Department of Environmental Conservation
Division of Environmental Health

Alaska Railroad Corporation
Application for
Permit to Use Herbicide
for Vegetation Management
on the Railroad Right-of-Way
Between Clear and Fairbanks

Decision Document
June 15, 2012

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Acronyms and Abbreviations

AAC	Alaska Administrative Code
AMPA	Aminomethylphosphoric acid
ARRC	Alaska Railroad Corporation
CFR	Code of Federal Regulations
DEC	Alaska Department of Environmental Conservation
DOE	United States Department of Energy
EPA	United States Environmental Protection Agency
EPSP	Enolpyruvylshikimate phosphate synthase
FEIS	Final Environmental Impact Statement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FRA	Federal Railroad Administration
K_{oc}	Organic carbon partition coefficient
LC50	Concentration lethal to 50% of exposed organisms
mg/L	Milligrams per liter
MSDS	Material Safety Data Sheet
POEA	Polyethoxylated tallow amine
ppm	Parts per million
RED	Re-Registration Eligibility Document
UAF	University of Alaska Fairbanks
USDA	United States Department of Agriculture
WHO	World Health Organization

Alaska Department of Environmental Conservation
Decision Document for Alaska Railroad Corporation
Permit Application for Herbicide Application in the
Clear-Fairbanks Area
June 15, 2012

1.0 DEPARTMENT DECISION – SUMMARY AND CONCLUSIONS

In accordance with Title 18, Chapter 90, Section 525 of the Alaska Administrative Code (18 AAC 90.525), the Alaska Department of Environmental Conservation (DEC) approves the pesticide permit application submitted by the Alaska Railroad Corporation (ARRC) to apply a herbicide on the railroad right-of-way between Clear and Fairbanks, Alaska. The permit proposes to apply the herbicide AquaMaster along with Agri-Dex, a non-ionic surfactant and spray oil.

DEC's decision is based upon its analysis of information contained in the permit application, administrative record, and referenced in this Decision Document. DEC finds that existing scientific evidence and other available information demonstrate that there will be no unreasonable adverse effect expected from the proposed activity:

1. The application proposes the use of an herbicide (AquaMaster) and surfactant (Agri-Dex) that have been widely used for vegetation control and have a history of safe use.
2. Although AquaMaster and Agri-Dex are both approved for aquatic application, the application locations and distance to surface water are adequate to prevent the chemicals from drifting, leaching, or running off to surface water.
3. Given the fate and transport of AquaMaster and Agri-Dex, contamination of groundwater through leaching is not expected.
4. The biochemical mechanism by which AquaMaster acts on plants is not found in animals.
5. The surfactant Agri-Dex does not contain polyethoxylated tallow amine (POEA), which is primarily responsible for the toxicity of other surfactants.
6. Risks to human health, safety, and welfare are considered low based on toxicology studies, the proposed application area, and the low likelihood that the proposed herbicide use will result in off-site transport of herbicides.
7. Risks to animals and the environment are considered low based on toxicology studies, the proposed application area, and the low likelihood that the proposed herbicide use will result in off-site transport of herbicides.
8. There are no unreasonable adverse effects expected, based on the environmental, social, or economic costs and benefits of performing the activity.

2.0 BACKGROUND INFORMATION

On November 10, 2011, DEC received a pesticide use permit application from the Alaska Railroad Corporation (ARRC) to apply herbicide for the purpose of vegetation management on the railroad right-of-way between Clear and Fairbanks. Additional documentation was provided on November 23, 2011.

The ARRC proposes to apply herbicide to a 16 foot wide strip of the railroad right-of-way on approximately 60 miles of track between Clear and Fairbanks.

Specifically, the ARRC submitted an application for a permit to apply:

- **AquaMaster Herbicide**, U.S. Environmental Protection Agency (EPA) Registration Number (Reg. No.) 524-343, with the active ingredient glyphosate; and
- **Agri-Dex**, a non-ionic surfactant and spray oil with principle functioning agents of heavy range paraffinic oil, polyol fatty acid esters, and polyethoxylated derivatives.

Controlling vegetation along or adjacent to the railroad is a federal requirement under 49 Code of Federal Regulations (CFR) 213.37. While non-chemical methods have been generally successful in controlling wayside brush, the ARRC has been unable to effectively control vegetation in and around the track structures (e.g., rails and ties) within the proposed application area. The reasons why control of vegetation around such structures is necessary are twofold:

- The track must be visible to allow inspection of critical components such as ties, rail, and the fasteners that secure the rail to the ties; and
- Vegetation in the track structure holds moisture, increasing the degradation of the track structure. This includes accelerated deterioration of track components such as ties, which rot more quickly in moist environments. The moisture also reduces the ability of the track to support traffic, which increases required maintenance efforts and costs.

AquaMaster is a post-emergent, systemic herbicide used for control of weeds, woody brush, and trees. Plants absorb the herbicide through foliage. The active ingredient, glyphosate, kills target plants by inhibiting the production of aromatic amino acids in plants (Boutin, 2004). EPA approves this product for aquatic uses.

Agri-Dex is a non-ionic surfactant and crop oil concentrate designed to improve herbicide application and efficacy by modifying the wetting and deposition characteristics of the spray solution. EPA does not require registration for adjuvants (including surfactants and crop oils), and the specific ingredients in adjuvants are generally not disclosed. However, Agri-Dex is approved for aquatic use by Washington State, which conducts reviews to ensure that adjuvants are not expected to be sources of water contamination. The State of Washington requires manufacturers of adjuvants to provide information on the specific contents of adjuvants, and conducts a review of documentation and acute toxicology studies for each product and its specific constituents for potential toxicity before allowing registration. These studies and analyses are based on proprietary information and are not available for outside review. However, DEC frequently relies on Washington's process to determine which adjuvants can be safely used.

A 25-foot buffer zone will be observed for any water body near the application area. Water bodies will be identified and marked prior to application by an Alaska Railroad representative who is a certified pesticide applicator. The spray areas will be marked using yellow and blue marking spray paint; blue to indicate the beginning of a spray area, and yellow to indicate where spraying must stop.

The proposed herbicide and surfactant will be tank-mixed and applied by certified applicators using low pressure, large droplet size application techniques. The products will be applied from a Hy-rail equipped boom truck with nozzles two to three feet above the ground.

An Alaska Railroad representative who is a certified pesticide applicator will accompany the contracted applicators at all times during application activities. This person will be in radio contact with the applicators at all times, during application activities, to ensure that the applicator is aware of upcoming buffer zones. This person will also examine the spray areas for any changes to water levels or temporary water bodies that may have developed, and mark additional buffer zones as required. In areas that are difficult to access with the Hy-rail boom (e.g., switch stands), a low volume backpack sprayer will be used.

The railroad right-of way does not meet the definition of a public place under Alaska Statutes in AS 46.03.320(4)(c), which requires information about the pesticide application to be posted in accordance with 18 AAC 90.630. However, the railroad will be required to post signs containing information about upcoming pesticide applications prior to pesticide application. These signs will list the pesticide to be applied and the potential dates for application. It will also include a telephone number and website address where interested people can find updated information about the specific dates when application occurs, which will be dependent on weather and other conditions. These signs will be posted at all road crossings within the proposed treatment areas, as well as nearby depots, and train cars serving flag stop passengers. Once spraying is initiated, the signs, website, and telephone line will be updated with the specific dates when spraying was conducted.

3.0 REGULATORY BACKGROUND AND ANALYSIS

The State of Alaska pesticide permitting requirements are found in 18 AAC 90.500 through 18 AAC 90.540.

3.1 PERMIT APPLICATION REQUIREMENTS

Under 18 AAC 90.500, a permit is required for application of pesticide within a state owned or leased right-of-way. With respect to this proposed application, 18 AAC 90.515 states that a permit application must contain the following information:

- The common or brand name of each pesticide to be used, the name of the seller/distributor from whom the pesticide will be obtained, and the EPA registration number(s) of the pesticide(s);
- The targeted pests to be controlled;
- Each type of formulation to be used;
- Each type of adjuvant to be used;
- The percentage of each active ingredient in each formulation;
- The rate of application for each active ingredient;

- A description of the treatment area, including the location and size, vegetation, potentially affected water bodies and drinking water systems within 200 feet, soil characteristics, and annual precipitation;
- The date and time of proposed application of each pesticide;
- The application method;
- The method of disposal of excess pesticide;
- Special precautions to protect human health, safety, welfare, animals, and the environment;
- Evidence that a person who directs or participates in the project has working knowledge of the pesticides, the necessary safety precautions, and impact on the environment, including certification under 18 AAC 90.300 – 18 AAC 90.315;
- Information about endangered and threatened species that may occur in the treatment area; and
- Information that demonstrates the pesticides do not cause unreasonable adverse effects.

3.2 PUBLIC PROCESS

In accordance with 18 AAC 90.520 and 18 AAC 15.050, a public notice and comment period were held, and in accordance with 18 AAC 90.520 and 18 AAC 15.060, a public hearing was held.

Notice of the permit application was published in the Fairbanks Daily News Miner on January 12 and 13 of 2012. Notice included information about a public hearing and the opportunity to submit comments on the permit application. DEC also posted the public notice online at *www.state.ak.us/dec/eh/pest* and *www.dec.state.ak.us/public_notices.htm*.

The 60 day public comment period for the permit application began on January 12, 2012, and ended March 12, 2012. DEC received written comments from 73 individuals within the comment period. A public hearing was held in Fairbanks on January 31, 2012. No one provided testimony at the public hearing.

DEC reviewed all comments received during this process. DEC prepared a Responsiveness Summary, which summarizes the comments received, and includes DEC responses.

3.3 PERMIT ISSUANCE CRITERIA

In accordance with 18 AAC 90.525, in order for DEC to issue or deny a permit for application of pesticides, DEC must evaluate the permit application and review the public record that results from the public notice and public hearings, as well as comments from local, state, or federal agencies. DEC also reviews and evaluates existing documentation and data.

In its discretion, DEC will deny a permit if:

1) The applicant has failed to supply information or evidence required by 18 AAC 90;
2) The applicant or a person under the applicant's direct supervision has failed to abide by a condition of a previous permit;
3) A proposed action is unlawful;

4) DEC determines that special precautions referred to as part of the permit application are inadequate to prevent unreasonable adverse effects; or
5) DEC finds that the application of the pesticide will result in an unreasonable adverse effect.

On November 10, 2011, DEC received a pesticide use permit application from the Alaska Railroad Corporation (ARRC) to apply herbicide for the purpose of vegetation management on the railroad right-of-way between Clear and Fairbanks. Upon request, additional documentation was provided on November 23, 2011, after which DEC determined that for purposes of its evaluation, the permit application adequately addressed items required in the application and no further information was needed.

With respect to identification of water bodies, the proposed method of identifying water features on the ground is a more thorough approach, and will provide more protection for surface water than requiring a list of potentially affected water bodies.

The ARRC and the contracted certified applicators have no record of violation of any conditions of a previous pesticide use permit in Alaska.

The proposed pesticide application does not violate any laws or regulations. Application sites, methods, rates, and other details of the proposed application comply with label requirements.

Explanation of our analysis of the potential for unreasonable adverse effects, including special precautions, is provided in the following sections.

4.0 UNREASONABLE ADVERSE EFFECT ANALYSIS

The basis of this evaluation to determine if the proposed project would result in unreasonable adverse effects is research conducted for pesticide use permit #10-SOL-01, issued to the ARRC in 2010. Permit #10-SOL-01 was issued for similar or identical conditions, including proposed products, application methods, target pests, and environmental conditions; any differences in conditions for this permit decision were carefully considered and evaluated. DEC is not aware of any significant new scientific documentation since permit #10-SOL-01 was issued, nor was any new information brought forth as part of public comments and testimony, that would influence the current permit decision.

A number of studies and documents were reviewed and evaluated in the analysis to determine if the proposed project would result in unreasonable adverse effects. Only unbiased, scientifically based, peer-reviewed or validated data were utilized in this evaluation. Section 6.0 includes a list of references cited in this evaluation.

4.1 UNREASONABLE ADVERSE EFFECT REGULATORY REQUIREMENT

In order for DEC to issue a permit for the application of pesticides, it must find that the proposed activity will result in no unreasonable adverse effect.

- Unreasonable Adverse Effect is defined in 18 AAC 90.990(54) as an unreasonable risk to humans, animals, or the environment, taking into account the economic, social, and environmental costs and benefits of the use of a pesticide, as determined by the department.

- 18 AAC 90.515(16) states that the applicant must include information that demonstrates to the department's satisfaction that the pesticide to be applied does not cause an unreasonable adverse effect.

- Under 18 AAC 90.525(b) the department may deny a permit if the application of the pesticide will result in an unreasonable adverse effect (90.525(b)(5)), or if special precautions are inadequate to prevent unreasonable adverse effects (90.525(b)(2)).

- 18 AAC 90.525(c) also allows the department to include conditions in a permit to protect human health, safety, or welfare, animals, or the environment. (90.525(c)).

The discussion, analysis, and findings regarding DEC's review of the ARRC project regarding unreasonable adverse effect are included in Section 4.

4.2 EPA REGISTRATION REVIEW

Under the Federal Insecticide, Fungicide and Rodenticide Act, 7 U.S.C. §§136, et. seq., before manufacturers can sell pesticides in the United States, the Environmental Protection Agency (EPA) evaluates the pesticides thoroughly to make sure they can be used without posing harm or "unreasonable adverse effects" to human health or the environment.

Pesticide products must undergo rigorous testing and evaluation prior to registration approval. EPA scientists and analysts carefully review data to determine whether to register a pesticide product, and whether specific restrictions are necessary. EPA uses internal and external reviews involving peers and the public through a comment process when conducting these evaluations.

The scientific data requirements for product registration are very detailed. Required data includes characterizations of the pesticide's chemistry and manufacturing process; mammalian and eco-toxicology; environmental fate; residues in or on human and livestock food or feed crops; applicator, occupational, and bystander exposures; product efficacy; and incident reports. Registrants can be required to conduct and submit up to 100 or more individual scientific studies for the registration of a new pesticide.

By definition, all pesticides are toxic to some degree. The level of risk from a pesticide depends on how toxic or harmful the substance is, and the likelihood of people coming into contact with it. Uncertainty factors are built into the risk assessment. These factors create an additional margin of safety for protecting people who may be exposed to the pesticides.

In order for a pesticide to be registered, the EPA must determine that the product can be used as labeled without causing unreasonable adverse effects to humans or the environment. If risks or concerns are identified, appropriate risk mitigation measures are required. These are implemented through product label requirements, which may include reductions in application

rates, restrictions to approved sites or commodities, advisory statements, implementation of specific management practices, and other restrictions or limitations designed to mitigate risk.

The proposed product label must provide the active pesticide ingredients, application directions, use restrictions, and warnings. This label information is based on the underlying scientific data and conclusions about potential hazards, exposures, and risks from use according to the label.

EPA also conducts regular reassessments of currently registered pesticides. Through this re-registration program, EPA assesses new scientific studies and information about registered products. If there is new evidence documenting unreasonable risk to human health and the environment, the allowed usage is modified and the label changed. When EPA identifies data gaps, new studies are required and reviewed.

If new information or studies show that a pesticide represents an unreasonable risk even after a change of allowable usage, EPA has the authority to cancel registration of products containing that pesticide. Whenever EPA determines there are urgent human and environmental risks from pesticide exposures that require prompt attention, EPA will take appropriate regulatory action, regardless of the registration review status of that pesticide.

EPA's extensive analyses of each pesticide product, and incorporation of new scientific data regarding safety and use of existing products, is considered to be sufficient to protect human health and the environment from unreasonable adverse effects.

All available data indicates that the proposed products will behave as expected and as reported in the literature and on the labels. There are no site-specific conditions at the proposed application locations that would invalidate the EPA registration review process with respect to this particular proposed pesticide use.

4.3 APPLICATION METHODS

Target vegetation along the application area are predominantly weeds, including cow parsnip, foxtail, dandelion, horsetail, sweet clover, and other broadleaves and grasses. Some woody plants (i.e., willow, alder) are also within the proposed application areas.

As previously described, the product will be applied primarily using a Hy-rail equipped boom truck with nozzles close to the ground surface; this method allows for control of spray direction. In areas that are difficult to access with the spray truck, a low volume backpack sprayer will be used. The sprayer will hold no more than four gallons of product and has a maximum spray pressure of 30-40 pounds per square inch (psi). Drift of product using these methods is expected to be minimal.

All application areas will be pre-marked using yellow and blue marking spray paint to identify the application areas. In areas where application will be done with a track-mounted spray vehicle, a single railroad tie will be spray painted blue to indicate the beginning of the spray area, and three consecutive railroad ties will be spray painted yellow to indicate the end of the spray area. This pre-marking also ensures that the 25-foot buffer zones between application areas and water bodies will be met. All water bodies, as defined by Alaska Statutes in AS 46.03.900(37)

within 25 feet of the application areas will be identified in person onsite, and spray zones will be measured and marked before application with blue and yellow spray paint, as described above.

An ARRC representative who is a licensed certified applicator will accompany the contracted applicator at all times during application activities. The ARRC representative will be in constant radio communications with the applicator to ensure that they are aware of the location of buffer zones and the beginning and ending of application areas.

AquaMaster will be diluted approximately 98% prior to application (3 quarts per 30-40 gallons of water), and Agri-Dex will be diluted 99.75% prior to application (1 quart per 100 gallons of water). The following amounts of product, which comply with label requirements, will be applied:

- AquaMaster: 3 quarts/acre; total application per treatment of 100.5 gallons; and
- Agri-Dex: 0.3 quarts/acre; total application per treatment of 11.2 gallons.

4.4 CHEMICAL PROPERTIES

The herbicide AquaMaster is a mixture of glyphosate isopropylamine salt (glyphosate IPA; 53.8%) and water (46.2%) (Monsanto, 2005). Glyphosate works by inhibiting an enzyme, enolpyruvylshikimate phosphate synthase (EPSP), which is essential in a pathway for biosynthesis of amino acids that enable the plant to produce proteins necessary for plant growth and survival. The EPSP enzyme and associated amino acid biosynthesis pathway are found only in plants, not in animals, helping to limit the effects of glyphosate herbicides on organisms other than plants (USDA, 2000; Williams et al., 2000).

The surfactant Agri-Dex will be applied with the herbicide to increase the absorption through plant tissues and to increase spray retention (Bakke, 2007). Agri-Dex consists of a proprietary blend of heavy range paraffin base petroleum oil, polyol fatty acid esters, and polyethoxylate derivatives (Helena, 2005).

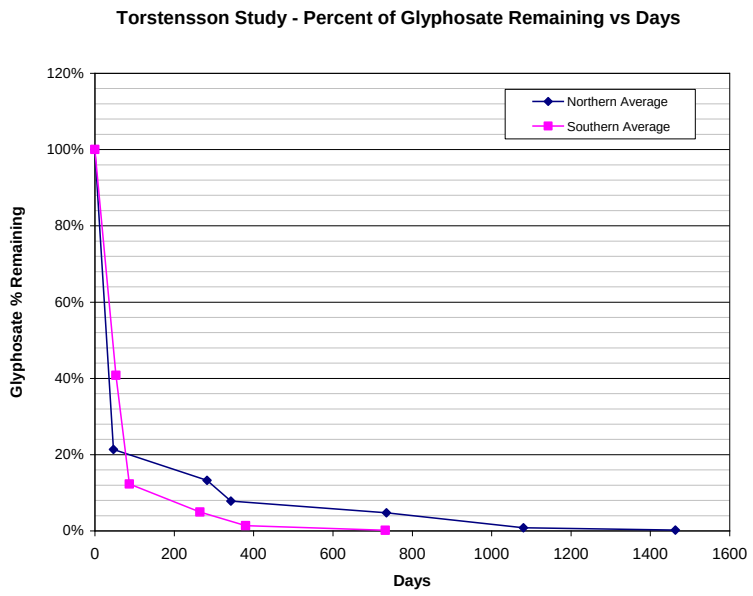
Glyphosate and many of its commercial formulations, including those with and without surfactants, have been studied for a wide variety of potential effects to non-target organisms. Less information is available for the surfactant Agri-Dex, but literature is available on this as well as other surfactants. The results of these studies, as relevant to the proposed use of AquaMaster and Agri-Dex as specified in the permit application, are summarized below.

4.5 PERSISTENCE AND MOBILITY

Glyphosate dissolves easily in water and has a water solubility of 12,000 milligrams per liter (mg/L; USDA 2000). However, it also strongly adsorbs to soil particles, with an organic carbon partition coefficient (K_{oc}) of 24,000 (USDA, 2000; DOE, 2000, Battaglin, 2005). This means that glyphosate is not particularly mobile because of strong sorptive ability. Glyphosate degrades relatively rapidly, with reported half-lives in water of 3 to 249 days (USDA, 2000).

In a recent study on agricultural soils, the half-life both of applied glyphosate and its primary breakdown product, aminomethylphosphonic acid (AMPA), were studied (Simonsen et al., 2008). Glyphosate was shown to have a soil half-life of 9 days, and AMPA had a half-life in soil of 32 days. This demonstrates that neither chemical is persistent in soil.

In a study on a total of 11 sampling locations at two different cold-climate sites in Sweden, 53 days after application of glyphosate, the remaining soil concentration averaged 30% of the initial concentration. These sampling locations were in humic acidic soils (pH around 5). At one of the sites (Southern Sweden, longitude approximately 57°), all glyphosate was gone after 2 years, and at the other site (Northern Sweden, longitude 67° within the Arctic circle), all glyphosate was gone after 4 years (Torstensson, 1989). However, the chemical was not mobile in either environment, partitioning into the soil and degrading in that medium. As shown in the following graph from the Torstensson (1989) study, glyphosate concentrations decline rapidly after application, with less than 20% of the original mass remaining after about 2 months.



The University of Alaska Fairbanks (UAF) Water and Environmental Research Center has been conducting an ongoing study on the environmental fate of herbicides in Alaska. The results of this study are directly applicable to the proposed permit.

In the first phase of this study, two herbicides, including AquaMaster herbicide mixed with Agri-Dex were applied on selected portions of the southern section of the ARRC rail line near Seward. The first phase of this study, which applied the herbicides under similar or identical conditions as the proposed permit, including products, application methods, target pests, and environmental conditions, has been completed

Additional phases of this research using lysimeter experiments and a block plot study are still being completed at the UAF Fairbanks Experiment Farm. However, data from the first phase of the study is available, and was provided in the permit application.

Results from two test locations where glyphosate had been applied to railroad bed materials, and its fate and transport measured for 80 days by UAF Water and Environmental Research Center professors, support the persistence and mobility information summarized above.

Soil samples taken at various distances below the soil surface in the treatment site showed that concentrations in the soil drop off quickly in the days after application. On average, no glyphosate was detected in the upper inch of soil 4 days following application in one area, and none was detected in surface soil after two weeks. Seventy-nine days after application the maximum concentration of glyphosate found in soils was 0.18 mg/kg, measured in root zone soils.

Soil samples were taken at various distances away from the treatment site one week after application, including within the sprayed area, and at 3 feet, 6 feet, 10 feet, and 12 feet away from the edge of the sprayed area. The test results from these samples show that, after one week, only minute quantities of glyphosate, or its degradate AMPA, were present outside of the treatment area. Most samples taken 10 to 12 feet away from the spray areas showed no detectable levels of glyphosate. One soil sample taken 12 feet from the spray areas showed the presence of 0.12 mg/kg of glyphosate. The data from this study indicate that the maximum possible drift or transport of glyphosate using the proposed methods is 25 feet (Barnes, 2010).

Water samples taken from ground water wells located between the rails and directly below the application area, showed minute concentrations of glyphosate, with levels generally undetectable after 80 days. The maximum concentration measured in ground water was 0.017 mg/L, measured 9 days after application.

These measured amounts are extremely low, and much less than any levels that might cause health effects in humans. The EPA dietary reference dose for glyphosate is 2 mg/kg/day. The reference dose, based on toxicity studies, represents the amount that can be safely ingested each day over a lifetime without causing adverse health effects. For glyphosate, an average adult male, weighing 200 pounds (~90 kilograms), could ingest 180 milligrams of glyphosate each day for a lifetime without any adverse health effects.

The UAF study has not yet been completed and published. However, the results to date from this ongoing study provide substantial documentation that the behavior of the proposed products, including persistence and mobility, does not vary significantly from that in warmer climates. Under typical Kenai Peninsula weather glyphosate applied to the soil is not downwardly mobile, is metabolized by soil microorganisms, and dissipates within approximately two weeks. The proposed treatment location has essentially similar climate and weather to that in the study, particularly during summer months when treatment is proposed.

The strong adsorption of glyphosate to soil particles overrides its relatively high solubility, and glyphosate is relatively non-mobile in soil. Once in the soil, it degrades relatively rapidly and is not considered to be persistent. Additionally, Folmar et al. (1979) showed the toxicity of Roundup (glyphosate and POEA adjuvant) to decrease with decreasing water temperature. While it is not clear if this relationship is specific to glyphosate, the surfactant, or some combination of the two, it likely is relevant towards the use of glyphosate in the proposed application area since water temperatures are low relative to most other application areas.

The ARRC proposes to use glyphosate for vegetation control during warm weather periods when vegetation will be growing. The glyphosate will bind to the soil particles with which it comes in contact. Once it reaches the soil, it will begin degrading through the activity of bacteria. Degradation rates will be highest during warm weather. During cold weather, the mobility of any remaining glyphosate will be further limited by the cold temperatures, snow, and ice, as shown in the study in Sweden (Torstensson, 1989). Although it may take longer to completely degrade in the cold temperatures of Alaska, the mass will remain bound to soil and not move to aquatic systems or other locations where exposure could occur.

Little information is available on the mobility and persistence of Agri-Dex, but water solubility is reported to be low (Helena, 2005). Preliminary information from the test areas evaluated by UAF indicates that AquaMaster and Agri-Dex behave as expected and as reported in the literature and on the labels.

4.6 SYNERGISTIC EFFECTS

While synergistic effects are known to occur for some herbicide-adjuvant mixtures, none have been reported for glyphosate and Agri-Dex. For example, Chen (2004) identified a link between use of Vision (containing glyphosate and a POEA-adjuvant) synergistic effects with food or pH; effects between herbicide and adjuvant were not reported. One article (Diamond and Durkin, 1997) provided evidence that the POEA-based adjuvants are substantially more toxic than glyphosate, and can result in synergistic effects with regard to acute fish toxicity when used as part of a formulation. However, Agri-Dex does not contain POEA and has been shown to be much less toxic than POEA-containing adjuvants (5-100 times less toxic; Diamond and Durkin, 1997). As a result, the potential for the adjuvant and glyphosate to act synergistically is remote. Therefore, the potential for synergistic effects of glyphosate and Agri-Dex to result from application of these products as proposed is considered acceptably low.

4.7 WATER RESOURCES

EPA approves AquaMaster for use in aquatic conditions. As discussed above, although glyphosate has high water solubility, it strongly binds with soil particles and suspended sediment, becoming immobile in soils rather than partitioning to water (Boutin, 2003; USDA, 2000). AquaMaster is not expected to be a source of water contamination through leaching to groundwater, or by runoff or drift to surface water.

Although AquaMaster is EPA approved for use in water bodies, the 25-foot buffer established around water bodies provides additional assurance that water contamination should not occur. To add an additional level of protection for water, the permit includes a stipulation to limit product application to periods without heavy precipitation and when the wind speed is between 2 and 10 miles per hour. These stipulations will minimize the potential for drift and runoff.

Agri-Dex is approved for aquatic use by Washington State, which conducts reviews to ensure that adjuvants are not expected to be sources of water contamination. The State of Washington requires manufacturers of adjuvants to provide information on the specific contents of adjuvants, and conducts a review of documentation and acute toxicology studies for each product and its specific constituents for potential toxicity before allowing registration. These studies and

analyses are based on proprietary information and are not available for outside review. However, DEC frequently relies on Washington's process to determine which adjuvants can be safely used.

4.8 HUMAN HEALTH, SAFETY, AND WELFARE

In order for human health to be adversely impacted, there must be both a complete exposure pathway which could lead to a dose, and there must also be toxicity significant enough to cause an adverse reaction.

4.8.1 Exposure

Pesticides will be applied close to the ground by a slow moving vehicle during periods of low wind, which will prevent significant aerial drift during application. Glyphosate adsorbs strongly to soil particles, and is either taken up by plants or degraded by microorganisms, making it unavailable for dispersion after application. Any potential exposure would be limited to the immediate application area.

Individuals who would be present during pesticide application will all be Certified Applicators, or under the supervision of a Certified Applicator. Certified Applicators are trained and tested to ensure they are competent to safely and effectively apply pesticides.

The AquaMaster label does not specify a re-entry interval, meaning that EPA does not consider it a risk to enter the treated immediately after application. Even immediately after spraying, only very insignificant exposures would be expected to result from entering the spray area

Signs containing information about upcoming pesticide applications will be posted prior to pesticide application. These signs will list the pesticide to be applied and the potential dates for application. It will also include a telephone number and website address where interested people can find updated information about the specific dates when application occurs, which will be dependent on weather and other conditions. These signs will be posted at all road crossings within the proposed treatment areas, as well as nearby depots, and train cars serving flag stop passengers. Once spraying is initiated, the signs, website, and telephone line will be updated with the specific dates when spraying was conducted. Individuals who wish to remain away from the treated areas will have the necessary information to do so.

4.8.2 Toxicity

Toxicity categories are assigned to pesticides based on their ability to cause harm by various routes of exposure (oral, dermal, inhalation, etc.) There are four categories, with Category I being the most toxic, and Category IV the least toxic, listed as "practically non-toxic".

Both oral and dermal absorption of glyphosate are low (Williams et al., 2000). The United States Department of Agriculture (USDA) provides rankings for glyphosate and Agri-Dex based on the acute toxicity categories for pesticide products specified in 40 CFR 156.62 (40 CFR 156.62). Glyphosate was categorized as "Slightly Toxic" (Category III) based on acute effects from both oral and dermal exposure to laboratory animals, as well as eye irritation (Mild Irritant; Category III). These data are used by EPA and USDA to make inferences about toxicity to humans

(USDA, 1997). For skin irritation, glyphosate was classified as "Not an Irritant" (Category IV). One study reviewed by Williams et al. (2000) showed that Roundup had a skin irritation potential similar to baby shampoo, and was less irritating than both dishwashing detergent and a common household cleaner. The Agri-Dex surfactant was classified as "Practically Non-toxic" (Category IV) for oral toxicity and "Slightly Toxic/Slightly Irritating" (Category III) for dermal toxicity and eye irritation, respectively. Agri-Dex was classified as "Moderately Irritating" (Category II) to skin (USDA, 1997).

Roundup herbicide includes glyphosate as well as a number of other ingredients including the surfactant POEA. As part of a human health safety evaluation and risk assessment for Roundup, and for glyphosate alone, Williams et al. (2000) reviewed studies performed for regulatory purposes as well as published research reports. This review indicated that no significant toxicity occurred in acute, sub-chronic, or chronic studies, and that glyphosate was not teratogenic or developmentally toxic. Williams et al. (2000) also concluded that no effects from glyphosate on reproductive tissues and no evidence of endocrine modulation were apparent, and summarized two multi-generation reproduction studies that showed no effects on fertility or reproductive parameters. The effects to humans observed following occupational and accidental exposures to Roundup herbicide were limited to minor skin and eye irritation. The only instances of death associated with ingestion of Roundup occurred in suicide attempts involving very large doses; in these cases the clinical symptoms associated with the cause of death were attributed to the surfactant POEA, and not to glyphosate (Williams et al., 2000). POEA is not present in the glyphosate formulation found in AquaMaster.

The studies examined in this review, which also included evaluations of the glyphosate breakdown product and POEA, lead to the conclusion that "under present and expected conditions of use, Roundup herbicide does not pose a health risk to humans." In addition, a World Health Organization (WHO) document on glyphosate in drinking water stated that due to the low toxicity of glyphosate, the health-based value is orders of magnitude higher than the concentrations normally found in drinking water, and therefore establishment of a guideline value for glyphosate in drinking water "is not deemed necessary" (WHO, 2003).

4.8.3 Carcinogenicity

The EPA's Re-Registration Eligibility Document (RED) classified glyphosate as a Group E chemical, indicating evidence of non-carcinogenicity in humans (EPA, 1993). Most chemicals that are unlikely to be carcinogenic in humans are assigned to Group D (Not classifiable regarding carcinogenicity). The Group E categorization implies a strong weight of evidence that glyphosate is not carcinogenic.

The WHO Environmental Health Criteria document # 159 for glyphosate states that "Animal studies show that glyphosate is not carcinogenic, mutagenic or teratogenic" (WHO, 1994). A critical review of the human health literature on glyphosate also concluded that glyphosate is noncarcinogenic, stating that "Multiple lifetime feeding studies have failed to demonstrate any tumorigenic potential for glyphosate" (Williams et al., 2000). Some studies have shown tumor incidence in mice and rats, but these have so far been determined not to be treatment-related effects (Williams et al., 2000; EPA, 2010).

As summarized in USDA (2000), the US Forest Service Pacific Northwest Region Final Environmental Impact Statement (FEIS) assumed that glyphosate was a carcinogen and conducted a human health risk assessment under this assumption. The highest resulting worst-case cancer risk was 4 in 100 million, which is much lower than the EPA and Forest Service threshold risk value of one in one million. Another more recent risk assessment, also summarized in USDA (2000), assumed a much higher cancer potency estimate than that used in the FEIS assessment; the highest worst-case risk estimate resulting from that study was 0.8 in one million, which is still below the EPA/Forest Service threshold of concern.

Some types of ethoxylated ingredients, including ethylene oxide (unreacted) and 1,4-dioxane, are likely human carcinogens. Agri-Dex does contain ethoxylated ingredients, but information about the exact types it may contain is not available. It is possible that ethylene oxide (unreacted) and 1,4-dioxane could be present in the final formulation as a result of ethylene oxide reactions in the manufacturing process (Bakke, 2007). Based on the fact that Agri-Dex has much lower toxicity than other adjuvants containing ethoxylated ingredients, it can be assumed that if either is present, the concentrations are low.

4.8.4 Endocrine Disruption

Recent research has shown endocrine-related effects of low-level exposures of amphibians to atrazine and other triazine herbicides. Both the chemical components and mode of action of these herbicides are completely different from those of AquaMaster. Atrazine works via photosynthesis inhibition, while glyphosate works by inhibiting the production of amino acids necessary to plants (Diana et al., 2000; Sipcam, 2000). Due to these significant differences, conclusions drawn about endocrine impacts from atrazine and other triazine herbicides is not relevant for glyphosate-based herbicides, and should not be considered an indication that they would have similar effects in the environment.

Specific studies focusing on endocrine disruption of glyphosate are available but not numerous. Most consider specific formulations, which include additives and other ingredients not found in AquaMaster. For example, Roundup was used in a Walsh (2000) study where effects on protein synthesis associated with steroidogenesis in Leydig cells were reported. This endpoint may be a biomarker for endocrine disruption effects. However, it is not clear if the effects were due to glyphosate, the relatively more toxic adjuvant, or the formulation. Given the large effort focused on identifying endocrine disrupting compounds over the past several years, the lack of literature indicating potential endocrine disruption effects from glyphosate is strong negative evidence.

Many endocrine disruptors are identified through effects on amphibians. In a review of potential products to use for weed control, a member of the North Carolina Partners in Amphibian and Reptile Conservation recommended Agri-Dex to “ensure we are using the least toxic product currently available to us. In this case that means obtaining a surfactant-free 53.8% glyphosate product such as Accord Concentrate, Foresters Non Selective, AquaMaster, AquaNeat, Rodeo or a comparable herbicide and mixing it with the surfactant Agri-Dex” (Hughes, 2009).

4.9 ANIMALS AND THE ENVIRONMENT

As summarized by the USDA (USDA; 1997, 2000), glyphosate itself is relatively non-toxic to fish, algae, aquatic invertebrates, and aquatic macrophytes. Studies have shown commercial

formulations of glyphosate such as Roundup and Kleeraway, which contain surfactants, to be toxic to fish, aquatic invertebrates, and amphibians at low levels (Folmar et al., 1979; Cauble and Wagner, 2005; Smith, 2001). However, many of the toxic effects associated with commercial glyphosate formulations have been shown to be due to the presence of the surfactants rather than the glyphosate itself (Folmar et al., 1979; Howe et al., 2004; USDA, 2000).

One study that examined the effects of a glyphosate formulation (Roundup) and its components on aquatic invertebrates and fish found the surfactant to be the primary source of toxicity. The LC50 values (concentrations lethal to 50 percent of test organisms) for glyphosate alone were one to two orders of magnitude higher than those for the Roundup surfactant, indicating that glyphosate has much lower toxicity than the surfactant in Roundup (Folmar et al., 1979).

Another study that examined the acute and chronic effects (including endocrine-related effects) of glyphosate, several commercial glyphosate formulations, and the polyethoxylated tallow amine surfactant POEA commonly found in Roundup, on four amphibian species showed that the surfactant POEA and glyphosate formulations containing either POEA or other ethoxylated tallow amine surfactants were much more toxic than glyphosate alone. In most cases, glyphosate alone had no effects (Howe et al., 2004).

A similar study in which tadpoles of four Australian frog species were exposed to several formulations, including Roundup and glyphosate IPA alone, showed that while Roundup and other formulations demonstrated acute toxicity to the tadpoles, glyphosate IPA was found to be nontoxic (Mann and Bidwell, 1999).

In a University of Washington study comparing the toxicity of four surfactants commonly used with glyphosate herbicides to juvenile rainbow trout with respect to survival and behavior, Agri-Dex was found to be the least toxic, with LC50s almost two orders of magnitude higher than the most toxic surfactant (Smith et al., 2004). This study states “To minimize non-target effects…we recommend Agri-Dex over the other three surfactants.” Three of the four surfactants tested by Smith et al. (2004) were also compared by USDA (1997) and Diamond and Durkin (1997) using other available studies; while the LC50 values reported in these studies were higher than those in the Smith et al. (2004) study, the relative toxicity was similar; LC50s for Agri-Dex were one to two orders of magnitude higher than those for the other two tested surfactants. Agri-Dex was classified as “Practically Non-toxic” for both fish and aquatic invertebrates (USDA, 1997).

As summarized in USDA (1997, 2000), most studies show no adverse effects of glyphosate on soil microorganisms. While non-target terrestrial plants may be affected by unintentional drift, the effects are likely to be most evident within 50 meters of the intended application (USDA, 2000). EPA (1993) classified glyphosate as no more than “Slightly Toxic” to upland game birds and waterfowl when ingested in the diet, and concluded that glyphosate was not expected to cause reproductive impairment in birds. The avian studies evaluated by EPA (1993) were conducted using technical grade glyphosate at much higher concentrations (83% - 98.5%) than that found in AquaMaster (53.8% glyphosate IPA; Monsanto, 2005).

While data for other terrestrial wildlife species, such as mammals, are limited, USDA (2000) states, “very few studies suggest the potential for toxic effects.” Glyphosate has been shown to

not bioaccumulate or breakdown in rats given oral doses. As a result, "most glyphosate is excreted unchanged in urine and feces". The primary effects noted were changes in population density related to changes in food and habitat availability resulting from herbicide application (USDA, 2000). Affected vegetation will be limited to the immediate spray area, and as such, food and habitat availability changes will not be an issue. DEC does not believe there is a significant risk to mammal and other terrestrial wildlife based on a limited exposure pathway and evidence that glyphosate does not bioaccumulate.

4.10 OVERALL FINDING OF ENVIRONMENTAL ANALYSIS

Based on the analysis provided above, DEC does not expect an unreasonable adverse effect to water resources, animals, the environment, or human health, welfare, and safety.

4.11 ENVIRONMENTAL, SOCIAL, AND ECONOMIC COSTS AND BENEFITS

DEC evaluated the social and economic costs and benefits of the proposed ARRC herbicide application proposal.

4.11.1 Environmental Cost/Benefit Issues

Issues related to environmental costs and benefits are not specifically addressed in the permit application. Some issues related to environmental costs were brought forward as part of the public comment period. Environmental cost and benefit issues are presented in this subsection.

<u>Environmental costs from public comments</u>

The public comment period brought forth several issues relevant to potential environmental costs of the proposed project. These issues include:

- Glyphosate may contaminate water bodies.
- Glyphosate and its degradates could migrate into marine waters and impact the endangered Cook Inlet Beluga Whale by contaminating food sources and beluga breast milk.
- Glyphosate is harmful to aquatic invertebrates, aquatic insects, tadpoles, salmon, and other fish.
- Herbicide damage to aquatic invertebrates and plankton can result in ecosystem collapse.
- Dying vegetation will change the oxygen level in the water, which will kill fish.
- Removal of vegetation that shades surface water will increase water temperatures.
- Glyphosate will eliminate a wide variety of non-target vegetation.
- Glyphosate can reduce browse for moose, elk, and deer.
- Weeds in agricultural areas have become glyphosate resistant.
- Glyphosate will impact the health of soil by inhibiting nitrogen fixation, reducing fungus, and increasing disease susceptibility of plants.
- Glyphosate use will reduce songbird density.
- Glyphosate use will harm small mammal and bird populations by damaging food supplies and habitat.
- Glyphosate has adverse effects on beneficial insects including pollinators, earthworms and other soil aerators, predators, soil producers, and microorganisms.
- Spills and improper application are inevitable and will result in contamination.

Potential environmental benefit issues

- Vegetation in the track structure holds moisture that increases the degradation of the track structure, including ties that rot in moist environments. The degradation increases the chance for derailment, which could result in significant environmental damage due to spilled fuel and cargo. A potential environmental benefit of the proposed project includes reduced risk of catastrophic derailment and associated environmental damage.
- The proposed project has the potential to help reduce the spread of invasive weeds, which more easily propagate and spread along right-of-ways, and are known to exist in the proposed treatment area.

4.11.2 Social and Economic Cost/Benefit Issues

Issues related to social and economic costs and benefits were discussed in the permit application, and were brought forward as part of the public comment period. These issues are presented in this subsection.

Permit application discussion of social and economic cost and benefits

Part 8.1 of the permit application includes a discussion of Economic and Social Costs and Benefits, from the ARRC perspective. Part 8.1 starts with establishing the need to use herbicides to control vegetation around railroads. Reasons given include:

1) The need for the track to be visible to allow inspection of critical components such as ties, rail, and the fasteners that secure the rail to the ties.
2) The need to remove vegetation to allow safe walking by train crews, to maintain visibility of wayside signals and signs, and to prevent vegetation from brushing against the sides of trains or track equipment.
3) The need to remove vegetation in the track structure, because it holds moisture that increases the degradation of the track structure, including ties that rot in moist environments. The moisture also reduces the ability of the track to support traffic and increases maintenance efforts and costs.

This discussion notes that vegetation maintenance is a federal safety requirement. It also provides copies of the Federal Railroad Administration (FRA) inspections, which have resulted in ongoing monetary fines for lack of vegetation control.

The discussion in the application mentions that the ARRC has been able to control wayside brush using conventional brush cutters and hand labor, but vegetation control in and around the track structure has not been effective. ARRC uses a number of non-chemical control methods, including mechanized rail-based brush cutters, off-rail hydro axing, and manual cutting. ARRC has tested methods such as steam, infrared, hot water, and burning, but these methods have proven ineffective.

The FRA has stated that the vegetation problems on the railroad are unacceptable, and that there has been no visible progress in dealing with these problems. In a letter attached to the permit application, the FRA states that if the vegetation management problem persists or worsens, FRA may use additional enforcement tools, including speed restrictions, a compliance order,

assessment of civil penalties, and an emergency order removing the affected track from service (Strang, 2009).

The permit application includes three examples of economic and social impacts of delays or interruptions in Alaska Railroad service:

1) Delay example – The railroad transports 500,000 passengers annually between communities along the railbelt. Impacts of delays listed include increased congestion on the highways. It also cites that delays will result in late arrivals of passengers, which will negatively affect small businesses that serve tourists.
2) Service interruption example – The Alaska Railroad hauls petroleum products from the North Pole Refiners to Anchorage for distribution to military bases and the Anchorage International airport and coal from the Usibelli coal mine in Healy to the port of Seward. Highway transportation of these products is not economical.
3) Fines and penalties – The fines for non-compliance with Federal regulations in 2009 are estimated to range between $130,000 and $2,000,000.

<u>Social and economic costs and benefits from public comments</u>
The public comment period brought forth several issues relevant to social and economic costs and benefits of the proposed project. These issues include:

- Impacts on state's tourism, sport fishing, and commercial fishing industries because of damaging the perception of Alaska as a pristine environment.
- ARRC has not considered the liability, clean up costs, and monitoring if herbicides contact groundwater.
- There is great aesthetic and quality of life value to living in an area that is free from pesticide use.

4.11.3 Analysis of Environmental Costs/Benefits

Potential environmental costs of performing this activity would include any adverse effects on humans, animals, or the environment. Conversely, potential environmental benefits from performing this activity would involve either any prevention of environmental impacts, or improvements to the environment due to the activity. DEC evaluated the potential environmental costs and benefits of the proposed herbicide application.

Environmental Costs

DEC considered the potential environmental costs listed in Section 4.11.1, and finds no significant environmental cost from performing the proposed activity. As detailed in the environmental analysis in Sections 4.4 through 4.9, DEC does not believe that there will be significant environmental impacts from the proposed project.

In addition to the analysis performed in Sections 4.4 through 4.9, DEC finds the following on environmental costs:

- The proposed herbicide application is limited to railroad right of way, and the herbicide is not particularly mobile or persistent. EPA has approved the herbicide for use on water. It will not adversely affect fish or aquatic life; furthermore, based on its mobility and buffers required by the permit, it will not reach water, so water resources and aquatic life will not be impacted.

- Although the proposed project will eliminate vegetation in the railroad right-of-way, due to the characteristics of the herbicide, no impacts to vegetation outside of the spray area will result from the proposed project.
- Health impacts to mammals, birds, insects, and soil producing organisms are not expected. Due to the limited application area, there is a limited exposure pathway, and the biochemical mechanism by which the proposed herbicide acts on plants is not found in animals. The size of the target spray area is not large enough to impact bird, mammal, or insect habitat.

- Herbicide resistance is a factor in some heavy use areas. However, due to the limited target spray area and the limited quantity of herbicide proposed to be applied, herbicide resistance is not expected.

- The pesticide will be applied by experienced, licensed and certified professional applicators. As a result, spills and improper application of glyphosate are considered to be unlikely. Due to the limited quantity of herbicide proposed to be applied, and the limited persistence and mobility of the proposed pesticide, significant environmental impacts are unlikely in the event of a spill.

DEC finds the following on potential environmental benefits of the proposed activity:

- Although there is a remote chance of catastrophic derailment due to track damage resulting from uncontrolled vegetation in the right-of-way, the potential environmental costs of such a derailment are high. To the extent that the proposed project can minimize potential derailments, there is a slight environmental benefit from the proposed project.

- The proposed project will eliminate invasive weeds within the target spray area. The overall impact to the spread of invasive weeds is likely to be insignificant, due to the small target spray area. To the extent that the proposed project can inhibit the spread of invasive weeds, there is a slight environmental benefit from the proposed project.

DEC believes that there are insubstantial potential environmental costs, as well as insubstantial potential environmental benefits as a result of the proposed project. DEC does not believe that this limited application of herbicide will have a significant impact on the environment in Alaska.

4.11.4 Analysis of Economic Costs and Benefits

The economic costs of herbicide application involve both the cost to the applicant of performing the herbicide application, and the economic costs of either performing or not performing the proposed herbicide application.

The ARRC stated in their application materials that they employ rail-based brush cutters, off-rail hydro-axing, and wayside manual cutting. In addition they've tested alternative methods such as steam, infrared, hot water, and burning. However, they have found these methods to be ineffective and uneconomical to achieve adequate weed control.

The threat of fines and threat of track closures or slowdowns by FRA is a significant factor in DEC's opinion. ARRC does have a significant history of attempting to manage vegetation using a number of non-chemical methods, and in spite of these efforts, vegetation management has not been adequate in the opinion of the FRA. Most railroads in the United States use herbicides as part of vegetation management.

The fines that FRA has assessed and is threatening to assess are significant; however, the greater economic cost is the threat of track slowdowns or closures. The ARRC is a significant component of the State of Alaska's economy, and it is a critical component of other Alaska industries, including coal and tourism. The ARRC has been hurt by worldwide economic conditions, and track slowdowns or closures between Anchorage and Seward or Fairbanks would make this economic condition worse. If ARRC's economic situation becomes bad enough that its economic survival is threatened, this would more broadly impact Alaska's economy, including impacts on the North Pole refinery and Anchorage International Airport.

Other economic impacts were considered, such as the threat to other industries (such as the fishing industry), activities, and to property values based on negative perception of herbicide application. DEC considered these issues, but does not believe that there will be any negative economic impact to these industries, or to property values. The proposed herbicide application is to railroad right of way, and the herbicide is not particularly mobile or persistent.

- EPA has approved the herbicide for use on water. It will not adversely affect fish; furthermore, based on its mobility and buffers required by the permit, it will not reach water, so fisheries will not be impacted.

- This application is to the railroad right of way only. The low mobility of the herbicide will ensure that adjacent areas which might be recreation areas, gathering areas, and other areas where the public may be present will not be impacted.

- The low mobility of the herbicide will ensure that adjacent areas will not be impacted; therefore it will not impact subsistence gathering activities.

- The wildlife discussion in this document indicates that animals will not be adversely impacted; therefore, there will be no adverse effect on hunting.

- Property values are not expected to be impacted. Glyphosate is routinely used for vegetation control, and this use has not been shown to adversely affect property values.

There are potential economic costs to tourism both from conducting or not conducting this activity. The potential economic costs of applying herbicide on tourism are potential negative

perceptions will make Alaska less desirable to tourists. The potential economic cost on tourism of not applying herbicide would be if ARRC is forced to slow down railroads or if tracks are closed. DEC believes that there is a greater potential cost to tourism if herbicides are not used, due to the sanctions likely to be imposed by FRA. DEC does not believe that this limited application of herbicide will have a significant impact on tourists' perception of Alaska and whether they will or will not travel to Alaska.

4.11.5 Analysis of Social Costs and Benefits

DEC evaluated the potential social costs and benefits of the proposed herbicide application. The potential social costs involved with this project involve the following:

- Potential job losses from impacts to industry from any FRA-based curtailment of ARRC activities.

- Potential job losses to both ARRC employees and affected industries from any FRA-based curtailment of ARRC activities.

- Perceptions and concerns of individuals on herbicide use.

Potential social benefits involved with this project involve the following:

- Decreased risk to ARRC passengers from better track inspections and conditions due to vegetation removal.

As discussed in the economic review in Section 4.11.4, DEC does not believe that there will be significant economic impacts on tourism or other industries from herbicide application, and as such, the activity should not affect jobs of individuals.

DEC recognizes that some individuals are opposed to herbicide use, and the application of herbicides for vegetation control will concern them. The amount of public comment received specific to general opposition was not substantial. The social impact on ARRC employees who could lose their jobs if weeds are not adequately controlled is significant, given the realistic threat of curtailment of ARRC activities by FRA due to not adequately managing vegetation. From a potential social benefit perspective, the safety to passengers of maintaining the rail lines is important, as any train derailment due to unsafe track conditions would have a serious social impact, in addition to potential economic impacts.

4.11.6 Finding on Environmental, Social, and Economic Costs and Benefits

Based on its analysis, DEC does not believe there is an unreasonable adverse effect based on environmental, social or economic issues, and that there is a greater potential economic cost if the herbicide permit is not issued.

4.12 OVERALL UNREASONABLE ADVERSE EFFECT FINDING

In issuing or denying a permit application, the criteria given for potentially denying a permit based on unreasonable adverse effect are included in 18 AAC 90.525(b)(2) and (5). As discussed in this section, DEC finds that proposed herbicide application will not pose an unreasonable risk

to humans, animals, or the environment, based on consideration of economic, social, and environmental costs and benefits of the use of the herbicide.

5.0 CONCLUSION

A permit application was provided to DEC by ARRC. A public notice, comment period, and hearings were held in accordance with the regulatory requirements, and DEC reviewed the record resulting from the public notice and hearings. DEC also considered all comments received from local, state and federal agencies. The proposed herbicide application project meets applicable regulatory requirements.

The available literature on glyphosate, the only ingredient in the herbicide besides water in AquaMaster herbicide, and Agri-Dex, the surfactant that will be used with AquaMaster, was reviewed to evaluate the potential health effects and fate and transport of these products in a cold environment. Based on this review, glyphosate appears to be relatively non-toxic and its use in the proposed setting is appropriate. Agri-Dex has been shown to be much less toxic than other surfactants recommended for use with glyphosate herbicides, and appears to be the best option for use in the proposed setting.

Both environmental costs and environmental benefits of the proposed project are insubstantial. The potential economic costs of not performing the proposed activity are significant, and in the opinion of DEC outweigh any potential economic costs of performing the activity. Furthermore, the social costs of not applying herbicides to control vegetation outweigh the social costs of applying herbicides.

Based on the information contained in the permit application, the public comment, and the available literature, as summarized above, and based on its analysis of the proposed project, DEC has concluded that the application of the herbicide and surfactant would result in no unreasonable adverse effect and therefore this permit application is approved. Under the authority of 18 AAC 90.525, DEC will approve the permit application. The permit will take effect 40 days after issuance, and will expire five years after the effective date.

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