A POSITION PAPER FOR THE SELECTION OF CONCRETE FORM RELEASE PRODUCTS FOR NEW BRIDGE CONSTRUCTION OVER MINNESOTA SURFACE WATERS

I. Purpose of Position Paper

The purpose of this position paper is to recognize the need for minimizing the contributions of concrete form release products to Minnesota surface waters during new construction of bridges. The Minnesota Department of Transportation (MnDOT) has chosen to manage the new construction form release products with simpler formulations containing vegetable based products and/or products that include EPA listed ingredients from the Safer Choice program. MnDOT believes that favoring cost effective form release products with non-petroleum components will reduce the release of petroleum residues to Minnesota surface waters.

II. Background Information

The Minnesota Department of Transportation is charged with the construction of transportation bridge structures over Minnesota waterways. During the construction of concrete bridge structures, concrete forms are used to shape and contain the concrete until it has cured to a solid condition. Concrete form release agent is applied to forms that could be wood, metal, or plastic. After curing, the forms are separated from the concrete with the aid of the form release agent.

Pier Wash Water

After form removal the concrete must be power washed, in some cases, to remove form release agent so paint will adhere to the concrete. Wash water from pier washing has been allowed to mix with the adjacent surface water. The high pressure washing of new concrete-formed structures (e.g. piers, abutments, decks, beams) during bridge construction mainly removes residual concrete form release agent from the concrete. In cases where the concrete will not be painted, power washing is not needed.

Concrete Form Release Products

The composition of concrete form release agent products is highly variable. Product components may be as few as two (mineral oil and oleic acid surfactant) or as many as ten. The one common chemical characteristic of all the form release products is their hydrophobicity so that water and hydrous suspensions are repelled at the form surface.

The form release hydrophobicity is due, largely, to hydrocarbon complex mixture formulations. The hydrocarbon fraction of the product could be one or more of the following: base oil, light aliphatic naphtha, heavy aliphatic naphtha, light napthenic naphtha, heavy naphthenic naphtha, kerosene, coconut oil fatty acids, diesel fuel, rapeseed oil (canola oil), tall oil, tall oil fatty acids (distilled tall oil),

salts of tall oil fatty acids, hydrotreated light distillates, hydrotreated petroleum distillates, hydrotreated light aliphatic distillates, hydrotreated light naphthenic distillates, white mineral oil, mineral seal oil, Stoddard solvent, soybean oil, and ethoxylated castor oil. Other components could be preservatives, emulsifiers, colorants, and solvents.

EPA Safer Chemical Ingredients

The EPA, in the early 1990's, established a program to identify chemicals of various types in product manufacturing that could be used as safer alternatives to current production choices. The original program was called the Design for the Environment (DfE) program. The DfE program was expanded in February 2015 and renamed via the Safer Choice Standard that described how product ingredients would earn the Safer Choice (SC) label and a place on the Safer Choice Ingredient List.

Among the chemicals on the list are hydrocarbon complex mixtures (oils) that conform to the standard (https://www.epa.gov/saferchoice/safer-choice-standard) and appear on the list (https://www.epa.gov/saferchoice/safer-ingredients#searchList) with a green or half-green circle code and are thereby excluded from additional testing. The EPA has determined that "Certain products intended for use outdoors are likely to bypass sewage treatment, limiting the time for degradation prior to entering sensitive environments. For these products, like boat cleaners and graffiti removers, Safer Choice has raised the bar in its standard environmental criteria to address the potential for immediate contact with aquatic life. Any ingredients (including surfactants, preservatives, solvents, etc.) that have aquatic toxicity values <10 mg/L are not allowed in Safer Choice direct release products."

Environmentally Acceptable Hydrocarbon Mixtures

The US EPA has designated certain active ingredients as environmentally acceptable hydrocarbon mixtures that do not significantly impact human health or the environment. These are, in many cases, complex mixtures of long chain (aliphatics) and/or aromatic (single or multiple benzene rings) compounds. An EPA Re-registration Eligibility Decision for Flower and Vegetable Oils lists several natural oils that have sufficient study data to conclude they can be used in pesticide formulations without posing unreasonable risk to human health or the environment. These oils include Soybean Oil, Anise Oil, Lemongrass Oil, Eucalyptus Oil, Mustard Oil, and Essential Oils (which consists of 24 distinct natural oils). The EPA believes a broadly reduced set of test data is appropriate for re-registration of these oils. Consequently these oils can be used as pesticide active ingredients and are considered to be direct release ingredients.

A December 2015 updated list of "Active Ingredients Eligible for Minimum Risk Pesticide Products" lists natural chemicals and oils that can be used in non-food use products. Pesticidal components as active ingredients in form release products should comply with the Minimum Risk

Exemption stated in 40CFR 152.25(f). This list shows 20 plant oils and 24 organic/inorganic chemicals for use in this manner (non-food use).

Future MnDOT Bridge Construction Approach

Going forward, MnDOT will favor the use of plant based or non-petroleum based concrete form release products from the MnDOT Form Release Agent Approved Products List. The formulations of these products will have one or more of the Safer Choice plant or non-petroleum oils as a major component(s) of the final product. Favoring the listing of Safer Choice or non-petroleum form oil products will increase the use of low aquatic toxicity/high biodegradation potential products.

Using products which are predominately non-petroleum oils preserves the EPA intention of promoting greener chemistry in manufacturing. The use of non-petroleum form oils in simpler formulations also reduces the need for product aquatic toxicity testing.

III. References

US EPA, Office of Chemical Safety and Pollution Prevention, Active Ingredients Eligible for Minimum Risk Pesticide Products, Updated December 2015, 3 pages.

US EPA, R.E.D Facts, Flower and Vegetable Oils, Office of Prevention, Pesticides, and Toxic Substances, EPA-738-F-93-027, December 1993, 3 pages.

US EPA, Office of Wastewater Management, Environmentally Acceptable Lubricants, EPA 800-R-11002, November 2011, 27 pages.

US EPA, Safer Choice Standard, February 2015, 41 pages.