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Yamhill County Planning and Development

RE: Farm Use Impacts Assessment Planning Commission U

Dear Yamhill County Planning and Development,

This document constitutes Applicant's ***Farm Impacts Assessment*** for the proposed Riverbend Landfill expansion. The Assessment has been updated to reflect information submitted to the Planning Commission during the hearing and the open record period. The Farm Impacts Assessment contains the following fundamental components:

- Introduction
- Overall Response to Farm Impacts Assessment from Testimony
- Surrounding Lands Determination
- Potential Farm Impacts Identification and Methodology
    - Farm Use Inventory
    - Farm Practice Characterization
    - Potential Impacts from Landfill Externalities
    - Farm Practices and GIS Inventory Data Synthesis
    - Analysis and Methods General Limitations
- Farm Impacts Assessment
    - Assessment for Immediate Vicinity Surrounding Lands
    - Assessment for Broad Area Surrounding Lands
- Forestry Use Impacts Assessment
- Summary Assessment
- Recommended Mitigation Measures

This document includes data and analysis prepared by land use planners with demonstrated expertise in the State of Oregon. Input data for the analysis was collected from a variety of sources and our best efforts were made to utilize the best available information on farm practices in Yamhill County. On this basis, the data and analysis presented herein constitute facts upon which a reasonable person can base land use decisions addressing potential farm use impacts in Yamhill County.

The analyses presented herein are complex and require a series of technical and analytical choices. CSA exercised our best professional judgment for all such choices.

Respectfully Submitted,

CSA Planning, Ltd.

Jay Harland
Principal

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1 INTRODUCTION

This Farm Impacts Assessment supports the Site Design Review application for the proposed expansion of Riverbend Landfill. The Farm Impacts Assessment relies upon the design and details provided in the Site Design Review portion of the application. The purpose of this Farm Impacts Assessment is to determine whether it is reasonably expected that the proposed landfill expansion will significantly impact accepted farm practices or significantly increase the cost of accepted farm practices.

1.1 Riverbend Landfill Expansion Project

The Riverbend Landfill Expansion project has been sought by Waste Management over the last seven years. During that period, the scope and scale of the project has been modified. The most current proposal is described in the Site Design Review land use application for which this assessment was prepared.

The Riverbend Landfill has been in continuous operation since 1982. This analysis relies upon current and expected future operations and management of the Riverbend Landfill. The Farm Impacts Assessment assumes that current operations will be extended through the useful life of the remaining landfill capacity and the capacity added by the expansion proposed in the land use application.

1.2 Farm Impacts Analysis Requirements

Yamhill County Zoning Ordinance section 402.02(V) requires landfills in the Exclusive Farm Use zone to satisfy the standards set forth in ORS 215.296(1). That statute requires that the proposed landfill will not:

(a) Force a significant change in accepted farm or forest practices on surrounding lands devoted to farm or forest use; or

(b) Significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use.

The statute requires that "surrounding lands" be identified and within these surrounding lands supported conclusions be reached for each subsection of the statute. The statute does not present an absolute standard that requires no level of interference with farming activities of any kind be categorically demonstrated; the statute requires only that any impacts not rise to the level of being significant.

ORS 215.296(2) further provides that conditions of approval may be imposed to assure potential impacts do not give rise to the level of a significant change in farm practices or costs.

2 OVERALL RESPONSE TO OPPONENT TESTIMONY

Leading up to and during the Planning Commission proceedings for the land use application, testimony presented to the Planning Commission raised a number of issues relating to the Applicant's initial farm impacts assessment. CSA Planning reviewed the testimony and provides this update to the farm impacts assessment in response to that testimony. Updates to the farm impact assessment include the following:

1. Farm uses or practices identified during the land use proceedings, but not included in the original assessment, have been added.
2. Additional GIS analysis has been performed to update crop inventory data based upon testimony provided to the record. The location of specific objections identified in that testimony has been mapped to the extent feasible.Changes to the assessment have been made where testimony provided a reasonable criticism of the original assessment related to the prevailing wind direction and associated direction of potential impacts related to air particulates and litter. While the criticism of the windrose data was valid, it was also overstated to a significant degree because it implied that any use of a wind rose must be done on a month-by-month basis. This is not a regulatory requirement and the yearly data reflects all the monthly data and provides a more complete view of the annual wind patterns.
3. Additional analysis for specific objections associated with farm practices has been provided, including the following:
    a. The alleged need for farming practice changes to avoid crop contamination from coccidiosis transmitted from birds (from the landfill) to crops or humans
    b. Crow population increase risks to livestock and farming
    c. Risk to grass seed crops from gull consumption
    d. Additional information on rodent control and population concentrations

In addition to the above specific updates, the Planning Commission received general comments related to the farm impacts assessment that warrant a response here:

- Opponents incorrectly testified that the inventory only included the primary crops and that this method was improper. In fact, the inventory included all crop types (that CSA could identify) within one mile of the landfill. For lands beyond one mile from the landfill, specific mapping units for each crop were not developed and it is unnecessary to do so. First, the sheer volume of data is large and most secondary farm uses tend to be uses that are also primary farm uses on other parcels in the broad area or in the area that is within one mile of the landfill. Second, potential impacts, if any, are expected to be less acute beyond a mile for all farm uses. This manner of analysis does not mean the farm uses were not inventoried or analyzed. Further, where testimony identified specific potential impacts with secondary farm practices on parcels beyond one mile from the landfill, the updated analysis assesses potential impacts to those specific secondary farm practices identified by opponents.

- The Planning Commission received testimony about an "absence" of farm uses allegedly resulting from the presence of the landfill. The premise of that testimony is that the existing landfill operations have fundamentally changed the nature and character of the farm uses on surrounding lands and that farming operations would be different if the landfill had not been present for the last forty years. CSA Planning conducted an overall survey of aerial photos for the entire region on Google Earth; the region being the valley floors and low-lying foothills of Yamhill County. That survey did not depict any

discernable difference in farm use patterns for lands that are distal from the landfill versus those that are proximate. It is an accepted fact of economic geography that the distribution of economic activities is heterogeneous. *See Trade and Geography* (Krugman 1991). The location of specific economic firms and activities are influenced by a wide array of factors. Properly controlling for the stochastic factors to identify discrete pattern differences requires a sophisticated geographic analysis. Without the benefit of a sophisticated geographic analysis, and where the readily observable aerial photo data indicates no apparent land use pattern differences, the assertion that the concentration of farm uses is affected by the proximity to the landfill cannot be supported.

Several of the appendices from the original Farm Impacts Assessment have been supplemented and some additional appendices have been added to this update. Only new or supplemented appendix information is supplied with the updated Farm Impacts Assessment.

3 SURROUNDING LANDS DETERMINATION

This section describes the geographic extent of the study area analyzed in the Farm Impacts Assessment. CSA Planning Ltd. has over 30 years of professional land use planning experience in Oregon and the identified study area constitutes our expert opinion of an appropriate study area. CSA's opinion is that this study area is adequate for purposes of identifying potential changes to accepted farm practices and potential cost increases to accepted farm practices.

3.1 Immediate Vicinity Surrounding Lands

Immediate Vicinity Surrounding (IVS) Lands are located in the immediate vicinity of the landfill. All lands within 1 mile are inventoried and analyzed as Immediate Vicinity Surrounding Lands. The farm uses in this area were inventoried according to "crop areas" based upon the most recent aerial photography available on Google Earth which is dated July 6, 2012. For this area, Tax Lots that appear to be devoted to multiple farm uses are inventoried according to each crop area. This level of inventory resolution allows the immediate vicinity surrounding lands' farm practices to be evaluated for each of its respective farm uses. The IVS lands are depicted on Atlas Pages 12 and 13.

3.2 Broad Area Surrounding Lands

Broad Area Surrounding (BAS) Lands are located beyond the immediate vicinity of the landfill. These lands are more than one mile from the landfill and up to 2.5 to 3 miles from the landfill expansion area[1]. All discernable farm uses on these lands are inventoried, but are analyzed by acreage of the primary farm use on each tax lot, except where specific issues related to a specific property were raised in testimony. Analysis of potential farm practice impacts on these lands is slightly more generalized due to its greater distance from the proposed landfill expansion, except where specific issues related to a specific property were raised in testimony. The BAS lands are depicted on Atlas Page 11. Lands beyond the Broad Area Surrounding lands are not considered surrounding lands for purposes of the analysis initially submitted with the application.

[1] As illustrated on Atlas Page 9, the Broad Area Surrounding Lands inventory extends approximately 2.5 miles to the north and east to the City of McMinnville and Unincorporated Community of Whiteson, respectively. The inventory extends approximately 3 miles to the south and west to Bellevue Highway and Muddy Valley Road respectively.

4 POTENTIAL FARM IMPACTS IDENTIFICATION AND METHODOLOGY

Oregon land use planning requires decisions that are supported by substantial evidence. Reasoning and opinion offered by experts constitute substantial evidence. The rational assertion and deductions presented in this impacts analysis are the reasoning and opinion of CSA Planning Ltd., which is a professional land use planning firm with over 30 years' experience in Oregon Land Use Planning. The assertions and deductions are based upon field data collected directly by CSA Planning Ltd., other professionally collected data, Geographic Information System (GIS) analysis conducted by CSA Planning, published data sources, and testimony received during the proceedings.

4.1 Farm Use Inventory

This section describes CSA's methods to identify and classify farm uses on surrounding lands.

4.1.1 Data Collection and Development Methodology

CSA Planning Ltd. obtained GIS base data through Yamhill County. This base data is stored and updated periodically by the Mid-Willamette Valley Council of Governments (COG). The data provided by the COG included GIS layers for Tax Lots, Zoning, Comprehensive Plan Designations, Urban Growth Boundaries as well as floodplain data for the County as a whole. Floodplain data for the project area was obtained directly in CAD format from the project's environmental consultant Latimer Environmental. The floodplain CAD data was imported and projected into the GIS layers for the analysis project. July 2012 Aerial Photos from Google Earth were geo-referenced and incorporated into the GIS layers for the project.

Current site-specific inventory data was collected through fieldwork conducted by CSA Planning Ltd, Principal Jay Harland, see Jay Harland resume in Appendix B. This data was collected using a GOPRO Hero 3+ taking pictures outside a vehicle front passenger window on October 1, 2014 on all major roadways throughout the study area. October 1, 2014 was a calm day that was somewhat foggy in the morning and then cleared off at approximately 9:30 am. The GOPRO was set to take a high resolution image every five seconds; each image file was time stamped. Simultaneously, a Garmin 60csx was logging time-stamped Global Positioning System (GPS) track data in the vehicle. This time stamped data was reconciled and GPS coordinates were assigned to all images along with the direction of vehicle. This data is depicted on Atlas Pages 17 through 25.

Additional data utilized in the farm use identification and classification includes historical aerial photos available on Google Earth (See Atlas Pages 14, 15 and 16).

The identification and classification of farm uses was conducted for each tax lot within the study area. This identification and classification process requires a certain degree of subjective judgment during the assessment and categorization process. The classification work was conducted by Michael Savage. Mr. Savage's resume is included as Appendix B. The classification process is based upon the use that appears to be the primary farm use on each tax lot. In general, the farm use classification assumed more intensive cultivation when choosing between a pair of classifications given available data. For example, if the choice was between hay and grass seed, the tax lot was classified as grass seed *e-ceteris paribus*.

These classification judgments were based in significant part on CSA's understanding of major crops produced in Yamhill County. Major crops CSA understands to be produced in Yamhill County are based upon the following data:

Table 1.
Yamhill County Agricultural Sales by Commodity (2011)

Commodity	Sales (in dollars)	Percent
Nursery & Greenhouse Crops	$84,750,000	33%
Tree Fruit & Nuts	$39,995,000	15%
Grass & Legume Seeds	$37,485,000	14%
Grain & Hay	$19,708,000	8%
Other crops	$15,826,000	6%
Small Woodlots & Christmas Trees	$7,489,000	3%
Vegetable & Truck Crops	$7,388,000	3%
ALL CROPS	**$212,641,000**	**82%**
Dairy Products	$22,540,000	9%
Poultry	$11,177,000	4%
Cattle	$7,224,000	3%
Other Animal Products	$5,431,000	2%
ALL LIVESTOCK	**$46,372,000**	**18%**
ALL CROPS & LIVESTOCK	**$259,013,000**	**100%**

Preliminary sales by commodity are shown in Table 1[2].

Table 2.
Yamhill County Top Five Commodities (2012)

Rank	Commodity	Sales (in dollars)
1	Nursery crops	$82,158,000
2	Wine grapes	$28,594,000
3	Tall fescue	$24,117,280
4	Dairy products	$22,540,000
5	Perennial ryegrass	$12,712,000

The top five sales by commodity are shown in Table 2[3].

[2] Oregon State University Extension Service, Economic Information Office, Oregon Agricultural Information Network (OAIN) *2011 Oregon County and State Agricultural Estimates*.
[3] Oregon State University Extension Service, Economic Information Office, Oregon Agricultural Information Network (OAIN) *Top 5 Commodities for Yamhill County (2012)*.

Table 3.
Yamhill County Harvested Acreage (2011)

Commodity	Acres	Percent
Grass & Legume Seeds	39,697	40%
Hays & Forage	19,450	20%
Grains	16,817	17%
Tree Fruits & Nuts	14,735	15%
Acreage Not Disclosed	5,743	6%
Field Crops	1,580	2%
Small Fruits & Berries	1,455	1%
Specialty Products	150	0%
Total Acres	**99,627**	**100%**

Preliminary harvested acreage for the County is summarized in Table 3[4].

It is worth reiterating that the classification of farm uses was based upon the primary farm use present on the tax lot for farm uses located in the BAS lands and based upon individual "crop areas" for the IVS Lands. Several parcels include multiple farm uses. As such, the harvested acreages will differ from the GIS calculated acreages to some degree between these two analysis areas and the IVS lands estimate for harvested acreage is a higher resolution for each crop type.

Table 4.
Farm Uses Identified on IVS Surrounding Lands

Farm Use	Acres	Percent
Grass Seed	1,813.6	81.8%
Orchard	194.3	9.0%
Nursery & Vegetables	53.3	2.5%
Grain (including corn)	53.4	4.9%
Barns & Facilities	18.5	0.9%
Nursery	9.3	0.4%
Pasture	5.2	0.2%
Farm Stand & Facilities	3.3	0.2%
Totals	**2,151.0**	**100%**

[4] Oregon State University Extension Service, Economic Information Office, Oregon Agricultural Information Network (OAIN) *2011 Oregon County and State Agricultural Estimates*.

Table 5.
Farm Uses Identified on BAS Surrounding Lands

Farm Use	Lots	Acres	Percent
Grass Seed	169	12,214.8	68.3%
Pasture	47	2,082.6	11.7%
Woodlot	27	1,070.4	6.0%
Orchard	17	826.1	4.6%
Vineyard	12	732.0	4.1%
Nursery & Field Crops	5	451.8	2.5%
Grain	1	158.9	0.9%
Tree Farm	1	150.5	0.8%
Pond	3	87.4	0.5%
Nursery	6	56.3	0.3%
Field Crop	2	40.2	0.2%
Totals	**290**	**17,870.9**	**100%**

4.2 Farm Practice Characterization

This section provides a broad summary of accepted farm practices associated with farm uses identified on surrounding lands. CSA sought data and information on farm practices from published sources where such data was readily available.

4.2.1 Orchard Farm Practices

The primary source of information for farm practices on nut orchards in the area was from the OSU Extension publications, accessed from the following website: http://extension.oregonstate.edu/yamhill/hazelnuts-filberts. This website lists extension service publications for hazelnut orchards. The Farm Impacts Assessment generally assumes that the orchards in the area are tree nut orchards (this was the only type of orchard observed in the fieldwork inventory). Farm practices for other tree nut orchards besides filberts are assumed to be substantially similar for impacts analysis purposes. The below tables are reproduced from OSU publication EM8556. These tables list all the major expenses associated with hazelnut farming in western Oregon. Money spent on farm management provides insight into the farm use activities themselves and lists the equipment types typically used. The associated cost estimates also indicate the relative efforts associated with the various farm practices for hazelnut farming.

Table 6.
Hazelnut Farming - $/acre economic costs and returns
in the Willamette Valley Oregon, 2008[5]

GROSS INCOME		Quantity	Unit	$/Unit	Total	Price/Lb
Hazelnuts		2,800	Pounds	$ 0.70		$ 0.70
Total GROSS Income					$ 1,960	
VARIABLE CASH COSTS	**Description**	**Labor**	**Machinery**	**Materials**	**Total**	**Cost/Lb**
Production Pruning	1.2 hours	16.80	15.94	0.00	32.74	0.012
Maintenance Pruning	1.5 hours	21.00	0.00	0.00	21.00	0.008
Brush Removal		3.40	4.67	0.00	8.07	0.003
Fertilizer – Urea		0.85	1.19	51.79	53.82	0.019
Potash		0.85	1.19	19.66	21.69	0.008
Lime		0.00	0.00	24.20	24.20	0.009
Herbicide Strip Spray	1.0 appl.	3.85	8.48	5.10	17.43	0.006
IPM Scouting		14.00	0.00	2.57	16.57	0.006
Nutrient Analysis		0.00	0.00	0.58	0.58	0.000
Sucker Control	4.0 appl.	10.27	14.36	9.50	34.13	0.012
Boron Spray	0.5 appl.	1.92	4.24	4.80	10.97	0.004
Filbertworm Spray	1.5 appl.	5.77	12.72	13.65	32.15	0.011
Flailing Orchard	3.0 times	10.19	17.89	0.00	28.08	0.010
Aphid/Leafroller Spray	0.25 appl.	0.96	2.12	4.16	7.24	0.003
Rodent Control		0.00	0.00	7.00	7.00	0.003
Leveling Orchard		2.26	3.75	0.00	6.02	0.002
Harvesting Nut		6.60	12.56	0.00	19.16	0.007
Sweeping Floor		8.88	10.00	0.00	18.88	0.007
Loading Totes		9.90	13.53	0.00	23.43	0.008
Washing & Drying Nuts	2800 Lbs	0.00	0.00	128.80	128.80	0.046
Pickup		0.00	40.50	0.00	40.50	0.014
Shop		0.00	0.00	6.92	6.92	0.002
Miscellaneous and Overhead		0.00	0.00	44.75	44.75	0.016
Interest: Operating Capital	6.0 mons	0.00	0.00	12.84	12.84	0.005
Total VARIABLE COSTS		117.51	163.15	336.30	616.95	0.220
FIXED CASH COSTS				**Unit**	**Total**	**Cost/Lb**
Machinery and Equipment Insurance				acre	7.54	0.003
Pickup Insurance				acre	9.99	0.004
Property Taxes				acre	5.00	0.002
Total CASH Costs					22.53	0.008
NON-CASH Costs						
Machinery and Equip - Deprec. & Interest				acre	191.61	0.068
Pickup - Depreciation & Interest				acre	30.19	0.011
Shop				acre	17.14	0.006
Land Interest Charge				acre	400.00	0.143
Amortized Establishment Costs				acre	$1,539.88	0.550
Total NON-CASH Costs					2,178.83	0.778

[5] Oregon State University Extension Service, *Table 1 from Enterprise Budget, Hazelnut, Willamette Valley, EM 8556, 2008*

Total FIXED COSTS	2,201.36	0.786
Total of All Costs Per Acre	2,818.31	1.007
Net Projected Returns	(858.31)	(0.307)

Table 7.
Estimated per acre returns over cash costs
at varying yields and prices

Pounds Per Acre							
Price per lb	1,600	2,000	2,400	2,800	3,200	3,600	4,000
$ 0.25	(184)	(103)	(21)	61	142	224	305
$ 0.40	56	197	339	481	622	764	905
$ 0.55	296	497	699	901	1,102	1,304	1,505
$ 0.70	536	797	1,059	1,321	1,582	1,844	2,105
$ 0.85	776	1,097	1,419	1,741	2,062	2,384	2,705
$ 1.00	1,016	1,397	1,779	2,161	2,542	2,924	3,305
$ 1.15	1,256	1,697	2,139	2,581	3,022	3,464	3,905

Table 7 estimates the returns over cash costs per acre based on varying yields and prices. In this budget, a grower should expect $1,321, based upon a yield of 2,800 pounds at $0.70 per pound. At this yield, breakeven occurs at approximately $0.25 per pound for cash costs.[6]

Table 8.
Estimated per acre returns over total economic costs
at varying yields and prices.

Pounds Per Acre							
Price per lb	1,600	2,000	2,400	2,800	3,200	3,600	4,000
$ 0.25	$ (2,363)	$ (2,282)	$ (2,200)	$ (2,118)	$ (2,037)	$ (1,955)	$ (1,874)
$ 0.40	$ (2,123)	$ (1,982)	$ (1,840)	$ (1,698)	$ (1,557)	$ (1,415)	$ (1,274)
$ 0.55	$ (1,883)	$ (1,682)	$ (1,480)	$ (1,278)	$ (1,077)	$ (875)	$ (674)
$ 0.70	$ (1,643)	$ (1,382)	$ (1,120)	$ (858)	$ (597)	$ (335)	$ (74)
$ 0.85	$ (1,403)	$ (1,082)	$ (760)	$ (438)	$ (117)	$ 205	$ 526
$ 1.00	$ (1,163)	$ (782)	$ (400)	$ (18)	$ 363	$ 745	$ 1,126
$ 1.15	$ (923)	$ (482)	$ (40)	$ 402	$ 843	$ 1,285	$ 1,726

Table 8 estimates the returns over total economic costs per acre based on varying yields and prices. In this budget a grower should expect -$858, based on 2,800 pounds at $0.70 per pound. At this yield, breakeven occurs at approximately $1.15 per pound for total costs.[7]

The above tables provide a detailed listing of key year-to-year farm practices and their associated costs. Irrigation, while not specifically listed above, is a farm practice typically associated with hazelnut farming.

Orchard establishment is a specific type of farm use that occurs several years before the year-to-year operating orchard practices begin. This is a highly technical process wherein the specific cultivar is selected for a site, irrigation systems are designed and installed, and tree starts are planted according the orchard design for the site. The inventory did not identify any sites being prepped for new orchard installation. However, certain sites were identified where recently planted orchards have been identified.

[6] Oregon State University Extension Service, *Table 5 from Enterprise Budget, Hazelnut, Willamette Valley, EM 8556, 2008*
[7] Oregon State University Extension Service, *Table 6 from Enterprise Budget, Hazelnut, Willamette Valley, EM 8556, 2008*

4.2.2 Farm Practices for Grass Seed, Grain and Hay

Atlas Pages 9 through 11 depict the considerable extent of grass seed farm use in the area. This is unsurprising given that OSU estimates 40 percent of the harvested acreage in Yamhill County is grass and legume seeds (primarily grass). The Oregon Agriculture in the Classroom Foundation website provides a good summary of grass seed production in western Oregon[8], and is recited herein below:

*"**How Grass Seed is Grown***

When a perennial grass field is being planted for the first time, and will be in production for many years, farmers take great care to make sure the field is properly prepared and weed free. Weed control is important to the health and profitability of a grass field because farmers are able to get more money for a crop with no weed seeds and the field will have higher yields.

Soil tests are taken to measure the field's pH levels. Lime may be added to raise the pH levels. The heavy rain in western Oregon soils can cause the soil pH level to drop and become too acidic for grass plants.

The next step is to prepare the field by tilling it and using herbicides to make the best seed bed possible. After the soil is tilled up and loosened, it is checked for pH and other nutrient levels. Once this is done the planting can begin. Planting occurs in both fall and spring depending on the variety. Varieties that are planted in the fall can start growing in the winter when the [sic] rains.

Carbon Banding

A planting drill is used to put the seed and fertilized [sic] into the soil. To help control weeds, farmers use carbon band seeding. Carbon banding is where a slurry of activated charcoal is sprayed over the rows where the seeds have been drilled. Next, an herbicide is sprayed over the entire field to control weeds prior to the weeds or grass seed germinating. The charcoal over the drill row adsorbs the herbicide and allows the grass crop to emerge unharmed.

Once the grass is established, additional herbicides may be used to control both volunteer grass seedlings and broad leaf weeds. Grass fields are typically fertilized with nitrogen, phosphorus, and potassium in March and April.

Rusts and other diseases are serious problems in some grass seed species and fungicides are used to help control them. These diseases that can plague grass seed crops can have their biggest impact on seed yield.

Grass seed farmers grow different varieties of grass to protect themselves from a poor crop. Rain, or hot and freezing temperatures that hurt one type of seed may actually help a different variety produce more seed. Farmers may lose money on one variety at times, but hope to make money on another.

Sheep

Sheep are sometimes used to graze the forage grass seed fields. Grazing is like pruning a tree. Wherever a blade has been cut off, the plant puts up more shoots. The more shoots, the more seed a plant will produce. The animals graze on the fields during the winter months through March.

Pests

Two other creatures that feed on grass fields are geese and slugs. They can destroy crops in a matter of days. They eat the grass and roots, leaving nothing, but a poor stand (crop) and mud.

Swamp Buggies

[8] http://aitc.oregonstate.edu/grown/comm_grass.htm#how

Since very few places grow grass seed the equipment they use must either be modified or manufactured by the dealer or farmer. Swamp buggies, for example, were created to apply fertilizers and chemicals on wet fields. A swamp buggy has huge, balloon-like tires that can move across the wet fields without leaving ruts. Since grass seed is grown mostly on wet soils, swamp buggies can go on fields during the winter and spring months when normal tractors would sink in the mud.

Harvesting

Harvest time for grass seed crops begins in late June or early July. A machine called a windrower or swather cuts the grass and lays it in rows. This is done while the grass seed is still somewhat green to prevent it from shattering. Seed shattering is a natural way seeds are dispersed.

The grass then dries in the sun and wind for about 5-10 days before being harvested. A combine separates the seed from the straw and spreads the straw back on the field. The seed is then transferred from the combine to trucks and transported to the seed cleaning warehouse." "A seed cleaner is used to remove the soil, weeds and small pieces of straw from the tons of harvested grass seed. The cleaner has several screens which move back and forth inside the cleaner and the good seed falls through the screens. The bigger pieces of weed and straw are left on the top screen. The bottom screen is finer and only the dirt and tiny weed seeds fall through. The good seed is left on top of the last screen.

Seed Certification

After cleaning, the seed is bagged and sampled for germination and purity. The price a farmer gets for the crop depends on how well the new seeds grow and if it contains any weed seeds. The definition of a weed is, "any plant where it is not supposed to be." So, if the crop is supposed to be ryegrass and the test shows Orchardgrass, then it has a lower value.

Many growers use the Seed Certification Service at Oregon State University or other private lab to test their seed. The certification program helps assure buyers the seed they buy is of a high quality. To meet certification standards, a grower's field must pass a seedling inspection, a crop inspection prior to harvest, and cleaned seed must meet germination and purity requirements.

A seed certification service inspects fields to evaluate if seed is genetically pure. The grass must be planted in rows so inspectors can easily check for weeds. These inspections are timed so off-type seeds, other crops and weed contamination can be easily detected. The inspector looks for evidence of volunteer plants, weeds or other problems that could cause problems in the genetic purity of the seed. Before each harvest, the crop is again inspected, usually when the plants are in the final stages of seed formation.

Certain harvesting practices must be followed to meet certification standards. If there are strips along the edges of a field that could be contaminated genetically by nearby fields, these must be harvested separately and seed lot records must be maintained for each lot. These isolation strips can only be sold as less profitable uncertified seed. Field equipment must also be cleaned when fields of different cultivars are harvested.

Finally, a sample from each harvested seed lot is tested for germination and mechanical purity by visual inspection.

Post-harvest residue management

In the mid-1940s open-field burning was a way growers controlled disease problems (ergot, blind seed, and seed gall nematode) and pest like rodents and slugs. Field burning was also used to dispose of straw following seed harvest. However, during the 1970s and 1980s this practice became increasingly controversial and as of 2010 is no longer an option.

By Products

As farmers adjusted to reduced field burning, a new export market developed for the straw. Over one billion pounds (600,000 tons) of grass and grain straw is now exported annually to Japan, Korea and Taiwan for dairy and beef cattle feed. These exports sales have an estimated value of $50-$60 million.

Forage grass is used for pastures for cattle and other livestock to graze on, roadside plantings, and is often used to help stop soil erosion. Turf grass seed is used for soccer and other types of sport fields, and is used on the fields of premier sporting events including the Super Bowl, World Cup Soccer, the Olympics and major golfing events. The straw from both types of grass is baled and sold for livestock feed.

Grass Species

There are many different kinds of grass seed and each type is used for a specific location and purpose.

Annual Rye - *Lolium multiflorum - (forage grass) It is a fast growing forage grass planted along roadsides and other areas requiring quick, economical ground cover. Annual Ryegrass is often used on hillsides to curb wind and water erosion problems.*

Perennial Rye - *Lolium perenne - (turf and forage grass) This is the most widely used grass in the world. It is used in the northern states for permanent turf and forage pastures and for overseeding of dormant grasses in the southern U.S.. It has been s[sic] cultivation as a forage grass since the 17th century.*

Tall fescue - *Festuca arundinacea - (turf and forage grass) This is a popular grass in the transition zone between northern cool-season grass species and warm-season southern species.*

Bentgrass - *Agrostis capillaries - (turf grass) Oregon produces nearly all the Bentgrass seed grown in the United States. Predominantly a Willamette Valley crop, Bentgrass seed is exported in large quantities to Europe and the central and northern states for use in turf mixtures. This grass is widely used on golf courses throughout the world.*

Fine Fescue - *Festuca rubra spp. rubra - (turf grass) This group of grasses is used for golf courses. It grows well in shaded areas and is very drought tolerant.*

Orchardgrass - *Dactylis glomerata (forage grass) This grass is used in the northern states for pastures and grass hay. Oregon is the nation's leading producer of orchard grass seed and it is most commonly used for cattle feed."*

The farm inventory data collected for the analysis generally classified lands that appeared to be intensively cultivated for grass as *grass seed*. Without interviewing every property owner and/or trespassing onto private property, it is difficult to discern which lots are devoted to grass seed production and which might be devoted to hay or cereal grain production from the available inventory data. As such, the mapping and summary data assumes grass seed production for these lands unless the inventory data was definitive. However, the actual cultivation could be grains or simply hay. From an impacts analysis standpoint, this approach is more conservative because grass seed is the most intensive form of this general cultivation category. This approach is appropriate for impacts analysis purposes because the farm practices are similar (except for native hay which is less complex), as summarized in the below data prepared Gregory Butler[9].

[9] Gregory Butler holds a Master of Science Degree in Natural Resources and the Environment from the University of Arizona.

Table 9.
Perennial Ryegrass Farm Practices

Establishment
▪ Soil Sample
▪ Disk (multiple times)
▪ Rip
▪ Plow
▪ Harrow & Roll
▪ Lime
▪ Harrow & Roll
▪ Plant Seed
o Charcoal
▪ Seedling Weed Control
o Spray Bug60 7 mph
o GlyphosateGAL3
o Surfactant--Induce
▪ Ditching
▪ Seedling Weed Control
o Spray Bug60 7 mph
▪ Nortron (pt)
▪ Slug Control
▪ Fertilize - Spring
o 33-0-0-12 LB
o 46-0-0 Urea LB
▪ Rodent Control
▪ Broadleaf Weed Control
o Spray Bug60 7 mph
o 2, 4-D
o Banvel
▪ Rogue Weed Control
▪ Border Spray
▪ Plant Growth Reg.
o Spray Bug60 7 mph
o Apogee (PGR)
▪ Rust Control
o Spray Bug60 7 mp
o Quilt/Fungicide
o Surfactant--Induce
▪ Swath
▪ Flail

Production
▪ Fall Fertilizer
o 16-16-16 LB
▪ Seedling Weed Control
o Spray Bug60 7 mph
o Prowl H20
o AziomOZ
o Surfactant--Induce
▪ Slug Control
▪ Fertilize - Spring
o 33-0-0-12 LB
o 46-0-0 Urea LB
▪ Broadleaf Weed Control
o Spray Bug60 7 mph
o 2, 4-D
o Banvel
o Surfactant--Induce
▪ Rogue Weed Control
▪ Plant Growth Reg.
▪ Spray Bug60 7 mph
▪ Palisade (PGR)
▪ Rust Control
o Spray Bug60 7 mph
o Quilt/Fungicide
o Surfactant--Induce
▪ Swath
▪ Combine
▪ Clean & Bag Seed
▪ Custom Bale
▪ Flail
▪ Border Spray

Table 10.
Spring Wheat Farm Practices

Operations
▪ Disk
▪ Fertilize - Spring
o 16-16-16 LB
▪ Plant
o Drill

Operations
o Harrow/Cultipacker
o Treated Sp.Wht. Seed
▪ Spring Grass/Broadleaf Control
o Spray Bug60 7 mph
o MCPA Amine
▪ Fertilize - Spring
o Spray Bug100 7 mph
o 40-0-0-6 LB
▪ Fungicide & Insecticide
o Spray Bug60 7 mph
o Stratego
o Diomethoate
▪ Combine
▪ Haul Grain
o Transport to PDX

Table 11.
Tall Fescue Farm Practices

Establishment
▪ Soil Sample
▪ Plow
▪ Disk (multiple times)
▪ Harrow & Roll
▪ Lime
▪ Harrow & Roll
▪ Seedling Weed Control
o Spray Bug60 7 mph
o GlyphosateGAL1
▪ Border Spray
▪ Plant Seed
▪ Drill
▪ Chemical Fertilizer - Spring
o 16-16-16 LB
▪ Broadleaf Weed Control
o Spray Bug60 7 mph
o Bronate
▪ Insect Control
o Spray Bug60 7 mph
o Lorsban
▪ Border Spray
▪ Flail

Production
▪ Fall Weed Control
o Spray Bug60 7 mph
o AxiomLB
o Goal
o Diuron
▪ Fall Fertilizer
o 16-16-16 LB
▪ Broadleaf Weed Control
o Spray Bug60 7 mph
o 2, 4-D
o Banvel
o Surfactant--Induce
▪ Fertilize - Spring
o 40-0-0-6 lb
o 0-0-60 lb
▪ Plant Growth Reg.
o Spray Bug60 7 mph
o Apogee (PGR)
▪ Fungicide
o Spray Bug60 7 mph
o Quilt/Fungicide
o Surfactant--Induce
▪ Border Spray
▪ Swath
▪ Combine
▪ Flail
▪ Clean & Bag Seed

Table 12.
White Clover Farm Practices

Establishment and Year 1 Production
▪ Soil Sample
o Grid Sample
▪ Flail
▪ Disk
▪ Lime
▪ Harrow & Roll
▪ Land Level
▪ Harrow & Roll
▪ Plant
o Drill
o 3-Point Blade
o White Clover Seed
o 10-34-0 LB
o Slug Bait
o 32 Solution LB
▪ Slug Control
▪ Fall Grass & Insecticide
o Spray Bug80 7 mph
o Select
o Lorsban
o Surfactant
▪ Spring Fertilizer
o 16-20-0-14 LB
o 0-0-60 LB
o 0-0-21-21S-10.5 Mg
o 46-0-0 Urea LB
o 10-34-0 LB
o Boron
▪ Rodent Control
▪ Spring Herbicide
o Spray Bug80 7 mph
o Kerb
o MCPA Amine
o Surfactant
▪ Spring Grass Control
o Spray Bug80 7 mph
o Select
o Surfactant
▪ Spring Broadleaf Control
o Spray Bug80 7 mph
o Basagran
o Raptor
o Surfactant
▪ Bee Pollination
▪ Insect Control
o Spray Bug80 7 mph
o Capture
▪ Swath
▪ Combine
▪ Clean & Bag Seed

Year 2 Production
▪ Slug Control
▪ Winter Broadleaf Control
o Spray Bug80 7 mph
o Kerb
▪ Rodent Control
▪ Spring Fertilizer
o 0-0-60 LB
o 16-20-0-14 LB
o 0-0-21-21S-10.5 Mg
o 11-52-0
o Boron
▪ Spring Herbicide
o Spray Bug80 7 mph
o Goal
o Gramoxone Inteon
o MCPA Amine
o Surfactant
▪ Spring Broadleaf Control
o Spray Bug80 7 mph
o Basagran
o Raptor
o Surfactant
▪ Spring Grass Control
o Spray Bug80 7 mph
o Select
o Surfactant
▪ Bee Pollination
▪ Insect Control
o Spray Bug80 7 mph
o Capture
▪ Swath
▪ Combine
▪ Clean & Bag Seed

Table 13.
Native Hay Farm Practices

Operations	Machine
▪ Farm Pickup	▪ Old Tractor
▪ Drag Meadows	▪ Loader Tractor
▪ Custom Ditch Maintenance	▪ Pull Swather
▪ Clean Ditches	▪ Ditcher
▪ Fertilizer (nitrogen)	▪ Drags/Harrow
▪ Flood Irrigate	▪ Hay Wagon
▪ Swath	▪ Round Baler
▪ Rake	▪ Side Deliver Rake
▪ Bale	▪ Pickup
▪ Haul & Stack	▪

4.2.3 Farm Practices for Pasture with Livestock

The farm use inventory identified relatively few pasture sites with associated livestock on surrounding lands. Large scale ranching operations can involve some complicated and technical farm practices. However, the nature and scale of the observed livestock and associated pastureland on surrounding lands of Riverbend Landfill were such that more simplified practices would be expected.

Farm practices would involve field fencing construction and maintenance, livestock medical treatments, animal feeding during times of low food sources, pasture rotations, livestock watering, and related activities. The pasture itself might be irrigated. Rodent control practice is typically employed. Occasional chemical treatments including weed control and nutrient supplies are common.

During the Planning Commission proceedings, project opponents identified specific additional farm practices related to specific livestock practices on specific lands:

- Lambing is a farm practice for sheep ranching. Redmond farms described farm practices that include practices to prevent corvid harassment and potential predation by corvids.
- McPhillips farms identified dairy goats and milking as an accepted farm practice of dairy goat farming.
- McKinney farms were identified to have a cattle operation that appears to consist of an approximately 12 acre area of pasture and associated barns. The initial inventory identified these as having pasture which was assumed to include livestock.

4.2.4 Poultry, Pheasants, Ducks, and Eggs

McPhillips farms identified pheasant rearing as a farm use. The best available data CSA Planning could locate to identify accepted farm practices for pheasant rearing is Publication 8155 from the Division of Agriculture and Natural Resources at UC Davis. This 25-page publication provides an excellent overview of game bird farming practices which includes pheasant farming. This publication is provided in Appendix E and is incorporated herein as Applicant's summary of the customary and accepted farm practices associated with raising pheasants.

Valley Creek Farm was identified by Friends of Yamhill County to have poultry, ducks and egg production from poultry. McPhillips farm indicated they have chickens as well. Poultry farming involves feedings, constructing coops and pens, cleaning coops and pens, picking up eggs, and incubating and hatching chicks if not raised from a pullet.

4.2.5 Farm Practices for Field Crops and Vegetables

Farm practices for the production of field crops and vegetables varies to some extent according to the type of vegetables and field crops being grown. Many of these crop types require irrigation and associated infrastructure and maintenance. These crops are typically annuals and must be planted anew each season. This involves preparing the field for planting by tilling the soil, applying appropriate chemicals such as pesticides, herbicides and nutrients. Planting typically occurs in the spring. Crops are tended through the summer months with additional fertilizers, pesticides and herbicides for weed control for the particular crops under cultivation. Farm practices typically include rodent control. Harvest occurs in late summer and into fall depending on the crop type. Harvest methods vary by crop. Most field crops and vegetables must be brought to market quickly after harvest.

Generally, field crops and vegetables are somewhat limited in their level of mechanization except as part of very large commercial operations for singular crop types which were not observed in the inventory data collection for surrounding lands. Smaller operations require more manual labor and overall higher labor inputs when compared to other farm uses that can achieve greater levels of mechanization. Most smaller-scale field and vegetable crop operations utilize a standard tractor with attachments appropriate to their crops such as discs, sprayers, trailers, and more specialized harvesters if appropriate.

4.2.6 Farm Practices for Nurseries

Several nurseries are located on surrounding lands. Nurseries in the Willamette Valley typically are container nurseries. These nurseries produce ornamental plants in individual potting containers for sale at wholesale and retail establishments. Some nurseries also sell direct to consumer at their respective farm site. Most nurseries have tens to hundreds of plant varieties.

Nurseries often have greenhouses to extend the growing season and accelerate production. Nurseries require irrigation. However, many nurseries have irrigation water recycling systems to reuse water that drains through its containers. Nurseries are labor intensive farm uses and involve nearly constant pruning, fertilizing, pest control and irrigation management.

Products need to be available for supply to market throughout the planting season. Peak periods of market demand are the spring and fall.

Planting and propagation methods vary by plant variety. New soil imports for container planting must be made available from either on-farm sources or the importation of soils.

4.2.7 Farm Practices for Vineyards

The surrounding vineyard lands are all located within the McMinnville American Viticultural Area. Basic information on this wine growing region is quoted from the AVA's website below:

The McMinnville AVA lies due west of the town of McMinnville in the Coast Range Foothills of Yamhill County. This AVA is the most westerly of all Oregon AVAs and is

geologically and climatically very different from any other in the Willamette Valley. An AVA or "American Viticultural Area" is defined as a delimited, grape-growing region distinguishable by unique geographical features and recognized by the Bureau of Alcohol and Tobacco as having unique characteristics.

Geologically, the soils in the McMinnville AVA are the oldest and most complex of any Oregon AVA with a combination of marine sedimentary soils and basalt. The soils in our AVA were created during the Eocene period 38-55 million years ago and were the result of a combination of Cascade Mountain lava flows and tectonic plate movements that created the Coast Range Mountains. The plate movement exposed ancient and weathered soils in the foothill regions where our AVA is located and the lava flows created 'basal lava fingers' which can be seen amongst marine soils in the McMinnville AVA vineyards. The soils are primarily uplifted marine sedimentary loams and silts, with alluvial overlays. Beneath is a base of the uplifting basalt. Clay and silt loams average 20-40 inches in depth before reaching harder rock and compressed sediments, shot with basalt pebbles and stone. The uniqueness of the soils for winegrowing is in the 20 to 40 inch depth.

Climatically, this AVA is again in a class of its own. These primarily east and south facing slopes facing sit in a protected weather shadow of the Coast-range Mountains. Rainfall is lower (33 inches annually) than sites only 12 to 20 miles to the east. The foothills also provide protection from chilling winds in the unstable air conditions of the spring and fall. Winegrowers also have the option of placing vineyards on more southerly facing sites to take advantage of the drying winds from the Van Duzer corridor, which helps control mold and mildew on the grapes during Oregon's humid summer days.

Critical to vineyard farming practice is the siting and designing of the vineyard itself. It is necessary to select the proper varietals for a particular terroir. The vineyard should be designed to take maximum advantage of solar and micro-climate affects.

Vineyards are a high intensity agricultural practice. According to *Oz Clarke's Wine Atlas, Wines & Wine Regions of the World*, (Little, Brown and Company, 1995) the farming practices associated with ongoing viticulture are: in winter, grape vines are pruned as a way to control the yield. Sometimes the vines are chip budded to change varieties. If new planting is planned, it is done in the spring once the ground has warmed and the risk of frost is reduced. Spring is also the time fertilizers and pesticides are applied to the grape vines , which is typically done mechanically but can also be done by hand. Throughout the growing season, new foliage is tied to the wood and wire supports that are common to viticulture throughout the world. In spring, mechanical spray equipment is used to treat the vines with chemicals to prevent or suppress mildew and other diseases common to grapes. Irrigation is applied, as needed, throughout the growing season – typically by overhead sprinklers or drip irrigation. Water management is critical to wine grape quality to obtain optimum sugar levels at the time of harvest. The vines are pruned again in summer to prevent excess foliage from shading the grapes. Methods are often employed to protect grapes from birds once the grapes begin to ripen. In the fall, grapes are constantly monitored for sugar content. Harvesting occurs (either mechanically or by hand) during a very short window when grape sugar content is optimal for wine production of the particular varietal being cultivated. The grapes are processed then into wine. After the grapes have been harvested, winter pruning is undertaken in preparation of the next season.

4.2.8 Farm Practices for Christmas Tree Farms

There is one Christmas tree farm on surrounding lands. Christmas tree farming involves the planting of conifers (typically firs such as noble, grand and Douglas). Some Christmas tree farms utilize a direct to consumer sales model where customers come to the farm and select their desired tree. Others farms harvest and transport them to retail sales lots in more populated market areas. Trees can be planted from starts from conifer nurseries or from seed. Trees are routinely pruned to produce "full" trees. Market ready trees typically take 6 to 10 years from seedling. Irrigation may be used to establish trees. Precipitation in western Oregon is typically sufficient to allow trees to grow without supplemental irrigation after establishment. Varying levels of nutrient management occur for a given farm operation, which can be done by tractor or by hand. Final pruning occurs before sale to optimize tree aesthetics.

4.2.9 Farm Practices for Apiary (Beekeeping)

Below is a summary of accepted beekeeping practices in the Northwest summarized from the Clark County Beekeepers' website, see link: http://www.ccbees.net/beekeeping-calender.html.

Table 14.
Beekeeping Practices

Farm Practices						
Month	Check Hives	Supplementary Feeding	Equipment Assembly/ Maintenance/ Winterize	Divide/ Combine Hives/ Flipping	Supers and Harvesting	Pest Management (Yellow Jackets, Mites, Mice, Wax Moths)
January	X	X	X			
February	X		X			
March	X	X		Flipping/ Combine		Mites
April	X	X		Divide		
May	X			Divide		
June	X				Supers	
July	X				Harvest	
August	X				Harvest	Mites and Yellow Jackets
September	X	X	Winterize	Combine		Yellow Jackets, Mice
October	X		Winterize			Moths
November	X	X				
December	X					

4.2.10 Local Farmer Interviews

CSA Planning interviewed a local farmer who primarily farms hazelnuts on surrounding lands. He operates one hazelnut farm that is essentially adjacent to the landfill, another that is approximately 1 mile away and a third that is approximately two miles away. The oldest and the youngest orchard is the orchard closest to the landfill. Most of this orchard is approximately 30 years old and is being replanted. The first replanted portion is three years old. The orchard approximately a mile away is approximately 15 years old. The orchard that is approximately two miles away is five years old.

The farmer stated that he has not experienced any negative impacts to his farming practices from the proximity to the landfill. He stated that his operations and practices are the same for the orchard that is nearest to the landfill from the one that is located farther away. He indicated that crop losses due to bird destruction are not noticeably different for any of the orchards. He stated rodent control practices are the same for all three orchards and that greater impacts from the orchards closest to the landfill have not been observed.

4.3 Potential Impacts from Landfill Externalities

The purpose of this section is to identify the landfill externalities that must be analyzed for potential farm impacts.

4.3.1 Externalities Identified with Logical Potential for Impacts

Identifying and determining landfill expansion externalities that have discernable potential to change accepted farming practices or to increase the cost of accepted farming practices on surrounding lands involves a deductive process that ties potential threats to accepted farm practices to the externality character. Not all landfill expansion externalities are necessarily a threat to a given farming practice. Thus, the universe of all possible landfill externalities need not be analyzed if there is no discernable potential for that externality to change accepted farming practices or to increase the cost of accepted farming practices on surrounding lands.

Based upon the farm uses and associated farm practices on surrounding lands, the following landfill expansion externalities have a discernable potential to change accepted farming practices or to increase the cost of accepted farming practices and warrant further evaluation:

- Litter
- Water Quality Impacts
- Air Particulates
- Traffic
- Nuisance Bird Attraction
- Rodent (and other Vermin) Attraction

During the proceedings, two additional externalities were identified by opponents, odor and noise.

4.3.2 Assessment of Externalities' Potential Intensity and Scale

The next step in the inquiry is to determine if each of the above identified landfill externalities has sufficient potential from the standpoint of scale and intensity that could cause significant impacts. The potential scale and intensity of each of the above identified externalities is assessed below:

- ***Litter*** – Litter is simply refuse destined for the landfill that either never made it to its destination in the landfill or somehow managed to escape the landfill prior to compaction and covering. Landfill management requires litter containment and elimination efforts. Litter containment and elimination is an operational challenge that is managed now and will continue to be managed in the future.. The intensity

and scale of potential litter impacts are expected to be concentrated along the delivery route (being Highway 18) and for properties located adjacent to the landfill site. The degree to which litter has the potential to change farm practices will vary by the type of farm practice and the success of litter containment and elimination management practices. For these reasons, potential for impact to farm practices from litter warrants detailed analysis.

- ***Water Quality*** –Prior to modern landfill design and construction, documented impacts to water quality from other landfills occurred due to leachate infiltration. Those historical impacts to water quality triggered the creation of EPA *Sub-Title D* regulations with which new landfills (or landfill expansions) must comply. These regulatory changes ushered in a new era of landfill design and construction technology. The engineering and design of landfills has evolved over the last thirty years. These technological and regulatory advancements in landfill design and construction have functionally eliminated water quality impacts resulting from leachate transmission through a landfill built to modern standards. This conclusion is based on expert opinion that the rate of failure is effectively zero and the functional life of the design exceeds the period of time the decaying refuse represents a significant risk to water quality. Once the landfill is closed, the volume of leachate diminishes significantly because the water cannot enter the landfill through the cap nor escape it through the liner.

  With a properly designed and constructed liner system built to modern standards, water quality impact potential at Riverbend Landfill is essentially limited to two sources – storm water and leachate seepage. These two sources of potential water quality impact are analyzed in Appendix C prepared by SCS Engineering. That technical analysis concludes that regulatory requirements of ODEQ and resulting best management practices of Riverbend Landfill render significant risk to water quality from storm water or leachate seepage to be very limited.

  Based upon the technological advancements in landfill design and construction that are standard industry practice and further mandated by ODEQ regulations and the regulatory monitoring and management required prior to closure, the scale and intensity of water quality externalities appears limited and not sufficient to cause significant changes to accepted farm practices or to increase the cost of accepted farm practices on surrounding lands. A more detailed evaluation of potential impacts is therefore not warranted.

- ***Air Particulates*** **–** The Riverbend Landfill has a Title V point source permit for air particulate emissions. This permit sets a cap on air particulate emissions that are allowed under applicable ODEQ and EPA regulations. On the basis of the particulate emissions permitting alone, air particulate externalities warrant detailed evaluation for potential impacts to farm practices.

- ***Traffic*** **–** New uses that create significant changes in traffic volumes on certain roads used in farming operations have the potential for significant impacts to farm practices. However, the scale and intensity of traffic externalities for the Riverbend

Landfill expansion are limited. Two factual circumstances exist to support this expectation. First, the landfill is already in operation so no actual changes to the traffic patterns will occur from the existing conditions due to the landfill expansion itself. Second, Riverbend Landfill has access directly to Highway 18. Highway 18 is a higher volume State Highway. Any farm practices utilizing this road must be conducted in a manner that negotiates the traffic volumes on Highway 18. Highway 18 has over 1175 cars per hour just in the PM peak, or a car every 3.06 seconds on average, see Appendix D with traffic study for the prior zone change. Of these cars, Riverbend Landfill expansion at full build-out in the future (including a separate green-tech facility not part of the subject application) is only 48 trips or 4.1% of the total peak hour traffic volumes. For the above reasons, the scale and intensity of traffic externalities for the Riverbend Landfill expansion are sufficiently limited that significant impacts to accepted farm practices is not expected and does not warrant detailed analysis.

- ***Nuisance Bird Attraction*** – Landfills have the potential to attract birds – especially corvids (such as jays and ravens), gulls and pigeons. Birds can and do harm certain types of crops. Given this relationship, nuisance bird attractant externalities warrant detailed evaluation for potential impacts to farm practices.
- ***Rodent (and other vermin) Attraction*** – Landfills have the potential to attract and to propagate rodents and other vermin. Rodents and other vermin can and do harm certain types of crops. Given this relationship, rodent attractant externalities warrant detailed evaluation for potential impacts to farm practices.

The Planning Commission received testimony raising the issue of noise associated with the landfill. Much of that testimony concerned effects on nonfarm uses which are not relevant to the Farm Impact Assessment. The farm impact testimony related to noise concerned pheasant rearing on the McPhillips farm and impacts to sheep. Appendix E provides a detailed guide to raising game birds, including a number of management practices to mitigate mortality risks. The guide includes no mention of noise sources as a significant source of mortality nor does it make specific recommendations for infrastructure construction or facility siting to avoid noise sources on the order of 40.8 L_{10} dBA or less. A 40.8 L_{10} dBA is a sound pressure level that is similar to a quiet bedroom or bird call and is the sound level calculated by Minor and Associates to be present at the residence near the McPhillips farm during operations. A review of the literature reveals an article by Robert Beason from USDA National Wildlife Research Center, see Appendix F. The context of this article was to consider avian hearing overall in relation to behavior response to noise sources. The article evaluates noise sources as a means to deter problem bird behavior. The conclusion of the article is that birds habituate to the noise sources not associated with predation. Noise sources from the landfill, which are low overall and not associated with predation, would be expected to have limited impact.

Kris Bledsoe provided testimony to the record that chicken laying eggs were sensitive to noise but no specific farming operation is identified so it is difficult to know what operation would be affected. Kris Bledsoe also provided testimony that sheep were sensitive to noise and cited three sources. The first two sources were Knight and Cole 1991 and Anderson and Keith 1980. No additional citation information was provided. A Google internet search of these references did not identify relevant articles. The only

references with these names and years associated with them for sheep noise studies CSA identified were for *big horn* sheep. Big horn sheep are wild sheep and would be expected to have very different behaviors from domestic sheep. The additional citation provided was for Harlow 1987, this article is provided in Appendix G. This article concerned experiments that were designed to stress the sheep and the chronic noise referenced in the Bledsoe letter involved a smoke alarm buzzer *[typically ~75db]* randomly set off within each of the confined sheep pens. The methods of this study are not comparable to the level of potential noise impacts on any surrounding farmlands estimated in the Minor and Associates noise study.

Without more detailed and specific evidence of impacts to a farm practice in relation to the limited potential for off-site noise above ambient levels, the scale and intensity of noise externalities for the Riverbend Landfill expansion are sufficiently limited that significant impacts to accepted farm practices is not expected and does not warrant detailed analysis.

4.3.3 Specific Farm Practices vs. Specific Externalities with Potential to Cause Impacts

The next step in the analytic process is to "cross-tab" the specific farm practices identified to be occurring on surrounding lands with the specific landfill externalities that warrant detailed evaluation. This is the last methodological step in the process to match which accepted farm practices need to be evaluated for potential impacts from specific potential landfill externalities. The below matrix depicts this cross-tab procedure. Potential for impact to a given farm practice from a given landfill externality is assigned one of three categories – INA which stands for potential Impact Not Apparent, LP which stands for Limited Potential, HP which stands for Heightened Potential.

Table 15.
Orchards Farm Practices
Level of Potential Impacts

	Generalized Farm Practice	Litter	Air Particulates	Nuisance Bird Attraction	Rodents (& Vermin)
Orchards	Orchard Establishment	INA	LP	INA	LP
	Crop Growth	INA	LP	INA	LP
	Chemical and Nutrient Applications	LP	LP	INA	INA
	Brush Removal	LP	INA	INA	INA
	Pruning	INA	INA	INA	INA
	Irrigation	LP	INA	INA	INA
	Rodent Control	LP	INA	LP	HP
	Bird Control	LP	INA	HP	LP
	Sucker Control	LP	INA	LP	LP
	Flailing Orchard Floor	LP	INA	INA	INA
	Leveling Orchard Floor	LP	INA	INA	HP
	Harvest and associated Nut Sweeping	HP	INA	HP	HP
	Washing and Drying Nuts (if onsite)	LP	LP	INA	HP

Table 16.
Grass Seed Farm Practices

Level of Potential Impacts

	Generalized Farm Practice	Litter	Air Particulates	Nuisance Bird Attraction	Rodents (& Vermin)
Grass Seed (assumed to include similar farm practices for grain and native hay production)	Chemical and Nutrient Applications	LP	LP	INA	INA
	Crop Growth	INA	LP	INA	LP
	Bird Control	LP	INA	LP	LP
	Rodent Control	LP	INA	LP	HP
	Planting	LP	INA	HP	HP
	Weed Control	LP	INA	INA	INA
	Tilling/Disc	LP	INA	INA	LP
	Sheep Grazing	INA	INA	INA	LP
	Swathing for Harvest	LP	INA	LP	LP
	Combine (& thresh)	HP	INA	INA	LP
	Clean and Bag Seed	HP	LP	INA	LP
	Straw baling or Flail	LP	INA	INA	LP

Table 17.
Pasture with Livestock Farm Practices
Level of Potential Impacts

	Generalized Farm Practice	Litter	Air Particulates	Nuisance Bird Attraction	Rodents (& Vermin)
Pasture (w/Livestock)	Chemical and Nutrient Applications	LP	LP	INA	INA
	Pasture Growth	INA	LP	INA	INA
	Animal Growth	INA	INA	INA	INA
	Birthing	INA	INA	LP	LP
	Medication	INA	INA	LP	LP
	Milking (only for dairy livestock)	INA	INA	INA	LP
	Rodent Control	LP	INA	LP	HP
	Livestock Medical Treatment	INA	INA	INA	INA
	Feeding and Watering	INA	INA	INA	INA
	Fence Maintenance	INA	INA	INA	INA

Table 18.
Poultry, Pheasants, Egg Production Farm Practices
Level of Potential Impacts

	Generalized Farm Practice	Litter	Air Particulates	Nuisance Bird Attraction	Rodents (& Vermin)
Poultry, Pheasants, Egg Production	Feed Production (if applicable)	INA	LP	INA	INA
	Animal Growth	INA	INA	LP	LP
	Incubating/Hatching	INA	INA	INA	LP
	Medication	INA	INA	LP	LP
	Egg Laying, Egg Collection	INA	INA	LP	LP
	Rodent Control	LP	INA	LP	HP
	Feeding and Watering	INA	INA	INA	INA
	Pen Construction and Maintenance	INA	INA	INA	INA

Table 19.
Field Crops Farm Practices
Level of Potential Impacts

	Generalized Farm Practice	Litter	Air Particulates	Nuisance Bird Attraction	Rodents (& Vermin)
Field Crops and Vegetables	Chemical and Nutrient Applications	LP	LP	INA	INA
	Crop Growth	INA	LP	INA	LP
	Bird Control	LP	INA	HP	LP
	Rodent Control	LP	INA	LP	HP
	Tilling and Planting	LP	INA	HP	HP
	Tilling/Disc	LP	INA	INA	LP
	Harvest (by hand or automated tractor)	HP	INA	HP	HP

Table 20.
Plant Nurseries Farm Practices
Level of Potential Impacts

	Generalized Farm Practice	Litter	Air Particulates	Nuisance Bird Attraction	Rodents (& Vermin)
Plant Nurseries	Chemical and Nutrient Applications	LP	LP	INA	INA
	Bird Control	LP	INA	HP	LP
	Rodent Control	LP	INA	HP	HP
	Plant Starts (typically in greenhouse)	INA	INA	INA	INA
	Pruning	LP	INA	INA	INA
	Plant Growth	LP	LP	INA	INA
	Irrigation	LP	INA	INA	INA
	Soil Stockpiling	LP	INA	INA	LP
	On-site Composting	LP	INA	LP	HP

Table 21.
Vineyards Farm Practices
Level of Potential Impacts

	Generalized Farm Practice	Litter	Air Particulates	Nuisance Bird Attraction	Rodents (& Vermin)
Vineyards	Vineyard Design and Installation (includes trellising and planting)	INA	INA	LP	LP
	Bird Control	LP	INA	HP	LP
	Rodent Control	LP	INA	LP	HP
	Pruning	LP	INA	INA	INA
	Weed Control	LP	INA	LP	INA
	Frost Protection	INA	INA	INA	INA
	Irrigation	LP	INA	INA	LP
	Application of nutrients and other chemicals	INA	INA	INA	INA
	Grape Growth	INA	LP	LP	LP
	Harvest (mechanical or by hand)	INA	INA	HP	HP

Table 22.
Christmas Tree Farm Practices
Level of Potential Impacts

	Generalized Farm Practice	Litter	Air Particulates	Nuisance Bird Attraction	Rodents (& Vermin)
Christmas Tree Farms	Chemical and Nutrient Applications	LP	INA	INA	INA
	Planting	INA	INA	INA	LP
	Weed Control	LP	INA	LP	LP
	Irrigation for new plantings	LP	INA	INA	LP
	Pruning	LP	INA	INA	INA
	Tree Growth	INA	LP	INA	LP
	Harvesting	INA	INA	INA	LP

The one additional farm use identified was an Apiary (Beekeeping). In reviewing the list of typical farm practices for an apiary, CSA did not identify any practices likely to be significantly affected by a landfill. CSA reviewed the Journal of Apicultural Science for the last 11 years and found no scholarly research on impacts from landfills on bee health. There are a wide array of variables that affect bee hive health and CSA could not identify any potential causal relationships between apiary farm practices and landfill operations generally or an expansion specifically.

4.3.4 Farm Practices and GIS Inventory Data Synthesis

The final step in the analysis is evaluating potential impacts to farm practices with specific farm use geography and landfill operations/management efforts taken into account. The geographic dimensions of each of the landfill externalities with potential for significant impacts to accepted farming practices is analyzed below:

- ***Litter*** – The potential for litter impacts is expected to be limited by geography. The geographic extent of this potential impact is expected to be limited to properties north and south of the landfill between Highway 18 and the South Yamhill River and properties north of Highway 18 north and northwest of the landfill. Prevailing winds are such that it would be rare for litter to be carried west or southwest of the landfill. Wind rose plots for the McMinnville Airport indicate winds blow with headings from the southeast through the northeast directions approximately 5% of the time or a total of about 18 days-worth of time each year, and the strength of winds from this direction exceeds 7kts only about 0.8% of the time, or less than three days-worth of time. Surrounding lands devoted to farm use to the east are protected to a significant extent by the riparian area of the South Yamhill River. Potential litter impacts are expected to be most acute immediately north and south of the landfill and right along and east of the Highway 18. See Atlas Pages 7 and 13. CSA Planning conducted a litter density analysis and it is provided in Appendix K; the results of that analysis indicate litter concentrations are at or below levels that exist on other highways in the area not used to any significant degree by landfill operations.

- ***Air Particulates*** – Potential for air particulate impacts is expected to be affected by geography to a significant degree. The geography with the greatest potential for air emission impacts is expected to be properties north and south of the landfill between Highway 18 and the South Yamhill River due to prevailing winds. Prevailing winds are such that it would be infrequent for emission particulates to be carried to the west

or southwest. South Yamhill River would provide a significant windbreak to the east but strong winds still have potential to carry particulates that direction. Many farm uses, especially ones that involve a lot of tilling and disc work that are common in the area, produce air particulate emissions. Thus, the overall background air quality in the area is expected to be determined in significant part by the existing farm practices surrounding the landfill. See Atlas Pages 10 through 13.

- ***Nuisance Bird Attraction*** – The geographic extent of nuisance bird attraction is difficult to quantify without extensive scientific research. Attracted birds are primarily corvids, gulls and pigeons. These birds are all mobile and are naturally prevalent irrespective of the landfill's existence or expansion; it is not expected that the landfill has a significant effect on the overall populations of these birds in the region and only micro-level attraction and patterns in and around the landfill are expected. It is expected that any potential for bird attraction impacts to agriculture diminishes with increasing distance from the landfill but the rate at which this occurs is not known with specificity, especially because intervening factors such as nearby vineyards or urban uses would interrupt any predictable decrease. ODEQ Administrative Rules for landfill operation requires bird control (see OAR 340-094-040(10)). This creates a downward pressure on populations at the landfill. Thus, it is expected that patterns of corvids, gull, and pigeons that live beyond 2.5 miles of the landfill expansion would have limited attraction and associated visitation to the landfill as part of their habits. See Atlas Pages 10 through 13. Analyzing any correlation between the landfill and increased bird populations is complicated by the fact that species attracted to the landfill are also species affected by urbanization overall. As an example of this trend, Appendix H contains an article by Marzluff (et al 2001) on crow populations in relation to urbanization. The article documents a correlation between urban population growth and crow population growth (including analysis of the northwest populations in and around Seattle and to a lesser degree Portland). The actual number of nuisance birds on the landfill have been reduced through falconry management, see attached letter from Airstrike Bird Control in Appendix L, which has reduced gull and raven populations by over one third.

- ***Rodents (and other Vermin)*** – The extent of the potential for rodent and vermin impacts is expected to be limited by geography. Rodents and similar vermin tend to have relatively small home ranges. These pests occur naturally. It is expected that the potential for rodent attraction impacts to agriculture diminishes with increasing distance from the landfill but the rate at which this occurs is not known with specificity. ODEQ Administrative Rules for landfill operation requires aggressive rodent control (see OAR 340-094-040(10)). This creates a downward pressure on rodent populations at the landfill. Given the relatively small home range of most rodents and the active control at the landfill, it is expected that population densities would diminish to naturally occurring densities in a mile or less from the landfill even without proper landfill rodent control management. See Atlas Pages 12 and 13. In the case of Riverbend Landfill, there is evidence in Appendix I that management and operations of the existing landfill has been successful at keeping problem rodents to a minimum. In the years 2012 and 2013, a trapping program at the landfill produced 7 beavers, 27 skunks, 11 Opossum, and only 1 rat; these are not outsized numbers for any property the size of Waste Management's land adjacent to a river the size of the Yamhill River and indicate that actual rodent populations are being managed consistent with DEQ objectives for the site. Waste Management also

interviewed the operator of the Mulkey RV Park next to the landfill. According to the operator, no rats have been sighted at the RV park since 1996, when the river flooded. The operator has also not received any complaints of rats from any of her tenants since 1996.

4.4 Analysis and Methods General Limitations

Precise farm cost and practice data for each farm on surrounding lands cannot be obtained unless each of the individual farmers were to provide this data. Some of the farmers in the area may not keep such records in a useable format and they would be under no obligation to provide such data in any event. As such, the analysis must utilize generalities based upon the published data sources that are available and field data that could be readily collected. Notwithstanding these limitations, the data utilized in the analysis is the best available and is sufficient to constitute substantial evidence for Oregon Land Use Planning permit purposes.

5 Farm Impacts Assessment

This section assesses the likelihood that identified landfill externalities will cause changes to accepted farm practices or to increase the cost of accepted farming practices. The assessment determines whether potential impacts are expected to be significant enough to change accepted farming practices or significantly increase the cost of accepted farming practices. The assessment includes two dimensions (background data and analysis) to support the conclusions reached for each potential impact. This assessment is geographic and accounts for geographic differences between farm practices and their location in relation to the proposed landfill expansion.

In the case of the proposed expansion of Riverbend Landfill, the use is already present. The assessment includes evaluation of observable data that would indicate whether impacts to farm practices have occurred or are occurring. If landfill externalities caused significant changes in the accepted farming practices on surrounding lands, it would be expected that these changes would already have occurred due to the landfill operations that have been ongoing for the past forty years.

Thinking about the assessment more scientifically, the null hypothesis is that the existing operating landfill has caused significant changes to the accepted farming practices on surrounding lands. Null hypotheses are tested by looking for empirical and observational data that proves the null hypothesis to be untrue. If the observational data does not support the null hypothesis, then credence is developed that the opposite conclusion is true.

In the case of landfill expansion, testing the null hypothesis involved looking for changes in farm use (and associated practices) on lands surrounding the landfill. Observational data to support the null hypothesis would include observable differences in farm use (and associated practices) as the distance from the landfill increases. Examples of such observable differences would be significantly different crop types and significantly different percentages of arable land in crop production as the distance from the landfill increases. Similar differences would be expected (and a stronger relationship would be expected) in looking at longitudinal data (or data over time). CSA did not have the benefit of historical farm inventory field data from prior years. However, Google Earth has historical aerial photos available for the entire study area since 1994 and these were used to assess changes over time in the farm use pattern on surrounding lands.

5.1 Immediate Vicinity Surrounding Lands

This section assesses the potential impacts to accepted farm practices for lands within 1 mile of the landfill expansion area.

5.1.1 Grass Seed Farm Uses (and similar such as grain and hay)

The predominant farm use in the IVS lands is Grass-Seed Farming (and farm uses with similar but slightly less intensive practices such as grain production and native hay farming). This use includes clover farming which is rotated in with Grass Seed over many years as a crop rotation benefit. The inventory estimates 81.8% of the IVS lands devoted to farm use are being used for grass seed (a portion of which may be native hay) and an additional 4.9% were devoted to grain (including corn which has very similar farm practices to grain). Thus, in total, 86.8% of the surrounding farm lands are devoted to the production of grass seed, clover seed, grain and hay.

Potential litter impacts for grass seed production is expected to be limited for all identified farm practices except for combine operations and cleaning and bagging the seed or hay baling. For all other farm practices, any litter appears to be an occasional annoyance rather than something that would significantly change accepted farm practices or increase the costs of farm operations. For example, litter may be one source of weed seed transport but there are many other transports for weeds and the presence of litter would not be expected to raise the agronomic rate of weed control application. Combine operations and seed cleaning and washing involve the use of machinery. Large volumes of litter may have a heightened potential to clog machines and slow down harvesting and cleaning operations. However, litter control is actively managed by existing landfill operations programs, including litter fences and litter collection. CSA conducted a litter density analysis between Highway 18 and the results of that analysis indicate that Waste Management's efforts are effective and actual observed litter densities are less than those observed on other rural roads in the area indicating that the actual potential for litter impacts is not significant from the existing landfill operations.

Air particulates have a limited potential to affect chemical applications and affect crop growth due to reduced photosynthesis. This potential impact appears to be too slight and insignificant for grass seed farming to change farm practices or increase its costs.

Nuisance bird attraction has limited potential to affect farming practices for grass seed. The primary bird problem for grass seed is geese. Landfills are not known to attract geese. The seed losses to geese are a far greater risk to crop yield than the bird varieties attracted by the landfill. Any bird control or hazing done to protect the fields from geese would be readily available and easy deployed for the comparatively small threat posed by nuisance birds attracted by the landfill. The Planning Commission received testimony from the McPhillips farm that gulls eat grass seed. The Cornell Lab of Ornithology produces an online bird encyclopedia entitled "Birds of North America". Reviewing the food habits for the American Gulls did not identify seeds generally, or grass seed specifically, as a major food source for these gulls, see: http://bna.birds.cornell.edu/bna/species/124/articles/foodhabits. It is also possible that the presence of gulls would discourage flocks of geese which would be expected to have a net positive effect on grass seed production.

Rodent control is an accepted farm practice for most types of field farming and is already employed because of the natural occurrence of rodents. Where rodent control is employed, it does not appear to be a significant cost factor or management issue for grass seed in the context of the entire enterprise. For White Clover, the OSU Extension Service Agricultural Enterprise Budget in AEB0021 estimates $5.00 per acre in rodent control expenses. The item is not even listed in AEB0011 indicating the cost is not significant for annual ryegrass production. Even though there is heightened potential for farm practice impacts for rodent control from the landfill, there is no evidence that such

impacts have in fact occurred. Even if such impacts were evident, it does not appear the costs rise to the level of significantly increasing the cost of the accepted farm practice. For example, in the extreme case that a white clover farm near the landfill has to double its rodent control to keep its rodent population consistent with other farms in the area, then that doubled cost over the standard AEB budgeted amount would be an additional $5.00 per acre. This hypothetical example would represent only 0.75% of the total direct expenses of production. From an actual impact standpoint, the Riverbend Landfill monitors and inspects the landfill for potential impacts from rodents and Appendix I shows the most recent 18 months of trapping potentially problem rodents. Quantities trapped are not out of line with expected quantities for a property of this size near a river and this contractor is available to be called for trapping rodents if population growth is observed. Waste Management also interviewed the operator of the Mulkey RV Park next to the landfill. According to the operator, no rats have been sighted at the RV park since 1996, when the river flooded. The operator has also not received any complaints of rats from any of her tenants since 1996. Rodent attraction and propagation is not expected to change accepted farming practices or significantly increase the cost of accepted farming practices for grass seed farming on surrounding lands.

5.1.2 Orchards

The second most common farm use on the IVS lands is orchards. These all appeared to be nut orchards (primarily hazelnut with some walnut orchards as well). Orchards constitute 9.9% of the IVS lands.

Litter impacts, if any, would be expected to be concentrated nearest the landfill between Highway 18 and the South Yamhill River and immediately north of Highway 18 to the north and northwest. In this area, there are five orchards. One orchard is approximately 3,900 feet southwest and 700 feet east of Highway 18. Potential litter impacts for orchard production are expected to be limited for all identified farm practices except for harvesting operations. However, litter control is actively managed by existing landfill operations programs, including litter fences and litter collection and it is unlikely given the location of this orchard that litter would be at such a quantity to impact harvesting operations as it is still a great distance from the landfill. Three of the four orchards west and northwest of the landfill are very new, some being planted within just the last few years. Orchard investments are significant and payback takes many years. Siting decisions to add new orchard lands take into account many factors. If litter represented such a potential issue that harvesting could significantly affect the farm practices then one would not expect these large scale orchard investments to be occurring in this location. These orchard investment decisions are consistent with the actual risk based upon actual volumes of litter where CSA analyzed litter densities and found that litter density along Highway 18 is not greater than, and is probably less than, densities found on other Highways in the area.

Air particulates have a limited potential to affect chemical applications and affect crop growth due to reduced photosynthesis and the washing and drying of nuts. Here, theonly orchard is downwind of the landfill to the southwest . This particular orchard area has been expanding over the last 20 years so it would appear any impacts are too slight to significantly change farm practices or to increase its costs. Similarly, three of the four orchards downwind to the north and northwest are brand new and so the potential for impacts appear very slight given the farm operator's willingness to make substantial investments in new orchards in this area.

Nuisance bird attraction has heightened potential to affect harvest yields. Corvids can eat hazelnuts. A hazelnut farmer was interviewed who farms an orchard immediately adjacent to the landfill expansion and approximately a mile away and another orchard approximately two miles. That farmer indicated no difference in losses to bird crop loss for the orchard nearest to the landfill versus the one that is two miles away. Based upon the information provided by a local hazelnut farmer, it does not appear that hazelnut losses to corvids rise to the level of a significant impact that is significantly changing accepted farming practices or significantly increasing orchard farming costs. Moreover, significant expansions in orchards within the IVS area have been occurring and corvid predation will be an issue with and without the landfill expansion due to rising populations in corvids associated with the population growth of the broader Portland area overall. If the risk from this potential source of loss was significant then one would not expect additional investments in new orchards to be made. There was a related issue expressed during the proceedings by the Frease farm related to the risk of Coccidiosis transmission from nuisance birds to hazelnut (also fruit trees) crops in a manner that would pose a human health risk. CSA Planning contacted Dr. DeBess with this question. Dr. Debess runs the State Veterinary Lab. Dr. Debess stated that, "he had never heard of such an event and that it would be rare and unlikely." He consulted the Merck manual on veterinary medicine and faxed the relevant sections to CSA Planning where the manual denotes that avian coccidiosis is not transmitted to humans, see Appendix J.

Rodent control is an accepted farm practice for orchard farming and is already employed because of the natural occurrence of rodents. Where rodent control is employed, it does not appear to be a significant cost factor or management issue for orchard operations. For Hazelnuts, the OSU Extension Service Agricultural Enterprise Budget in EM8556 estimates $7.00 per acre in rodent control expenses. Even though there is heightened potential for farm practice impacts for rodent control from the landfill, there is no evidence that such impacts have in fact occurred. Even if such impacts were evident, it does not appear the costs rise to the level of significantly increasing the cost of the accepted farm practice. For example, in the extreme hypothetical case that a hazelnut farm near the landfill has to double its rodent control to keep its rodent population consistent with other farms in the area, then that doubled cost over the standard AEB budgeted amount would be an additional $7.00 per acre. This hypothetical example would represen only 1.1% of the total direct expenses of production. The hazelnut farmer interview indicated that rodent control expenses and efforts did not vary with the distance to the landfill. Further, and as previously stated, the Riverbend Landfill monitors and inspects for rodent impacts. The landfill also has a contractor who can be called if necessary to trap or otherwise assist controlling rodents. Waste Management also interviewed the operator of the Mulkey RV Park next to the landfill. According to the operator, no rats have been sighted at the RV park since 1996, when the river flooded. The operator has also not received any complaints of rats from any of her tenants since 1996. Given the information provided by the hazelnut farmer and other testimony related to actual rodent densities and the relatively low cost of control in relation to orchard operating costs, rodent attraction and propagation does not appear likely to significantly change accepted farming practices or significantly increase the cost of accepted farming practices for grass seed farming on surrounding lands. This assessment is buttressed by the actual level of orchard investments occurring in the area. Approximately 113 acres of new orchards have been planted in the IVS farmlands area since 2010. These new orchard investments have been made with an understanding that rodents at the orchards will be subject to existing conditions associated with the operating landfill.

5.1.3 Plant Nursery and Vegetable Crops

The third most common farm use on the IVS lands are two crop units that appear to be managed together and they are part vegetable and field crops and part plant nursery. These farm uses constitute 2.8% of the IVS lands. The nursery and vegetable crop farm uses were analyzed above as separate farm uses with separate farm practices, but these two areas appear to have these two uses co-mingled.

Both of these uses are located west of Highway 18 to the southwest where few, if any, litter impacts are expected for the reasons described in Section 4.3.4. CSA conducted a litter density analysis between Highway 18 and the results of that analysis indicate that Waste Management's efforts are effective and actual observed litter densities are less than those observed on other rural roads in the area indicating that the actual potential for litter impacts is not significant. No significant impacts to farm practices are anticipated for farm uses at this location from litter impacts.

Both of these uses are located west of Highway 18 to the southwest which is a direction the wind rarely blows and therefore particulate transport would be no more than minimal. No significant impacts to farm practices are anticipated for farm uses at this location from emission particulate impacts.

Nuisance bird attraction has heightened potential to affect plant nurseries and vegetable farming. Corvids and gulls are omnivorous and could seek out food from vegetable farms and ornamental nurseries that are outdoors. Impacts from nuisance birds are likely not significant, however, because ODEQ requires landfills to actively control nuisance birds and because these birds are prevalent in the area with or without the landfill. Riverbend Landfill provides such controls in part through its falconry program, see Appendix L. Because nuisance bird control is already an accepted farm practice for vegetable farming and to a lesser extent plant nurseries, the expansion of Riverbend Landfill is not expected to impact that practice.

Rodent control is an accepted farm practice for most all farming practices. Nurseries and vegetable crops are higher value crops per acre than grass seed farming and on par with nut orchard farming. For similar reasons as for grass seed and orchard nuts described above, it is expected that potential cost increases to control rodents would be insignificant in relation to the overall production operations costs. Moreover, the data indicates that the management efforts taken by Riverbend Landfill to control rodent populations has been successful based upon the trap data from the last two years and these management efforts appear adequate to keep populations to levels one would otherwise expect in a rural area near a river. Waste Management also interviewed the operator of the Mulkey RV Park next to the landfill. According to the operator, no rats have been sighted at the RV park since 1996, when the river flooded. The operator has also not received any complaints of rats from any of her tenants since 1996. For these reasons, significant impacts from rodents are not expected.

5.1.4 Pasture (with Livestock assumed)

Only 0.2% of the IVS land area was inventoried to be devoted to pasture with livestock. The farm practices for this use in this area do not appear to be very intensive. The McPhillips farm is identified to have pasture with livestock one mile of the landfill expansion area. The McPhillips farm indicated they raise sheep and dairy goats. The most recent aerial photos available on Google Earth do not indicate a large area of this farm devoted to these uses and more detailed information was not provided to the record.

Two other farms are identified to have these uses within the IVS land area but they are near the boundary of the area.

There is some limited potential for impacts to medication of animals, milking and birthing activities. These potential impacts all stem from some level of harassment or control to address nuisance birds or rodents. Rodent control and dealing with nuisance birds is part of livestock production. Farms attract nuisance birds and propagate nuisance rodents with or without the presence of the landfill and nuisance corvid populations are on the rise due to regional urbanization. The expansion of the landfill would not change existing conditions in the area and the proposed expansion areas would get no closer to the McPhillips farm in the case of Module 10 and further from the farm in case of Module 11.

While there is some heightened potential for additional rodent control, this diminishes with distance from the landfill. Two of these uses are near the periphery of the 1-mile IVS boundary landfill and rodent concentrations at this distance are not expected to be affected by the landfill. For the McPhillips farm, greater potential exists if populations at the landfill are not appropriately managed. However, the data from the trapping efforts at the landfill site and management practices on the landfill indicate populations are being kept under control and levels are consistent with levels expected in these types of areas. Waste Management also interviewed the operator of the Mulkey RV Park next to the landfill. According to the operator, no rats have been sighted at the RV park since 1996, when the river flooded. The operator has also not received any complaints of rats from any of her tenants since 1996. Based upon the testimony about populations on-site and the nearby RV Park, it is not expected that any landfill externalities from rodent control would cause significant impacts to the pasture uses with associated livestock.

5.1.5 Poultry and Pheasants

The McPhillips farm identified chicken (poultry) and pheasants as farm practices. The literature for these farm practices identifies specific actions that are standard farm practices for successful operations. Much of the farm practices described in the literature concern facility design and construction and on-going maintenance. The literature indicates that risks to predation and disease are heavily dependent on the type of facilities and on-going maintenance activities. The literature does indicate that rodent control is an important customary farm practice because even properly constructed and maintained facilities still present some potential for rodent (and other problem vermin) to cause pheasant or other poultry mortality. However, the data from the trapping efforts at the landfill site and management practices on the landfill indicate populations are being kept under control and levels are consistent with levels expected in these types of areas. Waste Management also interviewed the operator of the Mulkey RV Park next to the landfill. According to the operator, no rats have been sighted at the RV park since 1996, when the river flooded. The operator has also not received any complaints of rats from any of her tenants since 1996. The expansion of the landfill will get no closer to the McPhillips farm on the north side (Module 10) and will get farther away on the south side (Module 11). Thus, there is no reason to believe that chicken rearing or pheasant rearing impacts will be increased from the proposed expansion in relation to existing conditions, provided on-going rodent control and nuisance bird management at Riverbend Landfill continues.

5.1.6 Longitudinal Analysis of IVS Lands

This section looks at farm use impacts from the standpoint of land use change for all IVS lands. CSA reviewed historical aerial photos since 1994 for all the IVS surrounding lands. From that analysis, it appeared that virtually no land that was in farm use in 1994 has been taken out of production except for new investments in farm facilities such as ponds or new barns. One hundred percent of the land that is inventoried as being in grass seed currently appears to have been devoted to grass seed in 1994. Some acreage was taken out of grass seed production and put into new vegetable/field crops. Over 100 acres have been converted from a lower value crop to orchards since 1994.

This longitudinal analysis indicates that the farm land use pattern is very stable over time. It appears that more investment in agriculture has occurred over the last 20 years while the Riverbend Landfill has been in full operation. Specifically, the longitudinal data supports increased investments in the very high value crop of nut orchards; an orchard investment takes many years of establishment expense amortization because the establishment is very expensive and generates no revenue for four years and is not fully productive until the fifth to seventh year after establishment.

5.2 Broad Area Surrounding Lands

This section assesses the potential impacts to accepted farm practices for lands from 1 mile to 2.5 miles of the landfill expansion area.

5.2.1 Grass Seed Farm Uses (and similar such as grain and hay)

The predominant farm use in the BAS lands is Grass-Seed Farming (and farm uses with similar but slightly less intensive practices such as grain production and native hay farming). Grass-Seed Farming includes Clover farming which is a crop that is often rotated with Grass-Seed for soil nutrient reasons. The inventory estimates 68.3% of the BAS lands devoted to farm use are being used for grass seed (a portion of which may be native hay) and an additional 0.9% were devoted to grain. Thus, in total, 69.2% of the surrounding farm lands are devoted to the production of grass seed, grain and hay.

Potential litter impacts for grass seed production is expected to be limited for all identified farm practices except for combine operations and the cleaning and bagging the seed. For all other farm practices, any litter appears to be an occasional annoyance rather than something that would significantly change accepted farm practices or increase the costs of farm operations. Litter may have a heightened potential to clog machines and slow down harvesting and cleaning operations. However, litter control is actively managed by existing landfill operations programs, including litter fences and litter collection. The volume necessary to cause a significant impact would be high, which is unlikely to occur, especially in light of the fact that BAS lands lie more than one mile from the landfill, and no changes to accepted farming practices or significant increases in costs would be expected from litter on BAS lands. CSA conducted a litter density analysis between Highway 18 and the results of that analysis indicate that Waste Management's efforts are effective and the actual observed litter densities are less than those observed on other rural roads in the area indicating that the actual potential for litter impacts is not significant.

Air particulates have a limited potential to affect chemical applications and affect crop growth due to reduced photo synthesis. This potential impact appears to be too slight and insignificant to rise to the level of significantly changing farm practices or increasing its costs for properties located over a mile from the landfill.

Nuisance bird attraction has limited potential to affect farming practices for grass seed. The primary bird problem for grass seed is geese. Landfills are not known to attract geese. The seed losses to geese are a far greater risk to crop yield. Any bird control or hazing done to protect the fields from geese would be readily available and easy deploy for the comparatively small threat posed by nuisance birds attracted by the landfill to grass seed operations. The Cornell Lab of Ornithology produces an online bird encyclopedia entitled "Birds of North America". Reviewing the food habits for the American Gulls did not identify seeds generally, or grass seed specifically, as a major food source for these gulls, see : http://bna.birds.cornell.edu/bna/species/124/articles/foodhabits. It is also possible that the presence of gulls would discourage flocks of geese which would be expected to have a net positive effect on crop yields.

Rodent control is an accepted farm practice for most all types of field farming as discussed above for the more immediate vicinity lands. For lands over a mile away, rodent concentrations would be expected to be unaffected by landfill populations and no additional rodent control would be expected. Additionally, the farm practice of rodent control is not likely to be affected to a significant degree for all the reasons described above for the IVS grass seed lands.

5.2.2 Pasture (with Livestock assumed)

The second most common farm use on the BAS lands is pasture (with assumed livestock). 11.7% of the BAS land area was inventoried to be devoted to pasture with livestock. The farm practices for this use in this area are not very intensive in general. For example, Opponents identified a cattle operation that had not been inventoried in the originally submitted Farm Impacts Assessment. This cattle operation is approximately 12 acres on a site that is over 1.5 miles away from the landfill expansion. There is not much reason to expect that the farm practices to raise cows on 12 acres 1.5 miles from the landfill expansion would be significantly affected by the landfill expansion. While there is some heightened potential for additional rodent control, this diminishes with distance from the landfill. These uses are more than a mile from the landfill and rodent concentrations at this distance are not expected to be affected by the landfill. Consequently, it is not expected that any landfill externalities would have the potential to cause significant impacts to the pasture uses with associated livestock.

An additional issue that was raised to the Planning Commission for pasture and livestock related to Redmond Farms and their sheep and lamb operation. The specific issue of concern was nuisance birds, specifically corvids, harassing sheep (especially during lambing) and their potential to spread disease directly (i.e. coccidiosis) or indirectly through changes to farm practices to deal with nuisance corvids (i.e. additional pen time causing illness). Dealing with nuisance bird attraction is an issue for many farms and aggressive corvid conflicts with lambs are an issue worldwide. Studies on the issue have been published in Australia. There is video of corvids harassing lambs on YouTube from Europe. While aggressive corvids may present a challenge to sheep farmers, Redmond Farms' experiences is likely more a function of geography and overall population trends than landfill activities. Redmond Farms is between the urban growth boundary of the City of McMinnville and the wooded foothills to the west. As the greater Portland area population has grown, corvid populations have grown as well. Studies of corvid habitat patterns indicate desirable locations for corvid population growth are the urban fringe suburban areas- like the housing development that has been occurring in McMinnville and moving closer to the Redmond Farms property over several years. Whatever

marginal attractant factor the landfill might exert would appear to be as likely to attract corvids away from Redmond Farms as it would to contribute to corvid management issues. Regional corvid population growth and the specific location of the Redmond Farms property is such that the causal nature of aggressive corvids and landfill operations is limited and the farm practices to deal with these birds is expected to persist into the future regardless of the landfill expansion outcome.

5.2.3 Poultry, (Chickens, Ducks and egg production)

The Planning Commission received testimony identifying a poultry farm that required an inventory update. This farm is approximately 2 miles from the expansion area. It is not expected that landfill operations would have any effect on a properly constructed and maintained poultry facility over two miles from the landfill.

5.2.4 Orchards

The third most common farm use on the BAS lands is orchards. These all appeared to be nut orchards (primarily hazelnut with some walnut orchards as well). Orchards constitute 4.6% of the BAS lands.

Litter impacts, if any, would be expected to be concentrated nearest the landfill between Highway 18 and the South Yamhill River. The orchard areas in the BAS land area are farther from the landfill than the IVS lands and none of the potential impacts would be expected to be more acute on these lands. Given the relatively significant investments in new orchards closer to the landfill, it does not seem likely that litter impacts would rise to the level of significant impacts. CSA conducted a litter density analysis between Highway 18 and the results of that analysis indicate that Waste Management's efforts are effective and actual observed litter densities are less than those observed on other rural roads in the area indicating that the actual potential for litter impacts is not significant.

Air particulates have a limited potential to affect chemical applications and affect crop growth due to reduced photosynthesis and the washing and drying of nuts. At over a mile away, it is expected that dispersion from air quality impacts would be sufficient to limit potential impacts to orchard operations. Given the relatively significant investments in new orchards closer to the landfill, it does not seem likely that air quality impacts would rise to the level of significant impacts.

Nuisance bird attraction has heightened potential to affect harvest yields. Corvids can eat hazelnuts. A hazelnut farmer was interviewed who farms an orchard immediately adjacent to the landfill expansion and approximately a mile away and another orchard approximately two miles from the landfill. That farmer indicated no difference in losses to bird crop loss for the orchard nearest to the landfill versus the one that is two miles away. Based upon the information provided by a local hazelnut farmer, it does not appear that hazelnut losses to corvids rise to the level of a significant impact that is significantly changing accepted farming practices or significantly increasing orchard farming costs. Moreover, significant expansions in orchards within the IVS area have been occurring and corvid predation will be an issue with and without the landfill expansion due to rising populations in corvids associated with the population growth of the broader Portland area overall. If the risk from this potential source of loss was significant then one would not expect additional investments in new orchards to be made. There was a related issue expressed during the proceedings by the Frease farm related to the risk of Coccidiosis transmission from nuisance birds to hazelnut (also fruit trees) crops in a manner that would pose a human health risk. CSA Planning contacted Dr. DeBess with this question. Dr. Debess runs the State Veterinary Lab. Dr. Debess stated

that, "he had never heard of such an event and that it would be rare and unlikely." He consulted the Merck manual on veterinary medicine and faxed the relevant sections to CSA Planning where the manual denotes that avian coccidiosis is not transmitted to humans, see Appendix J. Given the level of the investment in orchards on lands much closer to the landfill, the level of impact from nuisance birds on lands farther from the landfill is expected to be less and not significant.

Rodent control is an accepted farm practice for most all types of field farming as discussed above for the more immediate vicinity lands. For lands over a mile away, rodent concentrations would be expected to be at or below naturally occurring levels and no additional rodent control would be expected. Additionally, the farm practice of rodent control is not likely to be affected to a significant degree for all the reasons described above for the IVS orchard lands.

5.2.5 Vineyards

The fourth most common farm use on the BAS lands is vineyards. These vineyards are almost all located to the west of the landfill and are concentrated in a block of lands approximately a mile wide by two miles long. There is an additional vineyard to the northwest that is smaller and surrounded by woodlot (Youngberg Hill Winery). Vineyards constitute 4.1% of the BAS lands.

Litter impacts, if any, would be expected to be concentrated nearest the landfill between Highway 18 and the South Yamhill River and immediately north and northwest of Highway 18. There are no vineyards in this area and all vineyards, except Youngberg Hill, are upwind from the landfill. The Youngberg Hill vineyard is over two miles away and across the highway where the litter control efforts indicate litter densities are less than the densities than in other similarly situated farming lands in the county. See Appendix K.

Air emission impacts, if any, would occur downwind from the landfill. The only vineyard that is downwind of the landfill (under prevailing wind conditions) is Youngberg Hill. At two miles away, the particulate dispersion at that vineyard would be expected to be sufficient such that no significant impacts to chemical applications or photosynthesis would be expected. Thus, no particulate emissions impacts would be expected to change accepted vineyard farming practices or increase its costs on nearby lands.

Nuisance bird attraction has heightened potential to affect harvesting of wine grapes. Corvids, and potentially other nuisance birds, eat grapes. However, corvids are widespread native birds and vineyards attract other nuisance birds. Bird control is thus a standard farm practice for vineyards. OSU publication EM8413 lists four methods of bird control that include netting, predators, and scare devises and hazing, and shooting and direct control (many bird species are illegal to shoot or control directly). Netting has a nearly 100% efficacy but is expensive for the vineyard operator. The attraction of the landfill may attract problem birds toward the landfill and away from competing grape food sources. The landfill is also required to actively manage nuisance birds and employs a falconry program to control birds at the landfill. Falconry has reduced the overall bird population at the landfill by over one third, see Appendix L.

Rodent control is an accepted farm practice for most all types of farming as discussed above for the more immediate vicinity lands. For lands over a mile away, rodent concentrations would not be expected to be affected by the presence or absence of the landfill expansion.

5.2.6 Plant Nursery and Field Crops

The fifth most common farm use on the BAS lands are two crop units that appear to be managed together and they are part vegetable and field crops and part plant nursery. These farm uses constitute 2.8% of the BAS lands. The nursery and field crop farm uses were analyzed above as separate farm uses with separate farm practices, but several farming operations appear to have these two uses co-mingled. There are also some stand-alone nursery parcels that are the seventh most common farm use at 0.3% of the BAS lands and two stand-alone field crop uses that constitute 0.2% of the BAS lands.

These farm uses are primarily located east of the river which is expected to limit any litter impacts to a level that would not result in expected impacts to farm uses. There is another use of combined nursery and field crops over 2.5 miles away to the southwest and a stand-alone field crop parcel that are both sufficiently distant from the landfill to limit any litter impacts to a level that would not result in expected impacts to farm uses.

Air particulate emission impacts for lands more than a mile away are expected to be sufficiently dispersed to limit potential impacts below any level that would cause significant changes to accepted nursery or field crop farming practices.

Nuisance bird attraction has heightened potential to affect plant nurseries and vegetable farming. Corvids and gulls are omnivorous and could seek out food from vegetable farms and ornamental nurseries that are outdoors. Because plant nurseries and vegetable farming already attract birds, however, impacts are likely not significant because ODEQ requires landfills to actively control nuisance birds. Riverbend Landfill provides such controls in part through its falconry program, see Appendix L. Because nuisance bird control is already an accepted farm practice for vegetable farming and to a lesser extent plant nurseries, the expansion of Riverbend Landfill is not expected to impact that practice.

Rodent control is an accepted farm practice for most all farming practices. Nurseries and field crops are higher value crops per acre than grass seed farming and on par with nut orchard farming. For similar reasons as for grass seed and orchard nuts described above, it is expected that potential cost increases to control rodents would be insignificant in relation to the overall production operations costs. For lands over a mile away, rodent concentrations would not be expected to be affected by the presence or absence of the landfill.

5.2.7 Christmas Tree Farm

There is one Christmas Tree Farm southwest of the landfill expansion approximately two miles away. There is a limited potential for any of the identified Christmas Tree farming practices to be impacted by the landfill externalities and with a separation over a mile and a half no impacts are expected that would cause significant changes to accepted tree farming practices or significantly increase its cost.

5.2.8 Apiary (Beekeeping)

The Farm Impact Assessment identified an apiary approximately one mile from the landfill expansion. CSA did not identify any farm practices which we expect to be affected by a landfill expansion and especially not for an operation over one mile from the landfill.

5.2.9 Longitudinal Analysis of BAS Lands

This section looks at farm use impacts from the standpoint of land use change for all BAS lands. CSA reviewed historical aerial photos since 1994 for all the BAS surrounding lands. From that analysis, it appeared that virtually no land that was in farm use in 1994 has been taken out of production except for new investments in farm facilities such as ponds or new barns or conversion to another farm use. Some acreage appears to have been taken out of pasture and converted to woodlot. The vineyards located west of Southwest Oldsville Road and east of Southwest Muddy Valley Road have expanded over several dozens of acres since 1994, converting both pasture-land and open space lands to vineyard. Some grass seed lands were put into new vegetable/field crops and some grass seed lands were converted to nurseries.

This longitudinal analysis indicates that the farm land use pattern is very stable over time. It appears that more investment in agriculture has occurred over the last 20 years while the Riverbend Landfill has been in full operation. Specifically, the longitudinal data supports increased investments in nurseries, vineyards and orchards. All of which are very high value crops with significant start-up investments. Vineyards and orchards in particular can take many years of establishment expense amortization because the establishment is very expensive and generates no revenue for three to five years.

6 Forestry Use Impacts Assessment

There are approximately 27 woodlots that are mostly located in the western hills and a couple on the hills to the east at the far eastern boundary of the BAS lands that appear to be devoted to forest uses. These woodlots make up 6.0% of the BAS lands. There are no woodlots on the IVS lands within one mile of the landfill expansion. The presence of woodlots on BAS lands reflects the topographic relief that exists more than a mile from the landfill expansion area.

Forest practices involve occasional brush clearing; cleared brush is typically chipped or hauled to a disposal site in foothills step lands such as these. Depending on a the life cycle of the tree species every 7-12 years the site will be thinned using standard logging equipment including a chainsaw, skidder, caterpillar and a log truck. After a couple thinning cycles, the stand will become ready for harvest. Mature trees are harvested using standard logging equipment including a chainsaw, skidder, caterpillar and a log truck. After harvest, the site is restocked (typically from nursery starts) and the process begins anew.

The woodlot sites are well over a mile from the landfill expansion are and mostly upwind. CSA Planning Ltd. has not identified any landfill externalities of sufficient intensity or scale that would impact these forestry uses to any appreciable degree.

7 Summary Assessment

The longitudinal analyses for the IVS lands and the BAS lands do not support the null hypothesis that Landfill Operations have been causing significant changes to the accepted farm practices in the area or significantly increasing the cost of accepted farm practices. The use pattern since 1994 has been very stable, and if anything, has trended toward more intensive agriculture. The dominant farm use is grass seed production (and similar hay and grain production activities and including clover production) and this pattern has not changed in the last 20 years. Inventoried farm uses do not appear to vary with distance from the landfill (where topography is not a factor). The longitudinal and geographic empirical data indicates the null hypothesis should be rejected and this data lends support to the proposition

that landfill operations have not affected accepted farming practices and have not increased costs of accepted farming practices on surrounding lands.

While there was not sufficient data or a logical basis to conclude that litter or nuisance bird impacts actually exist, the mere potential for an impact does not indicate that such an impact exists or that such an impact would cause changes in farm practices. Litter, for example, is a potential impact that is actively managed. These management mechanisms appear adequate to prevent significant impacts.

Nuisance birds exist and impact farms with or without the landfill. Quantifying the landfill's potential effects is difficult. The hazelnut farmer interviewed for this analysis indicated no difference in crop loss or control efforts regardless of proximity of his orchards to the landfill. A similar lack of actual impacts can be extrapolated for vineyards and vegetable and field farms. Nuisance birds are actively controlled and managed by the landfill just as they are by farmers. This common objective increases the likelihood of success for such practices.

8 APPENDICES

APPENDIX A

ATLAS

APPENDIX B

RESUMES

- JAY HARLAND
- MICHAEL SAVAGE

APPENDIX C

TECHNICAL MEMORANDUM

Regulatory Monitoring Programs for Water Quality Protection at Riverbend Landfill, McMinnville, Oregon

SCS Engineers – November 5, 2014

APPENDIX D

TRAFFIC IMPACT ANALYSIS

Riverbend Landfill Expansion

Lancaster Engineering 2013