# Department of Environmental Conservation
# Division of Environmental Health

# Department of Natural Resources
# Application for
# Permit to Use Pesticide
# For Control of Elodea
# In the Fairbanks Area

## Public Noticed
## May 2 through June 2, 2016

## Decision Document
## November 9, 2016

**Project Description**
On April 27, 2016, the Alaska Department of Natural Resources (DNR), Division of Agriculture submitted an application for a permit to apply herbicide to control invasive Elodea in Chena Lake, Chena Slough, and Totchaket Slough in the Fairbanks area.

Elodea is an invasive aquatic plant that has the potential to grow abundantly and compromise water quality, hinder boat and float plane traffic, reduce dissolved oxygen, and impact fisheries. Control of this invasive plant is necessary to prevent spread to other locations. Physical or mechanical controls are inappropriate, as these methods break the plant into fragments which can then reproduce.

The proposed products include;

- Sonar Genesis, with EPA registration number 67690-54 and state of Alaska registration number AK-1600001;
- Sonar One, with EPA registration number 67690-45; and
- Sonar H4C, with EPA registration number 67690-61.

All products have the active ingredient fluridone. Treatment is proposed to occur between May and October throughout the duration of the permit.

Fluridone is a selective systemic herbicide labeled for use in controlling aquatic vegetation in a variety of aquatic sites. Fluridone kills target plants by inhibiting the formation of carotene. In the absence of carotene, chlorophyll is degraded by sunlight, preventing the plant from photosynthesizing.

Liquid product (Sonar Genesis) will be applied from motorboats using a weighted trailing hose to inject liquid herbicide into the lower portions of the water column (Chena Lake, Totchaket Slough) or via a continuous drip system (Chena Slough). Pelleted product (Sonar One, Sonar H4C) will be applied from motorboats using a forced air blower system, or applied by hand along shorelines.

The target concentration, which must be maintained for a minimum of 45 days, is 8 parts per billion (ppb). Application rates differ from target concentrations. The application rates for pelleted products (Sonar ONE and Sonar H4C) reflect the slow release rate inherent in these products, and are listed at 30 ppb and 70 ppb, respectively. These application rates are calculated to result in a steady concentration at the target level of 8 ppb.

**Public Comment**
Notice of the permit application was published in the Fairbanks Daily Newsminer on May 1 and 2, 2016. Notice included information about the opportunity to submit comments on the permit application. The Alaska Department of Environmental Conservation (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 public comment period for the permit application began on May 2, 2016 and ended June 2, 2016. DEC received 25 written comments within the comment period.

**Pesticide Use Permit Evaluation**

Under 18 AAC 90.505, a pesticide use permit is required to apply pesticides to waters of the state. Permits will only be issued if DEC determines that no unreasonable adverse effect is expected as a result applying the pesticide. Per definitions in 18 AAC 90.990(54), "unreasonable adverse effect" means 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.

Human and animal health risks and environmental costs and benefits of pesticide application are determined by evaluation of the product(s) proposed for use, site-specific aspects of the proposed application, and environmental impacts of use, including impacts on animals or other non-target species. Social and economic costs and benefits involve the analysis of perceived or actual impacts and benefits of the proposed project on the public, and the economic impact of performing or not performing the project. DEC's analysis of these aspects is laid out in the following sections.

**Human Health Risk and Environmental Cost/Benefit Analysis**

Product Evaluation

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 sufficient to protect human health and the environment from unreasonable adverse effects if used in accordance with the label.

The proposed products are currently registered with EPA and are also registered in the state of Alaska. Fluridone is approved for application to flowing waters. The federally approved product label for Sonar Genesis did not specifically address application to flowing waters; a state Special Local Needs registration status was applied for and received for this product.

Site and Conditions Evaluation

*Product Characteristics*
Fluridone binds to clay and soils with high organic matter, especially in pellet form (Washington DNR, 2012). Once bound to sediments, the products become biologically unavailable and are no longer active. For fluridone, proposed treatment levels are at very low concentrations and therefore require a contact time of 45-90 days (Washington DNR, 2012).

In most situations, fluridone is characterized as binding quickly to suspended sediment soils and organic matter, resulting in moderate to low mobility in soil. Pesticides bind more readily to fine grained particles, due to the increased surface area to which the molecules can adhere. Due to chemical characteristics, fluridone also tends to bind more readily to organic sediments.

Once it adheres to soil particles, fluridone is unavailable to disperse or to continue to act as an herbicide. Fluridone has an estimated half-life in water of only 20 days (EPA, 1986) and a hydrosoil half-life of approximately 119 days (NCBI, 2005). As a result, fluridone remains present in the environment for only a limited time.

*Site Characteristics*

Chena Lake is a man-made lake built for flood control located 16 miles east of Fairbanks. It has no inlets or outlets during normal flows, and the flood control structure has never been used since construction in 1979. There is some residential development near Chena Lake; five drinking water wells have been identified within 200 feet of the lake.

Totchaket Slough is 12 miles north of Nenana. It normally has a very low flow, with an average 8.5 $ft^3/s$ measured in 2015. It is recharged from groundwater and wetlands, and discharges into the Nenena River. It is relatively remote, with no drinking water wells identified nearby.

Chena Slough is 4 miles east of Fairbanks. It normally has a low flow, with an average 52 $ft^3/s$ measured in 2015. It is recharged from groundwater, and discharges into the Chena River. This area has significant residential development along its length. Many residents have lawns or gardens, and 153 drinking water wells have been identified within 200 feet of the treatment area.

There are no potable water intakes identified in any of the proposed treatment areas.

Under Alaska Statute 46.15, residents must obtain a water rights permit from the Department of Natural Resources prior to diverting or withdrawing significant quantities of water (greater than 500 gallons per day for ten or more days). As of July, 2016, DNR Water Resources has not issued any permits for this activity in the treatment areas. There may be a number of users who withdraw smaller quantities of water to irrigate gardens or landscaping.

The geology and hydrology of Chena Slough and the rest of the proposed treatment area are well understood. A large number of studies have been conducted over the years to provide an extremely well documented, comprehensive hydrologic and geologic characterization of the area.

There is significant documentation that Chena Slough is underlain with organic rich, fine grained sediment. Several studies note that Chena Slough has extensive vegetative mats, rooted aquatic plant growth, and excessive accumulation of organic fines. A United States Geological Society study (Kennedy, 2009) concluded that, "organic rich fine-grained sediments accumulate in Chena Slough because of the road crossing impoundments and flow velocities that are not high enough to flush the fines downstream." Chena Slough has been included on Alaska's section 303(d) list of impaired waters since 1994; it is listed due to excessive sediment loads.

The soil organic carbon partitioning coefficient, denoted as $K_{oc}$, is a measure of the tendency of a chemical to bind to soils. These values can vary substantially, depending on soil type, soil pH, the properties of the pesticide, and the type of organic matter in the soil. The larger the $K_{oc}$ value, the stronger the adsorption of the chemical to soil, leading to lower mobility.

In areas with fine grained, organic rich soils, such as the Chena Slough, the $K_{oc}$ of fluridone has been measured to be approximately 2,700, which indicates low mobility, or ability to travel through soils (Reinert 1989). It is possible (although no documentation has been provided) that some limited areas could be underlain with gravel. The $K_{OC}$ in these immediate areas would be lower. However, fluridone would bind to other fine grained soils as it moves through the surrounding substrate.

A Groundwater Ubiquity Score (GUS) is used to rank herbicides on their potential to migrate towards groundwater. The GUS relates herbicide persistence (soil half-life) and the tendency of the herbicide to bind to soils ($K_{oc}$). GUS is calculated by multiplying log10 (soil half-life) by [4-log10($K_{oc}$)].

| GUS | Potential to move toward groundwater |
|---|---|
| < 0.1 | Extremely low |
| 1.0-2.0 | Low |
| 2.0-3.0 | Moderate |
| 3.0-4.0 | High |
| > 4.0 | Very high |

Using a soil half-life of 119 days (NCBI, 2005) and a $K_{oc}$ of 2,700, as appropriate for areas with fine grained, organic rich soils, such as the Chena Slough, the GUS for fluridone is calculated to be 1.3, or a low potential to move towards groundwater.

**Calculation of GUS for fluridone in Chena Slough**

log10 (119) X (4 – log10 [2,700]) =

2.1 X (4 – 3.4) =

2.1 X 0.6 =

1.3

Even when more conservative factors are used to accommodate any differences in soil parameters, the GUS would still fall in the low range. For example, if the $K_{oc}$ value is reduced by 20% ($K_{oc}$ = 2,160), and a conservative soil half-life of 360 days is assumed (NCBI), the GUS would be 1.8, which is still in the low range.

Water quality in Chena Slough is already significantly compromised. In addition to sediment loads, nearby areas are known to have sulfolane contamination. Recent studies also found a number of semi-volatile organic compounds, PCBs, and historical DDT in its sediments, as well as elevated levels of phosphorous, sulfate, and chlorides (Kennedy, 2009).

Colder temperatures in Alaska can affect breakdown of some pesticides, and result in longer persistence. However, as explained above, fluridone binds to suspended sediment in the water column and to soils. Therefore, any increase in persistence would be irrelevant because the product becomes biologically unavailable when bound to sediments.

Fluridone has been used a number of times in recent years in Alaskan lakes, including Stormy Lake, Beck Lake, and Daniels Lake on the Kenai Peninsula; Lake Hood, Sand Lake, Campbell Lake, Little Campbell Lake, and DeLong Lake in Anchorage; and Eyak Cannery Ponds near Cordova. No unreasonable adverse effects have been identified as a result of any of these uses, even in lakes with significantly higher application rates, such as Campbell Lake. Fluridone has also been extensively

used in similar applications in other states, with no significant impacts to human health, non-target organisms, or the environment.

DEC is satisfied that the hydrology, geology, and other site characteristics of the treatment area are adequately understood. DEC is also satisfied that conditions would prevent significant migration of fluridone into surrounding ground water.

*Human Health*
The health effects of the proposed pesticide have been extensively studied and are well understood. This pesticide has been registered since 1986 and has been widely used across the United States.

A complete human health risk assessment for fluridone was completed in support of the EPA's 2004 fluridone Tolerance Reassessment Eligibility Decision (TRED). This assessment found that the food, drinking water, and recreational swimmer risks are not of concern separately or when aggregated.

One measure of risk that the EPA considers is the Residential Margin of Exposures (MOEs). MOEs greater than 100 are considered to be not of concern. The drinking water MOEs for fluridone and degradates are greater than 7,500. The recreational swimmer MOEs for fluridone and degradates are greater than 4,800. In the available toxicity studies, there was no indication that fluridone is an endocrine disruptor, nor does it impair immune function (EPA, 2004).

Dietary risk assessment incorporates both exposure to, and toxicity of, a given pesticide. Dietary risk is expressed as a percentage of an identified level of concern. This level of concern is referred to as the population adjusted dose (PAD), and reflects an amount that is predicted to result in no unreasonable adverse health effects, including sensitive members such as children. Estimated risks that are less than 100% of the PAD are below EPA's level of concern. For fluridone, the acute dietary exposure estimates are less than 1% of the acute PAD. The chronic dietary exposure estimates ranged from 1% of the chronic PAD for the general U.S. population, to 3.6% of the chronic PAD for children ages 1-2 (EPA, 2004).

The EPA has evaluated fluridone and has determined that it likely does not cause cancer. Fluridone is classified as a group E carcinogen, "evidence of non-carcinogenicity for humans." This classification is based on the lack of evidence of carcinogenicity in mice and rats (EPA, 2004).

The Material Safety Data Sheet (MSDS) for Sonar ONE which was included in the permit application dates from 2009. It does state that the product contains material which can cause cancer. However, the current 2015 MSDS does not include this statement. According to manufacturer SePro, the statement was related to a formulation additive, not the active ingredient fluridone. There is no evidence that the current formulation of Sonar ONE causes cancer.

There is some evidence that the degradation product N-methyl formamide (NMF), causes birth defects. However, since NMF has only been detected in the lab and not following actual fluridone treatments, EPA has indicated that fluridone use should not result in NMF concentrations that would adversely affect the health of water users. Further discussion of degradates can be found below.

DEC is satisfied that the proposed project would not result in any unreasonable risks to human health.

*Degradates*
As part of its evaluation of pesticides, EPA assesses potential impacts from degradates. There are two major compounds that may result when fluridone degrades; 3-triflurомethyl benzoic acid and NMF.

There is some evidence that the degradation product NMF may cause birth defects or other damage to fetuses and may cause damage to liver or other cells. However, NMF has only been detected in the lab and has never been observed as a breakdown product following actual fluridone treatments in natural conditions.

The State of Washington performed calculations to examine potential human health effects of NMF (WSDOE, 2000). They found that the safety factors for NMF exposure through drinking water and through skin absorption are very high. "Under worst case conditions, a person would need to drink 15,852 gallons of treated drinking water per day to reach the No-Observed-Effect Level (NOEL) or greater than 78,077 gallons per day under realistic case conditions. For incidental ingestion, a person would have to swim in fluridone treated water for 1,014 years under worst case conditions and for >5,070 years under realistic case conditions in order to be exposed to equal the NOEL" (WSDOE, 2000).

Since NMF has never been observed in natural conditions following fluridone treatments, EPA has indicated that fluridone use should not result in NMF concentrations that would adversely affect the health of water users (EPA, 2004).

The other primary degradate of fluridone is 3-triflurомethyl benzoic acid. There is no documentation indicating health risks associated with this degradate.

DEC is satisfied that degradates of fluridone as a result of this project are not likely to result in an unreasonable adverse effect.

*Medical Uses*
Some recent studies indicate that fluridone may have a pharmaceutical use as an anti-inflammatory. Research found that fluridone at micro-molar concentrations may have anti-inflammatory effects on several cell types, via action as an inhibitor of abscisic acid.

The potential that fluridone may be developed as an anti-inflammatory medication in the future does not represent viable evidence that use of fluridone as an herbicide presents any unreasonable risk to human or animal health. Fluridone has been extensively used in similar applications in other states, with no significant impacts to human health, non-target organisms, or the environment.

*Drinking Water*
Fluridone has a strong tendency to bind to soil particles, which means it is unable to migrate through the ground into nearby drinking water wells. In accordance with label instructions, low

concentrations of fluridone are allowable even when applied directly to potable water sources, a reflection of the low risk to human health from this product. The target concentration for fluridone for this project is 8 ppb, well below the allowable level of fluridone in drinking water sources.

DEC believes that detection in drinking water wells is remote, based on its low mobility in soil. However, in the unlikely event that fluridone does migrate through soil into nearby wells, DEC believes that concentrations would be well below levels of concern and would not be likely to result in an unreasonable adverse effect to human health.

As a precaution, the permit will stipulate a specific schedule for testing for the presence of fluridone in drinking water wells. If fluridone in excess of 20 ppb (label limit for application within ¼ mile of potable water intakes) is detected, additional fluridone application will be prohibited until specifically authorized by DEC. This is considered to be highly unlikely, as the target concentration is 8 ppb.

DEC is satisfied that any impacts to drinking water wells would not represent an unreasonable risk to human health.

*High Water Events*

Flooding events that impact drinking water wells can result in contamination from numerous sources, including sewer/septic systems and other types of contamination. Wells that have been impacted from flooding should always be cleaned and disinfected prior to use, to ensure water is safe to drink. The target concentration for fluridone for this project is 8 ppb, well below the allowable level of fluridone in drinking water sources. As such, DEC believes that other adverse effects that could occur if a drinking water wellhead is submerged by flood water are a much larger concern than any fluridone that might be present.

During high water flow events, such as storms and break up, the additional water flow would further dilute the concentration of fluridone. Terrestrial plants have less water permeable surfaces, and so are not as susceptible to the effects of fluridone as aquatic vegetation. In addition, fluridone must be in contact with vegetation for extended periods in order to be effective (treatment levels must be maintained for 45-90 days for elodea). As a result, impacts to terrestrial vegetation due to flooding would not be expected.

There are no restrictions for irrigation with treated water for trees, turf, or established plants when levels of fluridone are less than 10 ppb. Plants such as tomatoes, peppers, or newly seeded crops can be more sensitive to treated water; the pesticide labels limit irrigation for these plants if concentrations are greater than 5 ppb. The increased water flow during a flooding event would dilute the concentration of fluridone to less than 5 ppb, so damage to terrestrial plants from fluridone would not be expected. Many plants would be expected to drown during a flooding event in any case.

A dam or blockage could result in elevated levels of water with treatment concentration of fluridone. As a precaution, the permit will include a stipulation that requires the permit holder to monitor visually for dams or blockages weekly, as well as quickly investigate any unexpected changes in stream flow indicated on stream flow gauges. The permit will also include a stipulation that additional fluridone may not be applied during flooding events or if damming or blockage is present.

As explained above, fluridone binds readily to suspended sediment soils and organic matter. Fluridone is not expected to migrate through ground water to impact drinking water wells, even if water levels rise as a result of increased flow, flooding, or damming.

DEC is satisfied that changes to stream flow or flood events will not result in an unreasonable risk to human health or the environment.

*Irrigation Uses*
Terrestrial plants are not as susceptible to the effects of fluridone as aquatic vegetation. However, the product labels do establish some restrictions on use of treated water for irrigation. In accordance with label for Sonar Genesis, there are no restrictions for irrigation to established turf and lawns, established crops, ornamental plants, and most other types of vegetation. The labels for Sonar One and Sonar H4C caution against using treated water to irrigate established crops, turf, plants, or trees for seven days after treatment. Damage may occur to seedlings or plants in the nightshade family (tomatoes, peppers, potatoes, tobacco, etc.), at concentrations of 5 ppb or above.

Under Alaska Statute 46.15, residents must obtain a water rights permit from the Department of Natural Resources prior to diverting or withdrawing significant quantities of water (greater than 500 gallons per day for ten or more days), including waters from Chena Slough. As of July, 2016, DNR Water Resources has not issued any permits for this activity.

There may be a number of users who withdraw smaller quantities of water from Chena Slough to irrigate gardens or landscaping. These individuals may need to use an alternative source of water during the treatment period, such as well water. Any residents who use water from Chena Slough to irrigate will be cautioned to use an alternative irrigation source for the week immediately following treatments.

DEC is satisfied that the benefits of eradicating elodea through the use of fluridone are greater than the potential detriment of temporary loss of the use of small quantities of irrigation water.

*Stream Flow/Downstream Impacts*
Chena Lake is a closed water system. Totchaket Slough and Chena Slough are both recharged primarily by upwelling groundwater, and have limited outflow. Totchaket Slough streamflow was measured in 2015 with an average 8.5 cubic feet per second. Chena Slough streamflow was measured in 2015 with an average 52.0 cubic feet per second.

The label for fluridone allows for application to flowing water areas. While some pesticide will flow downstream of the sloughs, the relatively low streamflow is not expected to result in rapid dispersal. Within the sloughs, additional pesticide will need to be added to maintain required concentration. Proposed additional amounts are well within label limits.

Pesticide concentrations are expected to drop downstream due to degradation, dilution, binding to sediment and soil, and pesticide uptake by plants. The levels that would be present downstream would be less than normal treatment concentrations, and therefore well under the levels of concern. As a

precaution, the permit will stipulate that downstream areas must be monitored for impacts to vegetation.

Concentrations of fluridone downstream are expected to be negligible. No herbicidal effects are anticipated to occur downstream of treatment areas. DEC is satisfied that there will be no unreasonable adverse effects to areas downstream of treatment areas.

*Non-Target Organisms*
Within treatment areas, impacts to non-target organisms are not expected to be significant. Fluridone has been used a number of times in recent years in Alaskan lakes with no unreasonable adverse effects identified. Fluridone has been extensively used in similar applications in other states, with no significant impacts to non-target organisms.

Fluridone does not appear to have any apparent short-term or long-term effects on fish at normal application rates (Washington DNR, 2012). When used at label rates, there are no anticipated impacts to birds or mammals from fluridone. Fluridone shows moderate toxicity to aquatic invertebrates. Invertebrates that are affected would be expected to repopulate treated areas once treatment was completed.

As the permit application acknowledges, some non-target plants will be affected by the proposed pesticide use. In practical application, Elodea has been found to be more susceptible to the effects of fluridone than many native plants, so effects to non-target plants are expected to be limited. Elodea reproduces by fragmentation and maintains an extensive root system. Many native aquatic plants are seed producers, and seeds will not be affected by the fluridone treatment. Studies of other lakes in Alaska treated to control aquatic invasive plants have shown that native plants usually recover within a short period of time. Negative impacts to native plant communities are expected to be minor and short term in nature; overall the project is expected to restore native plant communities and benefit fish habitat.

DEC is satisfied that use of fluridone in this project is not likely to result in an unreasonable adverse impacts to invertebrate, fish, or other animal populations, vegetation, or other non-target organisms.

*Water Quality*
Effects on water quality parameters such as clarity, dissolved oxygen, and nutrient levels, which may be impacted by decaying plant matter, are expected to return to normal over a short period of time. The treatment is proposed during summer months when there is high lake turnover. This mixing is expected to result in a rapid return to normal oxygen levels in lakes. For the sloughs, stream flows would also result in rapid return to normal oxygen levels.

*Environmental Benefit of Pesticide Application*
The main environmental benefit of the proposed action is to eliminate Elodea, which is an invasive aquatic weed. The control of invasive species is a priority for environmental management agencies and groups across the state. Elodea is included on UAA's Alaska Exotic Plants Information Clearinghouse (AKEPIC) list of Non-Native Plant Species, developed in coordination with the U.S. Forest Service, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, Department of Natural Resources Plant Material Center, and Alaska Natural Heritage Program. There is evidence to show that Elodea poses a threat to natural habitats.

Allowing Elodea to remain in some areas, including the proposed treatment area, could result in spread to additional waterbodies across the state. It is common for plant fragments to adhere to boats, planes, and other equipment, and therefore be transported to other locations.

## Social and Economic Costs and Benefits

*Social or Economic Costs*
The potential economic/social costs of applying herbicide under the proposed project are:

- temporary loss of the use of small quantities of irrigation water used by residents adjacent to treatment areas; and
- decline of property values due to potential negative perceptions of herbicide use.

No significant users of irrigation water have been identified; DNR has not issued any water use permits to allow this activity. DEC does not believe that the temporary loss of the use of small quantities of irrigation water represent a significant economic or social impact. These users should be able to use an alternative source such as well water during the treatment period.

The proposed herbicide is not expected to impact drinking water wells, which could affect property values. Herbicides and other pesticides are routinely used by homeowners, and this use has not been shown to adversely affect property values.

Water quality in Chena Slough is already significantly compromised. Nearby areas are known to have some contamination from sulfolane. It has been included on Alaska's section 303(d) list of impaired waters since 1994 due to excessive sediment loads. Recent studies also found a number of semi-volatile organic compounds, PCBs, and historical DDT in its sediments, as well as elevated levels of phosphorous, sulfate, and chlorides (Kennedy, 2009). As a result, the perception of the water quality in Chena Slough is already somewhat negative.

Fluridone binds readily to suspended sediment soils and organic matter. Once it adheres to soil particles, fluridone is unavailable to disperse or to continue to act as an herbicide. Fluridone has an estimated half-life in water of only 20 days (EPA, 1986) and a hydrosoil half-life of approximately 119 days (NCBI, 2005). As a result, fluridone remains present in the environment for only a limited time.

DEC does not believe that short term addition of fluridone will change the perception or cause any significant additional concern regarding the water quality in Chena Slough. DEC is satisfied that that the proposed project is not likely to result in a negative impact to property values.

*Social or Economic Benefits*
The potential economic/social benefits of applying herbicide under the proposed project affect both the specific treatment area, and the statewide efforts to eradicate invasive elodea. At the treatment area, benefits of the proposed project are:

- improved navigation and safety for boat and float plane traffic and other recreation;
- reduced silt build up due to trapping in elodea vegetation mats; and
- improved fish habitat, resulting in enhanced fishing opportunity.

On a larger scale, control of invasive species is a priority for environmental management agencies and groups across the state. Elodea is included on UAA's Alaska Exotic Plants Information Clearinghouse (AKEPIC) list of Non-Native Plant Species, developed in coordination with the U.S. Forest Service, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, Department of Natural Resources Plant Material Center, and Alaska Natural Heritage Program. There is evidence to show that Elodea poses a threat to natural habitats and native species.

Allowing Elodea to remain in some areas, including the proposed treatment area, could result in spread to additional waterbodies across the state. It is common for plant fragments to adhere to boats, planes, and other equipment, and therefore be transported to other locations where it becomes established.

The potential economic/social benefits over a larger area of applying herbicide under the proposed project include:

- Preventing negative impacts to water quality such as reduced levels of dissolved oxygen caused by excessive elodea growth;
- Decreased silt trapping from elodea vegetation mats;
- Improved navigation and safety for boat traffic and other recreation;
- Reduced impacts to streamflow;
- Protection of native plant communities;
- Preventing severe impact to native fisheries; and
- Significantly reduced costs of controlling elodea now when it is confined to discrete populations, as opposed to costs of controlling after it has spread to additional waterbodies spread over a larger area.

DEC recognizes that some individuals are opposed to herbicide use, and the application of herbicides for elodea control will concern them. The benefits of application are significant, however, given the damage caused to water bodies by elodea, and the realistic threat of spread to other areas. This represents a serious environmental risk, in addition to potential social and economic impacts.

Evaluation Results
Based on this analysis, there is no evidence to indicate that conditions in Alaska or at the proposed application sites would significantly affect the persistence, fate, mobility, or action of these products

and would result in unreasonable adverse effects. The EPA evaluation and registration process is in itself sufficient to ensure no unreasonable adverse effects should be expected from the proposed use of pesticides specified in the permit application for the Fairbanks Area Elodea Control Project. In addition, fluridone has been used a number of times in recent years in Alaskan lakes with no unreasonable adverse effects identified. Fluridone has been extensively used in similar applications in other states, with no documented significant impacts to human health, non-target organisms, or the environment.

As additional protective measures, the permit will include the following stipulations:

- Require a specific schedule for testing for the presence of fluridone in drinking water wells.
- If fluridone in excess of 20 ppb is detected in drinking water wells, additional fluridone application will be prohibited until specifically authorized by DEC.
- Require weekly visual monitoring for dams or blockages in Chena Slough.
- Require installation and monitoring of two stream gauges in Chena Slough.
- Require investigation of any unexpected changes in stream flow indicated on stream flow gauges.
- Prohibition against applying additional fluridone during flooding events or if damming or a blockage is present
- Require visual monitoring of downstream areas for impacts to vegetation.
- Require that the automatic drip station controls in Chena Slough be located in a secure, locked box capable of containing any leaks which might occur at the distribution site.
- Require weekly monitoring of the drip station to ensure proper functioning.
- Require baseline measurement of water quality parameters such as clarity, dissolved oxygen, and nutrient levels, prior to treatment.
- Require notification to residents who may use treated waters for irrigation, cautioning them to use an alternative irrigation source for the week immediately following treatment.

**Conclusion**

The Pesticide Program has reviewed the permit application materials and determined that the proposed project is unlikely to result in any unreasonable adverse effects to humans, animals, or the environment, based on consideration of economic, social, and environmental costs and benefits of the use of the herbicide.

When used in accordance with label instructions, no unreasonable adverse effects are expected with these products. Similar applications have been successfully completed in other states and Alaska, with no problems observed.

Based on these findings, the Pesticide Program will grant a Pesticide Use Permit for the above referenced project.

**Citations:**

Bureau of Land Management. November, 2005. *Fluridone Ecological Risk Assessment Final Report.*

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