastern Regional SEPA Coordinator, reviewed the SEPA Checklist for the Rosman Unit biosolids land application areas located in Lincoln County as proposed by Fire Mountain Farms, Inc. Upon reevaluation of the SEPA Checklist and the review process for this proposal, I, along with Waste 2 Resources Program staff and Assistant Attorney General, Jonathan Thompson, have determined that SEPA Review was conducted appropriately. SEPA Checklist question B.5.a. asks the applicant to circle any birds and animals which have been observed on or near the site or are known to be on or near the site. Fire Mountain Farms personnel discussed this question with the property owner, and the animal species circled were hawk, eagle, songbirds, deer, turkey and coyote as the animal species the property owner has observed on or near the land application site or knows to be on or near the land application site. Additionally, the applicant added the following: Most birds and animals common to the local area could be found on the site. No threatened and endangered species have been observed at the site by either the applicant or land owner. Threatened and Endangered species ranges were reviewed. The proposed land application sites are not identified as areas where threatened and endangered species are located. Additionally, even though not required per WAC 197-11-340(2), the Department of Archaeology and Historic Preservation and the Confederated Tribes of the Colville Reservation were consulted prior to issuing a SEPA threshold determination.

ITEM 2

Highly Erodible Land

HIGHLY ERODIBLE LAND CONSERVATION (HELC) AND WETLAND CONSERVATION (WC) CERTIFICATION

(See Page 3 for Nondiscrimination, Public Burden and Privacy Act Statements).

1. Name of Producer	2. I.D. Number *(Last 4 digits only)*	3. Crop Year
Rosman Enterprises, Inc.	1954	2007

	YES	NO
4. Do you have any interest in land that produces or could produce an agricultural commodity? ***If "YES", or, if you are a Farm Loan Applicant continue with Item 5. If "NO", and you are not a farm loan applicant, go to Item 12 and sign and date.***	✓	
5. ***For farm loan applicants only:*** Will you conduct any activities for fish production, trees, vineyards, shrubs, building construction, or other non-agricultural purposes on lands for which a wetland determination has not been completed by NRCS?	N/A	
6. Are you a landlord or tenant on any farm that will not be in compliance with HELC and WC provisions? ***If "YES", enter the farm number or contact your County FSA Office before completing this form. Farm Number: _____ (Contact your county FSA office if you are unsure of the HEL or wetland determinations applicable to your farming interests.)***		✓
7. Do any of your landlords refuse to comply with HELC requirements on any farms? ***If "YES", enter the farm number or contact your County FSA Office before completing this form. Farm Number: _____***		✓

8. List affiliated persons with farming interests. ***See Page 3 for an explanation. Enter "NONE", if applicable.***

Harry Rosman + Katherine Rosman

	YES	NO
9. During the crop year entered in Item 3 above, or the term of a requested USDA loan, did you or will you plant and produce an agricultural commodity on land for which a highly erodible determination has not been made?		✓
10. Since December 23, 1985, or during the current crop year, or during the term of a requested USDA loan, has anyone performed, or will anyone perform any activities to:		
A. Create new drainage systems, or conduct land leveling, filling, dredging, land clearing, excavation, or stump removal, that has **NOT** been evaluated by NRCS? ***If "YES", indicate year(s): _____***		✓
B. Improve or modify an existing drainage system that has **NOT** been evaluated by NRCS? ***If "YES", indicate year(s): _____***		✓
C. Maintain an existing drainage system that has **NOT** been evaluated by NRCS? ***If "YES", indicate the year(s): _____*** *Note: Maintenance is the repair, rehabilitation, or replacement of the capacity of existing drainage systems to allow for the continued use of wetlands currently in agricultural production and the continued management of other areas as they were used before December 23, 1985. This allows a person to reconstruct or maintain the capacity of the original system or install a replacement system that is more durable or will realize lower maintenance or costs.*		✓

11. If "YES" to Items 5,10A and/or 10B or 10C enter the following for the land the answer applies to:

A. Farm and/or tract/field number: _____

B. Activity: _____

C. Current land use (specify crops): _____

D. County: _____

A "YES" answer in Items 5, 9 or 10 authorizes FSA to refer this AD-1026 to NRCS. If you check "YES" to Item 10C, NRCS does not have to *conduct a certified wetland determination. (Contact your County FSA Office if you are unsure about the answers to Items 5, 9 and 10.)*

Continuous AD-1026 Certification:

I have read the AD-1026 Appendix and understand and agree that my eligibility for certain USDA program benefits is contingent upon this certification of compliance with highly erodible land and wetland conservation provisions of the Food Security Act of 1985 as amended, and if a determination is made that results in a violation and ineligibility, I agree to refund all applicable payments.

- **I agree to the terms and conditions stated on AD-1026 Appendix on all land in which I have or will have an interest and understand that I am responsible for any non-compliance with these provisions.**
- **I agree that I will file a revised AD-1026 if there are any changes in my operation or activities that may affect compliance with these provisions.**
- **I understand that affiliated persons are also subject to compliance with these provisions and their failure to comply or file AD-1026 will result in loss of eligibility to persons or enterprises with whom they are affiliated.** ***(See Page 3 of this form for affiliated persons.)***

12. Signature of Producer ▶ ***I hereby certify that the information on this form is true and correct to the best of my knowledge, and I authorize NRCS to make a HEL and/or certified wetland determination on the tract or farm numbers listed above.***

by Harry Rosman Pres — Producer's Signature

04-19-07 — Date *(MM-DD-YYYY)*

13. Referral to NRCS *(Completed by FSA)* Sign and date if a NRCS determination is needed for any reason including a "YES" answer in Items 5, 9, 10A, 10B, or 10C.	13A. Signature of FSA Representative APR 19 2007	13B. Date *(MM-DD-YYYY)*

ORIGINAL - FSA COPY ☐ NRCS COPY ☐ PRODUCER'S COPY ☐

July 2014

Fact Sheet

Highly Erodible Land Conservation and Wetland Conservation Compliance

Overview

Highly Erodible Land Conservation (HELC) and Wetland Conservation (WC) provisions aim to reduce soil loss on erosion-prone lands and to protect wetlands for the multiple benefits they provide. HELC and WC provisions apply to all land that is considered highly erodible or a wetland, and that is owned or farmed by persons voluntarily participating in USDA programs, unless USDA determines an exemption applies.

Producers, and any affiliated individuals or entities who participate in most programs administered by the Farm Service Agency (FSA), the Natural Resources Conservation Service (NRCS), and the Risk Management Agency (RMA) are required to comply with these provisions. Non-compliance may affect the following types of USDA program benefits:

- FSA loans and disaster assistance payments
- NRCS and FSA conservation program benefits
- Federal crop insurance premium subsidies

Compliance with HELC and WC Provisions

To comply with the HELC and WC provisions, producers must fill out and sign form AD-1026 certifying they will **not**:

- Plant or produce an agricultural commodity on highly erodible land without following an NRCS approved conservation plan or system;
- Plant or produce an agricultural commodity on a converted wetland; or
- Convert a wetland which makes the production of an agricultural commodity possible.

In addition, producers planning to conduct activities that may affect their HEL or WC compliance, for example removing fence rows, conducting drainage activities, or combining fields, must notify FSA by filing form AD-1026. FSA will notify NRCS, and NRCS will then provide highly erodible land or wetland technical evaluations and issue determinations if needed.

Agricultural Commodity

An agricultural commodity is any crop planted and produced by annual tilling of the soil, including one-trip planters and sugarcane.

Highly Erodible Land

Highly erodible land is any land that can erode at excessive rates because of its soil properties. Highly erodible land is designated by field and based on the proportion of the total field acreage that contains highly erodible soils.

Producers who produce agricultural commodities on land identified as highly erodible are required to farm such land in accordance with a conservation plan or system that is approved by

NRCS and that substantially reduces soil loss. Producers proposing to produce agricultural commodities on highly erodible land that has no crop history prior to Dec. 23, 1985, (known as Sodbusting) are required to farm such land in accordance with a conservation plan or system that provides for no substantial increase in soil erosion. A conservation plan or system to reduce soil erosion is not required for land that is not highly erodible.

Wetland

A wetland is an area that:

- Has a predominance of hydric soils (wet soils);
- Is inundated or saturated by surface or groundwater (hydrology) at a frequency and duration sufficient to support a prevalence of hydrophytic (water tolerant) vegetation typically adapted for life in saturated soil conditions and
- Under normal circumstances supports a prevalence of such vegetation except that this term does not include lands in Alaska identified as having a high potential for agricultural development and a predominance of permafrost soils.

NRCS and FSA Roles in Making Determinations

When making HELC and WC compliance determinations:

- NRCS responsibilities include:
  - For HELC compliance:
    - Making highly erodible determinations;
    - Working with producers to develop conservation plans and systems; and
    - When required, determining if highly erodible land is being farmed in accordance with a conservation plan or system approved by NRCS.
  - For WC compliance:
    - Making wetland determinations, including establishing if certain technical exemptions apply, such as prior converted cropland; and
    - Determining if a wetland conversion has occurred.

- FSA makes eligibility determinations, such as who is ineligible based upon NRCS technical determinations of HELC or WC non-compliance. FSA also acts on requests for the application of certain eligibility exemptions, such as the good faith relief exemption.

Highly Erodible Land and Wetland Identification

FSA maintains the official USDA records of highly erodible land and wetland determinations. The determinations are recorded within the geographic information system and the automated farm and tract records maintained by FSA; however, it is important to know that determinations may not include all of the producer's land. Producers may obtain aerial imagery of their farms and a printout of their farm and tract records from the FSA office servicing their farm. If a producer is uncertain of the highly erodible land and wetland determinations applicable to their land, the producer should contact the appropriate USDA Service Center for assistance. The following link will help in locating local USDA Service Centers: http://offices.sc.egov.usda.gov/locator/app.

HELC and WC Non-Compliance

The 2014 Farm Bill re-established the applicability of the HELC and WC provisions to crop insurance subsidies. The Act made no change in HELC and WC implementation with respect to NRCS and FSA programs.

FSA and NRCS Programs

Producers who are not in compliance with HELC and WC provisions are not eligible to receive benefits for most programs administered by FSA and NRCS. If a producer received program benefits and is later found to be non-compliant, the producer may be required to refund all benefits received and/or may be assessed a penalty.

In particular, unless specific exemptions apply, a producer participating in FSA and NRCS programs must be in compliance with an NRCS approved conservation plan or system for all highly erodible land used for agricultural commodity production; not have planted or produced an agricultural commodity on a wetland converted after Dec. 23, 1985; and after Nov. 28, 1990, must not have converted a wetland making the production of an agricultural commodity possible on such converted wetland.

A producer who violates HELC or WC provisions is ineligible for applicable FSA and NRCS benefits for the year(s) in violation. A planting violation, whether on highly erodible land or a converted wetland, results in ineligibility for benefits for the year(s) when the planting occurred. A wetland conversion violation results in ineligibility beginning with the year in which the conversion occurred and continuing for subsequent years, unless the converted wetland is restored or mitigated before January 1 of the subsequent year.

HELC and WC Non-Compliance - Risk Management Agency – Policies Reinsured by the Federal Crop Insurance Corporation

Producers obtaining federally reinsured crop insurance will not be eligible for any premium subsidy paid by the Federal Crop Insurance Corporation (FCIC) for any policy or plan of insurance if the producer:

- Has not filed an accurately completed AD-1026 with FSA certifying compliance with HELC and WC provisions; or
- Is not in compliance with HELC and WC provisions. Unless specific exemptions apply, a producer must:
  - Be in compliance with a NRCS-approved conservation plan for all highly erodible land;
  - Not plant or produce an agricultural commodity on a wetland converted after Feb. 7, 2014; and
  - Not have converted a wetland after Feb. 7, 2014, to make possible the production of an agricultural commodity.

A producer is ineligible for any premium subsidy paid by FCIC on all policies and plans of insurance for the reinsurance year(s) (July 1 – June 30) following the reinsurance year of a final determination of a violation of HELC or WC provisions, including all administrative appeals, unless specific exemptions apply. Further, a producer will be ineligible for any premium subsidy paid by FCIC on all policies and plans of insurance for the reinsurance year if they do not have a completed form AD-1026 on file with FSA certifying compliance on or before June 1 prior to the beginning of the subsequent reinsurance year (July 1), unless otherwise exempted.

Regaining Eligibility for Benefits Lost Because of a Violation

Producers who are found to be in violation of HELC or WC provisions, but acted in good faith and without the intent to violate, may file a request to regain eligibility for the period in violation at the FSA office where their farm records are administered. If the request is approved, producers are required to take corrective action within an established period. There are exemptions that may apply in limited circumstances.

Additional Information

For additional information on HELC and WC compliance, contact the FSA office or the NRCS office at a local USDA Service Center. Additional information can be found online at www.fsa.usda.gov for FSA, www.nrcs.usda.gov for NRCS and www.rma.usda.gov for RMA. The regulations covering these provisions are set forth in the Code of Federal Regulations at 7 CFR Part 12.

ITEM 3

Erosion

ITEM 3 EROSION

Rosman Enterprises Inc. has been in the Conservation Stewardship Program (CStP) on forest and cropland since 2011. Soil erosion resource concern is treated on the forest land enrolled.

Rosman Farms follows a Best Management Practice (BMP) which is a signed agreement with the US Dept. of AG. BMP, components include an erosion control plan and periodic inspections.

Rosman Enterprises Inc. has met annual certified through CStP for their benchmark stewardship.

NRCS
CStP Contract #8105461500H on 1015.2 acres of cropland with enhancement to harvest hay in a manner that allows wildlife to flush and escape, plant tissue tests and analysis to improve nitrogen management, and ply nutrient no more than 30 days prior to planned planting date.

NRCS
CStP Non-industrial Forestland with Enhanced wildlife habitat on expired tree covered CRP acres or acres with similar woody cover managed as forestland beginning in 2015.
FSA
(HELC) (WC) is certified by NRCS

FSA
CRP implemented 1986
Active Contracts
Contract # 10374 2012-2022
Contract # 10375 2012-2022
Contract # 10535 2013-2023
Contract # CN2612A 2010-2020

Some of the steps taken by Rosman Farms to control erosion are:

- Reduced tillage
  - Reduced tillage will reduce particulate matter thus reducing water and wind erosion by retaining organic matter and increasing soil tilth.
- Riparian Buffers
  - Rosman Farms has in place riparian buffers to preserve water quality and prevent erosion. (FSA) (CRP)
- Implement Biosolids Management
  - Using biosolids has the benefit of improving the water-holding capacity of soil by increasing the organic material, therefore reducing erosion.

ITEM 4

Health

Item 4 Health

Many commenters expressed concerns that the beneficial use of biosolids at this site presents an unacceptable threat to human health, from either pathogens or toxic chemicals contained in the biosolids. Some commenters also expressed concern that not enough is known about potential contaminants or concentrations of contaminants to ensure that public is protected. However, no comments were received that identified a specific threat to public health from the beneficial use of biosolids at this site when applied in conformance with the Site Specific Land Application Plan, rule, and general permit.

Chapter 173-308, Biosolids Management, and the General Permit for Biosolids Management requires all biosolids be tested for nitrogen, nine metals, and pathogens (or be processed to significantly reduce pathogens). Several commenters requested that biosolids be tested for all potential contaminants prior to beneficial use at the site.

The constituent testing requirements in the rule were chosen based on a risk assessment performed by EPA in over a nine year period while developing the federal biosolids rule, 40 CFR Part 503. A Guide to the Biosolids Risk Assessments for the EPA Part 503 Rule, publication EPA/832-B-93-005, September 1995, is available from the US EPA at this link: https://www.epa.gov/sites/production/files/2015-06/documents/a_guide_to_the_biosolids_risk_assessments_for_the_epa_part_503_rule.pdf

There has been considerable interest in other potentially harmful constituents found at trace levels in biosolids since the original risk assessment. Biosolids are not required to be tested for these constituents prior to beneficial use. However, there have been multiple efforts by EPA and others to test numerous representative biosolids for these constituents. These include non-regulated metals, other pathogens, antibiotics, industrial and household chemicals, odorants, aerosols, personal care products, pharmaceuticals, surfactants, plasticizers, flame retardants, perfluorinated chemicals, polychlorinated biphenyls, and dioxins and furans. The analytical results of the sampling surveys for these constituents provide typical and maximum concentrations that are found in biosolids. Conclusions drawn from the data indicate that the beneficial use of biosolids in conformance with the rule and general permit do not pose a threat to public health.

Several conditions must be met before any substance or microorganism can have an adverse health effect. Chemical substances must be toxic, there must mechanism for public exposure, and the exposure dose must be sufficient to cause harm. Similarly, microbes must be an infectious agent, there must mechanism for public exposure, and the exposure must be sufficient to cause disease. The concentration and chemical and physical properties of the constituents and microorganism, procedures used to reduce pathogens, agronomic rate limitations, and buffer areas surrounding land receiving biosolids prevent the conditions required for adverse public health effects from being met.

Two publications are attached that provide further information. WSU Extension Guide to Biosolids Quality, FS192E, and Water Environment Federation Land Application of Biosolids: Human Health Risk Assessment Related to Microconstituents, WSEC-2017-FS-014.

WASHINGTON STATE UNIVERSITY EXTENSION

GUIDE TO BIOSOLIDS QUALITY

WSU PEER REVIEWED

FS192E

GUIDE TO BIOSOLIDS QUALITY

By
Dr. Shannon M. Mitchell, Assistant Professor, University of South Alabama, **Georgine Yorgey**, Assistant Director, Center for Sustaining Agriculture and Natural Resources, Washington State University, **Chad Kruger**, Director, Center for Sustaining Agriculture and Natural Resources, Washington State University

Abstract

Biosolids are the material produced from digestion of sewage at city wastewater treatment plants. Biosolids may be spread over land for plant fertilization and soil conditioning.

This publication summarizes the benefits of land-applied biosolids, describes and discusses major categories of contaminants, and explains what is currently known about emerging contaminants in biosolids. While this publication does not include a comprehensive list of individual contaminants, it does discuss the more relevant classes of contaminants.

Table of Contents

Guide to Biosolids Quality

Introduction

Biosolids are the **biomass** material produced following **aerobic and anaerobic digestion** at **municipal wastewater** treatment facilities. **Sewage sludge**, food particles, feces, and other organic solids are converted biologically, within engineered systems, to produce a completely transformed biosolids product. Biosolids are comprised of living and dead wastewater treatment **microorganisms**, small **inorganic** particles, and **insoluble** compounds. In Washington State, biosolids are most often land applied for plant fertilization and soil conditioning as part of a **sustainable practice** to manage municipal **wastewater residuals** (Figure 1).

Like animal manures, biosolids are a source of plant nutrients and stable **carbon compounds.** When biosolids are land applied for crop production, plant nutrients and **organic matter** improve crop production, allowing for recycling of nutrients, and reducing the amount of **synthetic** fertilizers needed. For example, approximately 5,000 tons of nitrogen (N) and 2,000 tons of phosphorus (P) were recycled in Washington State in 2012 by land-applying biosolids (WA Dept. of Ecology 2014a; Sullivan et al. 2015).

Land-applying biosolids keeps valuable organic carbon and plant nutrients from being disposed of in landfills or incinerated. In Washington State, approximately 81% of biosolids are land applied, 18.5% are incinerated, and 0.5% is disposed of in landfills (Figure 2). Of the portion that is approved for land application, 70% is used in agriculture, 25% is used in residential or commercial settings, and 5% is used in forestry (Figure 2).

Class A biosolids can be used as a fertilizer in residential or commercial areas. The Washington State University (WSU) publication *Using Biosolids in Gardens and Landscapes* (Cogger 2014) provides information on Class A biosolids use. **Class B biosolids** are used as a fertilizer in Washington State for wheat, alfalfa, and timber production (WA Dept. of Ecology 2014a). The WSU publication *Fertilizing with Biosolids* (Sullivan et al. 2015) provides information on Class B biosolids use in agriculture.

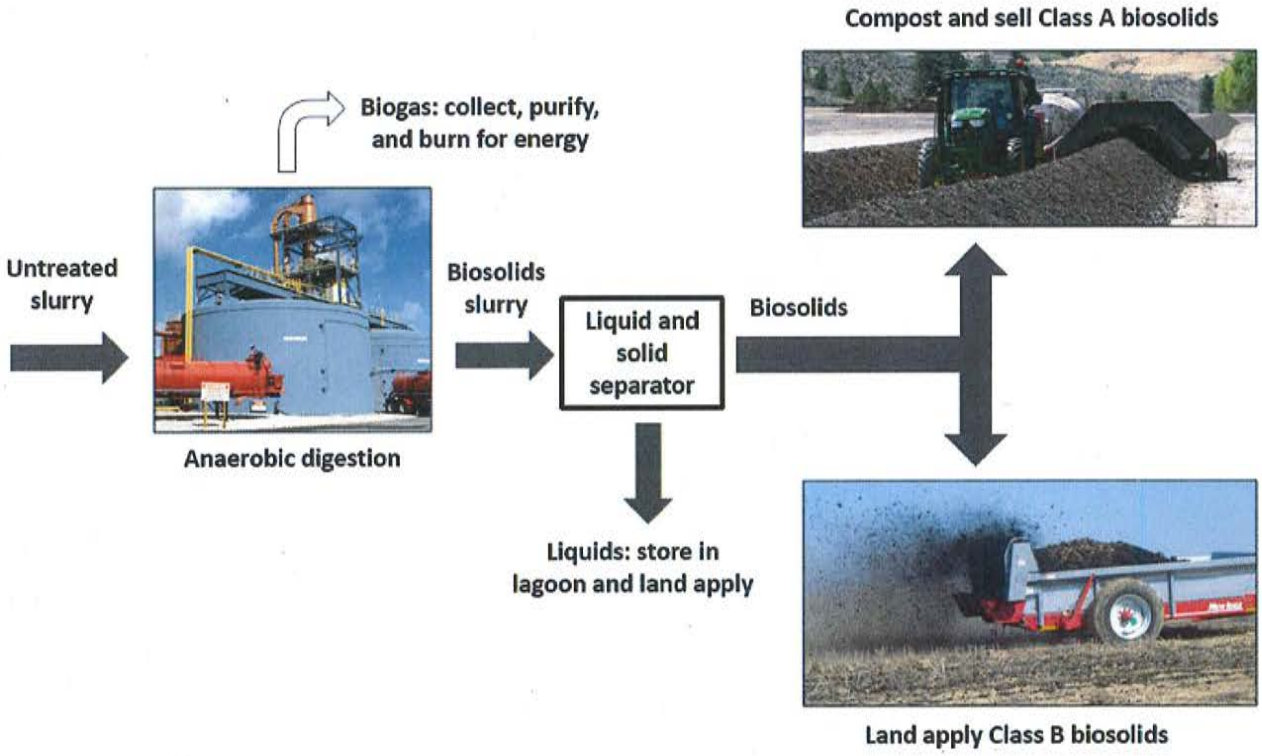

Figure 1. Treatment of sewage slurry using anaerobic digestion. Adapted from: Slurry, Options for slurry treatment by anaerobic digestion. Department of Environment, Food and Rural Affairs (Defra) 2011. (Land application photo by Andy Bary, WSU; anaerobic digestion photo from Energy.gov Flickr page and compost photo from Food and Drug Administration Flickr page per USA.gov U.S. Government Works.)

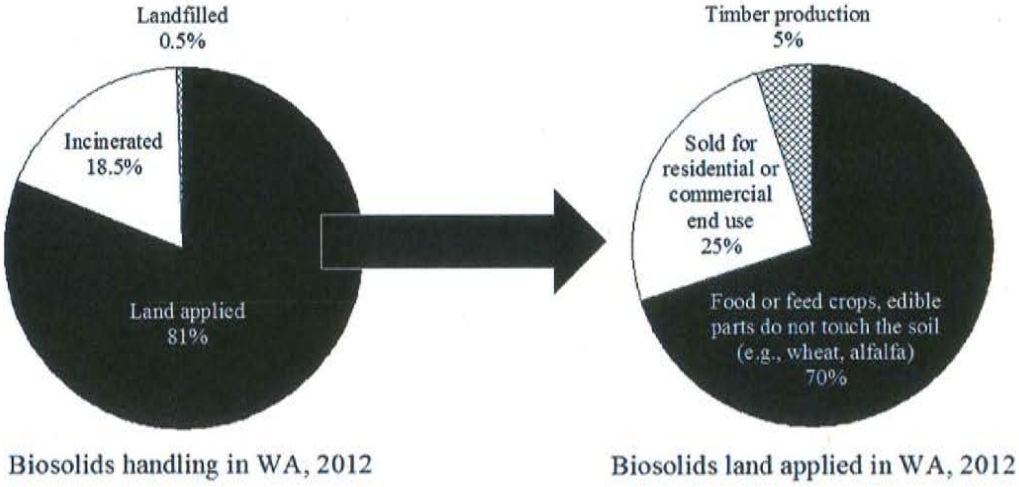

Figure 2. Biosolids use data for 2012, by percentage, for Washington State. Approximately 110,000 dry tons of biosolids were handled in Washington in 2012 (WA Dept. of Ecology 2014a). (Illustration by Shannon M. Mitchell, USA)

Class A biosolids are used as a soil amendment and plant fertilizer in gardens and landscapes. They meet EPA standards for regulated ***contaminants****, and they have been treated to reduce* ***biological contaminants*** *to very low levels.*

Class B biosolids are used as a soil amendment and plant fertilizer for agricultural land, timberland, rangeland, and land reclamation sites. They meet the criteria for regulated contaminants, and the level of biological contaminants has been substantially reduced. Plants whose edible parts do not make contact with the soil when harvested, such as wheat, barley, and alfalfa, can be harvested 30 days after the last biosolids application.

Recycling biosolids means that they are used for a useful purpose, instead of being disposed of in landfills or incinerated. Recycling biosolids through land application as a soil amendment and fertilizer is highly regulated. Only biosolids that meet the criteria for maximum allowable concentrations of potentially toxic **trace elements** and **pathogens** are land applied. There are also required setback distances from water sources to limit the potential for contamination of surface water and **groundwater** (WA Dept. of Ecology 2014a).

Scientific research shows that there are many **agronomic** benefits and minimal environmental or human health risks from biosolids when land application follows federal regulations (Cogger et al. 2013; EPA 2014a; Sullivan et al. 2015). Nevertheless, the public has many questions regarding biosolids recycling, and some are apprehensive about supporting biosolids land application because some contaminants can be found in biosolids.

This Washington State University (WSU) publication summarizes the benefits of land-applied biosolids, describes and discusses major categories of contaminants, and explains what is currently known about **emerging contaminants** in biosolids. This publication does not include a comprehensive list of individual contaminants, but rather, discusses the more relevant classes of contaminants. The WSU publication *Fertilizing with Biosolids* (Sullivan et al. 2015) provides more information on plant nutrients in biosolids, application guidelines, and soil quality benefits.

Biosolids Quality: Crop Production Benefits

The major benefit of using biosolids as a fertilizer and **soil conditioner** for crop production is that it can be an inexpensive method for providing nitrogen and improving soil quality. Class B biosolids are less expensive for farmers to use than synthetic fertilizers, and agricultural operations using biosolids have the same or increased crop yield and crop quality as crops grown with synthetic fertilizers (Epstein 2003; Cogger et al. 2013). The desirable aspects of biosolids for crop producers are summarized below.

Figure 3. Biosolids being spread on agricultural fields (left), and biosolids covering agricultural soil prior to incorporation (right). (Photos by Andy Bary, WSU)

Organic Carbon

The organic carbon (organic C) content in biosolids ranges from 5% to 54%, with a mean value of 24% (Girovich 1996; Gilmour et al. 2003). Adding organic C to soils low in organic matter improves soil quality. Physical improvements include higher **soil porosity**, **soil aggregation**, **water-holding capacity**, and lower **bulk density** (Epstein 2003). Plants grown in biosolids-amended soils exhibit improved root to shoot ratios as a result of decreased resistance to root penetration. Organic C is also a source of food for soil microorganisms and **macrofauna**.

Macronutrients

Organic nitrogen (organic N) is the primary nutrient in biosolids. Biosolids are a slow-release N fertilizer compared to synthetic fertilizers (e.g., anhydrous ammonia). Other plant **macronutrients** that are abundant in biosolids include phosphorus (P), magnesium (Mg), and calcium (Ca). However, there are only low levels of potassium (K), so supplements may be needed if soil analysis shows that concentrations of this element are below optimal levels (Epstein 2003).

In Washington State, the amount of biosolids land applied to a given site is calculated as part of the Washington Department of Ecology biosolids land-application program (WA Dept. of Ecology 2014b), so maximum crop yield can be targeted, while reducing the risk of **nitrate leaching**. Typically from 2 to 10 dry tons per acre (5–20 metric ton/hectare) of biosolids are applied to agricultural fields every 1 to 5 years (Girovich 1996). They can be applied in liquid slurry or solid form. The solid form is typically applied to fields with a spreader and then incorporated into the soil by tilling or disking (Figure 3).

Cogger et al. (2013) compared biosolids and anhydrous ammonia fertilizers in a dryland wheat–fallow rotation. Biosolids were applied at 2, 3, and 4 dry tons per acre (5, 7, and 9 metric ton/hectare). Biosolids treatments were applied once every 4 years for 16 years. Standard anhydrous ammonia application was done once every 2 years for 16 years for the synthetic fertilizer treatment. On average, over the eight harvests from the wheat–fallow rotation, the biosolids-amended fields produced equal or greater wheat yields compared to the fields fertilized with anhydrous ammonia. Wheat harvesting and sample collection in fields where biosolids were applied is shown in Figure 4.

Figure 4. Wheat harvesting and sample collection from fields where Class B biosolids were land applied. (Photo by Andy Bary, WSU)

Micronutrients

Plant **micronutrients** in biosolids include boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (M), molybdenum (Mo), zinc (Zn), and nickel (Ni). Other chemical elements in biosolids, such as cobalt (Co), sodium (Na), selenium (Se), and silicon (Si), can also be beneficial to plants at low concentrations (Girovich 1996; Epstein 2003; Goodman 2004). If farmers are supplementing micronutrients, biosolids can reduce or eliminate the need for these supplements. Some farmers might not find it cost effective to apply micronutrients (e.g., not enough yield benefits to justify the cost); however, soils will receive these nutrients as an added benefit when biosolids are applied.

Biosolids Quality: Contaminants

Municipal wastewater treatment facilities treat wastewater from industrial and household sources that may contain various contaminants. Those contaminants that bind to organic or inorganic particles and are not degraded normally remain in the wastewater solids, which are eventually converted into biosolids (Girovich 1996; Epstein 2003). Contaminants can include metals, pathogens, **antibiotics**, some industrial and household chemicals, **odorants**, and **aerosols**.

A representative biosolids sample is tested for regulated contaminants and plant nutrients as part of the biosolids land-application program. In addition, many researchers and the **Environmental Protection Agency (EPA)** have surveyed numerous biosolids throughout the United States for a multitude of regulated and non-regulated contaminants, so the approximate contaminant concentration range is known. The types of contaminants that can be found in biosolids are summarized below and are discussed further in Appendix A.

Metals

Trace elements, including **heavy metals**, can be found in biosolids. Trace elements exist naturally in the environment and in agricultural soils and many are beneficial to living organisms. However, trace element concentrations in excess of beneficial levels can be toxic. Plants can uptake soluble or available trace elements into their roots and leaves. They are taken up to a lesser extent in fruits, seeds, and flowers (Epstein 2003).

Potentially toxic trace elements in biosolids are regulated and monitored in biosolids land-application programs. Concentrations of metals in biosolids have fallen sharply over the last 40 years since the passage of the **Clean Water Act** of 1972. Metals are no longer present in biosolids at concentrations that could cause human, animal, or environmental health issues (Cogger et al. 2000).

Metals bind to soils and have limited solubility in soils with a neutral pH, which lowers the risk of exposure to these metals.

There are several reasons why metal concentrations in biosolids should not be a concern when biosolids are applied to agricultural soils, but two major reasons are metal **sorption** characteristics and soil **pH**. Some metals bind to **hydrous oxide** surfaces and organic matter in soils, significantly lowering the amount that is plant-available (Epstein 2003). Metals are soluble at acidic pH levels, but most metals have drastically reduced **solubility** in the typical crop soil pH range of 5.5 to 7.5. When metal solubility decreases, it limits their transport and **bioavailability** (Epstein 2003). For example, aluminum is insoluble in soils above pH 5.5, so only a small fraction of the total aluminum is available for plant uptake in agricultural soils with a pH greater than 5.5.

Pathogens

Pathogens are disease-causing agents, and some pathogens are present in Class B biosolids. Pathogens are a universal problem in waste-derived soil amendments and even in yard debris with residual pet or animal waste (Table 1; WA Dept. of Ecology 2009; Gerba et al. 2011). Levels of **pathogenic bacteria** are lower in biosolids than in manure, but the number of **viruses** is higher in biosolids (Table 1). Free-range animals, such as deer and birds, living on agricultural lands also contribute to pathogen levels in soils.

The fate of pathogens in soils and crops is dependent on several factors, including climate and soil characteristics. Pathogen levels decrease in soil-crop systems over time due to pathogen sensitivity to heat, sunlight, drying, and competing **microbes**. Pathogens can live in soils and on plants, but plants do not uptake pathogens. Some **bacterial pathogens** and viruses survive for as long as several months (Gerba and Smith 2005). Pathogens do not leach through soil, but they can be transported by **surface runoff**.

There is the potential for pathogens to regrow in biosolids if climate and soil conditions are not harsh enough to kill them off, such as under moist and cool conditions. However, biosolids-amended soil is not a **reservoir for pathogens** following the end of the pathogen life-cycle (Epstein 2003). A review of pathogen **risk assessment** research confirms that current biosolids land-application guidelines are appropriate for protecting public health (Oun et al. 2014).

Table 1. Approximate concentrations of selected pathogenic bacteria and viruses in Class B biosolids, manure, and pet feces.

Pathogenic organism	Concentration (organism/g, dry weight)		
	Biosolids[a]	Manure[a]	Pet feces[b]
Bacteria			
Campylobacter jejuni	2	1400	
E. coli O157:H7	< 1	110	
Listeria monocytogenes	20	210	
Salmonella	50	180	1,000,000
Viruses			
Adenoviruses	20	Not detected	
Enteroviruses	< 1 to 30	Not detected	501,000

[a]Bacteria reported in **colony-forming units** per gram and viruses reported in **plaque-forming units** per gram (King et al. 2011).
[b]Values reported in organisms per gram (Gerba et al. 2011).

Hot, dry soils exposed to sunlight create conditions that kill pathogenic bacteria and viruses. After pathogens die, they can no longer cause illness. The risk of pathogen or viral infection to the general public are low because plants do not uptake pathogens, and fresh crops whose harvested parts come into contact with the soil are not grown using Class B biosolids.

Table 2. Maximum concentrations of selected antibiotics in biosolids and cattle manure.

Antibiotic class	Maximum concentration (mg/kg, dry weight)	
	Biosolids	Cattle manure
Macrolide	6.5[a]	8.1[b]
Sulfonamide	0.65[a]	0.36[c]
Tetracycline	8.7[a]	6.6[b]

[a]EPA (2009)
[b]Massé et al. (2014)
[c]Zhao et al. (2010)

Antibiotics and Antibiotic-Resistant Bacteria

Antibiotics can be found in biosolids or manure because many of them are not completely metabolized before being excreted in urine and feces. Maximum levels of some antibiotics in biosolids and cattle manure are similar (Table 2). Antibiotic concentrations in swine manure are higher, ranging from 4 to 59 mg/kg and from 7 to 760 mg/L (Heuer et al. 2011; Massé et al. 2014).

In addition to relatively low antibiotic concentrations in biosolids, those antibiotics that are found in biosolids tend to bind tightly to soil particles, which reduce their **biological activity**. Research on antibiotics in biosolids continues; however, to date, antibiotics have not been found to accumulate in soils or have adverse effects on microorganisms at concentrations found in land-applied biosolids. To date, the scientific literature shows that bioavailable antibiotic concentrations in biosolids are not high enough to influence **antibiotic resistance**.

Antibiotic-resistant bacteria are found in biosolids, manure, and even pristine soils (Minur et al. 2011; Brooks et al. 2015). The main concern with levels of resistant bacteria and antibiotics in biosolids or manure is that they may increase the risk of pathogenic bacteria acquiring antibiotic-resistance traits. Research shows that land-applied manure containing antibiotics and resistance genes can significantly influence resistant bacterial populations in soils (Heuer and Smalla 2007; Heuer et al. 2011).

In contrast, levels of resistant bacteria in soils amended with biosolids were not significantly different from unamended soils or soils fertilized with a synthetic fertilizer (Zerzghi et al. 2010). Research in the area of bacterial resistance continues, but currently the public health risk from resistant bacteria in biosolids is considered to be low. Risks are minimized by restrictions on public access to biosolids and by rules that limit the types of crops that can be grown using Class B biosolids (NRC 2002; Brooks et al. 2007; King et al. 2011).

Industrial and Household Chemicals

There can be numerous types of **persistent chemicals** in biosolids because biosolids are derived from industrial and household wastewater. Chemicals in biosolids can include **surfactants, plasticizers, pharmaceuticals, flame retardants,** and chemicals from **personal care products**—for example, **triclosan**, which is found in some hand soaps (Figure 5). These substances are not regulated by the EPA because risk assessments have so far shown that organic chemicals pose minimal risk to human health and the environment at the concentrations commonly found in land-applied biosolids.

Supplementing EPA risk assessments, Smith (2009) performed risk assessments for surfactants, **dioxins**, pharmaceuticals, **estrogenic compounds**, and other **organic contaminants** found in biosolids, concluding that they pose minimal risk to human health if the biosolids are land-applied on agricultural soils at normal agronomic rates. Additionally, Rocarro et al. (2014) performed risk assessments for pharmaceuticals and personal care products and found low risk for human health problems from land-applied biosolids.

Figure 5. The antibacterial compound triclosan is found in some hand soaps. (Photo by Shannon M. Mitchell, USA)

Three primary factors govern the assessment that industrial and household chemicals in biosolids are not likely to endanger human health or the environment when land-applied. First, **degradation** and sorption effectively lower bioavailable contaminant levels. Second, plants do not uptake significant levels of organic contaminants. Third, the required setback distances for land-applied biosolids limit contaminant transport to water sources (Sullivan et al. 2015).

Many contaminants found in biosolids are also found in household dust, personal hygiene products, and manufactured foods. For example, median concentrations of a flame retardant, plasticizer, and perfluorinated chemical are at similar levels for biosolids and household dust (Table 3). Although these levels are similar, the general population is exposed to a substantially greater amount of household dust than biosolids.

Another example is the **antibacterial** ingredient triclosan, which is found in some hand soaps. This contaminant concentration was greater in biosolids than in household dust; however, the general population can be exposed to high concentrations of triclosan (1,000 mg/kg) when using some hand soaps (Figure 5).

Concentrations of the plasticizer **di(2-ethylhexyl) phthalate (DEHP)** in both biosolids and household dust are relatively high in comparison to the other chemicals listed in Table 3. DEHP is found in some **polyvinyl chloride (PVC) resin** (Figure 6), and small amounts of DEHP can leach from these plastic resins. For example, up to 24 mg/kg of DEHP was found in olive oil stored in plastic containers (EHHI 2008). Consequently, it appears that the public is exposed to DEHP in many products they use daily.

Table 3. Median concentrations of selected contaminants in biosolids and household dust.

		Median concentration (mg/kg, dry weight)	
Category	Compound	Biosolids	Household dust
Flame retardant	PBDE 99	0.58[a]	0.30[c]
Plasticizer	BPA	1.00[a]	1.46[d]
Perfluorinated chemical	PFOS	1.02[a]	0.48[e]
Antibacterial	Triclosan	3.86[a]	0.22[d]
Plasticizer	DEHP	310.00[b]	340.00[c]

[a]Higgins et al. (2010)
[b]Maximum reported value from EPA (2009)
[c]Rudel et al. (2003)
[d]Greens et al. (2009)
[e]Kato et al. (2009)

Symbol	Type of plastic	Example
1 PETE	Polyethylene Terephthalate **PETE**	Beverage bottles
2 HDPE	High Density Polyethylene **HDPE**	Milk jugs
3 PVC	Polyvinyl Chloride **PVC with DEHP**	Cooking oil bottles
4 LDPE	Low Density Polyethylene **LDPE**	Zip-lock bags
5 PP	Polypropylene **PP**	Yogurt containers
6 PS	Polystyrene **PS**	Styrofoam containers
7 OTHER	Other e.g., Polycarbonate with **BPA**	Canned foods

Figure 6. Plastic resin materials in plastic products. DEHP is found in some PVC resin (symbol #3), and bisphenol A (BPA), shown in the category of Other, can be found in the lacquer lining of canned foods (symbol #7). Adapted from: Plastics that may be harmful to children and reproductive health. Environment & Human Health, Inc. Report (2008).

Certain chemicals, such as triclosan, dioxins, persistent pharmaceuticals, and some surfactants might be more of an environmental concern than others. For example, triclosan has been found to **bioaccumulate** in earthworms; some pharmaceuticals are persistent and can leach through the soil and into groundwater; some surfactants are toxic to aquatic species.

Recently, the EPA identified safer and more environmentally friendly surfactant alternatives for industrial use, replacing common surfactants like **nonylphenol ethoxylates (NPE)**. The EPA now evaluates manufacturing processes that use surfactants to assess potential environmental and human health risks (EPA 2012; 2014b). Because emerging contaminants have been studied for a shorter period of time relative to metals, less information is available. Thus, continued research is needed to supply the information necessary for new or improved risk assessments.

Odorants

Odors from biosolids come from a complex mixture of odorants. Unpleasant odors are the main public complaint about land-applied biosolids (NRC 2002). Although odorants are a nuisance, they are not a public health threat (Girovich 1996). Biosolids produced at different facilities have different odors because the wastewater treatment processes used are not always the same.

Aerosols

Aerosols are comprised of very small airborne particles that may contain contaminants, such as pathogens or chemicals. They travel through the air, but they do not travel very far (usually less than 541 ft), and they do not remain airborne for very long (usually less than one hour) (Low et al. 2007; King et al. 2011).

*The fate of industrial and household chemicals in soils results in low **effective concentrations**. Most chemicals in biosolids tend to bind to soils, and they also degrade in biosolids-amended soils. Risks to the general public are minimal because plants do not uptake significant amounts of organic chemicals into their edible parts.*

To minimize human contact with significant concentrations of aerosols, there are public access restrictions for biosolids-application sites. Authorized individuals who come in contact with biosolids should follow basic hygiene precautions and wear appropriate personal protective equipment (CDC 2002).

Summary

Biosolids are land applied as a sustainable way to manage municipal wastewater residuals. There are many benefits to land-applying Class B biosolids on agricultural fields because biosolids are rich in organic carbon, nitrogen, phosphorus, and other plant nutrients. Equal or greater crop yields are obtained using biosolids compared to synthetic fertilizer. Incorporating biosolids into the soil improves soil porosity and water-holding capacity, among other soil characteristics, and biosolids can help improve soil quality for more effective crop production.

Land-applying biosolids is highly regulated by state environmental protection departments and the EPA because, along with the organic carbon and plant nutrients in biosolids, there are low levels of contaminants derived from industrial and household wastewater. To date, research indicates that contaminants in Class B biosolids pose minimal risk to human, animal, or environmental health. Ongoing research on biosolids continues to investigate contaminants and measure potential impacts. New research findings are reviewed periodically and risk assessments conducted to reevaluate the effectiveness of existing biosolids land-application regulations.

For More Information

For more information on biosolids, visit the Washington State University Biosolids Management website.

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Guide to Biosolids Quality—Appendix A

This appendix describes and discusses the major categories of contaminants that may be found in biosolids. Part I of this section covers the categories of organic contaminants, and Part II covers the categories of biological contaminants. When interpreting the information provided here, it is important to understand that exposure to contaminants through biosolids may be minimal compared to exposure through other pathways, such as household dust, personal hygiene products, uncontrolled burning, and animal manures.

Many contaminants degrade in the soil or are neutralized when they bind tightly to soil particles, so potential negative effects in the terrestrial environment may be short-lived. However, some contaminants persist in the environment and can be potentially harmful. If risk assessments show that significant risk exists from an organic contaminant, use of the chemical may be restricted or banned. Risk assessments are periodically updated as new information becomes available in order to accurately evaluate potential environmental and human health risks from land-applied biosolids.

Part I: Organic Contaminants

Personal care products

Some personal care products, like lotions, soaps, fragrances, and cosmetics, contain chemicals that may be of environmental concern. Antibacterials such as triclosan and fragrances such as synthetic **musks** are of particular concern. Triclosan may negatively impact soil or aquatic microorganisms because of its antibacterial properties, which allow it to kill bacteria. However, overall, the effects of triclosan in the soil may be short-lived because it binds to soil particles and its **half-life** ranges from 17 to 35 days (Smith 2009).

Pharmaceuticals

Allowing pharmaceuticals into the environment is a concern because of their unknown effects on the aquatic or terrestrial ecosystems and their potential for groundwater contamination. There are hundreds of pharmaceuticals released into municipal wastewater treatment facilities every day because many medicines are not completely metabolized. Some pharmaceuticals, such as **carbamazepine**, are persistent and can leach through soils.

Not all pharmaceuticals are potentially harmful to the environment, but antibiotics are a unique group because they kill or inhibit certain bacteria when they are at effective concentrations. With antibiotics, there is the potential for soil microbial effects, including antibiotic-resistance selection, if relatively high antibiotic concentrations reach soils. However, most antibiotics found in biosolids are not bioavailable because they tend to bind tightly to soil particles, which neutralize them.

Surfactants

Surfactants are used in many industrial applications and consumer products and can end up in biosolids from industrial and municipal wastes. Some surfactants, including nonylphenol ethoxylates (NPEs) and **nonylphenol (NP)**, can cause environmental and human health problems. The use of these chemicals is being more closely monitored, regulated, restricted, or banned (EPCEU 2006; EPA 2014) because NPEs are toxic to some aquatic species and NP has endocrine-disrupting properties (Smith 2009), which can cause **endocrine disruption** in fish by mimicking estrogen compounds, thereby disrupting the natural balance of hormones. It can also bioaccumulate in fish and birds; however, currently there is inconsistent evidence that it bioaccumulates in humans.

Fish consumption may lead to higher levels of NP in breast milk, which may in turn negatively affect newborns (e.g., abnormal neurological development, growth, and memory function). However, drinking water with low levels of NP is not a significant source of exposure. In **terrestrial systems**, the effects of NPE and NP contamination may be short-lived because they tend to bind to soil particles and the half-life for each is less than 20 days (Smith 2009; González et al. 2010).

Plasticizers

Plasticizers (such as **bisphenol A [BPA]** and **phthalates**) are used to make soft plastics. One commonly used plasticizer is DEHP. DEHP has relatively low toxicity for aquatic species (Defra 1991), although it can bioaccumulate in aquatic organisms. Some evidence links DEHP to changing levels of male sex steroid hormones, potentially affecting fertility (Mendiola et al. 2012). The European Union has restricted the use of DEHP and other phthalates in order to lower the public's exposure to these plastic materials and to limit children's potential exposure to phthalates contained in children's toys (EPCEU 2006).

DEHP that ends up in biosolids comes from plastic pipes, industrial waste, and products stored in plastic materials (e.g., foods and soaps). DEHP exposure from biosolids is less concerning than DEHP inhalation and ingestion. In terrestrial systems, the effects of DEHP may be short-lived because it binds strongly to soils, and its half-life is less than 50 days (Smith 2009).

Perfluorinated chemicals

Perfluorinated chemicals (PFCs) are used to make non-stick, waterproof, stain-resistant, or fire-resistant surfaces. They are persistent and can leach through soil. Toxicity studies are limited at this time; however, these chemicals do not bioaccumulate. There is uncertainty about the effects of long term low levels of perfluorinated chemicals in the environment, such as **perfluorooctanoic acid (PFOA)**, and how they may affect human and animal health (NIH 2012).

Since 2000, the EPA has been working with manufacturers to phase out some perfluorinated chemicals. A review of emerging organic contaminants in biosolids by Clarke and Smith (2011) determined that the potential effects of perfluorinated chemicals in biosolids should be researched further since they are present at higher concentrations compared to other chemicals.

Flame retardants

Flame retardants are used in many materials and products to make them fire resistant. **Polybrominated diphenyl ethers (PBDEs)** are commonly used in building materials, electronics, furnishings, motor vehicles, plastics, polyurethane foams, and textiles (EPA 2009). PBDEs can end up in biosolids depending on how much is released into the sewer system. Toxicity is not well understood, but PBDEs may be endocrine disruptors or **neurotoxins**. The EPA states that PBDEs may be toxic to the liver and thyroid in humans.

The use of PBDEs was restricted in Washington State in 2008, and the Washington Department of Ecology released a report in January 2015 recommending restrictions on products and furniture that contain PBDEs as well as requirements for having manufacturers report PBDE use in their consumer products (WA Dept. of Ecology 2014a). Other states have or are in the process of phasing out or banning their use. PBDEs bind tightly to soil particles; they are very persistent, and they can bioaccumulate (EPA 2015c).

Polychlorinated biphenyls

Polychlorinated biphenyls (PCBs), also called **Aroclors**, were widely used in numerous materials and products (similar to PBDEs) prior to 1979. They were banned in 1979 because they were found to be **carcinogenic**. They can still be found in items that pre-date the ban, including electrical equipment, oil, thermal insulation, cable insulation, adhesives, paint, caulking, plastics, and floor finishes. PCBs can end up in biosolids depending on how much is released into the sewer system from these old materials. PCBs bind tightly to soil particles; they are very persistent, and they can bioaccumulate (EPA 2013a).

Dioxins and furans

Dioxins and **furans** are byproducts of certain industrial processes, incineration, and uncontrolled burning. Dioxins and furans are mainly released into the atmosphere and are eventually deposited on the Earth's surface. They can also be released into sewer systems from industrial and household wastewater, and because they are very persistent, they can end up in wastewater effluent and biosolids. Some dioxins cause adverse health effects at high enough levels, including cancer (EPA 2015b); 2,3,7,8-**tetrachlorodibenzo-*p*-dioxin (TCDD)** is the most toxic dioxin (EPA 2015b).

TCDD is a priority pollutant, and 16 other dioxins and furans may have endocrine-disrupting properties (WHO 2014). They are regulated as **nonconventional pollutants** in many **National Pollutant Discharge Elimination System (NPDES) permits**. Dioxins and furans are regulated in wastewater **effluents** to limit the amount discharged to the environment. They are not regulated in biosolids because an extensive risk assessment by the EPA concluded that these compounds are present in biosolids at levels that are too low to warrant regulation (EPA 2003). In the terrestrial system, dioxins and furans are persistent and tend to bind to soils since they are insoluble in water. They can also bioaccumulate because they concentrate in the fatty tissue of **biota** (Fiedler 2003).

Part II: Biological Contaminants

The primary pathogens of concern in sewage sludge and biosolids are listed in Table A-1. They fall under the following four categories: **enteric viruses**, bacterial pathogens, **protozoan parasites**, and **helminth parasites**. Many of these pathogens may not be detected in biosolids frequently, or they may be present at low concentrations; however, it is important to continue to monitor biosolids for pathogens so the public health risks from land-applied biosolids remain low.

Table A-1. Pathogens of concern in biosolids.

Enteric viruses	Bacterial pathogens	Protozoan parasites	Helminth parasites
Adenoviruses	*Aeromonas*	*Balantidium coli*	*Ascaris lumbricoides*
Astroviruses	*Burkholderia*	*Cryptosporidium* spp.	*Ascaris sum*
Caliciviruses	*Campylobacter jejuni*	*Cyclospora*	*Hymenolepis nana*
Coxsackieviruses	Enteropathogenic *E. coli*	*Entamoeba histolytica*	*Necator americanus*
Echoviruses	*E. coli* O157:H7	*Giardia lamblia*	*Taenia* spp.
Enteroviruses	*Helicobacter pylori*	*Microsporidia*	*Toxocara canis*
Hepatitis virus A/E	*Legionella* spp.	*Toxoplasma gondii*	*Trichuris trichirua*
Norovirus	*Leptospira*		
Norwalk virus	*Listeria monocytogenes*		
Polioviruses	*Salmonella* spp.		
Reoviruses	*Vibrio cholera*		
Rotaviruses	*Yersinia* spp.		

Adapted from: NRC (2002) and EPA (2011)

Table A-2. Pathogen/indicator maximum allowable levels in Class B and Class A biosolids.[a]

Pathogen or Indicator	Class B	Class A
Fecal coliform	< 2×10^6 CFU[b] or MPN[c] per gram	< 1×10^3 MPN per gram
Salmonella spp.	Reduced by a factor of 10	< 3 MPN per 4 grams
Enteric viruses	Reduced by a factor of 10	< 1 PFU[d] per 4 grams
Viable helminth ova	Not applicable	< 1 viable ova per 4 grams

Adapted from: EPA 2015a
[a]Total solids on dry weight basis
[b]CFU = colony-forming units
[c]MPN = **most probable number**
[d]PFU = plaque-forming units

Regulated pathogens or indicators

Currently, four types of pathogens or **indicators** are measured in biosolids to determine Class B and Class A equivalency. These four types are **fecal coliform**, ***Salmonella* spp.**, enteric viruses, and viable helminth **ova** (Table A-2). Testing for some pathogens or indicators is less expensive than testing for all pathogens that can be found in biosolids. However, some researchers believe that this traditional method of testing pathogen contamination in biosolids may be inadequate for estimating emerging pathogen concentrations. New molecular genetic methods for quantifying pathogen levels are advancing, and they may prove to be more accurate and reliable methods of testing in the future (EPA 2011).

Protozoan Parasites

The two most common protozoan parasites associated with biosolids are ***Cryptosporidium*** and ***Giardia***. Although these protozoa die within days of Class B biosolids treatment, more research concerning *Cryptosporidium* **oocyst** viability is needed for improved risk assessment evaluations (EPA 2011). In soils, *Giardia* can persist for less than a day or up to 28 days, and *Cryptosporidium* can persist from 28 days to over a year.

Helminth Parasites

Biosolids-borne helminthes and ova (i.e., eggs) are rare in the U.S. because the public has access to clean water and has a high level of personal hygiene (EPA 2015b). Very few helminths entering the sewer system means very few can end up in biosolids. However, helminth ova can persist for several years in soil (Gerba and Smith 2005), so it is important to continue limiting helminth parasites in biosolids. This is especially true for Class A biosolids since the primary route of helminth infection is through consumption of contaminated foods.

Aerosolized Endotoxins

Endotoxins are poisonous substances that are released when the cell walls of **gram-negative bacteria** break down. Concentrations of endotoxins are similar for biosolids, animal manures, and compost (EPA 2011). Aerosolized endotoxins can form following mixing, tilling, or disking biosolids, animal manures, and compost. The effects of inhaling aerosolized endotoxins can include fever, coughing, breathlessness, flu-like symptoms, and inflammation (EPA 2011).

Authorized individuals who come in contact with biosolids during mixing, disking, or tilling should wear appropriate personal protective equipment (CDC 2002). Aerosols are not airborne for very long and they do not travel very far, only around 541 ft (Low et al. 2007; King et al. 2011), so they are unlikely to become a public health concern.

Glossary

adenoviruses. Viruses affecting adenoid tissue (tonsils), most of which cause respiratory diseases, and spread by respiratory secretions and fecal contamination. See also **viruses**.

aerosols. Small particles or liquid droplets in air.

agronomic. Relating to agronomy, the science and technology of producing and using plants for food, fuel, fiber, and land reclamation.

anaerobic digestion. A series of biological processes in which microorganisms break down biodegradable material (often wastes such as liquid manure or food-processing wastes) in the absence of oxygen, which generates biogas containing methane, a source of renewable energy.

antibacterial. Chemical or agent that interferes with the growth and reproduction of bacteria. Used specifically for disinfecting surfaces and eliminating potentially harmful bacteria. Unlike antibiotics, antibacterial agents are not used as medicines for humans or animals, but can be found in soaps, detergents, health and skincare products, and household cleaners.

antibiotic. A substance used in medicines for humans and animals that is capable of destroying or weakening certain microorganisms, especially bacteria or fungi that cause infections or infectious diseases.

antibiotic resistance. The ability of a microorganism to withstand the effects of an antibiotic.

Aroclors. Also called PCBs. Synthetic (man-made) organic chemicals banned in 1979 after they were found to cause cancer in animals.

bacterial pathogens. Also called pathogenic bacteria. Bacteria that can cause disease, in contrast to the majority of bacteria, which are harmless or beneficial. See also **pathogens**.

bioaccumulate. To accumulate substances within a biological organism in concentrations greater than the concentrations found in the environment.

bioavailability. Degree and rate at which a substance is absorbed into a living system or is made available at the site of physiological activity.

biological activity. Describes the effects, either beneficial or adverse, of a chemical or drug on living matter.

biological contaminants. Biological substances, such as parasites, bacteria, and viruses that may pose a threat to human and animal health. See also **contaminants**.

biomass. Organic matter derived from living or recently living organisms.

biosolids. Treated sewage sludge, particularly that which is intended for agricultural use as a soil conditioner.

biota. The animal and plant life of a particular region, habitat, or geological period.

bisphenol A (BPA). Synthetic organic chemical used since 1957 to manufacture certain plastics and epoxy resins, commonly used as coatings on the inside of food and beverage cans, that is currently being investigated for potentially harmful effects on both human and environmental health because it is an endocrine (hormone system) disruptor.

bulk density. The dry weight (often of soil) in a given volume.

Campylobacter. Gram-negative bacteria, most of which are pathogenic and can infect humans and animals and are one of the main causes of bacterial foodborne disease in many developed countries.

carbamazepine. Brand name Tegretol. A medication used to treat epilepsy and neuropathic pain as well as schizophrenia and bipolar disorder.

carbon compounds. Compounds consisting largely of carbon atoms, which are the basis of all organic, living matter.

carcinogenic. Having the potential to cause cancer.

Class A biosolids. Sewage sludge that has been treated to reduce biological contaminants to very low levels. Meets EPA standards for regulated contaminants. Can be used as a soil amendment and plant fertilizer in home gardens and landscapes.

Class B biosolids. Sewage sludge that has been treated to substantially reduce the level of biological contaminants. Meets the EPA criteria for regulated contaminants. Can be used as a soil amendment and plant fertilizer for agricultural land, timberland, rangeland, and land-reclamation sites.

Clean Water Act. The primary federal law in the United States governing water pollution.

colony-forming unit. A unit of measure used to estimate the number of viable bacterial cells in a sample.

compost. Organic matter that has been composted; that is, decomposed through a series of biological processes in which microorganisms break down biodegradable material in the presence of oxygen; it can then be recycled as a fertilizer and soil amendment.

contaminants. Undesirable biological or chemical elements or agents, foreign matter, or other substances that if present may be potentially harmful to humans and the environment. Unlike pollutants, contaminants are not always hazardous. See also **pollutants**.

Cryptosporidium. Type of protozoan parasite that causes diarrheal gastrointestinal illness in humans. These parasites are able to form oocysts (i.e., a dormant and more resilient form of the organism) until favorable environmental conditions arise.

degradation. Breakdown of substances by chemical or biological reactions.

di(2-ethylhexyl) phthalate (DEHP). Synthetic organic chemical in the phthalate group, widely used as a plasticizer in the manufacture of some polyvinyl chloride (PVC) plastic materials.

dioxins. Highly toxic compounds produced as a by-product in some manufacturing processes, notably herbicide production and paper bleaching. They are a serious and persistent environmental contaminant.

effective concentrations. The amount of a substance needed to induce a response.

effluents. Outflowing liquid that is frequently wastewater or treated wastewater.

emerging contaminants. New, previously undetected, or poorly understood contaminants.

endocrine disruption. Interference with the human endocrine (hormonal) system. Any system in the body controlled by hormones can be derailed by a hormone disruptor, which can cause cancerous tumors, birth defects, and other developmental disorders.

endotoxins. Substances bound to the outer membrane of gram-negative bacteria that can be released when a bacterium ruptures or disintegrates, potentially eliciting a strong immune response in humans.

enteric viruses. Group of viruses that primarily infect the intestinal tract of humans through ingestion of food or water contaminated with viruses of fecal origin. This group includes adenoviruses and enteroviruses. See also **viruses**.

enteroviruses. Viruses found in feces and respiratory secretions that are spread through the fecal-oral route, potentially causing illnesses ranging from mild respiratory problems to meningitis. See also **viruses**.

Environmental Protection Agency (EPA). An agency of the U.S. federal government that was created for the purpose of protecting human health and the environment.

***Escherichia coli* O157:H7.** Distinct variation of the bacteria *E. coli* that is pathogenic and is typically passed to humans through consumption of contaminated food. It is infectious, causing diarrheal illness that if severe enough can lead to kidney failure.

estrogenic compounds. Substances having an action similar to that of estrogen, the primary female sex hormone that is responsible for development and regulation of the female reproductive system and secondary sex characteristics.

fecal coliform. Bacteria that live in the digestive tracts of warm-blooded animals, including humans, and are excreted in their feces. Most are not harmful, but some are pathogenic to humans and can cause disease.

flame retardants. Compounds added to a variety of manufactured materials to make them more fire resistant.

furans. Colorless, flammable, highly volatile liquids found in heat-treated commercial foods, such as roasted coffee and processed baby foods that are toxic and may be carcinogenic in humans.

Gram-negative bacteria. Bacteria that have an inner cell membrane and do not form spores (i.e., a more resilient form of the organism that allows for asexual reproduction), and are more resistant.

Giardia. Type of protozoan parasite transmitted by the fecal-oral route that can cause diarrhea, gas, cramps, and nausea. These parasites are able to form oocysts (i.e., a dormant and more resilient form of the organism) until favorable environmental conditions arise.

groundwater. Water present in soil pore spaces beneath the soil surface or in rock crevices and pores.

half-life. The time required for any specified substance to decrease by half (e.g., the length of time in days it takes for half of a contaminant concentration to be degraded).

heavy metals. Any relatively dense metal, such as alkali and alkaline earth metals, transition and post-transition metals, lanthanides, and actinides. Sometimes arsenic and antimony are also considered heavy metals.

helminth parasites. Large, worm-like parasites that can cause a wide variety of infectious diseases by infecting the gastrointestinal tract of humans. Infection can occur when, for example, helminth eggs are swallowed after touching contaminated soil.

hydrous oxide. A class of minerals that is highly porous with large surface areas that show an affinity for organic and inorganic contaminants.

indicator organism. A group of organisms used as a proxy or substitute for pathogen contamination testing. See also **pathogens**.

inorganic. Of, relating to, or denoting non-living compounds (not containing more than one carbon atom).

insoluble. Substance incapable of being dissolved. Refers to solubility in water unless otherwise indicated.

leaching. Draining away substances from soil or similar materials by the action of liquids, especially rainwater.

macrofauna. Organisms greater than 2 mm in length that live part of their life in the soil. Some examples are earthworms, insects and their larvae, slugs, and snails.

macronutrients. Nutrients needed in relatively large amounts. For plants, the primary macronutrients are nitrogen, phosphorus, and potassium. Calcium, sulfur, and magnesium are secondary macronutrients.

microbes. Shorter term for microorganisms.

micronutrients. Nutrients only needed in very small amounts.

microorganisms. Diverse, microscopic living organisms that include fungi, viruses, all bacteria, and almost all protozoa.

most probable number. In microbiology, microbial cultures grown in the laboratory are assessed visually to determine growth or no growth, bypassing the difficult process of colony counting.

municipal wastewater. Wastewater derived from local households and sometimes industrial facilities.

musks. Perfume ingredient essential in modern perfumery.

National Pollutant Discharge Elimination System (NPDES) permits. The permitting system used to regulate point source pollution (i.e., identifiable effluent discharge locations), such as municipal wastewater treatment facilities, industrial facilities, and some animal feedlots.

neurotoxins. Substances that are poisonous or destructive to nerve tissue.

nitrate. Chemical (NO_3^-) produced for use as a fertilizer in agriculture because of its high solubility and biodegradability characteristics.

nonconventional pollutants. Pollutants other than the conventional pollutants. Conventional pollutants are biochemical oxygen demand (BOD), fecal coliform bacteria, oil and grease, pH, and total suspended solids. Wastewater treatment facilities are designed to remove these conventional pollutants, but not nonconventional pollutants.

nonylphenol (NP). Synthetic organic compounds that are used in manufacturing antioxidants, lubricating oil, detergents, emulsifiers, and solubilizers (surfactants) that have been found to be an endocrine disruptor.

nonylphenol ethoxylates (NPE). Also called nonoxynols. Synthetic organic compounds used in detergents, emulsifiers, wetting agents, and defoaming agents (surfactants) that break down to nonylphenol in some cases and have mild to medium estrogenic function.

odorants. A chemical compound that has a smell or odor.

oocyst. A hardy, thick-walled spore that develops at a certain stage in the life cycle of coccidian parasites like *Cryptosporidium* and then is shed in the feces of infected individuals.

ova. For helminths, ova are the eggs produced by helminth worms for reproduction.

organic. Of, relating to, or derived from living matter.

organic contaminants. A class of chemical contaminants that has more than one carbon atom in its chemical makeup.

organic matter. Matter composed of organic (carbon-containing) compounds that have come from the remains of organisms such as plants and animals and their waste products.

organic solids. Solids made up of compounds with more than one carbon atom in their chemical makeup as opposed to inorganic solids which are made up of inorganic (non-carbon) compounds.

parasites. Organisms that live in or on a host in a non-mutual symbiotic relationship where they derive nourishment from the host while doing damage to it.

pathogenic bacteria. Single-celled microorganisms that cause disease.

pathogens. Agents that cause disease, especially living microorganisms such as bacteria, viruses, or fungi.

perfluorinated chemicals (PFCs). A group of fluorine-containing chemicals that have been used extensively in commercial applications to make products oil, stain, and water resistant such as stain-resistant carpeting and food packaging like microwavable popcorn bags.

perfluorooctanoic acid (PFOA). A type of PFC that is used in the process of making Teflon® and similar chemicals, although it is burned off during the process and is not present in significant amounts in the final Teflon products. It is a toxicant and carcinogen in animals.

persistent chemicals. Chemicals that are difficult to remove from the environment.

personal care products. Products used by individuals for personal hygiene and personal appearance, such as soaps, cosmetics, fragrances, and hair-styling products.

plasticizers. Additives that increase the plasticity or fluidity of plastic materials used to make soft plastics like some polyvinyl chlorides (PVCs). See **phthalates**.

plaque-forming unit. A unit of measure used to estimate the number of particles capable of forming plaques (e.g., virus particles) in a sample.

pH. A numeric scale used to specify the acidity or basicity of an aqueous (water-containing) solution.

pharmaceuticals. Compounds manufactured for use as medicinal drugs.

phthalates. A group of man-made chemicals used in a wide range of common products, and are often used as a plasticizer in plastics, especially in PVC resins.

pollutants. Undesirable biological or chemical elements or agents, foreign matter, or other substances or contaminants that are in high enough concentrations that they become hazardous to human or environmental health.

polybrominated diphenyl ethers (PBDEs). Organic chemicals, structurally similar to polychlorinated biphenyls (PCBs), used as a flame retardant, although they are being phased out in many products because they are persistent chemicals and they bioaccumulate.

polychlorinated biphenyls (PCBs). Organic chemicals, structurally similar to polybrominated diphenyl ethers (PBDEs), that were used as a flame retardant until they were banned in 1979 because they were found to be carcinogens.

polyvinyl chloride (PVC). A widely produced synthetic thermoplastic resin used chiefly for thin coatings, insulation, and piping. See resin.

protozoa. Single-celled organisms larger than bacteria, but smaller than helminth worms, that exhibit animal-like behaviors.

protozoan parasites. Microscopic, single-celled parasitic organisms transmitted to humans by such means as contaminated water, waste, blood, poorly handled food, and insects, potentially causing serious illness.

reservoir for pathogens. A long-term host for pathogens of an infectious disease.

resin. A solid or highly viscous substance that is malleable until it sets into a hard finish.

risk assessment. A process used to evaluate the nature and magnitude of a possible negative outcome in a defined situation, such as evaluating the level of risk or threat certain chemical contaminants pose to human and environmental health.

***Salmonella* spp.** Bacteria, usually motile (capable of motion), that are pathogenic to humans and other warm-blooded animals and cause food poisoning, gastrointestinal inflammation, typhoid fever, and septicemia.

sewage sludge. Residual, semi-solid material that is produced as a by-product during municipal and industrial sewage and wastewater treatment.

Shigella. Gram-negative bacterium related to *Salmonella* that causes disease in primates and humans and is one of the leading causes of bacterial diarrhea worldwide.

soil aggregation. The arrangement of soil particles into stable units or aggregates.

soil conditioner. A substance that is added to a soil to improve its physical qualities, such as texture, structure, and porosity, in order to increase its ability to provide plant nutrition.

soil porosity. A measure of the amount of air space between soil particles.

solubility. The ability of a solid, liquid, or gaseous chemical to dissolve into a bulk amount of material (solid, liquid, or gas), depending on its physical and chemical properties as well as temperature and pH.

sorption. A physical and chemical process by which one substance becomes attached to another.

surface runoff. Excess stormwater, meltwater, or water from other sources that flows over the Earth's surface.

surfactants. Substances that tend to reduce the surface tension of a liquid in which they are dissolved.

sustainable practices. Practices that can be maintained over time without adverse consequences.

synthetic. Of, relating to, or produced by chemical or biochemical synthesis, especially to imitate a natural product.

terrestrial system. Land-based communities that include living and non-living things.

tetrachlorodibenzo-*p*-dioxin (TCDD). The most potent of the toxic dioxin compounds, it is a persistent and carcinogenic chemical that is also known as Agent Orange.

trace element. An element (in the periodic table of elements) present in very small amounts.

triclosan. Antibacterial and antifungal agent found in consumer products, such as soaps, detergents, surgical cleaning treatments, and children's toys.

viruses. Submicroscopic infective agents that replicate inside living cells and often cause disease.

wastewater residuals. Materials comprised of suspended solids and sludge from the primary and secondary wastewater processing steps used by wastewater treatment plants, which after being treated and stabilized become biosolids.

water-holding capacity. Amount of water that can be stored in the soil.

Yersinia enterocolitica. Gram-negative bacteria that can infect both humans and animals, causing diarrhea in humans; animals that recover become carriers, and dogs, sheep, wild rodents, and environmental water may be reservoirs for pathogenic strains.

Definitions adapted from Merriam-Webster.com, wikipedia.org, U.S. Environmental Protection Agency (EPA), and Centers for Disease Control and Prevention (CDC).

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Land Application of Biosolids: Human Health Risk Assessment Related to Microconstituents

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Beneficial Use of Biosolids

Biosolids are generated during wastewater treatment processes and are extensively processed to meet the United States Environmental Protection Agency's (USEPA) 40 CFR Part 503 regulations promulgated in 1993, which dictate acceptable pollutant concentrations, pathogen levels, and material stability (as indicated by vector attraction reduction).

It is estimated that ~ 7.2 m dry tons of biosolids are generated in the US annually and approximately 55% (~ 3.9 m dry tons) are applied to soil for agronomic, sylviculture or land restoration purposes; the remaining 45% are disposed of in municipal solid waste landfills, surface disposal units, or incineration facilities (USEPA, 2010). With an average agronomic rate of application of 10 U.S. dry tons of biosolids per acre (rates for land restoration at brownfields and mined lands may be higher) only 390,000 acres across the entire US receive annual biosolids application. The biosolids-amended land is ~ 0.12% of total harvestable acreage in the US (314,964,000 acres harvested according to the 2012 Agricultural Census). Thus, a very small proportion of cultivated land receives biosolids application annually. In addition, the majority of the biosolids are applied to forage and row crops used for animal feed or grains and a small amount is used for fertilizing horticultural or vegetable crops.

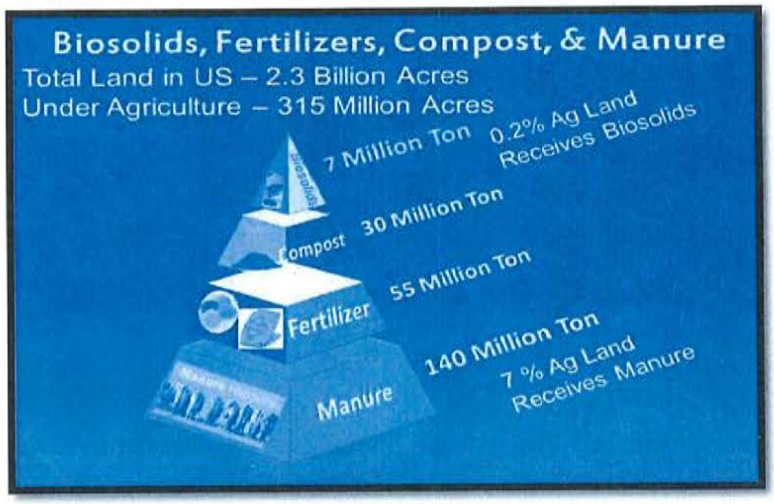

Figure 1: Kumar, K., Metropolitan Water Reclamation District of Greater Chicago, Land Application of Biosolids: Human Health Risk Assessment Related to Emerging Contaminants, presentation 01-MAR-2017.

Land application of biosolids results in enhancement of soil health by improving physical, chemical, and biological properties of soil, nutrient recycling, carbon sequestration, and increasing crop productivity by the addition of organic matter to soils. Biosolids have been used on farms and other lands across North America and other parts of the world for the several decades.

WSEC-2017-FS-014, RBC Sustainable Residuals Use Subcommittee

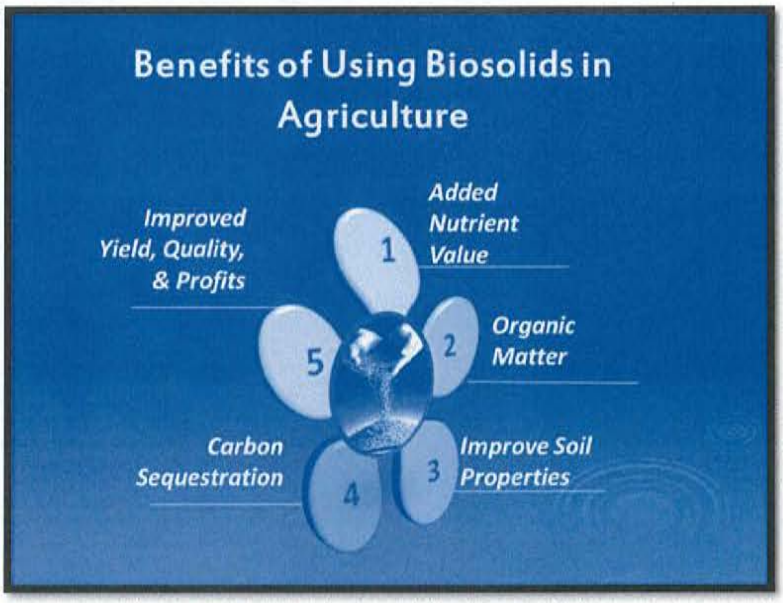

Figure 2: Kumar, K., Metropolitan Water Reclamation District of Greater Chicago, Land Application of Biosolids: Human Health Risk Assessment Related to Emerging Contaminants, presentation 01-MAR-2017.

Microconstituents in Biosolids

As a result of our modern lifestyle and widespread use of organic chemicals in many applications, large amounts of chemical residues from industries, agriculture, and homes are being continuously released in the environment, some of which may find their way into municipal wastewater. A few examples of microconstituents that may be found in the environment are pharmaceuticals, personal care and consumer products (PPCPs), pesticides, cleaning materials, chemicals used in building materials, additives in foods and drinks, chemicals used for printing, and chemicals used in the manufacturing of housewares, electronic goods, transportation, sports, laboratory, and educational materials. Unlike heavy metals, sources of these chemicals, especially from PPCPs manufacturing and use, in municipal wastewater are diverse, and source control programs that proved effective for heavy metals, are generally not effective in reducing the levels of microconstituents reaching water resource recovery facilities (WRRFs). Although many microconstituents that reach the WRRFs are destroyed through wastewater treatment and sewage sludge processing, some recalcitrant microconstituents and their metabolites may pass through the treatment process intact and may end up in the effluent or biosolids. Lipophilic (fat soluble) microconstituents show high affinities for organic carbon and preferentially partition into biosolids during solids separation and are inherently less bioavailable than the hydrophilic (water soluble) which may reach the aquatic environment via effluent discharges to receiving streams.

In general, wastewater influents contain microconstituents in concentrations ranging from nano-g/L to micro-g/L, in effluent from non-detect to nano-g/L, and in biosolids the concentrations vary from micro-g/kg to mg/kg.

Dissipation of Microconstituents after Biosolids Application to Soils

Dilution, mineralization, and strong binding with soil matrices are the three pathways which reduce the bioavailability of microconstituents when biosolids are land applied. In general, there is 100 to 200-fold dilutions of biosolids-borne microconstituents in soil when biosolids are applied at an agronomic rate of 5 to 10 t/ac or 10,000 to 20,000 lbs/ac and incorporated in 6-inch surface layer of soil weighing approximately 2 million-lbs. Mineralization of microconstituents and their binding to soil matrices may be considered as detoxification or decontamination because the bound fraction is often unavailable for plant uptake, leaching, and microbial metabolism. Several abiotic processes resulting from interactions between microconstituents and soil matrices, including hydrophobic partitioning, covalent bonding, ligand exchange, migration to and entrapment into micro-sites, and ionic bonding, may determine the magnitude and strength of bound residues of microconstituents in the soil matrix. The relative prevalence of these mechanisms is influenced by the characteristics of the microconstituents and soil matrices, their concentrations, and the duration of exposure (aging) in the soil. In general, these three processes reduce the bioavailable fraction of microconstituents in soil to very small concentrations.

Figure 3: Kumar, K., Metropolitan Water Reclamation District of Greater Chicago, Land Application of Biosolids: Human Health Risk Assessment Related to Emerging Contaminants, presentation 01-MAR-2017.

Exposure to Microconstituents via Food Crops Grown in Biosolids Amended Soils

The transpiration of water is the main driving mechanism for uptake and transport of microconstituents in plants with properties of microconstituents playing a vital role in determining their bioaccumulation in edible portions of plants (Kumar and Gupta, 2016). In general, review of published data on plant uptake of microconstituents from manure or other by-products amended soils and the State-of-the-science review conducted by WERF (Higgins et al., 2010) on trace organics in biosolids-amended soils show that:

- microconstituent bioaccumulation in edible parts from actual field studies <from pot studies <from hydroponic studies.
- microconstituents were not detected in most of the grains of row crops grown under field conditions.
- The potential for microconstituents to enter edible parts of vegetables and fruit crops was generally low under normal farming conditions when biosolids were land applied following typical agronomic practices.

Prosser and Sibley (2015a,b) conducted an extensive review of the literature for studies that reported residues of microconstituents in the edible tissues of plants grown on biosolids-amended soils, then used the data to estimate daily intake (EDI) of PPCPs by an adult or a toddler. These EDIs were then compared with acceptable daily intake (ADI) to determine whether PPCPs posed a hazard to human health via the ingestion of contaminated food. The ADI value of pharmaceuticals is the amount of these PPCPs that can be consumed daily over a person's lifespan without causing any adverse effect. These authors computed ADI for pharmaceutical compounds by dividing the lowest daily therapeutic dose for an adult (mg/day) by a safety factor of 1,000 and dividing by an additional factor of 10 was applied if the PPCPs belonged to an 'endocrine disruptors' group. ADI values for other microconstituents were computed by applying a safety factor of 300 to the no observable adverse effect level (NOAEL). Prosser and Sibley's assessment, using the above-mentioned conservative approach, indicates that consumption of trace concentrations of microconstituents via crops grown on biosolids-amended soils represents a *de minimis* risk to human health.

Quantitative Human Health Risk Analysis for Microconstituents

Recently, the Northwest Biosolids (NW Biosolids 2015) conducted a quantitative exposure assessment for land application of biosolids using the general risk assessment methodology outlined by the USEPA. The following scenarios of exposure to microconstituents in biosolids from dermal contact and incidental ingestion were evaluated:

- Child exposed while playing in a home garden or lawn fertilized with Class A biosolids compost.
- Adult gardener exposed while working in a home garden fertilized with Class A biosolids compost.
- Occupational worker exposed while applying Class B biosolids to agricultural land.

- Adult hiker exposed while hiking in a forested area fertilized with Class B biosolids.

In addition to risk analysis, they also conducted a series of comparative risk calculations and exposure comparisons to facilitate the communication of risk results; for example, exposure to microconstituents in biosolids were measured against exposure to the same microconstituents from the common use of PPCPs containing those microconstituents (see graphics below). For example, it may take hundreds or thousands of years of exposure to

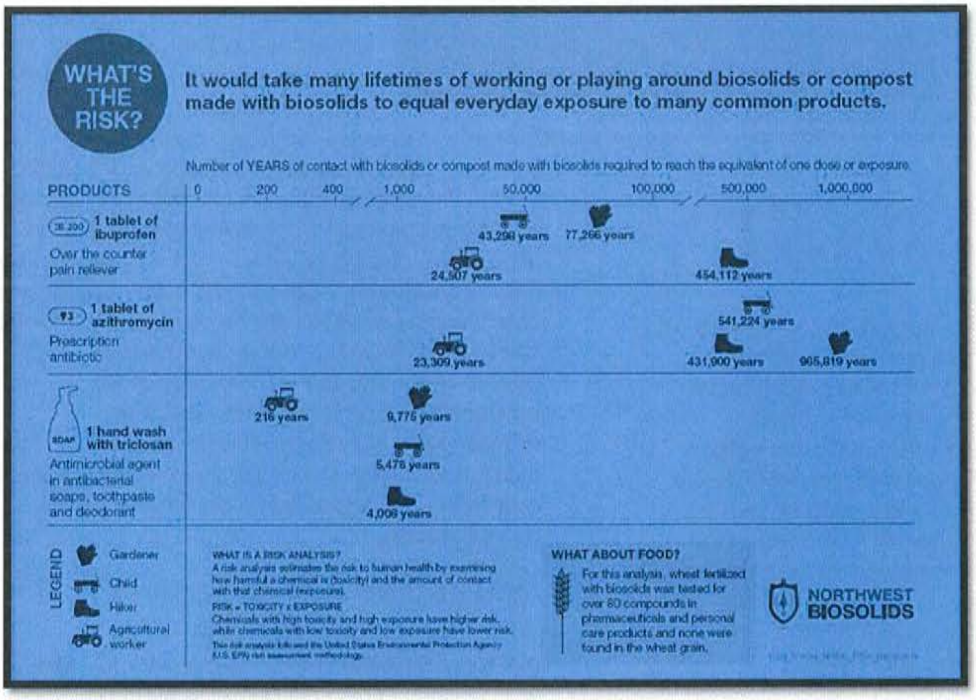

Figure 4: Source: Northwest Biosolids, What's the Risk? 2016. Reprinted with permission.

land applied biosolids to be equivalent to 1 tablet of Ibuprofen, or 1 tablet of the antibiotic azithromycin, or to be equivalent to triclosan from a single hand wash with anti-microbial soap. The results indicated that exposure to microconstituents via land applied biosolids is unlikely to result in any adverse health effects.

Relative Exposure of Microconstituents from Biosolids and from Other Direct Exposure Pathways

Most microconstituents found in the biosolids and terrestrial environment can be divided into six categories: (i) Pharmaceuticals (antibiotics, hormones, steroids and other drugs) and personal care products, (ii) Pesticides/fungicides/herbicides, (iii) Brominated flame retardants, (iv) Surfactants, (v) Plasticizers, and (vi) Perfluorochemicals.

Pharmaceuticals and personal care products (PPCPs)

Antibiotics and Drugs: It may take thousands of years of exposure to some antibiotics and over the counter drugs from land applied biosolids for the equivalent daily single dose of these compounds taken orally. Research from many studies show that exposure or hazard of this category of microconstituents is minimum from land applied biosolids or composted biosolids and entails minimum risk to human health.

Antimicrobials: Antimicrobial compounds triclocarban (TCC) and triclosan (TCS) are commonly added to a wide variety of personal care products (PCPs). TCC and TCS enter the WRRF via routine domestic activities and discharges from hospitals and nursing homes where these chemicals are heavily used as antiseptics. Land application of biosolids can introduce TCC and TCS into the environment. However, risks of human exposure to TCC and TCS via land application of biosolids are minimal because these compounds are tightly bound to

the biosolids matrix and are not taken up by the crops (Xia et al., 2010; Higgins et al., 2011). Dermal absorption and oral ingestion from PCPs are considered to be the major pathways for human exposure because the levels of TCC and/or TCS in antibacterial soaps and toothpastes are much higher (e.g., >6,000 ppm in bar soaps and 3,000 ppm in some toothpastes) than the levels generally observed in biosolids. Detectable levels of TCC have been observed in urine samples of people up to 72 hours after showering or bathing with antibacterial soaps, showing dermal absorption of TCC from bar soaps even after a single use. FDA banned these compounds in 2016 from consumer products. Many companies stopped adding these compounds to anti-microbial soaps after 2013 when FDA announced the rulemaking efforts, and concentrations of these compounds in biosolids have gone down significantly in the last 3 years.

Hormones and Steroids: Hormones and steroids are released into the environment from animal and human excrement. In the U.S., about 49 tons of hormones are excreted annually into the environment by farm animals alone. Humans excrete natural hormones 17β-estradiol (E2), estrone (E1), and testosterone, which enter the wastewater stream via domestic discharges. Unlike animal excrement, human excreta may also include a synthetic estrogen 17α-ethynilestradiol (EE2), which is used in oral contraceptives. It has been observed that large proportions (>98%) of E1 and E2 entering the WRRF are removed during the activated sludge process. Only 90 percent of EE2 is removed because it degrades slowly during the activated sludge process, and traces can be detected in biosolids. Trace levels of natural and synthetic hormones and steroids could be released into the soil after land application of biosolids. However, these contaminants are easily degraded by commonly occurring microbial populations in agricultural soils with half-lives of the hormones ranging from only 1 to 10 d (Higgins et al., 2010).

Synthetic Musks: Polycyclic and aromatic nitro musks are commonly used in perfumes. It was later discovered that aromatic nitro musks were unstable in light and alkaline media, so polycyclic musks (PCMs) gained popularity and are widely used in air fresheners and other PCPs. PCMs have been shown to be toxic to biota and are linked to endocrine disruption and increased breast cancer in humans. Measurable levels of PCMs have been detected in human blood, breast milk and newborn babies. Use of fragranced PCPs has been considered a major source of human exposure. HHCB (Glaxolide) and AHTN (Tonalide), the most commonly used PCMs, are ubiquitous in the environment and have been detected in biosolids and house dust at similar levels. PCMs enter the wastewater stream via domestic activities and indoor dust. A large portion of the PCMs entering the WRRF are eliminated during the wastewater treatment processes and anaerobic digestion of biosolids. A small fraction may exit the WRRF in the final effluent and the remainder is partitioned into biosolids. Irrigation with effluent and fertilization with biosolids may introduce PCMs to agricultural soils. While HHCB has been shown to degrade fairly rapidly in soil, AHTN tends to persist in the environment with a half-life of greater than 180 days (Higgins et al., 2010). AHTN, being highly lipophilic, is strongly bound to the biosolids and soil matrices and is not expected to be mobile or bioavailable in agricultural soils. Reducing direct exposure may be more important to protect human health.

Pesticides/Fungicides/Herbicides

Toxic and persistent chemicals are present in pesticides/fungicides/herbicides commonly used in and around the house, and are frequently detected in high concentrations in indoor air and house dust (Hundal et al, 2011). Trace levels of these chemicals are also frequently detected in agricultural soils and in municipal biosolids. Although land application of biosolids may potentially add trace levels of these contaminants to the soil, the levels coming from biosolids are negligible in comparison to the soil background levels resulting from regular use of these chemicals for crop production. The addition of organic matter due to the land application of biosolids may reduce the bioavailability of these chemicals in soil. The most significant human exposure pathways for pesticides/herbicides are ingestion of house dust and inhalation of indoor air or exposure from sites where these chemicals have been recently applied (Nigg et al., 1990).

Brominated Flame Retardants

Polybrominated flame retardants (PBDEs) are widely used to retard the flammability of many

consumer and industrial products. PBDEs are primarily indoor pollutants and are generally found at high levels in dust and air in the homes and at the workplace. Concentrations of PBDEs detected in house dust are much higher than the levels generally reported in biosolids. In addition to routine domestic activities and industrial input, the PBDEs may also enter the wastewater steam via leachate from municipal solid waste landfills because the vast majority of consumer products containing PBDEs are ultimately disposed of in the landfills. PBDEs are similar to polychlorinated biphenyls (PCBs) and have been shown to be persistent in the environment. They are ubiquitous in soil, water and air and are widely found in people and wildlife. The presence of PBDEs in the environment and humans is of serious concern because some PBDEs are potent endocrine disruptors. During the wastewater treatment process, PBDEs preferentially partition into biosolids due to their lipophilic nature. It has been shown that levels of PBDEs in soils increase after application of biosolids. However, the land application of biosolids is not considered a major exposure pathway because PBDEs have strong affinity for soil organic matter and tend to accumulate in the biosolids incorporation zone (6- to 8-inch surface layer). The PBDEs in the land applied biosolids are not taken up by crops and have minimal risks of translocation in the food chain (Xia et al., 2010; Hale et al., 2012). Risk assessment studies show that diet and ingestion of house dust are the major sources of PBDEs exposure to adults and children, but mother's milk is the major source of exposure to infants due to high body burdens of nursing mothers in North America.

Surfactants

Surfactants, like alkylphenol ethoxylates (APEs), are added as emulsifiers in PCCPs. Some APEs, especially nonoxynol-9, have spermicidal properties and are used in contraceptives. APEs are also used as antioxidants in the polymer and food industries. These contaminants are ubiquitous in the environment and their levels in the surface waters are increasing. APEs and their degradation products have received considerable attention due to their endocrine disruption effects in the environment. Nonylphenols (NPs), the raw material for making APEs, as well as their degradation product 4-nonylphenol 4-NP, have been implicated in fish feminization in rivers. Interestingly, the estrogenic effects of NPs in the environment have been known since 1938, but NPs are still widely used in consumer and personal products. A variety of APEs enter the WRRF via routine domestic activities and industrial discharges. APEs are generally degraded into shorter chain NPs like 4-NP during the wastewater treatment process, a small fraction of which may exit the WRRF in the final effluent. But the majority is removed by partitioning into biosolids. Some surfactants in biosolids may occur in concentration greater than found in house dust. However, human exposure to house dust is much greater than to biosolids. Also, NPs and 4-NP degrade rapidly (half-life = 3 to 30 d) in agricultural soil after land application of biosolids (Xia et al., 2010). There has been no report showing deleterious effects of APEs on human or environmental health following land application of biosolids.

Plasticizers

Phthalates: Phthalates are synthetic chemicals of increasing concern because of their endocrine disruption effects. Phthalates are commonly added to plastics to increase their flexibility and transparency. They are used to soften polyvinyl chloride (PVC). Most widely used phthalates are di(2-ethylhylhexyl) phthalate (DEHP), benzyl butyl phthalate (BBP), diethyl phthalate (DEP) and di-n-butyl phthalate (DBP). Phthalates are used in industrial applications as well as in PCCPs, children's toys and feeding bottles, pharmaceutical applications, and medical devices. Phthalates are not chemically bonded to the plastics or PVC and can be easily released in the environment via volatilization or leaching. They could also migrate into food from plastic containers. Many phthalates, especially DEHP and BBP, are ubiquitously present in air, water, soil and biosolids. High concentrations of phthalates have been observed in indoor air and house dust. Exposure to phthalates could occur through direct use (PCCPs, medical devices, etc.) or indirectly via environmental contamination. In the general population, oral intake is considered to be the main route of exposure because phthalates can easily migrate into food and beverages from the containers and wrappers. Levels of phthalates have been shown to be higher in young children as compared to other age groups. In addition to mother's milk and canned food, ingestion of house dust, inhalation of indoor air, and dermal absorption are other significant routes of exposure to phthalates in

young children who spend most of their time indoors, play close to the floor, and have frequent hand to mouth contact. In 2008, Congress permanently banned three types of phthalates: DEHP, DBP, and BBP in any amount greater than 0.1 percent (computed for each phthalate individually) in children's toys, and any child care article that is designed or intended by the manufacturer to facilitate sleep or the feeding of children age 3 and younger, or to help children age 3 and younger with sucking or teething. Congress has also banned on an interim basis three additional phthalates DINP (diisononyl phthalate), DIDP (diisodecyl phthalate), and DnOP (dioctyl phthalate) and directed the U.S. Consumer Product Safety Commission to convene a chronic hazard advisory panel on phthalates (CPSIA, 2008). However, other phthalates are still being used in children's toys. Phthalates enter the wastewater stream via industrial and domestic discharges due to their widespread use. Land application of biosolids could introduce phthalates into the soil environment. However, they are not persistent in the soils and are degraded fairly quickly with half-lives ranging from 20 to 25 d (Higgins et al., 2010). Land application of biosolids is not considered to be a significant source of phthalate exposure in humans (Hundal et al., 2011).

Bisphenol A: Bisphenol A (BPA) is a chemical intermediate used to make epoxy resins and polycarbonates. Free BPA (loose individual molecules), which has a much higher exposure potential than the BPA bound into resin or polycarbonates, is found in high concentrations (8 to 17 g/kg) in carbonless copy paper and thermal paper widely used for credit card and cash register receipts. On average, 0.2 to 0.6 µg BPA could be transferred to fingers upon contact with the paper, and the amount transferred could increase by ten times in cases of wet or greasy fingers (Biedermann et al., 2010). BPA is an endocrine disruptor compound and its estrogenic effect has been known since the 1930s. Considerable levels of BPA have been observed in indoor air and house dust. Levels observed in house dust are greater than the levels detected in biosolids. Measurable levels of BPA (<10 – 646.5 ppb) have also been reported to migrate into food and beverages due to leaching from plastic packaging and BPA lined cans and plastic containers. According to the Center for Disease Control and Prevention (CDC, 2010), nearly 95 percent of Americans have high levels of BPA (>0.1µg/L urine) in their system. Concerns over the harmful effects to infants were heightened by the fact that infants and children are expected to have the highest daily intake of BPA via release from baby bottles, pacifiers, ingestion of house dust, and inhalation of indoor air that contain considerable amounts of BPA. Use of BPA in baby bottles and toys has been banned in many countries including several states in the U.S. to minimize exposure to infants. BPA could be released into the soil via land application of biosolids. However, BPA has been shown to easily degrade under field conditions with an average half-life ranging from 1 to 10 d. Thus, land application of biosolids is not a significant pathway for human exposure to BPA.

Perfluorochemicals

Perfluorochemicals (PFCs) (more commonly being referred to as Per- and Polyfluoroalkyl Substances (PFASs)), especially perfluorooctane sulfonates (PFOS) and perfluorooctanoic acid (PFOA), have been used in industrial and consumer products since the 1950s. PFOA is also used in the production of Teflon and Gore-Tex. PFCs can be released into the environment from the manufacture of fluorinated chemicals and losses from PFCs-treated consumer products and eventually enter the wastewater stream. PFOA and PFOS were the most prominent PFCs detected in indoor air, house dust, and biosolids. They are also detected in low concentrations in the blood of wildlife and humans around the world. Exposure to PFOS and PFOA may result from the intake of contaminated food, including fish and water. The most significant human exposure results from ingestion of indoor air and house dust because the largest volume of PFCs (>2.5 million pounds in 2000) is used for indoor applications. Use of PFCs in food contact wrappers and boxes represent another potential source of oral exposure. PFOA is present in microwave popcorn bag paper at amounts as high as 300 µg/kg. According to the U.S. Food and Drug Administration, microwavable popcorn bags alone could account for about 20 percent of the PFOA levels measured in an individual consuming 10 bags of popcorn a year (US FDA, 2012; Egeghy and Laober, 2011; Trudel et al., 2008). These compounds were banned in US food packing papers in 2016. Ingestion of house dust and inhalation of indoor air are the major pathways for PFOS and PFOA exposure to

toddlers and children because they spend greater than 90 percent of their time indoors, exhibit the highest hand-to-mouth frequency and may ingest 100 to 200 mg of dust per day (Trudel et al., 2008; Langer et al., 2010; Hundal et al., 2011). Land application of biosolids may release trace levels of PFCs into the agricultural soils but it doesn't seem to be a major source of human exposure (Hundal et al., 2011; Blaine et al., 2013).

Conclusions

Diet, lifestyle, ingestion of house dust and inhalation of indoor air are the major sources of microcontituent exposure to humans (Hundal et al., 2011). Land application of biosolids may only account for minor exposure to some microcontituents at the most. On an average, 7.2 million dry tons of biosolids are produced in the U.S. annually and only 55 percent are land applied. Less than 0.12 % of the nation's total cropland receives biosolids application. This leads to the logical conclusion that only a small fraction of the total population consumes biosolids-fertilized crops and resides in the vicinity of biosolids-fertilized farmland. Therefore, the land application of biosolids alone cannot account for a significant amount of human exposure to microcontituents (USEPA, 1995).

Human exposure to biosolids-derived microconstituents would be expected to mainly occur via ingestion of biosolids fertilized soil, consumption of grains, produce, meat and dairy raised on biosolids-fertilized feed, fish from ponds adjacent to biosolids-fertilized fields, and ground or surface waters impacted by land application of biosolids. Both state and Federal biosolids land application regulations and management practices are designed to be very conservative and highly protective of human and environmental health. Strict adherence to these management practices and loading rate restrictions are protective because the biosolids-derived microconstituents have low bioavailability and are not very mobile in the soil profile. Lipophilic microconstituents like PBDEs are not generally taken up by the plants. Less lipophilic microconstituents tend to accumulate in vegetative parts of the plant and are generally not detected in grains, which further limit their translocation into the food chain. These arguments strongly suggest that land application of biosolids would not be a major pathway for human exposure to microconstituents.

Furthermore, experience with similar organic chemicals from Part 503 Risk Assessment shows that risk to humans is *de minimis*.

As a society, our exposure to microconstituents can be reduced by being smart consumers. Uses of antimicrobials in personal care products, excessive use of PBDEs and APEs in consumer products, and indiscriminate use of phthalates, BPA and PFCs in personal care and consumer products are unnecessary. Simply avoiding or minimizing use of such products can greatly reduce environmental contamination and human exposure. Also, regulatory agencies could help in reducing the environmental burden by banning unnecessary and indiscriminate use of microconstituents (recent bans on triclosan, triclocarban, and perfluorochemicals are good steps in the right direction) and by promoting non-toxic biodegradable alternatives.

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USFDA. 2012. CFSAN Constituent Update "FDA Announces the Voluntary Removal by Industry of Certain Perfluorinated Grease-proofing Agents from the Marketplace. Available at: https://www.fda.gov/Food/NewsEvents/ConstituentUpdates/ucm309925.htm

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Additional Resources

- National Biosolids Partnership
- U.S. Environmental Protection Agency
- Water Environment Federation
- Solids Process Design and Management, WEF Press, 2012, ISBN :978-0-07-178095-7
- Microconstituents in Biosolids, Technical Practice Update, WEF, 2007
- Emerging Contaminants in Biosolids, WEF webcast, 01-MAR-2017

Additional Notations:

This paper does not include a thorough assessment of impacts to other species.

Authors

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Ben Davis, Renda Environmental

Acknowledgements

Thank you to Rick Stevens, U.S. Environmental Protection Agency, as well as the WEF Residuals and Biosolids Committee, Sustainable Residuals Use Subcommittee, and the WEF Disinfection Committee for review and guidance.

For further Biosolids information, please see http://www.biosolids.org.

Contact

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ITEM 5

Hydrogeology Review

Department of Ecology

TO: File

FROM: Cole H. Carter
Hydrogeologist
Eastern Regional Office
Waste 2 Resources Program
Department of Ecology

DATE: March 1, 2017

SUBJECT: Hydrogeology of Fire Mountain Farms, Inc. biosolids application site at Rosman Farms.

The proposal to introduce biosolids as nutrients on agricultural land owned by Gary Rosman in Lincoln County has piqued interest by property owners and residents of the area. A major concern is the possibility that the application of biosolids will negatively impact the ground and surface waters at neighboring properties. This memo discusses the hydrogeology of the area and the likely fate and transport of contaminants associated with the biosolids. A visit to the proposed biosolids application areas and surrounding environs occurred on October 6, 2016.

Biosolids

Application of biosolids in the State of Washington is regulated by chapter 173-308 WAC. The definition of biosolids in WAC 173-308-080 is as follows:

> ***"Biosolids"*** *means municipal sewage sludge that is a primarily organic, semisolid product resulting from the wastewater treatment process, that can be beneficially recycled and meets all applicable requirements under this chapter. Biosolids includes a material derived from biosolids, and septic tank sludge, also known as septage, that can be beneficially recycled and meets all applicable requirements under this chapter.*

To meet the definition of biosolids and be used as an agricultural soil additive, the material must meet the regulatory requirements. They must be analyzed by specific analytical methods and applied in specified limited amounts in the prescribed manner. Refer to the regulation (chapter 173-308 WAC) for details of the requirements.

Location and Topography

The proposed biosolids application sites on Rosman Farms properties are located in Lincoln County, Washington in the following sections: T. 26 N., R. 37 E., sections 12, 13, 14, 23, and 24; and T. 26 N., R. 38 E., sections 18 and 19. Total area is about 1045 acres. The sites are located on a plateau at elevations ranging from approximately 2300 to 2600 feet above mean sea-level. Within the proposed application sites, slopes are less than 15 percent except for a couple of small areas. Biosolids will not be applied to areas with slopes greater than 15 percent. On the west, north, and east, slopes adjacent to the proposed application areas are 15 to greater than 75 percent.

Places near the proposed application sites that have been identified as areas of concern include two springs, one to the northwest and one to the east-southeast of the site, and a group of adjacent properties to the east-southeast of the site. The following table shows the map distance and bearing of the closest part of the areas of concern from the closest edge of a proposed application site.

Area of Concern	*Map Distance (ft.)*	*Direction*	*Elevation Difference (ft.)*
Hanson property	900	East	-200
Turnley Spring	2100	East	-475
Tolstoy Farm	4400	East-southeast	-620
Angel Spring	1800	Southwest	-200

Geology/stratigraphy

Most of the application sites are covered with Quaternary-age loess. The loess is generally homogenous, unconsolidated silt which is buff to light-brown in color. Soils formed in the loess are well-drained, and moderately deep to very deep silt loam. On 0 to 5 percent slopes, permeability is moderate with slow surface runoff and slight hazard of erosion. On the plateaus, depth to the volcanic rocks is 20 to 40 inches. Recent fluvial deposits are located in the valleys hosting Mill Creek and other streams. Volcanic rocks of the Columbia River Group underlie the loess. Locally the volcanics are mapped as tholeiites and andesites of Middle Miocene age.

Surface water flow direction

DEM elevation points (10 m) for the area were used to create a flow path diagram. A flow path is a computer representation of the path that water applied to the ground surface would follow if it did not infiltrate into the soil or evaporate. The flowpath line that goes through the Tolstoy farm near Mill Creek starts at the south edge of the application site and is almost 10,000 horizontal feet in length. No flow path lines from the application sites pass through Turnley Springs. The flow path from the northwest portion of the application site to Angel Springs is about 1700 feet map distance. It is improbable that any liquids from biosolids application on the Rosman Farms sites would reach the springs or the Tolstoy Farm through surface runoff. Liquids applied to the application areas is likely to infiltrate into the soil before it travels very far.

Groundwater

Near-surface groundwater movement generally follows the down-hill direction of surface topographic features. Structural deformation of litho-stratigraphic units can affect flow directions. Groundwater movement in volcanic host rocks is highly variable. Solid volcanic rocks may be impermeable to water flow, and movement of water occurs in fractured areas such as flow tops or in interbeds located between the volcanic flows. Basalt aquifers have been described as like a layer cake with water-bearing fracture zones interspersed between layers of dense, impermeable basalt. In some places water can move through vertical fractures, such as those seen in columnar features formed by cooling. Most groundwater movement in volcanic rocks occurs in sub-horizontal fracture zones.

Groundwater flow rates are generally low as the movement occurs as a slow seepage through networks of small cracks or between particles of unconsolidated earth materials. In 2015, the calculated groundwater flow in three aquifers in Columbia River Basalts in Lincoln County range from 400 to 1700 feet per year. In Grant County during the same year, calculated flow speeds in aquifers in a similar hydrogeologic environment ranged from 1 to 296 feet per year.

No wells are located on the biosolids application sites and eleven wells are located in the contiguous sections. Nine of the wells are in the Mill Creek drainage. Green Canyon and Harker Canyon each have one well. The wells range from 84 to 600 feet in depth.

Fate of Contaminants

State regulations have provisions to protect human health and the environment. The state of Washington antidegradation policy for groundwater is implemented with chapter 173-200 WAC, Water Quality Standards for Ground Waters of the State of Washington. Groundwater concentrations shall not exceed the criteria listed in Table 1 of the regulation, with exceptions for high background values and secondary contaminant exceedances in nonpotable groundwater. Sections of the biosolids regulations that enforce the antidegradation policy include WAC 173-308-160, Biosolids pollutant limits, WAC 173-308-170, Pathogen reduction, and WAC 173-308-190, Protecting waters of the state – Agronomic rate requirement.

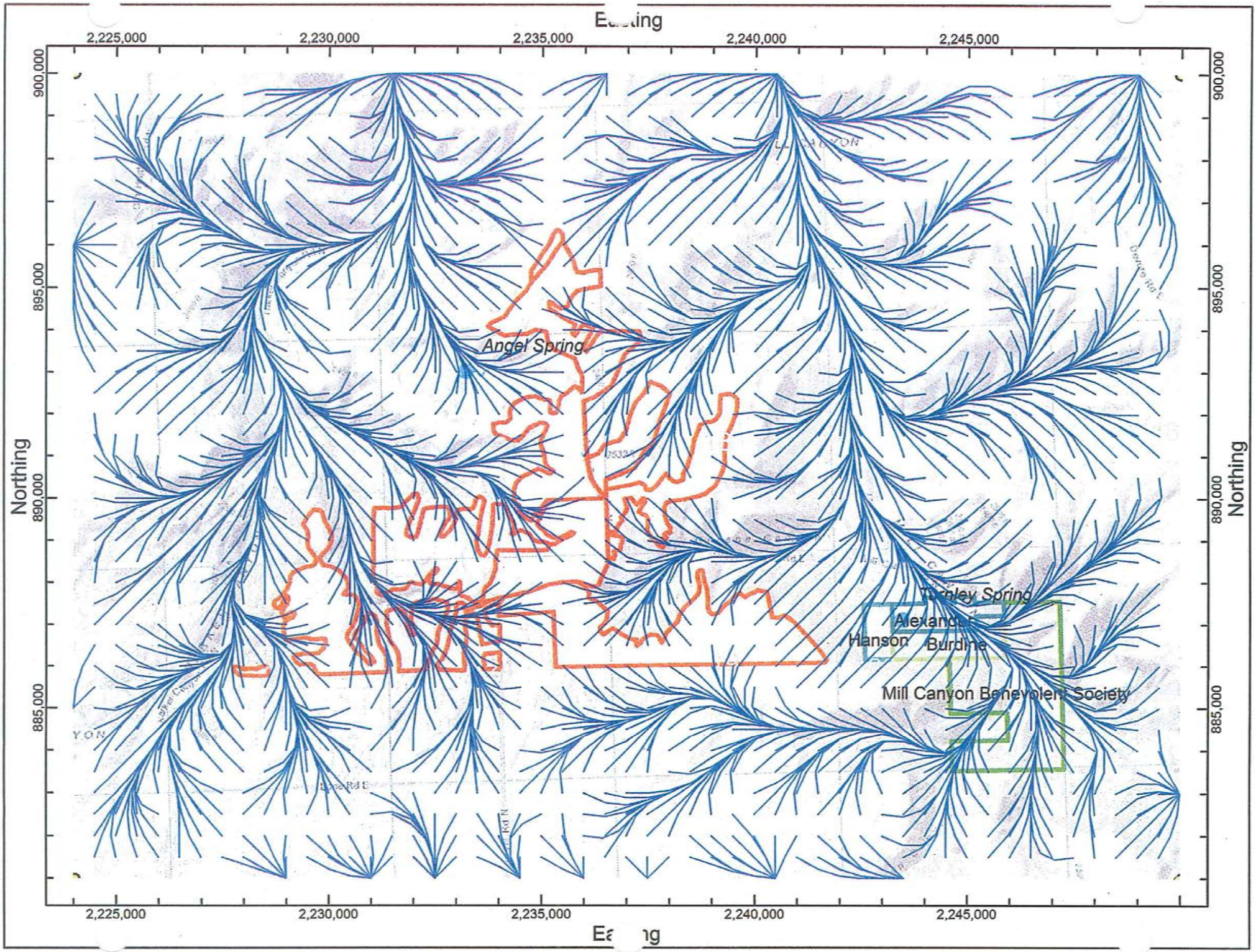
The ability of the natural environment to reduce contaminant concentrations is known as Natural Attenuation. These natural processes occur in soil, groundwater, and surface water and will decrease contaminant concentration and mobility of contaminants at the levels associated with biosolids application. The EPA definition of Natural Attenuation as follows:

> "a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in situ processes include biodegradation; dispersion; dilution; sorption; volatilization; radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants."

Conclusions

A review of the hydrogeology of the area proximal to the Fire Mountain Farms proposed biosolids application sites on the Rosman Farms indicates that contaminants from biosolids application will not impact areas of concern such as Turley Spring, Angel Spring, or the Tolstoy Farm. Factors that support this conclusion are the following.

- Regulations that limit the nature and application of biosolids materials,
- Distance and travel time from the application sites to the areas of concern,
- Nature of the soils and subsurface hydrostrigraphic units,
- Flow paths for surface and subsurface water, and
- Natural attenuation of contaminants in the environment.


Easting
2,225,000
2,230,000
2,235,000
2,240,000
2,245,000
900,000
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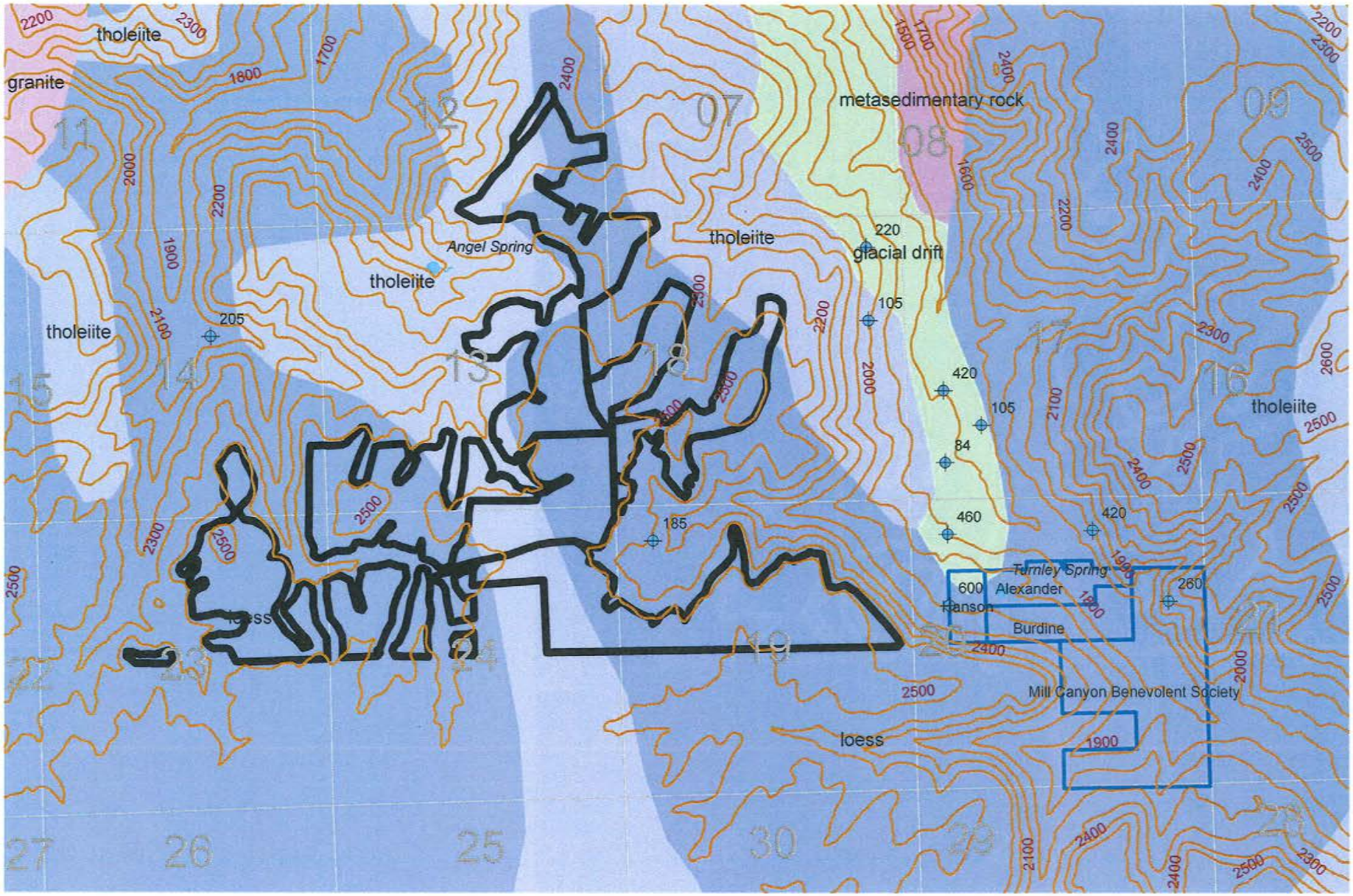
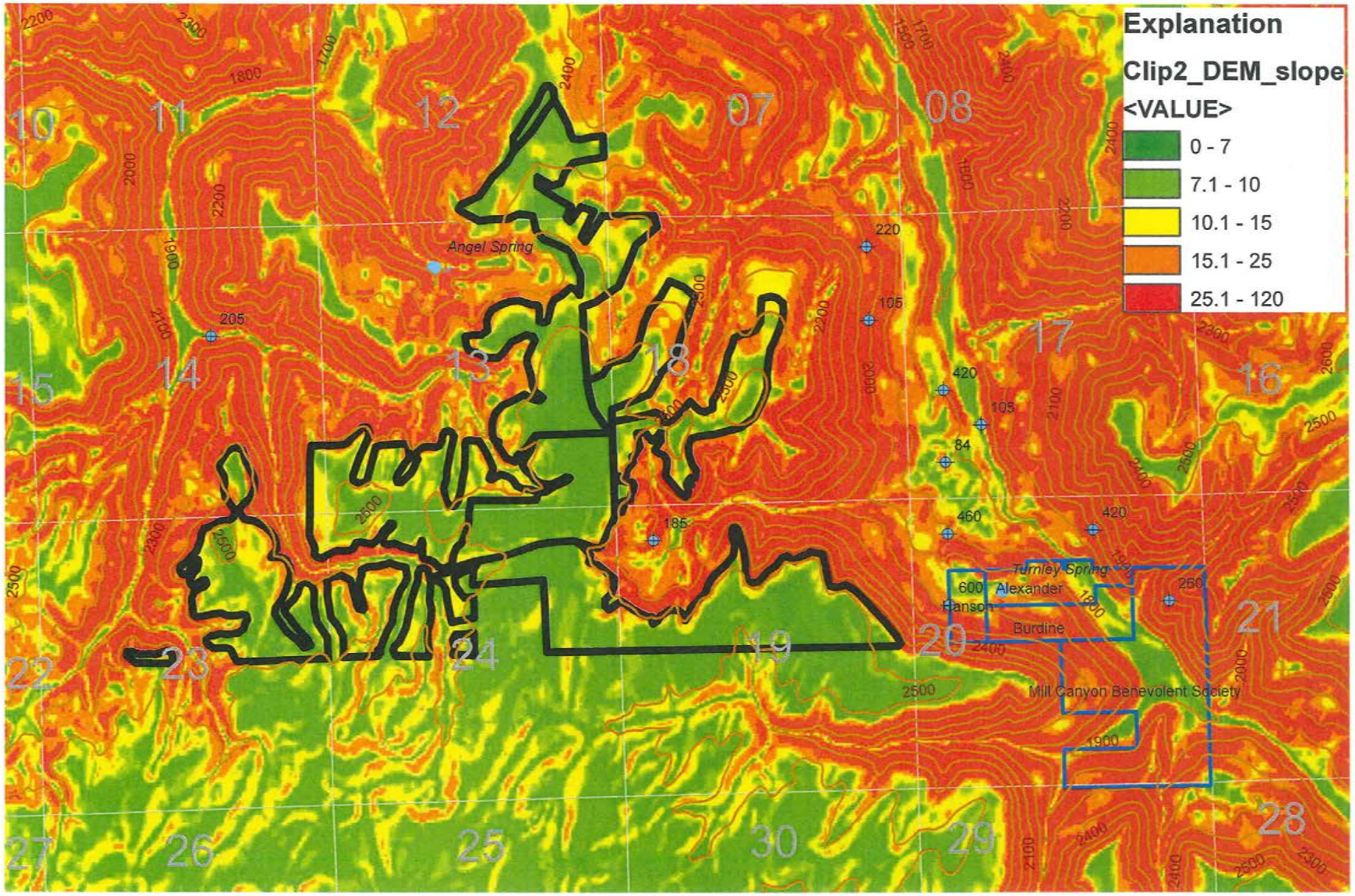
890,000
885,000
Northing
Angel Spring
Turnley Spring
Alexander
Hanson
Burdine
Mill Canyon Benevolent Society



Rosman Farms Biosolids

Surface Geology



N

0 0.125 0.25 0.5 0.75 1 Miles

Rosman Farms Biosolids

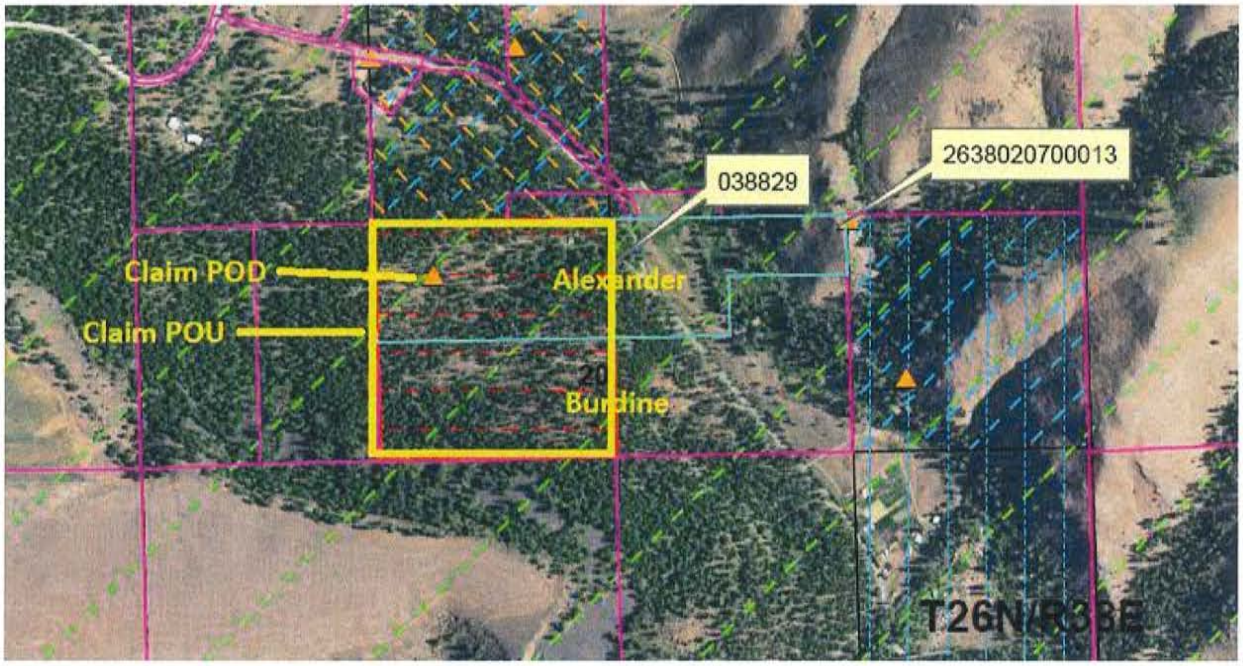
Percent slope

ITEM 6

Water Rights

Water Right Claim 038829 was filed by Robert Green during the Claim Registration Act. The Claim 038829 claims a use of 0.02 CFS (10 gallons per minute) 4 acre-feet per year for domestic supply, stock and irrigation of 3 acres with a claimed first use of 1911. The claimed place of use is described as the SE¼NW¼ of Section 20, T. 26 N., R. 38 E.W.M.

The intent of the Claims Registration Act, Chapter 90.14 RCW, was to document those uses of surface water in existence prior to the adoption of the State Surface Water Code, Chapter 90.03 RCW, which was adopted in 1917, and those uses of ground water in existence prior to the adoption of the State Ground Water Code, Chapter 90.44 RCW, which was adopted in 1945. Since each code(s) adoption, the only means of acquiring a water right within the state is by filing for, and receiving, a permit from the Department of Ecology or one of its predecessors or by establishing a right under the "domestic exemption" under the ground water code (RCW 90.44.050). The Department of Ecology recognizes that the final determination of the validity and extent associated with a claim registered in accordance with RCW 90.14 ultimately lies with the Superior Court through the general adjudication process provided for by Sections 90.03.110 through 90.03.240 RCW.



The yellow box indicated the claimed place of use. The parcels owned by Alexander and Burdine include the SW¼NE¼ lying outside of the claimed place of use. It is not clear as to the lands owned by Harris and Martinez.

Lacking a tentative determination of extent and validity by Ecology or a general adjudication by Superior Court in Lincoln County it is unclear if the Claim 038829 represents a valid water right or not.

ITEM 7

Agricultural Disposal of Sewage Sludge

Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge

Soil properties are important considerations in areas where soils are used as sites for the treatment and disposal of organic waste and wastewater. Selection of soils with properties that favor waste management can help to prevent environmental damage.

This table shows the degree and kind of soil limitations affecting the treatment of agricultural waste, including municipal and food-processing wastewater and effluent from lagoons or storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Food-processing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places it is high in content of sodium and chloride. In the context of this table, the effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied, checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

The ratings in the table are for waste management systems that not only dispose of and treat organic waste or wastewater but also are beneficial to crops. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Application of manure and food-processing waste not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Manure is the excrement of livestock and poultry, and food-processing waste is damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. The manure and food-processing waste are solid, slurry, or liquid. Their nitrogen content varies. A high content of nitrogen limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with the lye used in food processing, are not considered in the ratings.

The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the waste is applied, and the method by which the waste is applied. The properties that affect absorption include saturated hydraulic conductivity (Ksat), depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, and available water capacity. The properties that affect plant growth and microbial activity include reaction, the sodium adsorption ratio, salinity, and bulk density. The wind erodibility group, the soil erosion factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Application of sewage sludge not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. In the context of this table, sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant growth, and microbial activity include Ksat, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available water capacity, reaction, salinity, and bulk density. The wind erodibility group, the soil erosion factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

Report—Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge–Lincoln County, Washington					
Map symbol and soil name	Pct. of map unit	Application of sewage sludge		Application of manure and food-processing waste	
		Rating class and limiting features	Value	Rating class and limiting features	Value
4—Badge-Bakeoven-Rock outcrop complex, very steep					
Badge	40	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Cobble content	0.87	Cobble content	0.87
		Large stones on the surface	0.50	Large stones on the surface	0.50
Bakeoven	25	Very limited		Very limited	
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Droughty	1.00	Droughty	1.00
		Cobble content	0.98	Cobble content	0.98
		Slope	0.84	Slope	0.84
		Large stones on the surface	0.63	Large stones on the surface	0.63
Rock outcrop	20	Not rated		Not rated	
16—Broadax silt loam, 0 to 7 percent slopes					
Broadax	100	Not limited		Not limited	
17—Broadax silt loam, 7 to 25 percent slopes					
Broadax	100	Very limited		Very limited	
		Slope	1.00	Slope	1.00
18—Broadax silt loam, 25 to 40 percent slopes					
Broadax	100	Very limited		Very limited	
		Slope	1.00	Slope	1.00

Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge–Lincoln County, Washington					
Map symbol and soil name	Pct. of map unit	Application of sewage sludge		Application of manure and food-processing waste	
		Rating class and limiting features	Value	Rating class and limiting features	Value
20—Broadax-Lance silt loams, 7 to 25 percent slopes					
Broadax	60	Very limited		Very limited	
		Slope	1.00	Slope	1.00
Lance	30	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Slow water movement	0.22	Slow water movement	0.30
31—Dragoon very stony silt loam, 7 to 25 percent slopes					
Dragoon	100	Very limited		Very limited	
		Large stones on the surface	1.00	Large stones on the surface	1.00
		Slope	1.00	Slope	1.00
		Depth to bedrock	0.95	Depth to bedrock	0.95
		Droughty	0.41	Droughty	0.41
41—Hanning silt loam, 0 to 7 percent slopes					
Hanning	100	Not limited		Not limited	
42—Hanning silt loam, 7 to 25 percent slopes					
Hanning	100	Very limited		Very limited	
		Slope	1.00	Slope	1.00
45—Kuhl cobbly silt loam, 0 to 15 percent slopes					
Kuhl	100	Very limited		Very limited	
		Droughty	1.00	Droughty	1.00
		Depth to bedrock	1.00	Depth to bedrock	1.00
		Cobble content	0.13	Runoff	0.40
				Cobble content	0.13
54—Phoebe sandy loam, 0 to 15 percent slopes					
Phoebe	100	Very limited		Very limited	
		Filtering capacity	1.00	Filtering capacity	1.00
				Leaching	0.45
67—Speigle very stony silt loam, 25 to 55 percent slopes					
Speigle	100	Not rated		Not rated	

Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge–Lincoln County, Washington					
Map symbol and soil name	Pct. of map unit	Application of sewage sludge		Application of manure and food-processing waste	
		Rating class and limiting features	Value	Rating class and limiting features	Value
72—Spokane-Rock outcrop complex, very steep					
Spokane	40	Very limited		Very limited	
		Slope	1.00	Slope	1.00
		Droughty	0.85	Droughty	0.85
		Depth to bedrock	0.07	Depth to bedrock	0.07
Rock outcrop	25	Not rated		Not rated	
78—Tucannon silt loam, 0 to 5 percent slopes					
Tucannon	90	Somewhat limited		Somewhat limited	
		Depth to bedrock	0.46	Depth to bedrock	0.46

Data Source Information

Soil Survey Area: Lincoln County, Washington
Survey Area Data: Version 12, Sep 8, 2016