

DESCRIPTION OF PROPOSED ACTION FOR 2006 REVISION TO
6NYCRR PARTS 700 - 704

A. OVERVIEW

The proposal:

- adds or revises numerical ambient water quality standards for six substances;
- deletes a standard for one substance;
- adds or revises groundwater effluent limitations for six substances;
- adds narrative standards for flow and turbidity;
- revises/adds methodologies for deriving standards and guidance values for human health, aquatic life, recreation, and aesthetics;
- revises best usages language and clarifies the applicability of standards to trout waters;
- revises and adds definitions;
- creates a new Type of standard for Recreation;
- splits the existing Aesthetic Type into two Types;
- clarifies applicability of existing coliform standards;
- clarifies the consideration of wet weather when establishing surface water effluent limitations; and
- makes other minor revisions as described below.

The Table below summarizes the changes being proposed for specific parameters in Part 703.

Substance or Parameter	Proposed Action
Flow	Add narrative standard for all fresh surface waters
Turbidity	Add narrative standard for Class A-S and AA-S waters
Dissolved Oxygen (DO)	Revise marine water aquatic life standard for Class SA, SB, and SC
Acetaldehyde	Add H(WS) standard for surface waters and groundwaters, and groundwater effluent limitation
Ammonia	Add Aquatic Life standards for marine waters
Carbon Disulfide	Add H(WS) standard for surface waters and groundwaters, and groundwater effluent limitation
Formaldehyde	Add H(WS) standard for surface waters and groundwaters, and groundwater effluent limitation
Iron	Delete Aquatic Life standards (no substantive change to Aesthetic standards)
Metolachlor	Add H(WS) standard for surface waters and groundwaters, and groundwater effluent limitation
Copper	Revise groundwater effluent limitation (no change to GA standard)
Styrene	Revise groundwater effluent limitation (no change to GA standard)

Significant revisions to the standard-setting procedures for human health are proposed, for both oncogenic (carcinogenic) and nononcogenic effects. These revisions update and improve the procedures, provide the New York State Department of Environmental Conservation (Department) greater flexibility to use recently developed risk assessment methodologies, improve protection for children, and enhance the Department's ability to derive the most accurate standards to protect human health.

Revisions to the procedures for setting guidance values for human health are proposed to allow derivation of guidance values for certain organic mixtures such as gasoline and to clarify restrictions on the derivation of the general organic guidance value.

Revisions are made to the Aesthetic Type standards, in effect splitting this into two Types to more clearly differentiate between standards derived to protect aesthetic quality of the water for human uses and the aesthetic quality of the water for prevention of tainting of aquatic food for human consumption. A new Type of standard, Recreation (R) is created to facilitate derivation of standards and guidance values to protect the recreational uses of the waters. Concurrent revisions and additions are proposed to procedures for deriving Aesthetics and recreation type standards and guidance values.

Language is being added to Part 701 to describe waters classified for trout and trout spawning. Clarification is being added to Parts 703 and 704 to clarify the applicability of existing standards and thermal criteria to trout waters.

Language for best usages in Part 701 is being revised to indicate that, where waters are to be suitable for the propagation and survival of fish, they must also be suitable for the propagation and survival of shellfish and wildlife.

Revision is made to section 702.16 to more clearly indicate that intermittent streamflow and wet weather events are factors the Department considers in the establishment of surface water effluent limitations.

Revision is made to section 703.4 to clarify the times during which the coliform standards apply.

Definitions in Part 700 are added or revised commensurate with other changes in the regulations and to provide greater clarity and understanding.

B. SPECIFIC REVISIONS AND ADDITIONS

This portion describes the significant changes proposed to the regulations in the order in which they appear in the Express Terms. The Express Terms show the exact text of the proposed revisions; deletions from existing regulations are shown in [brackets]; additions are underlined. Where a large volume of text or table is added, a line drawn down the right side so indicates. To better understand the proposed amendments, it is recommended that the reader review the Express Terms in conjunction with this portion. Additionally, the proposed revisions contain a number of editorial or minor revisions that are not described below but are self-evident from a reading of the Express Terms.

1. SECTION 700.1: DEFINITIONS

Two definitions are proposed to be revised and 21 new definitions added. The existing definitions for “acute toxic effect” [700.1(a)(1)] and “chronic toxic effect” [proposed 700.1(a)(7)] are revised to add the phrase: “or other toxic pollutant.” “Toxic pollutant” is defined in the existing regulations at paragraph 700.1(a)(47). This revision clarifies that acute and chronic effects can be caused not only by chemicals but by other toxic pollutants (such as heat) as well.

The proposal adds definitions for several terms used in the procedures for deriving standards and guidance values to protect human health, including “biologically-based dose-response model,” “key event,” “linear at low doses,” “lowest-observed-effect level (LOEL),” “model,” “mode-of-action,” “no-observed-effect level (NOEL),” “nonlinear at low dose,” “point-of-departure,” and “reference dose.”

The proposal also adds definitions for the terms: “aquatic life,” “fish,” “salmonids,” “shellfish,” “trout,” “trout waters,” “trout spawning waters,” and “wildlife”

to clarify the meanings of these terms as used in the regulations.

A definition is proposed for “flow,” a parameter for which a new standard is proposed for Part 703.

Definitions are also proposed for "cooling water intake structure" and "cooling water." To dilute waste heat a thermal discharge is usually associated with an intake structure to suck in large quantities of diluting water. The federal Clean Water Act (CWA) Section 316(b) (33 USC 1326[b]) and New York State regulations at 6 NYCRR Part 704 regulate both thermal discharges and the design and operational parameters of cooling water intake structures. Existing State regulations at 6 NYCRR 704.5 require that: "The location, design, construction and capacity of cooling water intake structures, in connection with point source thermal discharges, shall reflect the best technology available for minimizing adverse environmental impact." However, the term "cooling water intake structure" is not currently defined in the State's regulations. The addition of the proposed definition will resolve this problem. A related definition is also proposed for "cooling water."

The proposed definitions are based on the current EPA definitions at 40 CFR Section 125.83. For "cooling water intake structure," the proposed definition in Part 700 substitutes the term "waters of the State" for the terms "waters of the U.S." and "surface water source" in the EPA definition. These changes will allow the definition to apply to groundwater as well as surface water sources in New York.

2. SECTIONS 701.2 and 701.3: CLASS N AND AA-SPECIAL FRESH SURFACE WATERS

A new, narrative standard for the parameter “flow” is proposed for each of these sections. The rationale for this standard is described under section 703.2:

Narrative Water Quality Standards, below. The proposed flow standard is being located in sections 701.2 and 701.3 for Class N and AA-Special waters respectively, to be consistent with the location of existing narrative standards for these water classes.

A narrative standard for the parameter “turbidity” is proposed for section 701.3 for Class AA-Special waters; this is described under section 703.2: Narrative Water Quality Standards, below.

3. SECTIONS 701.2 THROUGH 701.14: FRESH AND SALINE SURFACE WATERS

The proposal adds language to sections 701.2 through 701.14 for all surface waters which specifies that the waters are to be suitable for shellfish and wildlife as well as for fish.

In accordance with Environmental Conservation Law (ECL) Article 17, the waters of the State are grouped according to their best uses. These groupings are known as classifications. Standards are then identified to define the quality of water needed to ensure that waters attain the best uses for which they are classified. In the existing regulations, the best use of fishing has been used to provide explicit protection for fish that inhabit New York waters. Over the years, numeric standards have been derived and adopted to protect fish propagation and survival. However, numerous changes to the water quality standards have occurred since the best use of fishing was originally adopted. Those changes include adoption of standards designed to protect wildlife consumers of fish, and adopting procedures for deriving water quality standards that require data from at least eight different kinds of aquatic organisms. Earlier procedures were based strictly on protection of fish, and were

designed to be used with only fish data, however, data from other taxonomic classes could be used if it was available.

The commitment to ecosystem protection reflected in the water quality regulations has grown over time, and is obvious to users of the regulations. The one weakness of the existing regulations is that the best uses, as described in sections 701.2 - 701.14 have not changed even as changes have occurred in the standards and methodologies used to develop standards. The new types of standards, revised methodologies for deriving standards, and numeric standards that have been adopted based upon the revised methodologies provide significantly more ecological protection than that required to simply achieve the best use of fishing. In the existing regulations, the best use of fishing is modified with the conditional clause that: the waters be suitable for fish propagation and/or survival. This statement is incomplete, because the standards protect a broader range of organisms than fish. To remedy this, the proposal modifies this conditional clause to reflect the broader range of organisms that are, in fact, protected by the existing standards.

This proposed broader range of ecosystem protection in the existing standards is also consistent with the language and intent of the Declaration of Policy found in ECL 17-0101, which states: “It is declared to be the public policy of the state of New York to maintain reasonable standards of purity of the waters of the state consistent with . . . the propagation and protection of fish and wild life, including birds, mammals, and other terrestrial and aquatic life...”

4. SECTIONS 701.25: TROUT WATERS

A new section 701.25 is proposed, to establish within Part 701, “Trout

Waters” as a specifically defined group of waters. Related definitions for “trout,” “trout waters” and “trout spawning waters” are added to section 700.1 as noted above. (Existing section 701.25, regarding severability, is renumbered as section 701.26).

(T) and (TS) symbols are added to water classifications based on the presence of trout and trout spawning. Initially, specifications for dissolved oxygen were applicable to the waters so designated. The regulatory definition of the (T) and (TS) symbols is not explained in existing Part 701. Instead, it is included in the classification regulations (6NYCRR Parts 800 - 941), in each individual Part. Over time, (T) and (TS) have taken on a broader meaning. Instead of indicating only waters wherein a higher DO standard must be met, they have been used to indicate the water bodies to which any standard or criterion specified for “trout” (thermal criteria) or “cold water fishery” (nitrite standard) should be applied.

In addition to the new section 701.25, the proposal clarifies the applicability of existing standards for DO (section 703.3) and nitrite (section 703.5), and the thermal criteria (Part 704), to (T) and/or (TS) waters.

5. SECTION 702.1: BASIS FOR DERIVATION OF WATER QUALITY STANDARDS AND GUIDANCE VALUES

Addition and revision to the Types of standards and guidance values is proposed. The proposal adds a new Recreation Type, abbreviated as Type "R," to protect the recreational uses of waters. This new Type is added to subdivision 702.1(c). Related amendments are proposed for sections 702.12 and 702.15 as described under those sections, below. Additional explanation of the need for a Recreation Type is provided below as well.

The proposal splits the existing single Aesthetic ("E") Type into two Types: (1) Aesthetic (Water Source), abbreviated as "E(WS)" and (2) Aesthetic (Food Source), abbreviated as "E(FS)." E(WS) Type standards and guidance values are to protect the aesthetic quality of the waters for human uses. E(FS) Type standards and guidance values are to protect the aesthetic quality of waters to prevent the tainting of aquatic food for human consumption. Related amendments are proposed for sections 702.14 and 702.15 as described under those sections, below. Additional explanation of the need for the split of the Aesthetic Type is provided below as well.

6. SECTION 702.2: STANDARDS AND GUIDANCE VALUES FOR PROTECTION OF HUMAN HEALTH AND SOURCES OF POTABLE WATER SUPPLIES

Revision is proposed to this section to provide greater clarity, to ensure consistency with proposed changes to oncogenic (carcinogenic) effects procedures in section 702.4, and to ensure adequate protection for children. Subdivision (c) in the existing regulations, which provides the water consumption rates for oncogenic and chronic and acute nononcogenic effects, is split into three subdivisions: (c) for derivations for linear oncogenic effects; (d) for derivations for nonlinear oncogenic and chronic nononcogenic effects; and (e) for acute nononcogenic effects. Proposed subdivisions (c) and (d) allow the use of age-specific water consumption rates if scientific evidence suggests that children may be more sensitive than adults to oncogenic or nononcogenic effects. In the absence of such evidence, 2 liters per day (2 L/day) remains the default in the proposal for deriving values based on oncogenic and chronic nononcogenic effects. In addition, for linear oncogenic

effects derivations, age-specific points-of-departure may be used. These revisions will enable the Department, in such circumstances, to derive standards and guidance values more soundly based on scientific information and ensure adequate protection for children.

The language in existing subdivision (c) regarding acute effects is slightly revised but the water consumption rate is unchanged; this provision is relocated to proposed new subdivision (e) for greater clarity.

7. SECTION 702.4: PROCEDURES FOR DERIVING STANDARDS AND GUIDANCE VALUES BASED ON ONCOGENIC EFFECTS

The proposal replaces the existing section with new, more flexible procedures for deriving standards and guidance values to protect human health and sources of drinking water from oncogenic (carcinogenic) substances. As with the existing regulations, the human dose calculated via these procedures can also be used to derive standards and guidance values to protect human consumers of fish. Recent years have seen major scientific advances in the understanding of the modes of action of oncogens and in procedures to derive values protective of human health. However, the Department's procedures in regulation have not been substantially revised since 1985. In this proposal, these procedures are brought up to date to reflect the latest scientific knowledge and are consistent with the EPA's Methodology for Deriving Ambient Water Quality Criteria (AWQC) for the Protection of Human Health (2000).

Key elements of the proposed revisions include the use of biologically-based dose-response and other models, provision for an uncertainty factor approach for nonlinear oncogens and language ensuring consideration of the special sensitivity

of children.

The reader is referred to the Express Terms for the details of the proposed revision. In essence, under the proposal, the starting point for every substance is the point-of-departure. Extrapolation from the point-of-departure to the human dose at the level of the standard or guidance value is done via a biologically-based dose-response model, a linear approach or a nonlinear approach.

In 1986, when the EPA issued its first set of cancer risk guidelines, it was believed that any level of exposure to any oncogenic substance carried some level or risk, and that the level of risk was related to the amount of exposure. Thus, the existing standard-setting procedures, centered on a default linearized multi-stage (LMS) model approach, were appropriate. However, improved understanding of the oncogenic process has shown that some oncogens act via a nonlinear mode of action, in which there is some level of exposure below which no adverse effect would occur. For such nonlinear oncogens, the proposal appropriately allows ambient water quality values to be derived using an approach similar to that used for nononcogens.

Comparative Stringency of Proposed and Existing Procedures

For linear oncogens, the lifetime risk level for ambient water quality standards and guidance values remains unchanged from that in the existing procedures, i.e., at the one-in-one million level.

The Department believes that a biologically-based model may give an ambient water quality value (i.e., the water concentration corresponding to the one-in-one million risk level) that is somewhat different (either more stringent or less stringent) from the value estimated using the linearized multi-stage (LMS) model in

the existing procedures. However, because the biologically-based model is based on a more complete understanding of the oncogenic process, such difference is appropriate and does not represent a change in the intended level of health protection. Moreover, the Department and the EPA believe that currently, an adequate biologically-based model exists for very few substances. Thus, ambient water quality values for linear oncogens, at least in the near future will, in almost all cases, be derived using mathematical models. For the majority of substances, the Department believes that derived ambient water quality values will be similar to those based on the LMS model. The reader should note that the LMS model is not eliminated in the proposed procedures, but is retained as one of several models that can be used to estimate the point-of-departure.

Although the explicit addition of methods for nonlinear oncogens at low doses represents a major change from existing procedures, this option becomes possible only if a valid biologically-based dose response model is not available and if two other conditions are met. These conditions are: 1) sufficient evidence for nonlinearity of effects at low doses and 2) absence of evidence for linearity at low doses. An uncertainty factor is used such that exposure to the level of the ambient water quality value is “without appreciable risk.” Some early examples prepared by the EPA suggest that this uncertainty factor approach may lead to higher ambient water quality values than the linear approach, but again, such difference is appropriate and does not represent a change in the intended level of health protection because the derived standards and guidance values will be more soundly based on scientific information.

Specific Changes Related to Children's Risk

Under the proposal, for both linear and nonlinear oncogens, a body weight other than 70 kilograms can be used if scientific evidence indicates that children may be more susceptible to a substance. Changes to water consumption rates are described above for section 702.2. In addition, when an uncertainty factor approach is used (nonlinear oncogens), the proposal specifically requires that the special sensitivity of children be considered when accounting for intra-human (inter-individual) uncertainty in determining the level that is "without appreciable risk." These changes will enable the Department to derive standards and guidance values more soundly based on scientific information and better ensure that children's health is protected.

8. SECTION 702.5: PROCEDURES FOR DERIVING STANDARDS AND GUIDANCE VALUES BASED ON NONONCOGENIC EFFECTS

The proposal replaces existing section 702.5 with new procedures for deriving standards and guidance values to protect human health and sources of drinking water from nononcogenic (noncarcinogenic) effects. As with the oncogenic effects procedures in section 702.4, the human dose from the nononcogenic procedures can also be used in deriving values to protect human consumers of fish.

The proposed revisions are consistent with the latest EPA recommendations, contained in their Methodology of Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000), and specifically address the need to protect children.

The proposed revisions provide greater harmony with the proposed procedures for oncogenic effects, clarify the recommendations for uncertainty

factors, and add an uncertainty factor that can be used to reflect lack of completeness in the data base for a substance. This is not a significant change because the existing procedures did allow for uncertainty factors other than those specified, but the proposal makes it more evident and transparent. In the proposal, the inter-human (intraspecies) uncertainty factor explicitly addresses the special sensitivity of children. Additionally, the term “value” is being changed to “standard or guidance value” where appropriate to clarify the intent.

Another proposed change adds flexibility and ensures the protection of children by allowing body weights other than 70 kilograms to be used in deriving standards and guidance values based on chronic effects where deemed appropriate.

9. SECTION 702.7: PROCEDURES FOR DERIVING STANDARDS AND GUIDANCE VALUES BASED ON CHEMICAL CORRELATION

Revision is proposed for this section to change the term “value” to “standard or guidance value” for greater clarity of meaning.

10. SECTION 702.8: PROCEDURES FOR DERIVING STANDARDS AND GUIDANCE VALUES FOR PROTECTION OF HUMAN HEALTH FROM CONSUMPTION OF FISH

Revision is proposed to this section to replace the term “finfish” with “fish” in the first paragraph. This revision accompanies the addition of a definition for “fish” in section 700.1. The Department believes that the specification of “finfish” as opposed to fish is unnecessary and confusing and that the revision will result in greater consistency and clarity of the regulations.

Revision is also proposed to paragraph 702.8(b)(1) to replace the term “ADI” (meaning acceptable daily intake) with “RfD” (meaning reference dose) for consistency with the revisions to section 702.5. Similarly, language is added to paragraph 702.8(b)(2) for consistency with the revisions to section 702.4.

11. SECTION 702.9 STANDARDS AND GUIDANCE VALUES FOR PROTECTION OF AQUATIC LIFE

Revision is proposed to subdivisions (d) and (e) of this section to add “shellfish and wildlife” consistent with the proposed revisions to sections 701.2 through 701.14, above. Additional wording changes are made to these sections for greater clarity.

Revision is proposed to subdivision (g) of this section to enable deriving a standard or guidance value to protect aquatic life if a value cannot be derived according to the procedures in section 706.1. The existing regulations at subdivision 702.9(f) require that such values be derived according to the procedures in section 706.1. In general, having minimum data requirements, such as those in section 706.1, is appropriate and contributes to the defensibility of derived values. However, this can occasionally preclude the derivation of scientifically justified values using alternative procedures. The Department has sufficient scientific justification to revise the existing iron standard to a new value, but it would be difficult to do so under the rigid requirements of section 706.1. The Department does not propose the revision of the existing procedures in section 706.1, but is proposing to amend subdivision (g) within section 702.9 to allow other procedures to be used “if deemed appropriate.” This will give the Department sufficient flexibility to address iron and similar situations. The location of this provision within section 702.9, instead of

within section 706.1, makes the provision more visible and makes it clear that an alternative procedure can only be used where it is not possible to derive a value using section 706.1. Where an alternative procedure is used, the Department will describe the approach, as well as why the section 706.1 procedure could not be used, in the Fact Sheet for the substance in question.

12. SECTION 702.12: PROCEDURES FOR DERIVING STANDARDS AND GUIDANCE VALUES FOR PROTECTION OF RECREATION

A new section is proposed to add procedures to derive standards and guidance values of the new Recreation (R) Type described under section 702.1. This is proposed because there is both a lack of, and a need for, the derivation of standards and guidance values to protect the recreational uses of the waters of the State. Both primary and secondary contact recreation are existing best usages of the waters. However, there is neither a separate Type of standard and guidance value specified for protection of these usages, nor procedures for the derivation of such standards and guidance values. This proposal remedies this situation by adding both a new Type R to section 702.1 and by adding procedures to section 702.12 for deriving Recreation Type standards and guidance values. An accompanying change enabling the derivation of a Recreation Type guidance value in the absence of a standard is proposed for section 702.15. The addition of the Recreation Type may be especially important for adding future standards and guidance values for nutrients which can cause adverse impacts upon the recreational use of the waters.

13. SECTION 702.14: PROCEDURES FOR DERIVING STANDARDS AND GUIDANCE VALUES FOR PROTECTION OF AESTHETIC QUALITY

In this proposal, existing section 702.14 is repealed and is replaced by a new section that provides procedures for deriving both Aesthetic (Water Source) and Aesthetic (Food Source) Type standards and guidance values. These Types were described above under section 702.1. The existing regulations provide for the derivation of only a single Type of Aesthetic standard and guidance value that addresses the aesthetic quality of both sources of potable water supply and aquatic food for human consumption. This is problematic because it may at times be necessary to derive different values for the same class of waters to protect for both needs. For instance, the best usages of Class A waters include both “source of potable water supply...” and “fishing.” Under the existing regulations, a standard or guidance value based on aesthetic considerations can be derived based on either tainting of the flavor of fish for human consumption or on impacts on the aesthetic quality of potable water sources, but not both. A value based on protecting potable water sources is appropriate for groundwater (Class GA) and certain surface waters (A, AA, A-S and AA-S) but not other surface waters (Classes B, C, D, SA, SB, SC, I and SD); fish tainting-based values are appropriate for all fresh and marine surface waters but obviously not for groundwaters. The problem arises in the overlap, for those fresh surface waters (Classes A, AA, AA-S and AA-S) for which both potable-water source based and fish-tainting based aesthetic values could be appropriate, but the existing regulations allow only one value to be derived.

The proposal will change that, by in effect splitting the Aesthetic Type

standard into two separate Types, one for potable water sources and one for fish flesh tainting. The revised section 702.14 provides the procedures for deriving such values. Having two separate Types of Aesthetic value for the same body of water does not affect the level of protection in that the more stringent value would control, but the second value does provide information about the level of protection needed to protect for each separate consideration.

14. SECTION 702.15: DERIVATION OF GUIDANCE VALUES

Several significant changes are proposed for this section; these are discussed individually below under separate headings for greater clarity.

a. Paragraph 702.15(a)(2): Guidance Values for Protection of Human Health and Sources of Drinking Water: General Organic Guidance Value

The “general organic guidance value” provision in the existing procedures enables the Department to establish a guidance value of 50 ug/L for certain individual organic substances in the absence of sufficient toxicity data to derive a specific value. Unlike the Department of Health’s (DOH) drinking water standard (maximum contaminant level or MCL) of 50 ug/L for unspecified organic contaminants (UOCs), the general organic guidance value is not a true “default” that applies to all organics in the absence of a specific standard or guidance value. However, there is a widely held misconception that this is indeed the case, a misconception that must frequently be clarified on a case-by-case basis. To reduce the misconception, the proposal adds language explaining that this value is only derived for those substances as specified by the Department.

b. Paragraph 702.15(a)(3): Guidance Values for Protection of Human Health and Sources of Drinking Water: Specific Organic Mixture Guidance Value

A new procedure is added to allow the Department to derive a “specific organic mixture guidance value” of 100 ug/L as a new paragraph 702.15(a)(3). Under the existing procedures, it is not feasible to derive a standard or guidance value for certain specific commercially available products that are mixtures of organic substances. These include both mixtures of fixed or known composition, and mixtures whose composition varies from batch to batch based on conditions of production. For some mixtures of fixed composition, a value can be derived using the procedures in sections 702.3 through 702.7. For others, there are insufficient toxicity data on either the mixture as a whole or its components to derive a value using these procedures. For commercial mixtures of complex composition that vary with conditions of production (such as gasoline or Stoddard Solvent), it is not practicable to derive a toxicity-based value for the mixture as a whole based on toxicity data on a sample of the mixture or on the toxicity of its component compounds (because such data either do not exist or would vary between different production batches of the mixture). The lack of a procedure in the existing regulations to derive a standard or guidance value for organic mixtures in either case represents a significant gap in the Department’s ability to establish values to protect human health and sources of drinking water.

The proposal addresses this gap by enabling the Department to establish a “specific organic mixture guidance value” of 100 ug/L for an

organic mixture for which a value cannot be derived according to the procedures in sections 702.3 through 702.7. The wording of the proposed regulations makes clear that this is not a “default” value that applies or will be applied to all organic mixtures. The Department will only establish this guidance value if there is insufficient evidence to derive a specific value for the mixture, and only for those mixtures specified by the Department. The latter clause is included to prevent the misconception that 100 ug/L is a default value for all organic mixtures. Furthermore, there is not a “cap” of 100 ug/L for every organic mixture for which the Department derives a value. If there is sufficient scientific evidence to support a value greater than 100 ug/L for a particular mixture, a value greater than 100 ug/L for that mixture can be derived.

The value of 100 ug/L for these mixtures was selected in consultation with the DOH and is numerically consistent with the DOH maximum contaminant level (MCL) of 100 ug/L for the sum of principal organic contaminants (POCs) and unspecified organic contaminants (UOCs) in drinking water.

c. Subdivisions 702.15(f) and 702.15(g): Guidance Values Based on Aesthetic Considerations.

Existing subdivision 702.15(f) provides procedures for deriving guidance values in the absence of an applicable Aesthetic Type standard. Because the existing Aesthetic Type is being split into two Types, as described under sections 702.1 and 702.14 above, an accompanying change to the procedures for deriving guidance values is necessary. Thus, existing

subdivision 702.15(f) is, in effect, replaced by two subdivisions, 702.15(f) and (g) that provide for the derivation of guidance values in the absence of Aesthetic (Water Source) and Aesthetic (Food Source) standards respectively.

d. Subdivision 702.15(h): Guidance Values for Recreation

Accompanying the proposed revisions that create a new Recreation (R) Type of standards and guidance values (see discussion under sections 702.1 and 702.12, above), a new provision is added to section 702.15, as subdivision 702.15(h), to allow derivation of Type R guidance values in the absence of a Type R standard.

15. SECTION 702.16: DERIVATION AND IMPLEMENTATION OF EFFLUENT LIMITATIONS

Revision is proposed to paragraph 702.16(b)(1) to specifically list “intermittent streamflow” and “wet weather events” in the list of factors that the Department may take into account when deriving a water quality-based effluent limitation for surface water. The existing regulations allow the Department to consider these factors so this is not a substantive change. However, by specifically listing them in the regulations the Department is highlighting its practice and intent of considering them in its derivation of effluent limitations.

16. SECTION 703.2: NARRATIVE WATER QUALITY STANDARDS

The existing narrative standard for “turbidity” is extended to apply to additional water classes, and a new narrative standard is proposed for “flow.” These changes are described below.

a. Turbidity

A narrative standard for “turbidity” will also be added to section 703.2 for Class A-Special waters, identical to the existing turbidity standard in this section for other water classes. The addition of this standard, “No increase that will cause a substantial visible contrast to natural conditions” closes a gap in the existing regulations which do not address this parameter for this class. The same gap exists for Class AA-Special waters and the identical standard is being added for those waters as well. However, for consistency with the current structure of the regulations, the narrative standard for turbidity for AA-Special waters is added to section 701.3 as explained above.

b. Flow

A new narrative standard is proposed for all fresh surface water classes for the parameter "flow" of "no alteration that will impair the waters for their best usages." This standard for class AA, A-Special, A, B, C and D waters will be added to section 703.2. The same standard will be added to sections 701.2 and 701.3 for Class N and AA-Special waters respectively (see above). The need for the flow standard for all fresh surface waters will be addressed here.

To date, the Department's water quality standards have extensively addressed the quality of water but not the quantity. Achieving the best usage of the water often requires an appropriate quantity of water as well as sufficient quality. An appropriate quantity of water is vital to maintain best usages as a source of potable water supply, and for fishing, swimming and secondary contact recreation.

Currently, the Department has the authority to, and does regulate flow in the absence of a water quality standard, based on both State and federal law. In State law, ECL Article 15 declares that "All fish, game, wildlife, shellfish, crustacea . . . are owned by the state and held for the use and enjoyment of the people of the state, and the state has the responsibility to preserve, protect ... and to promote their natural propagation."¹ ECL Article 17 requires that all waters of the State be classified according to their best uses, and that standards be adopted to protect those uses. All perennial waters of the state include fishing (with the specification that the waters be suitable for fish propagation and survival), as a best use. Flow was one of the factors considered when the best use was adopted.² Protecting flow is necessary to ensure that waters continue to be suitable for the best use.³ At the federal level, the U. S. Supreme Court has ruled that the Clean Water Act (CWA) empowers states with the authority to promulgate flow standards to protect fish and wildlife.⁴

There is also a basis for establishing "flow" conditions as pollution in certain instances. There is recognition in the CWA itself that reduced stream flow, i.e. diminishment of water quantity, can constitute water pollution. First, the CWA's definition of pollution as "the man-made or man induced alteration of the chemical, physical, biological, and radiological integrity of water"

¹ ECL Article 15, Section 15-0103(8)

² ECL Article 17, Section 17-0301(3)(a)

³ ECL Article 17, Section 17-0301(2); 17-0301(4)

⁴ PUD No.1 of Jefferson County v. Washington Department of Ecology, 511 U.S. 700, 114 S. Ct. 1900 (1994).

encompasses the effects of reduced water quantity. [see 33 USC Section 1362 (19)]. Moreover, CWA Section 304 expressly recognizes that water "pollution" may result from "changes in the movement, flow, or circulation of any navigable waters ..., including changes caused by the construction of dams." [see 33 USC Section 1314(f)]. This concern with flowage effects is also embodied in EPA regulations. [see 40 CFR Section 131.10(g)(4)].

The addition of a flow standard will not create new regulatory authority, but it will serve to highlight and clarify that the Department considers flow critical to maintaining the best usages of the State's waters.

There is an additional, legal basis for having a flow standard. Prior to 1993, the Department used the legal authority cited above as the basis for adding flow-related conditions to CWA Section 401 water quality certifications, primarily for hydroelectric power generating facilities permits, because CWA Section 401(d) allowed the derivation of water quality certification conditions from "appropriate requirements of other state laws." A 1993 Court of Appeals decision regarding a case with Niagara Mohawk found that the Federal Power Act overrode the conditions based on "other state laws," and that CWA Section 401 water quality certification conditions had to be derived only from actual water quality standards. The U.S. Supreme Court ruling in PUD No.1 of Jefferson County found that the CWA does apply to flow, and states were empowered to promulgate flow standards. The Supreme Court did not overturn the Court of Appeals decision; it only empowered states to promulgate flow standards. New York now needs to close this regulatory gap and add the flow standard to

correspond with the Court of Appeals decision.

17. SECTION 703.3: WATER QUALITY STANDARDS FOR pH, DISSOLVED OXYGEN, DISSOLVED SOLIDS, ODOR, COLOR AND TURBIDITY

Two revisions are proposed to the standards for dissolved oxygen (DO) in this section. These are: 1) minor changes to freshwater language, and 2) a substantive revision to the numerical standard for saltwater.

For freshwater, the existing language “For cold waters suitable for trout spawning...” is proposed to be changed to “For trout spawning (TS) waters ...” This change is to clarify the waters to which this standard applies (also see above regarding trout waters under section 701.25).

For marine waters, the numerical DO standards for Class SA, SB, and SC waters are proposed for revision. Existing standards for these waters are “Shall not be less than 5.0 mg/L at any time.” The proposal replaces these with both chronic and acute standards to protect aquatic life. The proposed chronic standard, to protect for propagation, is 4.8 mg/L with allowable excursions down to, but never less than 3.0 mg/L, for limited periods of time. An acute standard, to protect for survival, of 3.0 mg/L is also proposed. These revisions are based on new EPA criteria guidance for DO for marine waters as described below and are fully protective of aquatic life.

In November of 2000, the EPA issued its Ambient Aquatic Life Water Quality Criteria for Dissolved Oxygen (Saltwater): Cape Cod to Cape Hatteras, which contains EPA’s updated recommendations to the states for appropriate and necessary levels of dissolved oxygen in their marine waters. This recommendation is based on extensive scientific research and public input. The Department carefully

reviewed this document including the data and procedures for derivation of EPA's recommended values. The Department believes that EPA's chronic (propagation) value of 4.8 mg/L (with allowable excursions below this level) is based on appropriate scientific data and derived by procedures consistent with those in New York's regulations, and is appropriate for the protection of aquatic life in New York State. The Department believes that this revision is necessary to update the existing standards to one based on the most appropriate scientific data and procedures. The proposed standard is less stringent than the existing standard for Class SA, SB, and SC waters, but because it is derived according to procedures consistent with those in regulation, is fully protective of aquatic life.

The reader will note that Class I waters are not included in this proposal for marine DO standard revision; the existing standard of never-less-than 4.0 mg/L is unchanged. Class I waters will be addressed in a future rulemaking.

For protection of survival of aquatic life, EPA recommends a DO value of never-less-than 2.3 mg/L. However, this value is based on controlled conditions in the laboratory and the Department believes that it is not sufficiently protective of the survival of aquatic life in the marine environment. Therefore, the proposed acute (survival) standard is 3.0 mg/L. The Fact Sheet provides greater detail in support of this value. In addition, the proposed chronic standard does not allow excursions below 3.0 mg/L.

The existing standard for Class SD waters, which must protect for survival of aquatic life but not its propagation, remains unchanged at never-less-than 3.0 mg/L. This standard is being clarified in the proposal as an "Acute" standard, consistent with other New York aquatic life standards to protect for survival of aquatic life.

18. SECTION 703.4: WATER QUALITY STANDARDS FOR COLIFORMS

Replacement language for subdivision 703.4(c) is proposed to clarify where the total and fecal coliform standards for Classes B, C, D, SB, SC, and I must be met. The language in the existing regulations at subdivision 703.4(c), that these standards shall be met during all periods when disinfection is “practiced,” has led to confusion regarding the applicability of the standards to waters without point sources where a formal determination on the need for disinfection was not needed. In the proposal, subdivision 703.4(c) is replaced with new language that clearly sets forth where these standards must be met. The proposed language is a functional equivalent of the existing language. However, it is an improvement because it links the standard to a determination of need that may or may not be made with the existing standard.

19. SECTION 703.5: WATER QUALITY STANDARDS FOR TASTE-, COLOR- AND ODOR-PRODUCING, TOXIC AND OTHER DELETERIOUS SUBSTANCES

Revisions to subdivision (b) of 703.5 are proposed to replace the Aesthetic Type with Aesthetic (Water Source) and Aesthetic (Food Source) and to add Recreation Type, consistent with the proposed revisions to Part 702 regarding these Types as discussed above.

Subdivision (f) of 703.5 includes Tables 1 and 2. Table 1 is the very large Table with more than 300 entries that provides the numerical ambient water quality standards. Table 2 is a short table that describes the Basis Codes. Revisions are proposed to both Table 1 and Table 2 as shown in the Express Terms.

Table 1 includes the following headings: “Substance (CAS No.),” “Water

Classes,” “Standard (ug/L),” “Type” and “Basis Code.” Within Table 1, entries for each substance are listed alphabetically and their applicable standards are listed by the water class to which they apply. The standards apply statewide to all waters of the listed class. The Type refers to the Types listed in section 703.5(b), and the Basis Code provides additional information about the technical basis for some of the standards. In addition, a “Fact Sheet” is prepared that provides the detailed technical basis for the standard.

PROPOSED REVISIONS TO TABLE 1

Proposed revisions to Table 1 include:

- addition of numerical standards for several substances (new entries);
- deletion of the aquatic life standards for one substance (iron - existing entry);
- revision of Aesthetic Types to Aesthetic (Water Source) and Aesthetic (Food Source);
- changes to provide clearer presentation of existing standards for individual phenolic compounds; and
- revision to Remark for one entry (Nitrite).

These revisions are described below. The reader is referred to the Express Terms for the complete proposed amendments to Table 1. The table below summarizes the proposed addition, revision, and deletion of standards, followed by a more detailed explanation of the proposed changes.

SUMMARY OF PROPOSED ADDITION, REVISION, AND DELETION OF AMBIENT
WATER QUALITY STANDARDS TO TABLE 1 OF SECTION 703.5

Substance (CAS No.)	Water Classes	Existing Standard (ug/L)	Proposed Standard (ug/L)	Type	Basis Code
Acetaldehyde (75-07-0)	A, A-S, AA, AA-S, GA	no standard*	8	H(W.S)	A
Ammonia, total	SA, SB, SC, I	no standard	35**	A(C)	
Ammonia, total	SA, SB, SC, I, SD	no standard	230**	A(A)	
Carbon Disulfide (75-15-0)	A, A-S, AA, AA-S, GA	no standard*	60	H(W.S)	B
Formaldehyde (50-00-0)	A, A-S, AA, AA-S, GA	no standard*	8	H(W.S)	A
Iron (CAS No. Not Applicable)	A, A-S, AA, AA-S, B, C	300	No standard***	A(C)	
Iron (CAS No. Not Applicable)	A, A-S, AA, AA-S, B, C, D	300	No standard***	A(A)	
Metolachlor (51218-45-2)	A, A-S, AA, AA-S, GA	no standard	9	H(W.S)	A

* There is an existing guidance value for these water classes equal to the proposed standard.

** Applies to unionized ammonia as NH₃.

*** The existing aquatic life standard for iron is proposed for deletion (see explanation below). The existing Remark, regarding waters of the Great Lakes System, is proposed for deletion as well. Existing Aesthetic standards for iron are not proposed for deletion.

Metolachlor (Human Health) - Adoption of New Standard

A new Health (Water Source) Type standard is proposed for the pesticide metolachlor to protect human health and sources of drinking water (both surface waters and groundwaters). This proposed standard of 9 ug/L is derived based on the oncogenic (carcinogenic) effect of metolachlor and is supported by a Fact Sheet prepared by the DOH.

It is important to add this standard because metolachlor is a widely used herbicide in New York State that leaches into the groundwater. It is one of the corn herbicides addressed in federal legislation for the proposed pesticide management plan. In Suffolk County on Long Island, past agricultural uses of metolachlor have caused a significant negative impact on the underlying aquifer, the sole source of drinking water for several million people. Metolachlor has recently been banned from use in both Nassau and Suffolk Counties on Long Island. More than 40 percent of private wells tested contained metolachlor or its degradates.

Acetaldehyde, Carbon Disulfide, and Formaldehyde (Human Health) - Adoption of New Standards

Existing Health (Water Source) Type guidance values for these three substances are proposed as standards. These guidance values were established in an Addendum to Division of Water Technical and Operational Guidance Series (TOGS) No. 1.1.1 in April of 2000 to protect human health and sources of drinking water and apply to both surface waters and groundwaters. Adoption of these values as standards is appropriate and provides greater legal strength. These proposed standards are supported by Fact Sheets prepared by the DOH.

Iron (Aquatic Life) - Deletion of Existing Standards

The existing aquatic life standards (both chronic and acute) of 300 ug/L are proposed for deletion. Existing Aesthetic standards for iron are not proposed for deletion. The Department has reevaluated the basis for its existing iron standards and no longer believes that 300 ug/L is the appropriate value for this substance. Although there is widespread non-attainment of the existing standards, there are no apparent adverse impacts upon aquatic life. The Department's review of the

scientific literature on the toxicity of iron has lead to the conclusion that the EPA 1976 criteria value of 1,000 ug/L (1 mg/L) is both protective of aquatic life and a more appropriate ambient value. However, the scientific evidence for the 1,000 ug/L value is not without some uncertainty and there is a good possibility that the Department may further revise its determination in the next several years based on additional scientific information. Therefore, instead of revising the existing aquatic life standards for iron to 1,000 ug/L at this time, the Department proposes to delete them altogether. Coincident with, or soon after the effective date of the deletion, the Department expects to propose aquatic life guidance values of 1,000 ug/L for iron for the Division of Water's TOGS No. 1.1.1. A revised aquatic life standard(s) for iron will be proposed in a future rulemaking when supported by the appropriate scientific information.

Ammonia (Aquatic Life) - Adoption of New Standards for Marine Waters

The proposal adds new acute and chronic aquatic life standards for ammonia for marine waters, based on EPA's 1989 ambient water quality criteria document for ammonia for saltwater. The state has heretofore not had a marine water standard or guidance value for this important parameter; the addition of these standards fills a key gap and is considered a priority by EPA.

There is no change proposed to the existing Health (Water Source) and freshwater Aquatic Life standards.

Other Revisions (Aesthetic Types, Phenolics Standards, and Nitrite Remark)

These revisions do not cause any change in existing numerical standards. Consistent with the creation of two different Types of Aesthetic standards (see above), revision is made to those entries in Table 1 that have existing Aesthetic (E)

Type standards. Specifically, all existing Type E standards are revised to either E(W) for Aesthetic (Water Source) or E(AF) for Aesthetic (Aquatic Food) as appropriate. These changes are made to the “Type” column for approximately 26 entries in Table 1 and are shown in the Express Terms.

Revision is also made to the Water Classes column for several entries for individual phenolic compounds. These are not substantive and do not reflect any actual change to existing standards; they merely clarify the application of existing aesthetic standards for total chlorinated or total unchlorinated phenols to these individual substances. These changes are proposed for 2,4-dimethylphenol, 2,4-dinitrophenol, hexachlorophene, hydroquinone, pentachlorophenol, and phenol. Revision is also made to the formatting of the Water Classes for the entry for aminocresols; the Class D is moved to the same line as Class C. This is consistent with the formatting of the referenced standard for total unchlorinated phenols.

Revision is also proposed for the Remark for the entry for “Nitrite” to clarify that the existing standard of 20 ug/L for “cold water fishery waters” applies to trout waters (T or TS) and, by inference, that the existing standard of 100 ug/L for “warm water fishery waters” applies to waters that are not T or TS. This is commensurate with the revisions regarding “trout waters” described above for section 701.25.

PROPOSED REVISION TO TABLE 2

Table 2, “Basis of Standards,” is revised to change the name for Basis Code V from “Aquatic Life, Aesthetics” to “Aquatic Food, Aesthetics” consistent with the new Type of Aesthetic standard, Aesthetic (Food Source) or E(FS).

20. SECTION 703.6: GROUNDWATER EFFLUENT LIMITATIONS FOR DISCHARGES TO CLASS GA WATERS

Table 3 of subdivision 703.6(e) provides the groundwater effluent limitations. Groundwater effluent limitations apply at the “end-of-pipe” and are used in the State Pollutant Discharge Elimination System (SPDES) program to help ensure that the ambient groundwater standards are achieved.

The proposal adds groundwater effluent limitations to Table 3 for four new substances: acetaldehyde, carbon disulfide, formaldehyde, and metolachlor. Groundwater effluent limitations have been set at or near the ambient groundwater standard on the assumption that little or no removal occurs in the unsaturated zone over the long term. The effluent limitations are proposed at equal to the proposed ambient standard for the three organics (acetaldehyde, formaldehyde, and metolachlor) and at twice the proposed ambient standard for the nonorganic (carbon disulfide), consistent with historical practice. Existing section 702.19, not proposed for revision, allows for modification of groundwater effluent limitations based on a determination for a particular discharge that a less stringent value can achieve the best usage.

Two existing groundwater effluent limitations in Table 3 are proposed for revision: copper and styrene. These are both substantially higher than the corresponding ambient standards, and inconsistent with the historical practice of twice or equal to the ambient standard as described above. For copper, the existing ambient groundwater (Class GA) standard is 200 ug/L and the existing groundwater effluent limitation is 1,000 ug/L. In keeping with the historical practice (above) the proposal revised the groundwater effluent limitation for copper to 400 ug/L, equal to

twice the ambient standard for this nonorganic. For styrene, the existing ambient GA standard is 5 ug/L (because it is a principal organic contaminant) and the groundwater effluent limitation is 930 ug/L. The proposal revises the groundwater effluent limitation for styrene to 5 ug/L, consistent with historical practice for this organic substance. No change is proposed to the existing ambient GA standards for copper or styrene.

Correction is also proposed to Table 3 to move the entry for “Chlorinated dibenzo-p-dioxins and Chlorinated dibenzofurans” to its proper alphabetical location.

The numerical additions and revisions to Table 3 are summarized in the table below.

PROPOSED REVISIONS AND ADDITIONS TO GROUNDWATER EFFLUENT LIMITATIONS IN TABLE 3 , SUBDIVISION 6 NYCRR 703.6(e)

SUBSTANCE	CAS NO.	EXISTING MAXIMUM ALLOWABLE CONCENTRATION (ug/L)	PROPOSED MAXIMUM ALLOWABLE CONCENTRATION (ug/L)
Acetaldehyde	75-07-0	no value	8
Carbon Disulfide	75-15-0	no value	120
Copper	Not Applicable	1,000	400
Formaldehyde	50-00-0	no value	8
Metolachlor	51218-45-2	no value	9
Styrene	100-42-5	930	5

21. SECTION 704.2: CRITERIA GOVERNING THERMAL DISCHARGES

Minor revision is made to this section to specify that criteria that apply to “trout waters” are for T or TS waters (see above discussion related to Section 701.25: Trout Waters”).

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PART 700

Existing section 700.1 is AMENDED to read as follows:

Section 700.1 Definitions.

(a) The terms, words, or phrases used in Parts 700-[705] 706 of this Title shall have the meanings described below.

(1) Acute toxic effect means an effect that usually occurs shortly after the administration of either a single dose or multiple doses of a chemical or other toxic pollutant.

(2) Administrator means the Administrator of the United States Environmental Protection Agency.

(3) Approved treatment as applied to water supplies means treatment accepted as satisfactory by the authorities responsible for exercising supervision over the quality of water supplies.

(4) Aquatic life or aquatic biota means fish, shellfish and those species of wildlife and plants that spend at least part of their life in water.

([4]5) Best usages as specified for each class of water means those uses as determined by the commissioner in accordance with the considerations prescribed by the Environmental Conservation Law.

(6) Biologically-based dose-response model means a model that describes and quantifies the key events in the molecular, cellular, tissue, or organismal responses to a chemical or other toxic pollutant across a range of doses. Model parameters should represent biological phenomena rather than arbitrary statistically-derived values such as polynomial regression coefficients. Such models, if they accurately describe the relationship between dose and response within the range of experimental observation, may provide biological justification for predicted responses at doses below the range of observation.

([5]7) Chronic toxic effect means an effect that is irreversible or progressive or occurs because the rate of injury is greater than the rate of repair during prolonged exposure to a chemical or other toxic pollutant.

([6]8) Coastal waters mean those marine waters within the territorial limits of the State other than estuaries and enclosed bays. Long Island Sound is designated as coastal waters for the purposes of thermal discharges.

([7]9) Commissioner means the Commissioner of the Department of Environmental Conservation.

([8]10) Consolidated rock or bedrock means the compact or solid hard rock beneath or exposed at the surface of the earth or overlain by surface waters.

(11) Cooling water means water used for contact or noncontact cooling, including water used for

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equipment cooling, evaporative cooling tower makeup, and dilution of effluent heat content. The intended use of the cooling water is to absorb waste heat rejected from the process or processes used, or from auxiliary operations on the facility's premises.

(12) Cooling water intake structure means the total physical structure and any associated constructed waterways used to withdraw cooling water from waters of the State. The cooling water intake structure extends from the point at which water is withdrawn from the waters of the State up to, and including, the intake pumps.

([9]13) Department means the New York State Department of Environmental Conservation.

([10]14) Disposal system means a system for disposing of sewage, industrial waste or other wastes, including sewer systems and treatment works.

([11]15) Effluent limitations mean any restriction on quantities, qualities, rates and concentrations of chemical, physical, biological, and other constituents of effluents that are discharged into or allowed to run from an outlet or point source or any other discharge within the meaning of section 17-0501 of the Environmental Conservation Law into surface waters, groundwater or unsaturated zones.

([12]16) Enclosed bays mean those marine waters within the territorial limits of New York State, other than coastal waters or estuaries, in which exchange of sea water is severely limited by barrier beaches. For the purpose of thermal discharges, the following are designated as enclosed bays: Jamaica Bay, Hempstead Bay, Great South Bay, Moriches Bay, Shinnecock Bay and Mecox Bay.

([13]17) Estuary means the tidal portion of a river or stream.

(18) Fish means all varieties of the super-class Pisces.

(19) Flow means the volume of water passing through the cross-sectional area of stream (or river) per unit of time.

([14]20) Fresh groundwaters mean those groundwaters having a chloride concentration equal to or less than 250 mg/L or a total dissolved solids concentration equal to or less than 1,000 mg/L.

([15]21) Great Lakes System means classified segments identified in Part 805; Parts 835 through 839; Parts 845 through 848; Parts 820 and 821; Parts 895 through 899; and Items 1a, 1b and 441 through 1661 of Part 910 of this Title.

([16]22) Groundwaters mean those waters in saturated zones.

([17]23) Groundwater effluent limitations mean those effluent limitations that have been adopted in section 703.6 or developed in accordance with section 702.16(c) of this Title for protection of groundwater.

([18]24) Guidance value means such measure of purity or quality for any waters in relation to their reasonable and necessary use as may be established by the department pursuant to sections 702.1 and 702.15 of this Title.

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([19]25) Heat of artificial origin means all heat from other than natural sources, including but not limited to cumulative effects of multiple and proximate thermal discharges.

([20]26) Industrial waste means any liquid, gaseous, solid or waste substance, or a combination thereof, resulting from any process of industry, manufacturing, trade, or business or from the development or recovery of any natural resources, that may cause or might reasonably be expected to cause pollution of the waters of the State in contravention of the standards adopted pursuant to the Environmental Conservation Law, article 17.

(27) Key event means a measurable and necessary step in a mode-of-action or a measurable indicator of such a step.

([21]28) Land application techniques include the following three basic methods of waste discharge application: irrigation, infiltration-percolation, and overland flow.

([22]29) Land utilization practices entail the use of plants, the soil surface, and soil matrix for removal of certain wastewater constituents.

(30) Linear at low doses means the frequency or severity of a molecular, cellular, tissue, or organismal response (i.e., key event) to a chemical or other toxic pollutant varies proportionally with dose at human doses that are at or near the standard or guidance value for that chemical or toxic pollutant.

(31) Lowest-Observed-Effect Level (LOEL) means the lowest dose or exposure level of a chemical or other toxic pollutant at which a statistically or biologically significant change in the frequency or severity of any effect is observed in the exposed population compared with an appropriate unexposed control population.

([23]32) Micrograms per liter (ug/L) means the weight in micrograms of any specific substance or substances contained in one liter of liquid.

([24]33) Milligrams per liter (mg/L) means the weight in milligrams of any specific substance or substances contained in one liter of liquid.

(34) Model means a mathematical function with parameters that can be adjusted so that the function closely describes a set of empirical data.

(35) Mode-of-action means a sequence of key events that provides a biologically-plausible explanation for how a chemical or other toxic pollutant interacts with a biological target in humans or experimental animals to cause a given effect.

([25]36) New York/New Jersey harbor means saltwater classified segments identified in Part 859; Part 864; Part 890, except Item 1 and its tributaries; Part 891; and Items 1, 2 and 3 and their tributaries of Part 935 of this Title.

(37) No-Observed-Effect Level (NOEL) means the highest dose or exposure level of a chemical or other toxic pollutant at which there are no statistically or biologically significant changes in the frequency or severity of any observed effect in the exposed population compared with an

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appropriate unexposed control population.

(38) Nonlinear at low doses means the frequency or severity of a molecular, cellular, tissue, or organismal response (i.e., key event) to a chemical or other toxic pollutant does not vary proportionally with dose at human doses that are at or near the standard or guidance value for that chemical or toxic pollutant.

([26]39) Oncogenic effect means the induction of tumors that has been demonstrated in:

- (i) humans;
- (ii) two mammalian species;
- (iii) one mammalian species, independently reproduced;
- (iv) one mammalian species, to an unusual degree with respect to incidence, latency period, site, tumor type, or age at onset;
- (v) one mammalian species, supported by positive results in short-term tests that are indicative of potential oncogenic activity; or
- (vi) one mammalian species, supported by positive results for another substance for which similar oncogenic effects are anticipated because of similarity of functional groups or metabolic or toxicologic pathways.

([27]40) Other wastes means garbage, refuse, decayed wood, sawdust, shavings, bark, sand, lime, cinders, ashes, offal, oil, tar, dyestuffs, acids, chemicals, leachate, sludge, salt and all other discarded matter not sewage or industrial waste that may cause or might reasonably be expected to cause pollution of the waters of the State in contravention of the standards adopted pursuant to the Environmental Conservation Law, article 17.

([28]41) Outlet means the terminus of a sewer system, or the point of emergence of any waterborne sewage, industrial waste or other wastes or the effluent therefrom, into the waters of the State.

([29]42) Pathogenic organism means any disease-producing organism.

([30]43) Person or persons means any individual, public or private corporation, political subdivision, government agency, municipality, industry, co-partnership, association, firm, trust, estate or any other legal entity whatsoever.

(44) Point-of-departure means a point on a dose-response curve for an effect of a chemical or other toxic pollutant that is within or near the range of experimental or observational data for the effect. It shall be the lower 95 percent confidence limit on a dose for an estimated level of excess risk for an effect, or it can be a NOEL or LOEL for an effect. It is the starting point for the extrapolation from the range of observation in human or animal studies to the human doses at or near the standard or guidance value for that chemical or toxic pollutant.

([31]45) Point source means any discernible, confined and discrete conveyance, including but not

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limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation or vessel or other floating craft from which pollutants are or may be discharged.

([32]46) Pollutant means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, and industrial, municipal, and agricultural waste discharged into water.

([33]47) Pollution means the presence in the environment of conditions and/or contaminants in quantities of characteristics that are or may be injurious to human, plant or animal life or to property or that unreasonably interfere with the comfortable enjoyment of life and property throughout such areas of the State as shall be affected thereby.

([34]48) Potable waters mean those fresh waters usable for drinking, culinary or food processing purposes.

([35]49) Primary contact recreation means recreational activities where the human body may come in direct contact with raw water to the point of complete body submergence. Primary contact recreation includes, but is not limited to, swimming, diving, water skiing, skin diving and surfing.

([36]50) Principal organic contaminant classes means the classes of organic chemicals listed below.

(i) Halogenated alkane: compound containing carbon (C), hydrogen (H) and halogen (X) where X = fluorine (F), chlorine (Cl), bromine (Br) and/or iodine (I), having the general formula $C_nH_yX_z$, where $y + z = 2n + 2$; n, y and z are integer variables; n and z are equal to or greater than one and y is equal to or greater than zero. Specifically excluded from this class are chloroform, bromoform, bromodichloromethane and dibromochloromethane.

(ii) Halogenated ether: compound containing carbon (C), hydrogen (H), oxygen (O) and halogen (X) (where X = F, Cl, Br and/or I) having the general formula $C_nH_yX_zO$, where $y + z = 2n + 2$; the oxygen is bonded to two carbons; n, y and z are integer variables; n is equal to or greater than two, y is equal to or greater than zero and z is equal to or greater than one.

(iii) Halobenzenes and substituted halobenzenes: derivatives of benzene which have at least one halogen atom attached to the ring and which may or may not have straight or branched chain hydrocarbon, nitrogen or oxygen substituents.

(iv) Benzene and alkyl- or nitrogen-substituted benzenes: benzene or a derivative of benzene which has either an alkyl- and/or a nitrogen-substituent.

(v) Substituted, unsaturated hydrocarbons: a straight or branched chain unsaturated hydrocarbon compound containing one of the following: halogen, aldehyde, nitrile or amide.

(vi) Halogenated nonaromatic cyclic hydrocarbons: a nonaromatic cyclic compound containing a halogen.

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(51) Reference dose (RfD) means an estimate of a daily oral exposure of the human population (including sensitive subgroups) to a chemical or other toxic pollutant that is likely to be without an appreciable risk of deleterious effects during a lifetime.

([37]52) Saline groundwater means groundwater having a chloride concentration of more than 250 mg/L or a total dissolved solids concentration of more than 1,000 mg/L.

([38]53) Saline surface waters mean all waters that are so designated by the commissioner.

(54) Salmonids, see "Trout."

([39]55) Saturated zones means any extensive portion of the earth's crust that contains sufficient water to fill all interconnected voids or pore spaces.

([40]56) Secondary contact recreation means recreational activities where contact with the water is minimal and where ingestion of the water is not probable. Secondary contact recreation includes, but is not limited to, fishing and boating.

([41]57) Sewage means the water-carried human or animal wastes from residences, buildings, industrial establishments or other places, together with such groundwater infiltration and surface water as may be present.

(58) Shellfish includes oysters, scallops, clams, mussels, and other aquatic mollusks, and lobsters, shrimp, crayfish, crabs, and other aquatic crustaceans.

([42]59) Source of water supply for drinking, culinary or food processing purposes means any water source, either public or private, that is used for domestic consumption or used in connection with the processing of milk, beverages or food.

([43]60) Specific MCL means a maximum contaminant level (MCL) included in 10 NYCRR 5-1.51, 5-1.52 or 5-1.55 for either an individual substance or group of substances. A Specific MCL does not include the 10 NYCRR Part 5 MCLs for principal organic contaminants or unspecified organic contaminants.

([44]61) Standards mean such measures of purity or quality for any waters in relation to their reasonable and necessary use as may be established by the department pursuant to section 17-0301 of the Environmental Conservation Law.

([45]62) Subsurface sewage disposal system means a disposal system that discharges sewage beneath the surface of the ground.

([46]63) Thermal discharge means a discharge that results or would result in a temperature change of the receiving water.

([47]64) Toxic pollutant means those pollutants, or combination of pollutants, including disease-causing agents, that after discharge and upon exposure, ingestion, inhalation or assimilation into any organism, either directly from the environment or indirectly through food chains, will, on the basis of information available to the department, cause death, disease,

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behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, including malfunctions in reproduction, or physical deformations, in such organisms or their offspring.

([48]65) Treatment works means any plant, disposal field, lagoon, pumping station, constructed drainage ditch or surface water intercepting ditch, incinerator, area devoted to sanitary landfills or other works not specifically mentioned here, installed for the purpose of treating, neutralizing, stabilizing or disposing of sewage, industrial waste or other wastes.

(66) Trout means any fish in the following genera: "Coregonus," "Oncorhynchus," "Prosopium," "Salmo," "Salvelinus," and "Thymallus."

(67) Trout waters are waters that provide habitat in which trout can survive and grow within a normal range on a year-round basis, or on a year-round basis excepting periods of time during which almost all of the trout inhabiting such waters could and would temporarily retreat into and survive in adjoining or tributary waters due to natural circumstances. When these conditions exist or have been met a water may be classified as a trout water and identified with the symbol (T), appearing in an entry in the "standards" column in the classification tables of Parts 800 through 941 of this Title.

(68) Trout spawning waters are trout waters in which trout eggs can be deposited and be fertilized by trout inhabiting such waters (or connecting waters) and in which those eggs can develop and hatch, and the trout hatched therefrom could survive and grow to a sufficient size and stage of development to enable them to either remain and grow to adult trout therein, or migrate into and survive in other trout waters. When these conditions exist or have been met a water may be classified as a trout spawning water and identified with the symbol (TS), appearing in an entry in the "standards" column in the classification tables of Parts 800 through 941 of this Title.

([49]69) Unconsolidated deposits means all non- or poorly indurated soil materials above the bedrock.

([50]70) Waste management system includes the management of mechanical equipment, crops, irrigation and monitors as an operational unit.

([51]71) Water quality-based effluent limitations means effluent limitations for surface waters that are derived from water quality standards or guidance values.

(72) Wildlife means wild game and all other animal life existing in a wild state, except fish, shellfish, and crustacea.

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PART 701

Existing section 701.2 is AMENDED to read as follows:

Section 701.2 Class N fresh surface waters.

(a) The best usages of Class N waters are the enjoyment of water in its natural condition and, where compatible, as a source of water for drinking or culinary purposes, bathing, fishing, fish propagation, and recreation. The waters shall be suitable for shellfish and wildlife propagation and survival and fish survival.

Existing subdivisions (b) and (c) are unchanged.

New subdivision (d) is ADOPTED to read as follows:

(d) There shall be no alteration to flow that will impair the waters for their best usages.

Existing section 701.3 is AMENDED to read as follows:

Section 701.3 Class AA-Special (AA-S) fresh surface waters.

(a) The best usages of Class AA-S waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival.

Existing subdivisions (b), (c) and (d) are unchanged.

New subdivisions (e) and (f) are ADOPTED to read as follows:

(e) There shall be no alteration to flow that will impair the waters for their best usages.

(f) There shall be no increase in turbidity that will cause a substantial visible contrast to natural conditions.

Existing section 701.4 is AMENDED to read as follows:

Section 701.4 Class A-Special (A-S) fresh surface waters.

(a) The best usages of Class A-S waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival.

Existing subdivision (b) is unchanged.

Existing section 701.5 is AMENDED to read as follows:

Section 701.5 Class AA fresh surface waters.

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(a) The best usages of Class AA waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival.

Existing subdivision (b) is unchanged.

Existing section 701.6 is AMENDED to read as follows:

Section 701.6 Class A fresh surface waters.

(a) The best usages of Class A waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival.

Existing subdivision (b) is unchanged.

Existing section 701.7 is AMENDED to read as follows:

Section 701.7 Class B fresh surface waters.

The best usages of Class B waters are primary and secondary contact recreation and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival.

Existing section 701.8 is AMENDED to read as follows:

Section 701.8 Class C fresh surface waters.

The best usage of Class C waters is fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Existing section 701.9 is AMENDED to read as follows:

Section 701.9 Class D fresh surface waters.

The best usage of Class D waters is fishing. Due to such natural conditions as intermittency of flow, water conditions not conducive to propagation of game fishery, or stream bed conditions, the waters will not support fish propagation. These waters shall be suitable for fish, shellfish, and wildlife survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Existing heading "SALINE SURFACE WATERS" is unchanged.

Existing section 701.10 is AMENDED to read as follows:

Section 701.10 Class SA saline surface waters.

The best usages of Class SA waters are shellfishing for market purposes, primary and secondary

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contact recreation and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival.

Existing section 701.11 is AMENDED to read as follows:

Section 701.11 Class SB saline surface waters.

The best usages of Class SB waters are primary and secondary contact recreation and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival.

Existing section 701.12 is AMENDED to read as follows:

Section 701.12 Class SC saline surface waters.

The best usage of Class SC waters is fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Existing section 701.13 is AMENDED to read as follows:

Section 701.13 Class I saline surface waters.

The best usages of Class I waters are secondary contact recreation and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival.

Existing section 701.14 is AMENDED to read as follows:

Section 701.14 Class SD saline surface waters.

The best usage of Class SD waters is fishing. These waters shall be suitable for fish, shellfish, and wildlife survival. This classification may be given to those waters that, because of natural or man-made conditions, cannot meet the requirements for primary and secondary contact recreation and fish propagation.

New heading to be located immediately following existing section 701.24 is ADOPTED to read as follows:

TROUT WATERS

New section 701.25 is ADOPTED to read as follows:

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Section 701.25 Trout waters (T or TS)

(a) The symbol (T), appearing in an entry in the "standards" column in the classification tables of Parts 800 through 941 of this Title, means that the classified waters in that specific Item are trout waters. Any water quality standard, guidance value, or thermal criterion that specifically refers to trout or trout waters applies.

(b) The symbol (TS), appearing in an entry in the "standards" column in the classification tables of Parts 800 through 941 of this Title, means that the classified waters in that specific Item are trout spawning waters. Any water quality standard, guidance value, or thermal criterion that specifically refers to trout, trout spawning, trout waters, or trout spawning waters applies.

Existing section 701.25 is RENUMBERED 701.26

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PART 702

Existing subdivision 702.1(c) is AMENDED to read as follows:

702.1(c) Standards and guidance values shall be of the following Types to protect the best usages of the waters as described in Part 701 of this Title:

- (1) Health (Water Source) or H(WS);
- (2) Health (Fish Consumption) or H(FC);
- (3) Aquatic (Chronic) or A(C);
- (4) Aquatic (Acute) or A(A);
- (5) Wildlife or W; [and]
- (6) [Aesthetic or E] Aesthetic (Water Source) or E(WS);
- (7) Aesthetic (Food Source) or E(FS); and
- (8) Recreation or R.

Nothing else within existing section 702.1 is changed.

Existing subdivision 702.2(c) is REPEALED and new subdivisions (c), (d), and (e) are ADOPTED to read as follows:

702.2(c) Standards or guidance values based on oncogenic effects that are based on the 95 percent lower confidence limit on the human dose corresponding to an excess lifetime cancer risk of one-in-one million or on chemical correlation to such effects shall be derived using age-specific water consumption rates and points-of-departure for a lifetime exposure period of 70 years if scientific evidence is sufficient to show that children may be more sensitive than adults to such oncogenic effects. If such scientific evidence is not available, a consumption rate of two liters of water per day for a lifetime exposure period of 70 years shall be used.

702.2(d) Standards or guidance values based on oncogenic effects that are based on the human equivalent dose at the point-of-departure divided by an uncertainty factor, chronic nononcogenic effects, or chemical correlation to such effects shall be derived using age-specific water consumption rates for a childhood exposure period (18 years or less) if scientific evidence is sufficient to show that children may be more sensitive than adults to such effects. If such scientific evidence is not available, a consumption rate of two liters of water per day shall be used.

702.2(e) Standards or guidance values based on acute nononcogenic effects or chemical correlation to acute nononcogenic effects shall be derived using a consumption rate of one liter of water per day or a different water consumption rate if deemed more appropriate based on scientific evidence.

Nothing else within existing section 702.2 is changed.

Existing section 702.4 is REPEALED and new section 702.4 is ADOPTED to read as follows:

Section 702.4 Procedures deriving standards and guidance values based on oncogenic effects.

(a) Standards and guidance values based on oncogenic effects shall be calculated using dose-

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response data from scientifically valid human or animal studies. Considering factors including but not limited to route, duration and timing of exposure, species, strain, tumor types and sites, nature and severity of effects, pharmacokinetics, mode-of-action, study quality, and statistical significance, the dose-response data deemed to be the most appropriate for evaluating potential human health risks at environmental exposures shall be used as the basis of the value.

(b) Standards and guidance values shall be based on the point-of-departure for the selected dose-response data.

(1) The point-of-departure shall be the LED10, which is the 95 percent lower confidence limit on the dose associated with 10 percent excess risk for oncogenic effects adjusted for background risk. A different level of excess risk may be used if deemed more appropriate based on scientific evidence.

(2) The point-of-departure shall be estimated using a validated, biologically-based dose-response model. If such a model does not exist, the point-of-departure shall be estimated using a mathematical model (i.e., the multistage, probit, logistic, or Weibull model) that best describes the dose-response data within the range of observation. Statistical measures, including the Chi-squared goodness-of-fit test, shall be used to determine which model best describes the data.

(3) If the selected dose-response data are not adequately described by methods in section 702.4(b)(2) of this Part, an alternative point-of-departure (e.g., a NOEL or LOEL) shall be used.

(c) If the point-of-departure is derived from an animal study, the human equivalent dose (milligrams of substance per kilogram of body weight per day) at the point-of-departure shall be estimated by multiplying the animal-to-human body weight ratio raised to the 0.25 power by the animal dose in milligrams of substance per kilogram of body weight per day. An alternative trans-species conversion method may be used if deemed more appropriate based on scientific evidence.

(d) The standard or guidance value shall be derived by extrapolating from the point-of-departure to the human dose at the standard or guidance value.

(1) If a validated biologically-based dose-response model is used to estimate the point-of-departure, the standard or guidance value shall be based on the 95 percent lower confidence limit on the human dose corresponding to an excess lifetime cancer risk of one-in-one million and shall be estimated using the model. If such a model is not available or is not validated for humans, the extrapolation method from the point-of-departure to the human dose at the standard or guidance value shall depend on the results of a mode-of-action analysis.

(2) If data on mode-of-action are unavailable, or if the mode-of-action analysis provides evidence of linearity at low doses or does not provide unequivocal evidence of nonlinearity at low doses, the standard or guidance value shall be based on the 95 percent lower confidence limit on the human dose corresponding to an excess lifetime cancer risk of one-in-one million. The human dose at the standard or guidance value shall be estimated by multiplying the human equivalent dose at the point-of-departure derived according to sections 702.4(b)(1) and 702.4(b)(2) of this Part by a factor equal to the risk level of one-in-one million divided by the risk level at the point-of-departure.

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(3) If a mode-of-action analysis provides no evidence for linearity at low doses and provides unequivocal evidence of nonlinearity at low doses, the standard or guidance value shall be based on the human equivalent dose at the point-of-departure identified by the methods in section 702.4(b) of this Part divided by an uncertainty factor that will insure that the human dose at the standard or guidance value will be without appreciable risk to the human population, including children. The magnitude of this factor will generally range from 10 to 3,000. Factors that will be considered in determining the magnitude of the uncertainty factor shall include: the nature of the dose-response curve and the point-of-departure; the relative sensitivities of experimental animals and humans; the nature and extent of human variation, including age-dependent differences in sensitivity during a lifetime; and the data gaps in the toxicological database.

(e) Standards and guidance values based on the 95 percent lower confidence limit on the human dose corresponding to an excess lifetime cancer risk of one-in-one million shall be derived using age-specific body weights for a lifetime exposure period of 70 years if scientific evidence is sufficient to show that children may be more sensitive than adults to the oncogenic effect. If such evidence is not available, a body weight of 70 kilograms and a lifetime exposure period of 70 years shall be used.

(f) Standards and guidance values based on the human equivalent dose at the point-of-departure divided by an uncertainty factor shall allow no more than 20 percent of the human dose at the standard or guidance value to come from drinking water and shall be derived using age-specific body weights for a childhood exposure period (18 years or less) if scientific evidence is sufficient to show that children may be more sensitive than adults to the oncogenic effect. If such evidence is not available, a body weight of 70 kilograms shall be used.

Existing section 702.5 is REPEALED and new section 702.5 is ADOPTED to read as follows:

Section 702.5 Procedures for deriving standards and guidance values based on nononcogenic effects.

(a) Standards and guidance values based on nononcogenic effects shall be calculated using dose-response data from scientifically valid human or animal studies. Considering factors, including but not limited to route, duration and timing of exposure, species, strain, nature and severity of effects, pharmacokinetics, mode-of-action, study quality and statistical significance, the dose-response data deemed to be the most appropriate for evaluating potential human health risks at environmental exposures shall be used as the basis of the value.

(b) Standards and guidance values shall be based on the point-of-departure for the selected dose-response data.

(1) The point-of-departure shall be the no-observed-effect level (NOEL), expressed as a dose in milligrams of substance per kilogram of body weight per day. Where a valid NOEL is not available, a lowest-observed-effect level (LOEL) may be used.

(2) If neither a NOEL or a LOEL are available, an alternative point-of-departure, e.g., the 95 percent lower confidence limit on the dose associated with a specified percentage of excess risk (e.g., 10 percent) for a nononcogenic effect adjusted for background risk, may be used. The alternative point-of-departure shall be estimated using one of the mathematical models that are

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appropriate for analysis of dichotomous or continuous dose-response data (e.g., power, polynomial, or linear), and shall be the model that best describes the dose-response data within the range of experimental observation. Statistical measures, including the Chi-squared goodness-of-fit test, shall be used to determine which model best describes the data.

(c) The standard or guidance value shall be derived by extrapolating from the point-of-departure to the reference dose (RfD). The RfD shall be estimated by dividing the NOEL (or LOEL, or an alternative point-of-departure) by an uncertainty factor. The magnitude of this factor shall insure that exposures at or below the reference dose are without appreciable risk to the human population, including children, and will generally range from 10 to 3,000. It shall account for the following areas of uncertainty:

(1) LOEL to NOEL extrapolation (where necessary, to account for uncertainty where extrapolating from a LOEL to a NOEL);

(2) subchronic to chronic extrapolation (where necessary, to account for uncertainty where extrapolating from a less-than-chronic study NOEL (or LOEL, or other point-of-departure) to a chronic NOEL, LOEL, or other point-of-departure;

(3) animal to human extrapolation (where necessary, to account for uncertainty where extrapolating from experimental animals to humans);

(4) inter-human variability (where necessary, to account for variation in sensitivity among the human population, including special consideration of the potential sensitivity of children); and

(5) data gaps (where necessary, to account for areas of scientific uncertainty in the toxicological database).

(d) Standards and guidance values based on chronic toxic effects shall allow no more than 20 percent of the reference dose to come from drinking water and shall be derived using age-specific body weights for a childhood exposure period (18 years or less) if scientific evidence is sufficient to show that children may be more sensitive than adults to such effects. If such evidence is not available, a body weight of 70 kilograms shall be used.

(e) Standards and guidance values based on acute toxic effects shall allow 20 percent of the reference dose to come from drinking water and shall be derived using a child body weight of 10 kilograms. Alternative values for percentage of reference dose or for body weight may be used if deemed more appropriate based on scientific evidence.

Existing section 702.7 is AMENDED to read as follows:

Section 702.7 Procedure for deriving standards and guidance values based on chemical correlation.

[Where] If the available data are deemed insufficient for deriving a standard or guidance value on the basis of either of sections 702.4 or 702.5 of this Part, a standard or guidance value may be based on correlation to a chemical for which a standard or guidance value has been established pursuant to those sections. [Values] Standards or guidance values based on chemical correlation

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may be established [where] if similar toxic effects are anticipated because of similarity of functional groups or metabolic or toxicologic pathways.

Existing section 702.8 is AMENDED to read as follows:

Section 702.8 Procedures for deriving standards and guidance values for protection of human health from consumption of fish.

Standards and guidance values for the protection of the best usage of fishing shall protect the health of human consumers of [finfish] fish and, for Class SA waters, human consumers of shellfish from chemicals that may bioaccumulate and are referred to as Health (Fish Consumption) values.

(a) Standards and guidance values based on bioaccumulation and human consumption of fish shall be equal to the acceptable daily intake from fish consumption divided by a fish consumption rate of 0.033 kilograms per day and by a bioaccumulation factor.

(b) The acceptable daily intake, in micrograms per day, from fish consumption shall be the more stringent of:

(1) 20 percent of the [ADI] reference dose (for nononcogenic effects) as determined from section 702.5 or 702.7 of this Part; or

(2) the human dose at the standard or guidance value (for oncogenic effects) as determined from section 702.4 or 702.7 of this Part.

(c) The bioaccumulation factor is the ratio of the concentration of a substance in fish flesh, in micrograms per kilogram, to the concentration in water, in micrograms per liter. Bioaccumulation factors will generally be based on measured values which may be supported by bioaccumulation factors derived from octanol/water partition coefficients.

Existing section 702.9 is AMENDED to read as follows:

702.9(d) Where the waters are to be suitable for [both] fish, shellfish, and wildlife propagation and survival, both Aquatic (Chronic) and Aquatic (Acute) standards or guidance values shall apply.

702.9(e) Where the waters are to be suitable [only] for fish, shellfish, and wildlife survival, Aquatic (Acute) standards and guidance values shall apply.

702.9(g) [Where] If the available data are deemed insufficient for deriving a standard or guidance value on the basis of section 706.1 of this Title, a value may be based on either:

(1) an alternative procedure if deemed appropriate based on scientific evidence; or

(2) correlation to a chemical for which a standard or guidance value has been established pursuant to [that] section 706.1 of this Title [where] if similar toxic effects are anticipated because of similarity of functional groups or metabolic or toxicologic pathways.

Nothing else in existing section 702.9 is changed.

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New section 702.12 is ADOPTED to read as follows:

702.12 Procedures for deriving standards and guidance values for protection of recreation.

(a) Protection of the best usage of recreation shall include standards and guidance values to protect the quality of the water for primary and secondary contact recreation, including aesthetic conditions. Such values are referred to as Recreation values and derived based on an evaluation of reported levels of the substance that affect the quality of the water and its use for recreation.

Existing section 702.14 is REPEALED and new section 702.14 is ADOPTED to read as follows:

702.14 Procedures for deriving standards and guidance values for protection of aesthetic quality.

(a) Protection of the best usage as a source of potable water supply shall include standards and guidance values to protect the aesthetic quality of the water, including but not limited to taste, odor, and discoloration, both as a source of potable water and for other human uses such as clothes washing and showering. Such values are referred to as Aesthetic (Water Source) values and shall be derived based on an evaluation of reported levels of the substance that affect the aesthetic quality of the water. Values derived shall not exceed the value of a Specific MCL that is based on aesthetic considerations.

(b) Protection of the best usage of fishing shall include standards and guidance values to prevent tainting of aquatic food, including but not limited to taste, odor, and discoloration. Such values are referred to as Aesthetic (Food Source) values and derived based on an evaluation of reported levels of the substance that affect the aesthetic quality of the fish flesh, aquatic life, wildlife, or livestock that are consumed by humans and that acquire such flavor, odor, or color because of habitation in, passage through, or ingestion of waters.

(c) If the available data are deemed insufficient for deriving a value based on subdivision (a) or (b) of this section, a value may be established based on chemical correlation to a chemical for which a standard or guidance value has been established pursuant to that subdivision, if similar aesthetic considerations are anticipated because of similarity of functional groups or metabolic or toxicologic pathways.

Existing subdivision 702.15(a) is AMENDED to read as follows:

702.15(a) For those substances that do not have an applicable Health (Water Source) standard in section 703.5 of this Title and that the department determines may pose a threat to human health if discharged to the waters of the State, a guidance value may be derived and shall be the [more] most stringent of the following:

(1) the values derived by applying the procedures from sections 702.3 through 702.7 of this Part; [or]

(2) a "general organic guidance value" of 50 ug/L for an individual organic substance. This paragraph does not apply if adequate and sufficient data are available to justify values greater than 50 ug/L using procedures from both sections 702.4 and 702.5 of this Part. The general organic guidance value applies only to those substances specified by the department; or

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(3) a "specific organic mixture guidance value" of 100 ug/L for a commercially available mixture of individual organic substances. This paragraph does not apply if adequate and sufficient data are available to justify values greater than 100 ug/L using procedures from both sections 702.4 and 702.5 of this Part. The derivation of this value for any specified mixture does not preclude the existence or derivation of a Health (Water Source) standard or guidance value for any individual organic substance in the mixture. The specific organic mixture guidance value applies only to those mixtures specified by the department.

Existing subdivision 702.15(f) is AMENDED to read as follows:

702.15(f) For those substances that do not have an applicable Aesthetic (Water Source) standard in section 703.5 of this Title and that the department determines may pose a threat to the aesthetic quality of sources of potable water [or food for human consumption] if discharged to the waters of the State, a guidance value may be derived by applying the appropriate procedure from section 702.14 of this Part.

New subdivision 702.15(g) is ADOPTED to read as follows:

702.15(g) For those substances that do not have an applicable Aesthetic (Food Source) standard in section 703.5 of this Title and that the department determines may pose a threat to the aesthetic quality of food for human consumption if discharged to the waters of the State, a guidance value may be derived by applying the appropriate procedure from section 702.14 of this Part.

New subdivision 702.15(h) is ADOPTED to read as follows:

702.15(h) For those parameters that do not have an applicable Recreation standard in section 703.5 of this Title and that the department determines may pose a threat to the quality of the water for recreation if discharged to the waters of the State, a guidance value may be derived by applying the appropriate procedure from section 702.12 of this Part.

Nothing else in existing section 702.15 is changed.

Existing paragraph 702.16(b)(1) is AMENDED to read as follows:

702.16(b)(1) When deriving a water quality-based effluent limitation from a surface water standard or guidance value, the department may take into account factors, including but not limited to analytical detectability, treatability, natural background levels, intermittent streamflow, wet weather events, and the waste assimilative capacity of the receiving waters.

Nothing else in existing section 702.16 is changed.

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PART 703

In existing section 703.2, the entry for the parameter “Turbidity” is AMENDED to read:

PARAMETER	CLASSES	STANDARD
Turbidity	AA, A, B, C, D, SA, SB, SC, I, SD, <u>A-Special</u>	No increase that will cause a substantial visible contrast to natural conditions.

To existing section 703.2, a new entry, for the parameter “Flow,” is ADOPTED and added, to be located at the end of the section, after the parameter “Thermal discharges.”

PARAMETER	CLASSES	STANDARD
<u>Flow</u>	<u>AA, A, B, C, D, A-Special</u>	<u>No alteration that will impair the waters for their best usages.</u>

Nothing else within existing section 703.2 is changed.

In existing section 703.3, the existing entry for the parameter “Dissolved oxygen (DO)” is AMENDED to read as follows:

PARAMETER	CLASSES	STANDARD
Dissolved oxygen (DO)	A-Special	In rivers and upper waters of lakes, not less than 6.0 mg/L at any time. In hypolimnetic waters, it should not be less than necessary for the support of fishlife, particularly cold water species.

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PARAMETER	CLASSES	STANDARD
	AA, A, B, C, AA-Special	[For cold waters suitable for trout spawning,] <u>For trout spawning waters (TS)</u> the DO concentration shall not be less than 7.0 mg/L from other than natural conditions. For trout waters <u>(T)</u> , the minimum daily average shall not be less than 6.0 mg/L, and at no time shall the concentration be less than 5.0 mg/L. For nontrout waters, the minimum daily average shall not be less than 5.0 mg/L, and at no time shall the DO concentration be less than 4.0 mg/L.
	D[, SD]	Shall not be less than 3.0 mg/L at any time.
	[SA, SB, SC]	[Shall not be less than 5.0 mg/L at any time.]
	<u>SA, SB, SC</u>	<u>Chronic: Shall not be less than a daily average of 4.8 mg/L*</u>

Remark: *The DO concentration may fall below 4.8 mg/L for a limited number of days, as defined by the formula:

$$DO_i = \frac{13.0}{2.80 + 1.84e^{-0.1t_i}} \quad \text{where } DO_i = \text{DO}$$

concentration in mg/L between 3.0 - 4.8 mg/L and t_i = time in days. This equation is applied by dividing the DO range of 3.0 - 4.8 mg/L into a number of equal intervals. DO_i is the lower bound of each interval (i) and t_i is the allowable number of days that the DO concentration can be within that interval. The actual number of days that the measured DO concentration falls within each interval (i) is divided by the allowable number of days that the DO can fall within interval (t_i). The sum of the quotients of all intervals (i ...n) cannot exceed 1.0: i.e.,

$$\sum_{i=1}^n \frac{t_i(\text{actual})}{t_i(\text{allowed})} < 1.0$$

. The DO concentration shall not fall

below the acute standard of 3.0 mg/L at any time.

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PARAMETER	CLASSES	STANDARD
	<u>SA, SB, SC, SD</u>	<u>Acute: Shall not be less than 3.0 mg/L at any time.</u>
	I	Shall not be less than 4.0 mg/L at any time.

Nothing else within existing section 703.3 is changed.

Existing subdivision 703.4(c) is REPEALED and new subdivision 703.4(c) is ADOPTED to read as follows:

703.4(c) The total and fecal coliform standards for classes B, C, D, SB, SC, and I shall be met during all periods:

(1) when disinfection is required for SPDES permitted discharges directly into, or affecting the best usage of, the water; or

(2) when the department determines it necessary to protect human health.

Nothing else within existing section 703.4 is changed.

Existing subdivision 703.5(b) is AMENDED to read as follows:

703.5(b) Standards are Health (Water Source), Health (Fish Consumption), Aquatic (Chronic), Aquatic (Acute), Wildlife [or Aesthetic], Aesthetic (Water Source), Aesthetic (Food Source), or Recreation based and are respectively designated as H(W.S), H(FC), A(C), A(A), W [or E], E(W.S), E(FS), or R in the column headed "Type." Where more than one Type of standard is listed for a water class, the most stringent applies.

Existing subdivisions 703.5(a), (c), (d), and (e) are unchanged.

New entries for the following substances are ADOPTED and added to existing Table 1 of existing subdivision 703.5(f) IN ALPHABETICAL ORDER within Table 1, to read as follows:

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
<u>Acetaldehyde</u> <u>(75-07-0)</u>	<u>A, A-S, AA, AA-S</u> <u>GA</u>	<u>8</u> <u>8</u>	<u>H(W.S)</u> <u>H(W.S)</u>	<u>A</u> <u>A</u>
<u>Carbon disulfide</u> <u>(75-15-0)</u>	<u>A, A-S, AA, AA-S</u> <u>GA</u>	<u>60</u> <u>60</u>	<u>H(W.S)</u> <u>H(W.S)</u>	<u>B</u> <u>B</u>

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<u>Formaldehyde</u> <u>(50-00-0)</u>	<u>A, A-S, AA, AA-S</u> <u>GA</u>	<u>8</u> <u>8</u>	<u>H(WS)</u> <u>H(WS)</u>	<u>A</u> <u>A</u>
<u>Metolachlor</u> <u>(51218-45-2)</u>	<u>A, A-S, AA, AA-S</u> <u>GA</u>	<u>9</u> <u>9</u>	<u>H(WS)</u> <u>H(WS)</u>	<u>A</u> <u>A</u>

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Existing entries in Table 1 of existing subdivision 703.5(f) for the following substances are AMENDED to read as follows:

NOTE: The material in italics below in the entry for "Pentachlorophenol" is NOT being deleted. The brackets in the "Remarks" section of that entry should remain in the text. The italics are only used to indicate what material this note refers to.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Acenaphthene (83-32-9)	A, A-S, AA, AA-S	20	E(WS)	U
Aminocresols (95-84-1; 2835-95-2; 2835-99-6)	A, A-S, AA, AA-S GA A, A-S, AA, AA-S, B, C, <u>D</u> [D]	* * ** [**]	E(WS) E(WS) E(FS) [E]	
Remarks:	* Refer to standards for "Phenolic compounds (total phenols)." ** Refer to standards for "Phenols, total unchlorinated."			
Ammonia and Ammonium (7664-41-7; CAS No. Not Applicable)	A, A-S, AA, AA-S GA A, A-S, AA, AA-S, B, C D <u>SA, SB, SC, I</u> <u>SA, SB, SC, I, SD</u>	2,000* 2,000* ** ** <u>35***</u> <u>230***</u>	H(WS) H(WS) A(C) A(A) <u>A(C)</u> <u>A(A)</u>	H H
Remarks:	* NH ₃ + NH ₄ ⁺ as N. ** Un-ionized ammonia as NH ₃ ; tables below provide the standard in ug/L at varying pH and temperature for different classes and specifications. Linear interpolation between the listed pH values and temperatures is applicable. *** <u>Applies to un-ionized ammonia as NH₃.</u>			
The remainder of the entry for “Ammonia and Ammonium” is not changed.				
Chlorobenzene (108-90-7)	A, A-S, AA, AA-S GA A, A-S, AA, AA-S, B, C, D SA,SB, SC, I, SD A, A-S, AA, AA-S, B, C A, A-S, AA, AA-S D	5 * 400 400 5 20 50	H(WS) H(WS) H(FC) H(FC) A(C) E(WS) E(FS)	I J B B U V
Remark:	* The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.			
2-Chloronaphthalene (91-58-7)	A, A-S, AA, AA-S	10	E(WS)	U

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SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Dichlorobenzenes (95-50-1;541-73-1;106-47-6)	A, A-S, AA, AA-S	3*	H(WS)	A
	GA	3*	H(WS)	A
	A, A-S, AA, AA-S, B, C	5**	A(C)	
	A, A-S, AA, AA-S	20***/30****	<u>E(WS)</u>	U
	D	50**	<u>E(FS)</u>	V
Remarks:	* Applies to each isomer (1,2-,1,3- and 1,4-dichlorobenzene) individually. ** Applies to the sum of 1,2-, 1,3- and 1,4-dichlorobenzene. For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title. *** Applies to 1,3-dichlorobenzene only. **** Applies to 1,4-dichlorobenzene only.			
2,4-Dichlorophenol (120-83-2)	A, A-S, AA, AA-S	0.3*	<u>E(WS)</u>	U
	GA	**	<u>E(WS)</u>	
	A, A-S, AA, AA-S, B, C, D	***	<u>E(FS)</u>	
Remarks:	* Also see standards for "Phenolic compounds (total phenols)." ** Refer to standards for "Phenolic compounds (total phenols)." *** Refer to standards for "Phenols, total chlorinated."			
2,4-Dimethyphenol (105-67-9)	A, A-S, AA, AA-S, B, C, D	1,000	H(FC)	B
	SA, SB, SC, I, SD	1,000	H(FC)	B
	A, A-S, AA, AA-S	*	<u>E(WS)</u>	
	GA	*	<u>E(WS)</u>	
	<u>A, A-S, AA, AA-S, B, C, D</u>	**	<u>E(FS)</u>	
Remarks:	* Refer to standards for "Phenolic compounds (total phenols)." ** Refer to standards for "Phenols, total unchlorinated."			
2,4-Dinitrophenol (51-28-5)	A, A-S, AA, AA-S, B, C, D	400	H(FC)	B
	SA, SB, SC, I, SD	400	H(FC)	B
	A, A-S, AA, AA-S	*	<u>E(WS)</u>	
	GA	*	<u>E(WS)</u>	
	<u>A, A-S, AA, AA-S, B, C, D</u>	**	<u>E(FS)</u>	
Remarks:	* Refer to standards for "Phenolic compounds (total phenols)." ** Refer to standards for "Phenols, total unchlorinated."			

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SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Foaming agents (CAS No. Not Applicable)	GA	500*	E(<u>WS</u>)	U
Remark:	* Determined as methylene blue active substances (MBAS) or by other tests as specified by the commissioner.			
Hexachlorocyclopentadiene (77-47-4)	GA A, A-S, AA, AA-S, B, C D SA, SB, SC SD A, A-S, AA, AA-S	* 0.45** 4.5** 0.07 0.7 1.0	H(<u>WS</u>) A(C) A(A) A(C) A(A) E(<u>WS</u>)	J U
Remarks:	* The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. ** For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title.			
Hexachlorophene (70-30-4)	GA A, A-S, AA, AA-S GA A, A-S, AA, AA-S, B, C, D	* ** ** ***	H(<u>WS</u>) E(<u>WS</u>) E(<u>WS</u>) E(<u>FS</u>)	J
Remarks:	* The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance. ** Refer to standards for "Phenolic compounds (total phenols)." *** Refer to standards for "Phenols, total chlorinated."			
Hydroquinone (123-31-9)	A, A-S, AA, AA-S, B, C D A, A-S, AA, AA-S GA A, A-S, AA, AA-S, B, C, D	2.2** 4.4** * * ***	A(C) A(A) E(<u>WS</u>) E(<u>WS</u>) E(<u>FS</u>)	
Remarks:	* Refer to standards for "Phenolic compounds (total phenols)." ** For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title. *** Refer to standards for "Phenols, total unchlorinated."			
Iron (CAS No. Not Applicable)	[A, A-S, AA, AA-S, B, C] [D] A, A-S, AA, AA-S GA	[300**] [300**] 300 300*	[A(C)] [A(A)] E(<u>WS</u>) E(<u>WS</u>)	 G F

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SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Remark[s] * Also see standard for "Iron and Manganese." [** For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) and (d) of this Title.]				
Iron and Manganese (CAS No. Not Applicable)	GA	500*	E(<u>WS</u>)	F
Remark:	* Applies to the sum of these substances; also see individual standards for "Iron" and "Manganese."			
Manganese (CAS No. Not Applicable)	A, A-S, AA, AA-S GA	300 300*	E(<u>WS</u>) E(<u>WS</u>)	G F
Remark:	* Also see standards for "Iron and Manganese."			
Naphthalene (91-20-3)	A, A-S, AA, AA-S	10	E(<u>WS</u>)	U
Nitrite (expressed as N) (CAS No. Not Applicable)	A, A-S, AA, AA-S GA A, A-S, AA, AA-S, B, C	1,000* 1,000* **	H(<u>WS</u>) H(<u>WS</u>) A(C)	G G
Remark	* Also see standards for "Nitrate and Nitrite." ** Standard is 100 ug/L [for warm water fishery waters and] <u>except</u> 20 ug/L for [cold water fishery waters.] <u>trout waters (T or TS)</u> . *** For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title.			
Nitrobenzene (98-95-3)	A, A-S, AA, AA-S GA A, A-S, AA, AA-S	0.4 0.4 30	H(<u>WS</u>) H(<u>WS</u>) E(<u>WS</u>)	A A U
Pentachlorophenol (87-86-5)	A, A-S, AA, AA-S, B, C A, A-S, AA, AA-S, B, C, D A, A-S, AA, AA-S GA <u>A, A-S, AA, AA-S, B, C, D</u>	* ** *** *** ****	A(C) A(A) E(<u>WS</u>) E(<u>WS</u>) E(<u>FS</u>)	
Remarks:	* exp [1.005 (pH) - 5.134] ** exp [1.005 (pH) - 4.869] *** Refer to standards for "Phenolic compounds (total phenols)." **** Refer to standards for "Phenols, total chlorinated."			

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SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
Phenol (108-95-2)	A, A-S, AA, AA-S	*	<u>E(WS)</u>	
	GA	*	<u>E(WS)</u>	
	<u>A, A-S, AA, AA-S</u> , B, C, D	**	<u>E(FS)</u>	
Remarks:	* Refer to standards for "Phenolic compounds (total phenols)." ** Refer to standards for "Phenols, total unchlorinated."			
Phenolic compounds (total phenols) (CAS No. Not Applicable)	A, A-S, AA, AA-S	1*	<u>E(WS)</u>	U
	GA	1*	<u>E(WS)</u>	U
Remark:	* Applies to the sum of these substances.			
Phenols, total chlorinated (CAS No. Not Applicable)	A, A-S, AA, AA-S	*	<u>E(WS)</u>	
	GA	*	<u>E(WS)</u>	
	A, A-S, AA, AA-S, B, C, D	1.0**	<u>E(FS)</u>	V
Remarks:	* Refer to standards for "Phenolic compounds (total phenols)." ** Applies to the sum of these substances.			
Phenols, total unchlorinated (CAS No. Not Applicable)	A, A-S, AA, AA-S	*	<u>E(WS)</u>	
	GA	*	<u>E(WS)</u>	
	A, A-S, AA, AA-S, B, C, D	5.0**	<u>E(FS)</u>	V
Remarks:	* Refer to standards for "Phenolic compounds (total phenols)." ** Applies to the sum of these substances.			
Phenyl ether (101-84-8)	A, A-S, AA, AA-S	10	<u>E(WS)</u>	U
Styrene (100-42-5)	GA	*	H(WS)	J
	A, A-S, AA, AA-S	50	<u>E(WS)</u>	U
Remark:	* The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to this substance.			
Tetrachlorobenzenes (634-66-2; 634-90-2; 95-94-3; 12408-10-5)	GA	*	H(WS)	J
	A, A-S, AA, AA-S	10**	<u>E(WS)</u>	U

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SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD (ug/L)	TYPE	BASIS CODE
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Remarks: * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to each isomer (1,2,3,4-, 1,2,3,5-, and 1,2,4,5- tetrachlorobenzene) individually.
 ** Applies to the sum of 1,2,3,4-, 1,2,3,5- and 1,2,4,5-tetrachlorobenzene.

Trichlorobenzenes (87-61-6; 120-82-1; 108-70-3; 12002-48-1)	GA	*	H(WS)	J
	A, A-S, AA, AA-S, B, C	5**	A(C)	
	SA, SB, SC	5**	A(C)	
	A, A-S, AA, AA-S	10**	E(WS)	U
	D	50**	E(FS)	V
	SD	50**	E(FS)	V

Remarks: * The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in this Table) applies to each isomer (1,2,3-, 1,2,4- and 1,3,5- trichlorobenzene) individually.
 ** Applies to the sum of 1,2,3-, 1,2,4- and 1,3,5-trichlorobenzene. For the waters of the Great Lakes System, the department will substitute a guidance value for the aquatic Type standard if so determined under section 702.15(c) of this Title.

Express Terms for 2006 Proposed Amendments to 6 NYCRR Parts 700-704

Nothing else within existing Table 1 of existing subdivision 703.5(f) is changed.

The existing entry for Basis Code “V” in Table 2 of subdivision 703.5(f) is AMENDED to read as follows:

BASIS CODE	BASIS
V	[Aquatic Life] <u>Food Source</u> , Aesthetics

Nothing else within existing Table 2 of existing subdivision 703.5(f) is changed.

New entries for the following substances are ADOPTED and added to existing Table 3 of subdivision 703.6(e) IN ALPHABETICAL ORDER to read as follows:

SUBSTANCE	CAS NO.	MAXIMUM ALLOWABLE CONCENTRATION (ug/L)
<u>Acetaldehyde</u>	<u>75-07-0</u>	<u>8</u>
<u>Carbon disulfide</u>	<u>75-15-0</u>	<u>120</u>
<u>Formaldehyde</u>	<u>50-00-0</u>	<u>8</u>
<u>Metolachlor</u>	<u>51218-45-2</u>	<u>9</u>

Existing entries for the following substances in existing Table 3 of subdivision 703.6(e) are AMENDED to read as follows:

SUBSTANCE	CAS NO.	MAXIMUM ALLOWABLE CONCENTRATION (ug/L)
Copper	Not Applicable	[1,000] <u>400</u>
Styrene	100-42-5	[930] <u>5</u>

The existing entry in Table 3 of subdivision 703.6(e) for “Chlorinated dibenzo-p-dioxins and Chlorinated dibenzofurans” is relocated, unchanged, from its existing location to its proper alphabetical location to immediately follow the existing entry for “Chloride.”

Nothing else within existing Table 3 of subdivision 703.6(e) is changed.

**Express Terms for 2006 Proposed Amendments to
6 NYCRR Parts 700-704**

PART 704

Existing paragraph 704.2(b)(2) is AMENDED to read as follows:

704.2(b)(2) Trout waters (T or TS).

Nothing else in existing section 704.2 is changed.

SUMMARY OF EXPRESS TERMS FOR 2006 REVISION TO
6NYCRR PARTS 700 - 704

In brief, this proposal:

- Adds or revises numerical ambient water quality standards for six substances;
- Deletes the ambient standard for one substance;
- Adds or revises groundwater effluent limitations for six substances;
- Adds narrative ambient standards for flow and turbidity;
- Revises procedures for deriving standards and guidance values for human health and aquatic life;
- Makes revisions/additions regarding best usages, trout waters, aesthetics, recreation, applicability of coliform standards, definitions, and surface water effluent limitations.

The proposed revisions are described in the table and text below. The reader is referred to the complete express terms for the full text of the proposed amendments. It is available as noted in the Notice of Proposed Rulemaking.

The Table below summarizes the changes being proposed for specific parameters in Part 703.

Substance or Parameter	Proposed Action
Flow	Adopt new narrative ambient standard of "No alteration that will impair the waters for their best usages" for all fresh surface water classes.
Turbidity	Adopt new narrative ambient standard of "No increase that will cause a substantial visible contrast to natural conditions" for Class A-S and AA-S waters.

Substance or Parameter	Proposed Action
Dissolved Oxygen (DO)	Revise existing ambient standard for Class SA, SB, and SC marine waters, currently never-less-than 5.0 mg/L. Revised standards would be a chronic standard of 4.8 mg/L, with excursions between 4.8 and 3.0 mg/L allowed for a limited period of time. The equation for this is provided in the complete express terms. Revised standards would also include an acute standard of 3.0 mg/L.
Ammonia	Adopt new aquatic life ambient standards for marine waters of 35 ug/L (chronic) and 230 ug/L (acute).
Acetaldehyde	Adopt new Health (Water Source) ambient standard of 8 ug/L for surface waters and groundwaters; adopt new groundwater effluent limitation of 8 ug/L.
Carbon Disulfide	Adopt new Health (Water Source) ambient standard of 60 ug/L for surface waters and groundwaters; adopt new groundwater effluent limitation of 120 ug/L.
Formaldehyde	Adopt new Health (Water Source) ambient standard of 8 ug/L for surface waters and groundwaters; adopt new groundwater effluent limitation of 8 ug/L.
Iron	Delete existing ambient chronic and acute Aquatic Life standards (see note 1) [no substantive change to Aesthetic standards].
Metolachlor	Adopt new Health (Water Source) ambient standard of 9 ug/L for surface waters and groundwaters; adopt new groundwater effluent limitation of 9 ug/L.
Copper	Revise existing groundwater effluent limitation from 1,000 ug/L to 400 ug/L [no change to GA standard].
Styrene	Revise existing groundwater effluent limitation from 930 ug/L to 5 ug/L [no change to GA standard].

Note 1 (regarding Iron): The Department has reevaluated the basis for its existing iron standards and no longer believes that 300 ug/L is the appropriate value for this substance. The Department's review of the scientific literature on the toxicity of iron has lead to the conclusion that the EPA 1976 criteria value of 1,000 ug/L is both protective of aquatic life and a more appropriate ambient value. However, the scientific evidence for the

1,000 ug/L value is not without some uncertainty and there is a good possibility that the Department may further revise its determination in the next several years based on additional scientific information. Therefore, instead of revising the existing aquatic life standards for iron to 1,000 ug/L at this time, the Department proposes to delete them altogether. Coincident with, or soon after the effective date of the deletion, the Department expects to propose aquatic life guidance values of 1,000 ug/L for iron for the Division of Water's TOGS No. 1.1.1. A revised aquatic life standard(s) for iron will be proposed in a future rulemaking when supported by the appropriate scientific information.

Significant revisions to the standard-setting procedures for human health are proposed, particularly for oncogenic (carcinogenic) effects, but also for nononcogenic effects. These revisions update and improve the procedures, provide the Department greater flexibility to use recently developed risk assessment methodologies, and enhance the Department's ability to derive the most accurate standards to protect human health. Key elements of the proposed revisions for carcinogens include the use of biologically-based dose-response and other models, provision for an uncertainty factor approach for nonlinear oncogens and language ensuring consideration of the special sensitivity of children.

Revision is proposed to subdivision (g) of this section to enable deriving a standard or guidance value to protect aquatic life if a value cannot be derived according to the procedures in section 706.1.

The proposal adds a new procedure to allow the Department to derive a "specific organic mixture guidance value" of 100 ug/L. Under the existing regulations, it is not feasible to derive a standard or guidance value for commercial mixtures of complex composition that vary with conditions of production (such as gasoline or Stoddard Solvent).

This represents a significant gap in the Department's ability to establish values to protect human health and sources of drinking water. The wording of the proposed regulations makes clear that this is not a "default" value that applies or will be applied to all organic mixtures.

The "general organic guidance value" provision in the existing regulations enables the Department to establish a guidance value of 50 ug/L for certain individual organic substances in the absence of sufficient toxicity data to derive a specific value. This is not a true "default" that applies to all organics in the absence of a specific standard or guidance value. However, there is a widely held misconception that this is indeed the case, a misconception that must frequently be clarified on a case-by-case basis. To reduce the misconception, the proposal adds language explaining that this value is only derived for those substances as specified by the Department.

Revisions are proposed to the Aesthetic Type standards and guidance values, in effect splitting this into two Types to better differentiate between those derived to protect aesthetic quality of the water for human uses and those to protect the aesthetic quality of the water for prevention of tainting of aquatic food for human consumption.

A new Type of standard, Recreation (R) is created to facilitate derivation of standards and guidance values to protect the recreational uses of the waters.

Revisions and additions are proposed to procedures for deriving Aesthetic and Recreation Type standards and guidance values.

Additional language is proposed for Part 701 to describe waters classified for trout and trout spawning. The proposal also clarifies the applicability of existing standards for DO (section 703.3) and nitrite (section 703.5), and the thermal criteria (Part 704) to (T) and/or (TS) waters.

Revision is proposed to section 702.16 to more clearly indicate that intermittent streamflow and wet weather events are factors the Department considers in the establishment of surface water effluent limitations.

Revision is proposed to section 703.4 to clarify the applicability of the existing coliform standards. [No revision to the existing standards for bacteria are proposed].

Additional language for best usages in Part 701 is proposed to indicate that, where waters are to be suitable for the propagation and survival of fish, they must also be suitable for the propagation and survival of shellfish and wildlife.

The proposal adds and revised definitions in Part 700 commensurate with other changes in the regulations and to provide greater clarity and understanding.

REGULATORY IMPACT STATEMENT FOR 2006 REVISION TO
6NYCRR PARTS 700 - 704

1. Statutory Authority:

The statutory authority for adoption of water quality regulations and standards is found in the Environmental Conservation law (ECL), Sections 3-0301.2.m, 15-0313, and 17-0301. The first cited section provides that the Commissioner may adopt regulations to carry out the purposes of the ECL in general. The other sections direct the Department to adopt standards that are applicable to the classification of waters and that are protective of life, health and property. Specifically, Section 17-0301 states:

- “1. It is recognized that, due to variable factors, no single standard of quality and purity of the waters is applicable to all waters of the state or to different segments of the same waters.
- “2. In order to attain the objectives of this article, the department after proper study, and after conducting public hearing upon due notice, shall group the designated waters of the state into classes. Such classification shall be made in accordance with consideration of best usage in the interest of the public...
- “4. The department, after proper study, and after conducting public hearings upon due notice, shall adopt and assign standards of quality and purity for each such classification necessary for the public use or benefit contemplated by such classification...”

2. Legislative Objectives:

The adoption of standards will contribute to the fulfillment of the legislative objective of the ECL to guarantee that the “widest range of beneficial uses of the environment is attained without risk to health or safety” (ECL Section 1-0101.3.b), and to “maintain reasonable standards of purity of the waters of the state consistent with public health and enjoyment thereof...” (ECL Section 17-0101). The action will also contribute to achieving the federal mandate “to restore and maintain the chemical, physical and biological integrity of the Nation’s waters,” and the national goal, wherever attainable, of “water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water” [Clean Water Act (CWA), Sections 101(a) and 101(a)(2)]. More specific regulatory requirements are provided under “Regulatory Requirements” in the section entitled “Need for Action.”

3. Needs and Benefits:

This proposed action is needed to protect and preserve water resources from the threat of toxic substances and to satisfy specific regulatory requirements. Descriptions of the water resource, threats and regulatory requirements follow.

a. Water Resources

The waters of New York State are one of our greatest natural resources. There are approximately 52,000 miles of surface streams, 7,850 freshwater lakes and ponds with about 5,500 square miles of surface area, and 1,530 square miles of marine waters in the boundaries of the State. They are divided into 17 major drainage basins.

The saline waters of the State are those rivers, bays and estuaries located primarily in and adjacent to Long Island Sound, the Atlantic Ocean, New York Harbor, and the lower Hudson River. Those around Long Island, in particular, provide a significant recreational

and shellfish seafood resource for the state's population.

New York's fresh surface waters provide the source of drinking water for most of the population of New York City (72 percent) and upstate. They are widely used for swimming, boating, and fishing. They are also the means for elimination of much of its wastes, and support a multitude of uses for its industrial, commercial and agricultural activities.

Groundwater resources in New York State supply water to millions of New Yorkers each day. They are also a major component of the hydrologic cycle where water is in continuous movement above, on, and below the surface of the Earth. Groundwater is recharged by receiving and storing precipitation and then is released to wells or back to the surface where it can evaporate from streams, rivers, lakes, ponds or wetlands to continue the cycle. During times of limited precipitation (drought) groundwater represents a significant recharge to streams, helping to maintain not only flow but also their corresponding ecosystems. Groundwater resources are composed of water bearing units called aquifers and may consist of unconsolidated material (e.g. sand and gravel) or bedrock. Although groundwater is present beneath all of New York, the volume available to wells in any one area may be limited due to aquifer characteristics. For Nassau and Suffolk Counties, an area representing less than 2 percent of the state, groundwater from unconsolidated aquifers is the only source of drinking water available. Millions of gallons are pumped each day to supply nearly 3 million residents, representing roughly 14.5 percent of the state's population (1990 USGS water use data). For New York as a whole, population dependence on groundwater is as follows: 14 counties have populations between 0 - 25 percent dependent on groundwater, 15 counties are between 26 - 50 percent, 21 counties are between 51 - 75 percent, and 12 counties are between 76 - 100 percent.

Aquifers are vulnerable to contamination and are difficult to clean up once contaminated. This is particularly true of unconsolidated, unconfined, sand and gravel aquifers, which are often the source of water for high capacity municipal supply wells. The New York State Department of Health (DOH) has identified a number of areas within the state that are highly dependent on groundwater for their potable water supply. These areas are referred to as Primary Aquifer areas. The Department has adopted the Primary Aquifer term. Areas where groundwater resources are capable of, but not currently supplying large amounts of groundwater for public use are referred to as Principal Aquifer areas. The Division of Water continues to pursue detailed mapping of these areas to assess ground water resources and provide technical information for management purposes.

b. Threats

New York is a highly populated and industrialized state, with about 19 million residents, and home to both the nation's largest metropolis and to thousands of industrial facilities. Activities associated with maintaining approximately seven million households result in the discharge of large volumes of wastewater to septic systems and municipal treatment plants. Toxic substances from sewage and industrial wastewaters, as well as from nonpoint sources, are discharged to the waters of the State. About 700 facilities released approximately 60 million pounds of toxic substances to water, air and land as reported through the New York State Toxic Release Inventory in 2000. Thousands of smaller facilities release additional quantities of toxic substances. Approximately 49 million gallons of hazardous substances can be bulk stored in about 5,400 tanks. Approximately 540 industries have SPDES permits for the discharge of toxic substances directly to surface waters and groundwaters. Over 1,500 industries classified in significant categories discharge to publicly owned treatment works (POTWs), and the majority of these are

sources of toxic substances to the water environment. Thousands of industries in non-significant categories discharge additional quantities of toxic substances to POTWs.

The water resources of New York State have been damaged at various times and locations by the excessive release of pollutants. The construction of wastewater treatment facilities during the past three decades has made major progress in restoring the integrity of the State's waters. However, the continuing widespread use and release of toxics chemicals, as well as contamination resulting from past abuses, requires the maintenance of a sound system of water quality regulations to effectively control the release of toxic chemicals.

c. Federal Regulatory Requirements.

As mentioned above, the federal Clean Water Act, section 303(c), requires all states to maintain adequate standards for pollutants that threaten its waters and includes a requirement for a formal review every three years. New York State last revised its water quality standards effective in March of 1998.

d. Reasons for the Specific Components of the Proposal.

A general description of the major components of this proposal is provided below, along with an explanation of why the Department believes each to be necessary.

In 2000, the United States Environmental Protection Agency (EPA) issued the document, Ambient Aquatic Life Water Quality Criteria for Dissolved Oxygen (Saltwater): Cape Cod to Cape Hatteras, which contains EPA's updated recommendations to the states for necessary minimum levels of dissolved oxygen (DO) to protect the best usages of marine waters. This recommendation was based on extensive scientific research and public input and represents a major difference from New York's existing marine standards for this important parameter. The Department believes that revision of its existing marine

DO standards is appropriate based on this EPA document. This revision will result in less stringent but fully protective DO standards for Class SA, SB, and SC marine waters.

A new standard is being added for ammonia for saltwater (marine waters), based on EPA's 1989 criteria recommendation. This fills a key gap in New York's standards and is described as a priority by the EPA. New York is undertaking extensive and expensive nitrogen control programs to abate low DO conditions in the marine district, now is the time to refine those programs to minimize the toxic effects of nitrogenous compounds, specifically ammonia. The proposed standard would be protective of marine resources.

Ammonia has been found to be toxic to a variety of marine organisms, including crustaceans, bivalve mollusks, fishes, and marine algae. Winter flounder, a popular recreational species in population decline, is the most sensitive species tested to date. The mean acute sensitivity of 88 percent of the species tested is within a factor of ten of that for the winter flounder. Other important commercial and recreational species at risk from ammonia toxicity are American lobster and striped bass. The catastrophic die-off of lobsters in 1999 is still unresolved and sediment ammonia toxicity could be one of the involved stressors. Of the tested species, hard clams and oysters appear to be the most tolerant to ammonia toxicity but it does affect their ability to filter algae (their food source) from the water. Hence, they would have slower growth rates (to reach market size) and could be more vulnerable to predation based upon a smaller size.

Information on the toxicity of ammonia to saltwater plants is limited, but tests have shown toxicity to benthic algae and red macroalgae species. This could affect the lower levels of the marine food web. Recent studies have shown that ammonia is toxic to eelgrass. Eelgrass beds are extremely important as nursery areas for economically important fish and shellfish (e.g., bay scallops) and coastal sediment stabilization. Eelgrass

beds have been decimated in New York Harbor and many have been reduced or lost in Long Island Sound and Peconic Bay. Nitrogenous compounds, which includes ammonia, have been implicated as a potential factor in the loss of tidal wetlands in Long Island Sound. This will be further investigated.

In April 2000 the Department established guidance values for several toxics to protect human health and sources of drinking water. Three of these, acetaldehyde, carbon disulfide and formaldehyde are proposed as standards, numerically equal to the existing guidance values. Adoption of these guidance values as standards is appropriate and provides greater legal support.

A new standard is added for the pesticide metolachlor to protect human health and sources of drinking water. Metolachlor is a widely used herbicide in New York that leaches into the groundwater. Past agricultural uses of metolachlor have caused a significant negative impact on the groundwater aquifer in Long Island, the sole source of drinking water for nearly 3 million residents.

The existing standards for iron to protect aquatic life are proposed for deletion. In its review, the Department found that its existing standard, promulgated in the mid-1980's, is not well supported by scientific evidence and that a different value, based on EPA criteria guidance, has greater scientific support. The Department expects to propose guidance values for iron for aquatic life at or shortly after the standard is deleted.

A new narrative standard is proposed for all surface water classes for the parameter "flow" of "no alteration that will impair the waters for their best usages." To date, the Department's water quality standards have extensively addressed the quality of water but not the quantity. Achieving the best usage of the water often requires an appropriate quantity of water as well as sufficient quality. An appropriate quantity of water is vital to

maintain best usages as a source of potable water supply, and for fishing, swimming and secondary contact recreation.

Currently, the Department has the authority to, and does regulate flow in the absence of a water quality standard, based on both State and federal law. In State law, ECL Article 15 declares that "All fish, game, wildlife, shellfish, crustacea . . . are owned by the state and held for the use and enjoyment of the people of the state, and the state has the responsibility to preserve, protect ... and to promote their natural propagation."¹ ECL Article 17 requires that all waters of the State be classified according to their best uses, and that standards be adopted to protect those uses. All perennial waters of the state include fishing (with the specification that the waters be suitable for fish propagation and survival), as a best use. Flow was one of the factors considered when the best use was adopted.² Protecting flow is necessary to ensure that waters continue to be suitable for the best use.³ At the federal level, the U. S. Supreme Court has ruled that the Clean Water Act (CWA) empowers states with the authority to promulgate flow standards to protect fish and wildlife.⁴

There is also a basis for establishing "flow" conditions as pollution in certain instances. There is recognition in the CWA itself that reduced stream flow, i.e. diminishment of water quantity, can constitute water pollution. First, the CWA's definition of pollution as "the man-made or man induced alteration of the chemical, physical, biological, and radiological integrity of water" encompasses the effects of reduced water

¹ ECL Article 15, Section 15-0103(8)

² ECL Article 17, Section 17-0301(3)(a)

³ ECL Article 17, Section 17-0301(2); 17-0301(4)

⁴ PUD No.1 of Jefferson County v. Washington Department of Ecology, 511 U.S. 700, 114 S. Ct. 1900 (1994).

quantity. [see 33 USC Section 1362 (19)]. Moreover, CWA Section 304 expressly recognizes that water "pollution" may result from "changes in the movement, flow, or circulation of any navigable waters ..., including changes caused by the construction of dams." [see 33 USC Section 1314(f)]. This concern with flowage effects is also embodied in EPA regulations. [see 40 CFR Section 131.10(g)(4)].

The addition of a flow standard will not create new regulatory authority, but it will serve to highlight and clarify that the Department considers flow critical to maintaining the best usages of the State's waters.

There is an additional, legal basis for having a flow standard. Prior to 1993, the Department used the legal authority cited above as the basis for adding flow-related conditions to CWA Section 401 water quality certifications, primarily for hydroelectric power generating facilities permits, because CWA Section 401(d) allowed the derivation of water quality certification conditions from "appropriate requirements of other state laws." A 1993 Court of Appeals decision regarding a case with Niagara Mohawk found that the Federal Power Act overrode the conditions based on "other state laws," and that CWA Section 401 water quality certification conditions had to be derived only from actual water quality standards. The U.S. Supreme Court ruling in PUD No.1 of Jefferson County found that the CWA does apply to flow, and states were empowered to promulgate flow standards. The Supreme Court did not overturn the Court of Appeals decision; it only empowered states to promulgate flow standards. New York now needs to close this regulatory gap and add the flow standard to correspond with the Court of Appeals decision.

Groundwater effluent limitations apply at the "end-of-pipe" and are used in the State Pollutant Discharge Elimination System (SPDES) program to help ensure that the ambient groundwater standards are achieved.

The proposal adds groundwater effluent limitations to Table 3 for four new substances: acetaldehyde, carbon disulfide, formaldehyde, and metolachlor. Groundwater effluent limitations have been set at or near the ambient groundwater standard on the assumption that little or no removal occurs in the unsaturated zone over the long term. The effluent limitations are proposed at equal to the proposed ambient standard for the three organics (acetaldehyde, formaldehyde, and metolachlor) and at twice the proposed ambient standard for the nonorganic (carbon disulfide), consistent with historical practice. Existing section 702.19, not proposed for revision, allows for modification of groundwater effluent limitations based on a determination for a particular discharge that a less stringent value can achieve the best usage.

Two existing groundwater effluent limitations in Table 3 are proposed for revision: copper and styrene. These are both substantially higher than the corresponding ambient standards, and inconsistent with the historical practice of twice or equal to the ambient standard as described above. For copper, the existing ambient groundwater (Class GA) standard is 200 ug/L and the existing groundwater effluent limitation is 1,000 ug/L. In keeping with the historical practice (above) the proposal revised the groundwater effluent limitation for copper to 400 ug/L, equal to twice the ambient standard for this nonorganic. For styrene, the existing ambient GA standard is 5 ug/L (because it is a principal organic contaminant) and the groundwater effluent limitation is 930 ug/L. The proposal revises the groundwater effluent limitation for styrene to 5 ug/L, consistent with historical practice for this organic substance. No change is proposed to the existing ambient GA standards for copper or styrene.

The scientific procedures for assessing risk to human health from both carcinogenic

and non-carcinogenic substances has evolved substantially over recent years. Many of the new approaches are contained in a recent EPA document, Methodology for Deriving Ambient Water Quality Criteria (AWQC) for the Protection of Human Health (2000). The proposed revisions reflect the latest science and enable the Department to derive the most accurate standards possible.

Under the existing procedures for deriving standards and guidance values, the Department is unable to establish values for certain organic mixtures that may pose a threat to human health if discharged to the waters of the State, including such complex products as gasoline and Stoddard Solvent. To address this key gap, a new provision is added to the procedures in 702.15, to enable the Department to derive a “specific organic mixture guidance value” of 100 ug/L.

The existing regulations list various forms of recreation among the best usages of the state's waters, but do not contain a specific Type of standard or guidance value to address this. Accordingly, a new Recreation or R Type is established, along with procedures and provisions for deriving such standards and guidance values.

The existing Type of standard and guidance value for protection of the aesthetic quality of the waters is being split into two Types, to enable the Department to specify the necessary levels of protection both for sources of potable water and for prevention of tainting of fish and other aquatic life for human consumption.

The existing regulations include several standards and criteria that refer to such terms as “trout waters” and “cold water fishery waters,” but do not define these terms. The proposal clarifies their applicability to trout (T) and trout spawning (TS) waters, adds a section to Part 701 to specifically address “trout waters” and adds related definitions to Part 700.

The water class descriptions in existing Part 701 do not explicitly address wildlife, although standards are derived for their protection. Revision is made to indicate that surface waters shall also be suitable for propagation and survival of shellfish and wildlife.

Definitions for several terms related to aquatic life and human health are added to Part 700 commensurate with other changes to the regulation and to provide for greater clarity.

4. Costs:

The only cost from the proposal is from the addition of aquatic life standards for ammonia in marine waters. The Department's analysis demonstrates that none of the other provisions of the proposal will result in any costs. A summary of the costs for marine ammonia is presented below, followed by a provision-by-provision explanation of why there is no impact from any other part of this proposal.

There is no cost to the Department (the regulating agency) for implementation and continued administration of the regulation (this is what the Department routinely does), and no cost to state government as a whole.

In general, to determine the pollution abatement costs associated with the proposed standards, the Department evaluated the treatment requirements for the proposed standards and compared them to the existing treatment facilities or treatment required by the current regulations but not yet implemented. SPDES permits that contain limitations or monitoring requirements for the proposed substances were identified through the Department's computerized Permit Compliance System (PCS). For those permittees, both current permit requirements and requirements for the proposed standards were established and compared. Existing treatment capacity and performance were assessed and the additional treatment requirements, if any, were evaluated using generalized designs for unit

treatment operations. Treatment costs were computed using generalized cost information.

It should be noted that a small percentage of SPDES permits are added to and deleted from the system on a continuing basis. Permit requirements and limitations are also periodically revised. The economic impacts of the proposed standards, therefore, may change as the content of the permit program changes.

The cost estimates for the marine ammonia standard were derived by the Department as follows: The Innovative and Alternative Technology Assessment Manual (EPA, 1980) contains figures that show what the cost for construction and Operation and Maintenance (O&M) would be at different flow rates for each type of technology (in 1980 dollars). Staff of the DEC Division of Water's Facility Operations Assistance Section were consulted as to what type of technology would be most beneficial at each treatment plant. In each case staff recommended more than one option. Based on cost information for each option contained in USEPA (1980), the least expensive option was selected. The ENR Construction Index (online at <http://www.enr.com/features/conEco/costIndexes/mostRecentIndexes.asp>) was used to find the factor to use for conversion of 1980 dollars to 2003 dollars. Construction costs were then converted to capital costs using procedures in Table A-2 of EPA (1980). The capital cost for one facility (Sag Harbor) was estimated by the Department in consultation with facility staff.

ITEM WITH REGULATORY IMPACT:

New Ammonia Standard for Marine Waters

Thirteen (13) sewage treatment facilities (publicly-owned treatment works or POTWs) were identified as potentially impacted by the proposed standards for marine ammonia for aquatic life.

Further analysis showed that eight (8) of these would have no impact:

Out of the 13 facilities potentially impacted by the proposed marine ammonia standard, five (5) will not be impacted because they already are, or will be, required to upgrade their facility to comply with the water quality based effluent limits for nitrogen, and will as a result meet limits for marine ammonia.

These are:

<u>Facility</u>	<u>SPDES Permit No.</u>
Jamaica	0026115
26 th Ward	0026212
Great Neck (V)	0022128
Great Neck SD	0026999
Glen Cove (C)	0026620

Four (4) other plants are either already meeting the projected water quality based effluent limits (WQBELs) or may be able to meet them with only operational modifications.

These are:

<u>Facility</u>	<u>SPDES Permit No.</u>
SCSD No.3	0104809
West Long Beach	0023523
Riverhead	0020061
Sag Harbor	0028908

SCSD No. 3 and West Long Beach are already meeting the projected WQBELs. Operational modifications may be needed at the other two plants, Riverhead and Sag Harbor. They both have sequencing batch reactors (SBRs), which have excellent nitrification capabilities. Modifications of treatment options, such as re-routing of some

scavenger wastes through the SBRs, may be necessary. The Department does not believe that there will be any costs associated with any needed operational modifications for Riverhead; thus there will be no regulatory impact from the proposal to this facility. Sag Harbor, however, could incur capital costs of 80 thousand dollars if operational modifications alone do not accomplish the necessary treatment. These costs are for covering two SBRs.

The proposal will result in an impact on the four (4) remaining facilities. Some form of upgrade to their treatment infrastructure will be needed to meet the water quality based effluent limit that will result from the proposed standard. The construction and O&M costs for these will be approximately as follows:

Facility	SPDES No.	Design Flow, mgd	Construction Cost, millions of dollars ⁽¹⁾	Capital Cost, millions of dollars ^{(1) (2)}	O&M Cost per year, millions of dollars ⁽¹⁾
Long Beach	0020567	6.36	2.55	4.03	0.16
Bay Park	0026450	70	8.84	13.97	0.67
Lawrence	0020354	1.5	2.55	4.03	0.10
Cedarhurst	0022462	1.0	2.14	3.38	0.08

⁽¹⁾ Costs were developed from Innovative and Alternative Technology Assessment Manual, EPA, February, 1980 and the April, 2003 ENR Construction Index as described above.

⁽²⁾ Capital cost includes construction cost.

The costs for the Long Beach upgrade assumed that the trickling filter would be replaced with a 6.5 mg aeration tank with diffused air and a new secondary clarifier.

The costs for the Bay Park upgrade assumed the installation of a new 20 million gallon aeration tank, one new primary clarifier, and one new secondary clarifier.

The costs for the Lawrence and Cedarhurst upgrades assumed the installation of an RBC unit after the trickling filter and a new secondary clarifier.

The detailed assessment sheet for all 13 facilities is attached as an appendix. Construction costs were converted to capital costs as described above.

The total capital and O&M costs to all facilities (including the potential capital cost to Sag Harbor) are: Capital Cost: 25.49 million dollars (includes Construction Cost); O&M Cost per year: 1.01 million dollars.

A small additional cost for monitoring for ammonia is expected to be incurred by three (3) other facilities; these facilities do not currently monitor for this parameter. The cost of this would be approximately 20 dollars per sample, once per month for each facility. The additional annual cost for each facility would be 240 dollars for a total monitoring costs for the three facilities of 720 dollars per year. These are different facilities from the 13 discussed above, and are listed below:

Facility	SPDES No.
Ocean Beach (V)	0020168
Watergate Gardens Apt.	0080730
E.F. Barrett Power Gene. - 005E	0005908

ITEMS WITH NO REGULATORY IMPACT

The Department has determined that none of the other items in the proposal will result in any cost. The basis for this determination is described below. Individual parameters are addressed in alphabetical order, followed by a more general discussion of revisions to procedures and other changes.

Acetaldehyde: Adoption of new Health (Water Source) standard equal to the

existing guidance value; also adoption of groundwater effluent limitation. There were no permitted discharges identified. Thus, no dischargers that would potentially have to modify their discharge and no impact.

Carbon Disulfide: Adoption of new Health (Water Source) standard equal to the existing guidance value; also adoption of groundwater effluent limitation. There were two permitted discharges identified but analysis by the Department found that there would be no impact.

Copper: Revision of groundwater effluent limitation to be more stringent; no change to existing ambient GA standard. Nineteen permitted discharges of copper to groundwater were identified but analysis by the Department showed that there would be no impact from the proposal.

Dissolved Oxygen (DO): Revision of standards for marine waters. There will be no regulatory impact because the standards for all classes affected by the revision (SA, SB and SC) will be made less stringent under the proposal.

Note: The proposal does not include revision of the DO standard for Class I waters. A future revision to the DO standard for Class I waters could result in a regulatory impact. However, the appropriateness of retention of the Class I designation should be examined as part of the reclassification of the marine waters of New York City, after the conclusion of the Use and Standards Attainment (USA) Project.

Flow: Adoption of new narrative standard.

The Department has carefully reviewed the potential regulatory impact from adding a new narrative standard for the parameter “flow” and concludes that it will not result in a significant economic impact. This is because addition of this standard imparts no new regulatory authority. The Department currently regulates flow based on state statutes (e.g.,

Environmental Conservation Law Articles 15 and 17) and federal law (Clean Water Act).

Adding a narrative flow standard to Part 703 will highlight, clarify and centralize the fact that the Department considers flow under existing authority when protecting the best usages of the waters. The approach that the Department will use to determine the need to prevent impairment due to flow conditions under the new standard is consistent with the approaches the Department currently uses under existing authorities.

In its review, the Department considered the potential impact from adding a flow standard to a wide variety of projects, including that of water supply permits. Specifically, the questions of: a) whether the standard would cause water supply permits to be reopened, and b) whether previously unlisted waters would be listed on the 303(d) list as impaired and requiring a Total Maximum Daily Load (TMDL) were considered. The conclusion is: a) water supply permits would not have to be reopened, and b) that although waters impaired due to flow conditions may be reported on the 305(b) list, they will not require the development of a TMDL because “flow conditions” is considered “pollution” rather than “a pollutant.”

Formaldehyde: Adoption of new Health (Water Source) standard equal to the existing guidance value; also adoption of new groundwater effluent limitation. Three permitted discharges were identified but none with any impact. For one of the discharges, Schenectady International, there might be a small increase or change in monitoring but this would result in no additional cost; there would be no regulatory impact in terms of treatment upgrades.

Iron: Deletion of Aquatic standards. This action will not result in any regulatory impact because the standard is being deleted and a less stringent guidance value will be established.

Metolachlor: Addition of new Health (Water Source) standard; also adoption of groundwater effluent limitation. There are no sources (dischargers) of metolachlor statewide.

Styrene: Revision of groundwater effluent limitation to be more stringent; no change to existing ambient GA standard. One permitted discharge of styrene to groundwater was identified but analysis by the Department showed that there would be no impact from the proposal.

Turbidity: Adoption of new narrative standard for A-S and AA-S waters. There are no permitted turbidity discharges to these waters; thus no impact. The Department also considered whether there would be any impact under the stormwater program and concluded that there was no impact.

Definitions: There will be no regulatory impact from the addition or revision of definitions in Part 700. The definition of terms used in the regulations does not create any regulatory authority nor result in any impact. Many of proposed new definitions are for terms used in the human health risk assessment methodologies for Part 702.

The definition of "cooling water" is identical to that contained in 40 CFR Part 125.83. The definition of cooling water intake structure is identical to that contained in 40 CFR Part 125.83, with two exceptions: the phrase, "waters of the State" replaces "waters of the US" and "surface water source." Adding these two definitions will not result in any regulatory impact.

Best Usages - Addition of Shellfish and Wildlife Protection: The addition of explicit protection of shellfish and wildlife to the best usages language for surface waters in Part 701 will not cause any regulatory impact. The addition of this language does not in and of itself result in the creation of any new standards.

Trout Waters: The addition of section 701.25, Trout Waters, and the revision of wording for standards for Dissolved Oxygen and Nitrite in Part 703 and thermal criteria in Part 704 will not result in any regulatory impact. These changes merely clarify the waters to which these existing standards and criteria apply.

Human Health and Aquatic Life Procedures: The revision of these methodologies for deriving standards and guidance values will not have any regulatory impact. The revision of such methodologies does not in and of itself impart any new authority nor create any new standards. The impact of any standards that are now or in the future derived according to these methodologies is addressed for the standard itself.

The addition of a procedure and authority for deriving a “specific organic mixture guidance value” will not have any regulatory impact. The addition of such procedure does not in and of itself create any new standards or guidance values.

The clarification of the application of the “general organic guidance value” has no effect on the existence of any values and no regulatory impact.

Recreation and Aesthetics - Types and Procedures:

There is no regulatory impact from the creation of a new Recreation Type of standard and guidance value. This action does not in and of itself create any new standards; it merely sets up a structure for assigning standards of this Type in the future. Nor will the creation of methodologies for deriving such standards and guidance values. If any standards of this Type are derived in the future, their regulatory impact will be assessed at the time the actual standards are proposed.

There is no regulatory impact from the splitting of the Aesthetic Type standard into two Types, Aesthetic (Water Source) and Aesthetic (Food Source). This is a structural change only and results in no change to the existing promulgated standards. Additionally,

the replacement of Type (E) for existing aesthetic standards with either Type E(Ws) or E(FS) as appropriate, identifies the new Type of standard but does not change the numerical value of the standard nor the water classes to which it applies.

The addition of listing of several surface water classes to the E(FS) entries for several phenolic compounds that are listed individually in Table 1 of 703.5, such as 2,4-dimethylphenol and hydroquinone, is merely for the information of the user and does not create any additional standard. The operative standard already exists and is referred to in the entry for the individual substance. Thus, there is no regulatory impact.

Coliforms Applicability Clarification: The proposed revision to 703.4(c) that clarifies where the existing standards for total and fecal coliforms for classes B, C, D, SB, SC and I shall be met is a clarification of the existing regulations and will not result in any regulatory impact. The proposal is the functional equivalent of the existing regulations, which apply the standard “when disinfection is practiced.” The proposal is an improvement because it links the standard to a determination of need that may or may not be made with the current standard. This is not an expansion or a reduction of our ability to apply the standard to where the current use is higher than the classified best use; we currently have the ability and plan to exercise it based on the same criteria, when necessary to protect public health; it’s just not currently expressed in the standard.

5. Paperwork:

As part of the SPDES program, all significant permittees are required to periodically report monitoring data for substances include in their permit. The proposed regulations are not expected to significantly increase or decrease the number of SPDES permittees or the amount of information that must be reported. Applicants for SPDES permits are currently required to report on the discharge of a broad list of toxics substances that are or may be

present in the discharge. New or more stringent standards are not expected to significantly increase the reporting requirements for SPDES applicants.

Those dischargers who may be required to report on a parameter for which they were previously not regulated will have to maintain records and report the discharge level of the newly regulated parameter. Facilities that discharge ammonia to marine waters will have to report this additional parameter on their Discharge Monitoring Reports, a negligible increase in paperwork. Other than this, there is no increase in paperwork from this proposal.

6. Local Government Mandates:

There are no specific mandates to local governments that result from this rule. However, it is again noted that the impacted facilities belong to local governments, so the above mentioned impact from the ammonia marine standard is to those specific local governments that operate the facilities described above.

7. Duplication Between This Regulation and Other Regulations and Laws:

The proposed regulation will not result in duplication of administrative requirements for regulated parties or the State.

8. Alternatives, Including What Would Happen if No Action was Taken:

Numerical ambient water quality standards represent levels protective of the best usages of New York's waters. They are derived according to scientific procedures that are in regulation and based on the best available data. Thus, they represent the Department's best judgement of the maximum allowable concentration of chemicals consistent with the protection of human health, aquatic life, wildlife and the aesthetic quality of the water.

A no-action alternative was considered for the proposed numerical ambient

standards. Taking no action would maintain the existing situation. For dissolved oxygen (DO), no-action would retain the existing standard. Because the scientific evidence supports revisions to this standard, retaining the existing standards would mean that the existing standard is less accurate than a revised standard. An accurate standard provides a clear statement of a level that the Department believes will protect the waters for their best usages. Retaining a less accurate standard acknowledges that the existing standard is overly stringent and thus potentially an unnecessary regulatory burden - and is thus rejected.

For acetaldehyde, carbon disulfide, and formaldehyde, for which the Department currently has guidance values, the no-action alternative would retain them as guidance values instead of new standards. This is rejected because guidance values lack the legal strength of standards.

For metolachlor and for ammonia (marine waters), the no-action alternative would mean that the current situation of no standard or guidance value, would continue for these parameters.

It is important to add a standard for metolachlor because it is a widely used herbicide in New York State that leaches into the groundwater. It is one of the corn herbicides addressed in federal legislation for the proposed pesticide management plan. In Suffolk County on Long Island, past agricultural uses of metolachlor have caused a significant negative impact on the underlying aquifer, the sole source of drinking water for several million people. Metolachlor has recently been banned from use in both Nassau and Suffolk Counties on Long Island. More than 40 percent of private wells tested contained metolachlor or its degradates.

Ammonia has been found to be toxic to a variety of marine organisms, including crustaceans, bivalve mollusks, fishes, and marine algae. Winter flounder, a popular recreational species in population decline, is the most sensitive species tested to date. Other important commercial and recreational species at risk from ammonia toxicity are American lobster and striped bass. Not adding the standard for ammonia for marine waters would continue to jeopardize these and other species and was therefore rejected. Adding guidance values instead of standards for metolachlor and ammonia (marine) was rejected because guidance values lack the legal strength of standards.

In addition, federal and state laws provide strong incentives for the adoption of water quality standards. Under these laws, a no-action alternative might be reasonable only if the revisions to the regulations were of marginal value or not within the work capacity of the Department. The proposed revisions are considered to be a significant improvement to the water quality standards regulations and are within the current work capacity of the Division of Water. Furthermore, in its federal oversight role over New York's water quality standards program, EPA strongly encouraged the Department to revise or add standards for key parameters including dissolved oxygen and ammonia. The no-action alternative was rejected for the all proposed addition and revision of numerical standards.

The no-action alternative for deletion of the existing iron standard was rejected. "No-action" would retain the existing aquatic life standards (both chronic and acute) of 300 ug/L that are proposed for deletion. The Department has reevaluated the basis for its existing iron standards and no longer believes that 300 ug/L is the appropriate value for this substance. The Department's review of the scientific literature on the toxicity of iron has lead to the conclusion that the EPA 1976 criteria value of 1000 ug/L (1 mg/L) is both protective of aquatic life and a more appropriate ambient value. Retaining the existing

standard would keep in place a standard that the Department believes is overly stringent, and was rejected.

The no-action alternative for flow is rejected as well. If the flow standard was not adopted, the Department would continue in its existing situation of having to regulate flow through existing authority but without the single water standard as a focal point. Given this, and the benefits of adding the flow standard described above under Needs and Benefits (section 3, above), the no-action alternative was rejected.

The no-action alternative for adding groundwater effluent limitations was rejected. The proposal adds groundwater effluent limitations for four new substances: acetaldehyde, carbon disulfide, formaldehyde, and metolachlor. Groundwater effluent limitations have been set at or near the ambient groundwater standard on the assumption that little or no removal occurs in the unsaturated zone over the long term. The effluent limitations are proposed at equal to the proposed ambient standard for the three organics (acetaldehyde, formaldehyde, and metolachlor) and at twice the proposed ambient standard for the nonorganic (carbon disulfide), consistent with historical practice.

For revision to two existing groundwater effluent limitations, the no-action alternative was rejected. The substances affected are copper and styrene. Their existing groundwater effluent limitations are both substantially higher than the corresponding ambient standards, and inconsistent with the historical practice of twice or equal to the ambient standard as described above. For copper, the existing ambient groundwater (Class GA) standard is 200 ug/L and the existing groundwater effluent limitation is 1,000 ug/L. In keeping with the historical practice (above) the proposal revised the groundwater effluent limitation for copper to 400 ug/L, equal to twice the ambient standard for this nonorganic. For styrene, the existing ambient GA standard is 5 ug/L (because it is a principal organic

contaminant) and the groundwater effluent limitation is 930 ug/L. The proposal revises the groundwater effluent limitation for styrene to 5 ug/L, consistent with historical practice for this organic substance. (No change is proposed to the existing ambient GA standards for copper or styrene). To not revise these effluent limitations would retain the inconsistency and confusion, and could make it more difficult for future discharges to meet the ambient groundwater standards for these pollutants. The no-action alternative was rejected.

A no-action alternative for the standard-setting procedures was also rejected. To retain the existing procedures would mean that the Department would not be as readily able to take advantage of recent scientific advances in human health risk assessment, and thus the ability to derive the most accurate future standards would be hindered. In addition, EPA strongly encouraged the Department to revise its standard-setting procedures for human health. For the aquatic life revision, not making the proposed change would limit the Department's ability to derive standards based on alternative procedures.

A no-action alternative was considered and rejected for the other revisions as well. Although the proposed actions regarding the Aesthetic and Recreation Types of standards, trout waters, protection of shellfish and wildlife, definitions and minor language revisions will not result in immediate environmental benefit, they do improve the structure and clarity of the regulations. To not make these revisions maintains the existing situation that is less clear and was rejected.

9. Federal Standards:

The proposal does not exceed any federal minimum standards. As described below, there are not any true federal standards to which the proposal can be compared. However, there is federal guidance from the EPA in the form of both substance-specific criteria for several of the parameters included in this rulemaking, and for deriving human health

standards. The proposal is consistent with that guidance. State and Federal roles in the water quality standards program are described below. The proposal's consistency with federal EPA guidance on dissolved oxygen, ammonia, and standard-setting procedures for human health is described under "Needs and Benefits" above (section 3).

Under federal law, surface water standards are primarily a state responsibility. EPA provides oversight and guidance and approves state standards for surface water, but does not promulgate standards that apply nationwide. Where a state's standards are inadequate, EPA will promulgate standards for the state. EPA's oversight and guidance does not apply to groundwaters.

New York State's standards are derived according to procedures that are in regulation. These procedures are designed to generate standards that fully protect the best uses of the State's waters. The procedures prescribe the level of protection that must be achieved to maintain the water quality for such uses as drinking water source, swimming and fishing. These fundamental levels of protection are not being changed in this proposal.

EPA provides guidance to the states in the form of ambient water quality criteria documents (e.g. ammonia and dissolved oxygen as described above) and on-line risk assessments, but states must adopt, implement and defend their own standards. EPA guidance is a major source of technical information and is often the actual basis for New York's standards. However, EPA will approve state adoption of a standard that differs from EPA's guidance or in the absence of EPA guidance if the standard is scientifically defensible and protects the waters for their best usages.

Reasons that a state may differ from EPA national guidance include a more recent toxicological database, different interpretations of data, more accurate procedures to assess risk and more appropriate exposure and risk assumptions. In 1992 when EPA

promulgated standards for several states that were judged deficient, EPA based its promulgated standards on more recent risk determination rather than its own criteria. The guidance aspect of EPA's criteria is further exemplified by human health criteria issued for carcinogens. For these substances, EPA provides cancer potency information, but does not set a risk level. Selecting a risk level is a management decision left to the states, but with EPA approval required.

10. Compliance Schedule:

The new water quality standards go into effect on the day that these regulations become effective. However, it is unreasonable, both physically and fiscally, to expect all the treatment works to be able to comply immediately. Therefore, when additional treatment is required, the compliance schedule would be worked out on a case-by-case basis with the permittee. Usually, the Department requires the permittee to submit a report in one or two years describing their chosen treatment alternative and including a schedule of construction. The Department would review and, hopefully, approve the report before construction would commence. So, it's difficult to say what the compliance schedule would be. The 5-year permit cycle is not considered during this process.

Appendix: POTWs affected by the proposed marine ammonia standard

Facility	SPDES No.	Design Flow, mgd	Receiving Water	Type of tmt.	WQBEL, mg/l (NH ₃ + NH ₄)	2002, inf. avg., mg/l	2002, eff. avg., mg/l	Percent ammonia removal
Jamaica	0026115	100	Jamaica Bay	AS	5.8	24.6	20.4	17
26 th Ward	0026212	85	Jamaica Bay	AS	3.0	13.0	6.0	54
Great Neck	0022128	1.5	LIS	TF	4.0	35.1	38.2	0
Great Neck SD	0026999	3.8	LIS	TF	4.0	21.3	12.9	39
Glen Cove	0026620	5.5	LIS	AS	3.1	35.6	7.7	79
SCSD No. 3	0104809	30.5	South Shore	AS	5.7	29.1	4.1	86
W. Long Beach	0023523	1.5	South Shore	TF	5.7	17.8	3.6	80
Riverhead	0020061	1.3	Peconic Bay	SBR	5.6	27.9	7.9	70
Sag Harbor	0028908	0.25	Peconic Bay	SBR	2.3	No data	3.0	--
Long Beach	0020567	6.36	South Shore	TF	3.1	19.8	18.7	5
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Cedar-hurst	0022462	1.0	Jamaica Bay	TF	2.7	23.6	24.9	0

Note: The standard is written as the sum of NH₃ and NH₄, and the ammonia monitoring in the current permits is for total NH₃, as N. Converting the monitoring data on the DMR to correlate with the WQBELs requires multiplying the DMR values by 1.27.

SUMMARY OF REGULATORY IMPACT STATEMENT FOR 2006 REVISION TO
6NYCRR PARTS 700 - 704

Statutory Authority and Legislative Objectives:

The statutory authority for adoption of water quality regulations and standards is found in the Environmental Conservation law (ECL), Sections 3-0301.2.m, 15-0313, and 17-0301. The first cited section provides that the Commissioner may adopt regulations to carry out the purposes of the ECL in general. The other sections direct the Department to adopt standards that are applicable to the classification of waters and that are protective of life, health and property. Specifically, Section 17-0301 states:

“1. It is recognized that, due to variable factors, no single standard of quality and purity of the waters is applicable to all waters of the state or to different segments of the same waters.

“2. In order to attain the objectives of this article, the department after proper study, and after conducting public hearing upon due notice, shall group the designated waters of the state into classes. Such classification shall be made in accordance with consideration of best usage in the interest of the public...

“4. The department, after proper study, and after conducting public hearings upon due notice, shall adopt and assign standards of quality and purity for each such classification necessary for the public use or benefit contemplated by such classification...”

The adoption of standards will contribute to the fulfillment of the legislative objective of the ECL to guarantee that the “widest range of beneficial uses of the environment is attained without risk to health or safety” (ECL Section 1-0101.3.b), and to “maintain

reasonable standards of purity of the waters of the state consistent with public health and enjoyment thereof..." (ECL Section 17-0101). The action will also contribute to achieving the federal mandate "to restore and maintain the chemical, physical and biological integrity of the Nation's waters," and the national goal, wherever attainable, of "water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water" [Clean Water Act (CWA), Sections 101(a) and 101(a)(2)].

Needs and Benefits:

This proposed action is needed to protect and preserve water resources from the threat of toxic substances and to satisfy specific regulatory requirements. Descriptions of the water resource, threats and regulatory requirements follow.

The waters of New York State are one of our greatest natural resources. There are approximately 52,000 miles of surface streams, 7,850 freshwater lakes and ponds with about 5,500 square miles of surface area, and 1,530 square miles of marine waters in the boundaries of the State. They are divided into 17 major drainage basins.

The saline waters of the State are those rivers, bays and estuaries located primarily in and adjacent to Long Island Sound, the Atlantic Ocean, New York Harbor, and the lower Hudson River. Those around Long Island, in particular, provide a significant recreational and shellfish seafood resource for the State's population.

New York's fresh surface waters provide the source of drinking water for most of the population of New York City (72 percent) and upstate. They are widely used for swimming, boating, and fishing. They are also the means for elimination of much of its wastes, and support a multitude of uses for its industrial, commercial and agricultural activities.

Groundwater resources of New York State supply water to millions of New Yorkers each day. They are also a major component of the overall hydrologic cycle. For Long

Island's Nassau and Suffolk Counties, the groundwater is the only source of drinking water available for nearly 3 million residents. In upstate New York, the groundwater is also utilized to supply potable water to a substantial portion of the population.

New York is a highly populated and industrialized state, with about 19 million residents, and home to both the nation's largest metropolis and to thousands of industrial facilities. Activities associated with maintaining approximately seven million households result in the discharge of large volumes of wastewater to septic systems and municipal treatment plants. Toxic substances from sewage and industrial wastewaters, as well as from nonpoint sources, are discharged to the waters of the State. About 700 facilities released approximately 60 million pounds of toxic substances to water, air and land as reported through the New York State Toxic Release Inventory in 2000. Thousands of smaller facilities release additional quantities of toxic substances. Approximately 49 million gallons of hazardous substances can be bulk stored in about 5,400 tanks. Approximately 540 industries have SPDES permits for the discharge of toxic substances directly to surface waters and groundwaters. Over 1,500 industries classified in significant categories discharge to publicly owned treatment works (POTWs), and the majority of these are sources of toxic substances to the water environment. Thousands of industries in non-significant categories discharge additional quantities of toxic substances to POTWs.

The water resources of New York State have been damaged at various times and locations by the excessive release of pollutants. The construction of wastewater treatment facilities during the past three decades has made major progress in restoring the integrity of the State's waters. However, the continuing widespread use and release of toxics chemicals, as well as contamination resulting from past abuses, requires the maintenance of a sound system of water quality regulations to effectively control the release of toxic

chemicals. Beyond this general need, the federal Clean Water Act requires states to maintain adequate standards for pollutants that threaten a state's water. It includes a requirement for formal review every three years. New York State last revised its water quality standards effective in March of 1998.

Because the only costs associated with this proposal are from the new standard for ammonia for marine waters, the needs and benefits for only this provision are described below. Needs and benefits for the remaining provisions of the proposal are discussed in detail in the full RIS.

A new standard is being added for ammonia for saltwater (marine waters), based on EPA's 1989 criteria recommendation. This fills a key gap in New York's standards and is described as a priority by the EPA. New York is undertaking extensive and expensive nitrogen control programs to abate low dissolved oxygen conditions in the marine district; now is the time to refine those programs to minimize the toxic effects of nitrogenous compounds, specifically ammonia. The proposed standard would be protective of marine resources.

Ammonia has been found to be toxic to a variety of marine organisms, including crustaceans, bivalve mollusks, fishes, and marine algae. Winter flounder, a popular recreational species in population decline, is the most sensitive species tested to date. The mean acute sensitivity of 88 percent of the species tested is within a factor of ten of that for the winter flounder. Other important commercial and recreational species at risk from ammonia toxicity are American lobster and striped bass. The catastrophic die-off of lobsters in 1999 is still unresolved and sediment ammonia toxicity could be one of the involved stressors. Of the tested species, hard clams and oysters appear to be the most tolerant to ammonia toxicity but it does affect their ability to filter algae (their food source)

from the water. Hence, they would have slower growth rates (to reach market size) and could be more vulnerable to predation based upon a smaller size.

Information on the toxicity of ammonia to saltwater plants is limited but tests have shown toxicity to benthic algae and red macroalgae species. This could affect the lower levels of the marine food web. Recent studies have shown that ammonia is toxic to eelgrass. Eelgrass beds are extremely important as nursery areas for economically important fish and shellfish (e.g., bay scallops) and coastal sediment stabilization. Eelgrass beds have been decimated in New York Harbor and many have been reduced or lost in Long Island Sound and Peconic Bay. Nitrogenous compounds, which includes ammonia, have been implicated as a potential factor in the loss of tidal wetlands in Long Island Sound.

Costs:

The only cost from the proposal is from the addition of aquatic life standards for ammonia in marine waters. The Department's analysis demonstrates that none of the other provisions of the proposal will result in any costs. A summary of the costs for marine ammonia is presented below. The full RIS presents the detailed explanation of why there is no impact from any other part of this proposal.

In general, to determine the pollution abatement costs associated with the proposed standards, the Department evaluated the treatment requirements for the proposed standards and compared them to the existing treatment facilities or treatment required by the current regulations but not yet implemented. SPDES permits that contain limitations or monitoring requirements for the proposed substances were identified through the Department's computerized Permit Compliance System (PCS). For those permittees, both current permit requirements and requirements for the proposed standards were established

and compared. Existing treatment capacity and performance were assessed and the additional treatment requirements, if any, were evaluated using generalized designs for unit treatment operations. Treatment costs were computed using generalized cost information.

Four (4) sewage treatment facilities (publicly-owned treatment works or POTWs) were identified as impacted by the proposed standards for marine ammonia for aquatic life. Some form of upgrade to their treatment infrastructure will be needed to meet the water quality based effluent limit that will result from the proposed standard. One (1) additional facility could incur capital costs if operational modifications alone do not accomplish the necessary treatment. The total capital and Operation and Maintenance (O&M) costs to all facilities are: Capital Cost: 25.49 million dollars (includes Construction Cost); O&M Cost per year: 1.01 million dollars.

A small additional cost for monitoring for ammonia is expected to be incurred by three (3) other facilities; these facilities do not currently monitor for this parameter. The cost of this would be approximately 20 dollars per sample, once per month for each facility. The additional annual cost for each facility would be 240 dollars, for a total monitoring costs for the three facilities of 720 dollars per year.

Paperwork:

As part of the SPDES program, all significant permittees are required to periodically report monitoring data for substances include in their permit. The proposed regulations are not expected to significantly increase or decrease the number of SPDES permittees or the amount of information that must be reported. Applicants for SPDES permits are currently required to report on the discharge of a broad list of toxics substances that are or may be present in the discharge. New or more stringent standards are not expected to significantly increase the reporting requirements for SPDES applicants.

Those dischargers who may be required to report on a parameter for which they were previously not regulated will have to maintain records and report the discharge level of the newly regulated parameter. Facilities that discharge ammonia to marine waters will have to report this additional parameter on their Discharge Monitoring Reports, a negligible increase in paperwork. Other than this, there is no increase in paperwork from this proposal.

Local Government Mandates:

There are no specific mandates to local governments that result from this rule. However, it is again noted that the impacted facilities belong to local governments, so the above mentioned impact from the ammonia marine standard is to those specific local governments that operate the facilities described above.

Duplication Between This Regulation and Other Regulations and Laws:

The proposed regulation will not result in duplication of administrative requirements for regulated parties or the State.

Alternatives:

Numerical ambient water quality standards represent levels protective of the best usages of New York's waters. They are derived according to scientific procedures that are in regulation and based on the best available data. Thus, they represent the Department's best judgement of the maximum allowable concentration of chemicals consistent with the protection of human health, aquatic life, wildlife and the aesthetic quality of the water.

A no-action alternative was considered for the proposed numerical ambient standards for ammonia. Taking no action would maintain the existing situation, i.e., no standard or guidance value. Ammonia has been found to be toxic to a variety of marine organisms, including crustaceans, bivalve mollusks, fishes, and marine algae. Winter

flounder, a popular recreational species in population decline, is the most sensitive species tested to date. Other important commercial and recreational species at risk from ammonia toxicity are American lobster and striped bass. Not adding the standard for ammonia for marine waters would continue to jeopardize these and other species and was therefore rejected. Adding guidance values instead of standards for ammonia was rejected because guidance values lack the legal strength of standards. In addition, federal and state laws provide strong incentives for the adoption of water quality standards. Under these laws, a no-action alternative might be reasonable only if the revisions to the regulations were of marginal value or not within the work capacity of the Department. The proposed revisions are considered to be a significant improvement to the water quality standards regulations and are within the current work capacity of the Division of Water.

Federal Standards:

The proposal does not exceed any federal minimum standards. Under federal law, surface water standards are primarily a state responsibility. EPA provides oversight and guidance and approves state standards for surface water, but does not promulgate standards that apply nationwide. Thus, there are no true federal standards to which the proposal can be compared. However, the proposed standards for ammonia are equivalent to EPA's recommended criteria.

Compliance Schedule:

The new water quality standards go into effect on the day that these regulations become effective. However, it is unreasonable, both physically and fiscally, to expect all the treatment works to be able to comply immediately. Therefore, when additional treatment is required, the compliance schedule would be worked out on a case-by-case basis with the permittee. Usually, the Department requires the permittee to submit a report

in one or two years describing their chosen treatment alternative and including a schedule of construction. The Department would review and, hopefully, approve the report before construction would commence. So, it's difficult to say what the compliance schedule would be. The 5-year permit cycle is not considered during this process.

REGULATORY FLEXIBILITY ANALYSIS FOR SMALL BUSINESS AND LOCAL
GOVERNMENT (RFA) FOR 2006 REVISION TO
6NYCRR PARTS 700 - 704

1. Effects on Small Business and Local Governments:

The only impact from the proposal is from the new standard for ammonia for marine waters. For the purposes of this assessment, small businesses are defined as any business independently owned, wholly within New York State, and employing 100 or fewer persons. One (1) small business will be affected by this proposal. Seven (7) facilities belonging to local governments will also be affected.

Four (4) municipal sewage treatment plants (publicly-owned treatment works or POTWs; i.e., local governments) are expected to incur capital and Operation and Maintenance (O&M) costs. These are as follows:

Name of Facility (Jurisdiction)

Long Beach (City of Long Beach)

Bay Park (Nassau County)

Lawrence (Village of Lawrence)

Cedarhurst (Village of Cedarhurst)

All four (4) facilities are located on Long Island and belong to the local governments specified above. Thus, the costs to those facilities are also the costs to local governments.

Two (2) additional POTW facilities, also belonging to local governments on Long Island, are expected to need no-cost operational modifications in order to achieve the new limit. These are as follows:

Name of Facility (Jurisdiction)

Riverhead (Town of Riverhead)

Sag Harbor (Village of Sag Harbor)

For Riverhead, no costs are expected from any such modifications. For Sag Harbor, however, capital costs may be incurred if operational modifications do not accomplish the necessary treatment.

A small additional cost for monitoring for ammonia is expected to be incurred by one local government facility (Ocean Beach(V), belonging to the Village of Ocean Beach); and by one small business (Watergate Gardens Apt., located in Suffolk County). These facilities do not currently monitor for this parameter.

One additional facility, which will also newly be required to monitor for ammonia, E.F. Barrett Power Gene. - 005E (utility, located in Suffolk County), is owned by Keyspan which employs thousands of persons and was determined to not meet the definition for a small business.

2. Compliance Requirements:

Facilities that discharge ammonia to marine waters will have to report this additional parameter on their Discharge Monitoring Reports, a negligible increase in paperwork. Other than this, there is no increase in paperwork from this proposal.

3. Professional Services:

For the four (4) POTWs for which upgrades will be necessary, professional services of consulting engineers will likely be needed. These engineers would likely address a range of issues including an evaluation of the existing facilities, plans and specifications for the upgraded facility, and various bid documents and estimated staffing and O&M budget for the upgraded facility.

For sampling and analysis, there would be no professional services necessary to comply with the regulation as the facilities already have technical staff people to do their sampling and analysis, or they would send out the sample for analysis.

4. Compliance Costs:

The only cost from the proposal is from the addition of aquatic life standards for ammonia in marine waters. Because the facilities that are expected to incur capital and O&M costs due to this proposed standard all belong to local governments, those costs to the regulated parties and cost to local governments are identical. The two (2) facilities that will need no-cost operational modifications also belong to local governments. Regarding the monitoring costs, one facility belongs to a local government; and one belongs to a small business.

The Department's analysis demonstrates that none of the other provisions of the proposal will result in any costs. A summary of the costs for marine ammonia is presented below.

Thirteen (13) sewage treatment facilities (publicly-owned treatment works or POTWs) were identified as potentially impacted by the proposed standards for marine ammonia for aquatic life.

Further analysis showed that eight (8) of these would have no impact:

Out of the 13 facilities potentially impacted by the proposed marine ammonia standard, five (5) will not be impacted because they already are, or will be, required to upgrade their facility to comply with the water quality based effluent limits for nitrogen, and will as a result meet limits for marine ammonia.

These are:

<u>Facility</u>	<u>SPDES Permit No.</u>
Jamaica	0026115
26 th Ward	0026212
Great Neck (V)	0022128
Great Neck SD	0026999
Glen Cove (C)	0026620

Four other plants are either already meeting the projected water quality based effluent limits (WQBELs) or may be able to meet them with only operational modifications.

These are:

<u>Facility</u>	<u>SPDES Permit No.</u>
SCSD No. 3	0104809
West Long Beach	0023523
Riverhead	0020061
Sag Harbor	0028908

SCSD No. 3 and West Long Beach are already meeting the projected WQBELs. Operational modifications may be needed at the other two plants, Riverhead and Sag Harbor. They both have sequencing batch reactors (SBRs), which have excellent nitrification capabilities. Modifications of treatment options, such as re-routing of some scavenger wastes through the SBRs, may be necessary. The Department does not believe that there will be any costs associated with any needed operational modifications for Riverhead; thus there will be no regulatory impact from the proposal to this facility. Sag Harbor, however, could incur capital costs of 80 thousand dollars if operational modifications alone do not accomplish the necessary treatment. These costs are for

covering two SBRs.

The proposal will result in an impact on the four (4) remaining facilities. Some form of upgrade to their treatment infrastructure will be needed to meet the water quality based effluent limit that will result from the proposed standard. The construction and O&M costs for these will be approximately as follows:

Facility	SPDES No.	Design Flow, mgd	Construction Cost, millions of dollars ⁽¹⁾	Capital Cost, millions of dollars ^{(1) (2)}	O&M Cost per year, millions of dollars ⁽¹⁾
Long Beach	0020567	6.36	2.55	4.03	0.16
Bay Park	0026450	70	8.84	13.97	0.67
Lawrence	0020354	1.5	2.55	4.03	0.10
Cedarhurst	0022462	1.0	2.14	3.38	0.08

⁽¹⁾ Costs were developed from Innovative and Alternative Technology Assessment Manual, EPA, February, 1980 and the April, 2003 ENR Construction Index as described above.

⁽²⁾ Capital cost includes construction cost.

The costs for the Long Beach upgrade assumed that the trickling filter would be replaced with a 6.5 mg aeration tank with diffused air and a new secondary clarifier.

The costs for the Bay Park upgrade assumed the installation of a new 20 million gallon aeration tank, one new primary clarifier, and one new secondary clarifier.

The costs for the Lawrence and Cedarhurst upgrades assumed the installation of an RBC unit after the trickling filter and a new secondary clarifier.

The detailed assessment sheet for all 13 facilities is attached as an appendix.

The total capital and O&M costs to all facilities are: Capital Cost: 25.49 million dollars (includes Construction Cost); O&M Cost per year: 1.01 million dollars.

A small additional cost for monitoring for ammonia is expected to be incurred by the three facilities that do not currently monitor for this parameter. The cost of this would be approximately 20 dollars per sample, once per month for each facility. The additional annual cost for each facility would be 240 dollars, for a total monitoring costs for the three facilities of 720 dollars per year. These are different facilities from the 13 discussed above, and are listed below:

Facility	SPDES No.
Ocean Beach (V)	0020168
Watergate Gardens Apt.	0080730
E.F. Barrett Power Gene. - 005E	0005908

5. Minimizing Adverse Impact:

Regarding the capital costs, it is possible that the facilities affected could comply with the effluent limits to meet the proposed standard in a more cost-effective way than projected.

The proposed standard itself was derived according to procedures set forth in regulation to protect the best usage of the waters, and is based on the national EPA criteria. Under the federal Clean Water Act, EPA criteria and state standards are derived solely based on scientific information and are independent of economic factors. However, the water quality regulations have a number of provisions that can mitigate economic impacts.

Where a standard or guidance value is developed on a statewide basis, a site-specific standard may be derived. A site-specific value has the potential to be less stringent and may mitigate impact. Such a standard could be considered in a future rulemaking for marine ammonia if information warrants. 6 NYCRR 702.16 allows the

substitution of a modified effluent limitation based on specified factors including that an effluent limitation cannot reasonably be achieved. Section 702.17 allows for a variance and a modified effluent limitation based on certain physical factors and economic and social impacts. Where the proposed regulations may result in substantial adverse impacts on production, it is anticipated that a permittee will request a variance.

Cost estimates for wastewater treatment facilities to meet proposed standards are broadly based assessments that include a number of assumptions and condition. Construction costs for each affected permittee will typically commence with the issuance or renewal of the SPDES permit and continue through a construction compliance period. The compliance schedule would be worked out on a case-by-case basis with the permittee. Usually the Department requires them to submit a report in one or two years describing their chosen treatment alternative and including a schedule of construction. The Department would review and, hopefully, approve the report before construction would commence. So, it's difficult to say what the compliance schedule would be. The five (5) year permit cycle is not considered during this process.

6. Small Business and Local Government Participation:

The Department has reached out to the public and regulated community throughout the development of this proposal. Specific activities in this regard include:

- S Statewide Notice in the Environmental Notice Bulletin (ENB) on April 1, 1998 that we were in the initial stage of developing ambient water quality values for several substances, including acetaldehyde, carbon disulfide, and formaldehyde, and inviting the public to submit information relevant to their toxicity for us to consider.
- S Publication in the New York State Register of the fact of the potential rulemaking twice a year in the DEC Regulatory Agenda from 2000 through 2002, and in March

of 2003 and 2004. Ammonia was specifically mentioned in several of these publications.

S Presentation to Annual Meeting of the New York Water Environment Association (NYWEA) on February 4, 2002 by Philip DeGaetano.

S Presentation to NYWEA's Legislative/Regulatory Forum May 7, 2002 by Scott Stoner.

S Presentation to NYS Business Council April 14, 2003 by Sandra Allen.

S Presentation to NYWEA's Legislative/Regulatory Forum May 6, 2003 by Sandra Allen.

S Presentation to NYWEA June 2003 by Tom Pearson.

S Presentations to the NYS Business Council at their October 2003 Industry-Environment Conference on October 8, 2003 by Sandra Allen and Scott Stoner.

S Letters to the nine impacted regulated parties (SPDES permittees) were sent on August 28, 2003 notifying them of the forthcoming rulemaking proposal and the way in which the Department believes they may be affected. These letters went to the four facilities that are expected to incur capital costs, the three facilities expected to incur monitoring costs, and the two facilities expected to need no-cost operational modifications. Follow-up correspondence and discussion was initiated by several of these permittees. An additional letter was sent to one permittee on November 4, 2004 after the Department determined that operational modifications alone might not be sufficient to accomplish the required treatment (and that a cost might be incurred).

7. Economic and Technological Feasibility

The necessary technology is available to effect the upgrades to the four plants

necessary to comply with the new standard. Likewise, the no-cost operational modifications to the two plants (Riverhead and Sag Harbor) are also feasible, as are the monitoring requirements. Ammonia analysis is inexpensive and readily available. The costs of the upgrades and monitoring have been estimated above.

Appendix

POTWs affected by the proposed marine ammonia standard

Facility	SPDES No.	Design Flow, mgd	Receiving Water	Type of tmt.	WQBEL, mg/l (NH ₃ + NH ₄)	2002, inf. avg., mg/l	2002, eff. avg., mg/l	Percent ammonia removal
Jamaica	0026115	100	Jamaica Bay	AS	5.8	24.6	20.4	17
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Note: The standard is written as the sum of NH₃ and NH₄, and the ammonia monitoring in the current permits is for total NH₃, as N. Converting the monitoring data on the DMR to correlate with the WQBELs requires multiplying the DMR values by 1.27.

SUMMARY OF RFA FOR 2006 REVISION TO 6NYCRR PARTS 700 - 704

Effects on Small Business and Local Governments:

The only impact from the proposal is from the new standard for ammonia for marine waters. For the purposes of this assessment, small businesses are defined as any business independently owned, wholly within New York State, and employing 100 or fewer persons. One (1) small business will be affected by this proposal. Seven (7) facilities belonging to local governments will also be affected.

Four (4) municipal sewage treatment plants (publicly-owned treatment works or POTWs; i.e., local governments) are expected to incur capital and Operation and Maintenance (O&M) costs. All four facilities are located on Long Island and belong to local governments. Thus, the costs to those facilities are also the costs to local governments.

Two (2) additional POTW facilities, also belonging to local governments on Long Island, are expected to need operational modifications in order to achieve the new limit. No costs are expected from these modifications. However, for one (1) of these facilities, capital costs may be incurred if operational modifications do not accomplish the necessary treatment.

A small additional cost for monitoring for ammonia is expected to be incurred by one local government facility, also on Long Island, and one small business on Long Island. These facilities do not currently monitor for this parameter.

Compliance Requirements:

Facilities that discharge ammonia to marine waters will have to report this additional parameter on their Discharge Monitoring Reports, a negligible increase in paperwork. Other than this, there is no increase in paperwork from this proposal.

Professional Services:

For the four POTWs for which upgrades will be necessary, professional services of consulting engineers will likely be needed. These engineers would likely address a range of issues including an evaluation of the existing facilities, plans and specifications for the upgraded facility, and various bid documents and estimated staffing and O&M budget for the upgraded facility.

For sampling and analysis, there would be no professional services necessary to comply with the regulation as the facilities already have technical staff people to do their sampling and analysis, or they would send out the sample for analysis.

Compliance Costs:

The only cost from the proposal is from the addition of aquatic life standards for ammonia in marine waters. The Department's analysis demonstrates that none of the other provisions of the proposal will result in any costs. A summary of the costs for marine ammonia is presented below. The full RIS presents the detailed explanation of why there is no impact from any other part of this proposal.

Because the facilities that are expected to incur capital and O&M costs due to this proposed standard all belong to local governments, those costs to the regulated parties and cost to local governments are identical. The two facilities that will need operational modifications also belong to local governments.

Four sewage treatment facilities (POTWs) were identified as potentially impacted by the proposed standards for marine ammonia for aquatic life. Some form of upgrade to their treatment infrastructure will be needed to meet the water quality based effluent limit that will result from the proposed standard. The total capital and O&M costs to all facilities are: Capital Cost: 25.49 million dollars (includes Construction Cost); O&M Cost per year: 1.01 million dollars.

A small additional cost for monitoring for ammonia is expected to be incurred by two other facilities, one belongs to a local government and the other to a small business. These facilities do not currently monitor for this parameter. The cost of this would be approximately 20 dollars per sample, once per month for each facility. The additional annual cost for each facility would be 240 dollars, for a total monitoring costs for the two facilities of 480 dollars per year.

Minimizing Adverse Impact:

Regarding the capital costs, it is possible that the facilities affected could comply with the effluent limits to meet the proposed standard in a more cost-effective way than projected.

The proposed standard itself was derived according to procedures set forth in regulation to protect the best usage of the waters, and is based on the national EPA criteria. Under the federal Clean Water Act, EPA criteria and state standards are derived solely based on scientific information and are independent of economic factors. However, the water quality regulations have a number of provisions that can mitigate economic impacts.

Where a standard or guidance value is developed on a statewide basis, a site-specific standard may be derived. A site-specific value has the potential to be less stringent and may mitigate impact. Such a standard could be considered in a future rulemaking for marine ammonia if information warrants. 6 NYCRR 702.16 allows the substitution of a modified effluent limitation based on specified factors including that an effluent limitation cannot reasonably be achieved. Section 702.17 allows for a variance and a modified effluent limitation based on certain physical factors and economic and social impacts. Where the proposed regulations may result in substantial adverse impacts on

production, it is anticipated that a permittee will request a variance.

Cost estimates for wastewater treatment facilities to meet proposed standards are broadly based assessments that include a number of assumptions and condition. Construction costs for each affected permittee will typically commence with the issuance or renewal of the SPDES permit and continue through a construction compliance period. The compliance schedule would be worked out on a case-by-case basis with the permittee. Usually the Department requires them to submit a report in one or two years describing their chosen treatment alternative and including a schedule of construction. The Department would review and, hopefully, approve the report before construction would commence. So, it's difficult to say what the compliance schedule would be. The 5 year permit cycle is not considered during this process.

Small Business and Local Government Participation:

The Department has reached out to the public and regulated community throughout the development of this proposal. Specific activities in this regard include:

- S Statewide Notice in the Environmental Notice Bulletin (ENB) on April 1, 1998 that we were in the initial stage of developing ambient water quality values for several substances, including acetaldehyde, carbon disulfide, and formaldehyde, and inviting the public to submit information relevant to their toxicity for us to consider.
- S Publication in the New York State Register of the fact of the potential rulemaking twice a year in the DEC Regulatory Agenda from 2000 through 2002, and in March of 2003 and 2004. Ammonia was specifically mentioned in several of these publications.
- S Presentation to Annual Meeting of the New York Water Environment Association (NYWEA) on February 4, 2002 by Philip DeGaetano.

- S Presentation to NYWEA's Legislative/Regulatory Forum May 7, 2002 by Scott Stoner.
- S Presentation to NYS Business Council April 14, 2003 by Sandra Allen.
- S Presentation to NYWEA's Legislative/Regulatory Forum May 6, 2003 by Sandra Allen.
- S Presentation to NYWEA June 2003 by Tom Pearson.
- S Presentations to the NYS Business Council at their October 2003 Industry-Environment Conference on October 8, 2003 by Sandra Allen and Scott Stoner.
- S Letters to the nine impacted regulated parties (SPDES permittees) were sent on August 28, 2003 notifying them of the forthcoming rulemaking proposal and the way in which the Department believes they may be affected. These letters went to the four facilities that are expected to incur capital costs, the three facilities expected to incur monitoring costs, and the two facilities expected to need no-cost operational modifications. Follow-up correspondence and discussion was initiated by several of these permittees. An additional letter was sent to one permittee on November 4, 2004 after the Department determined that operational modifications alone might not be sufficient to accomplish the required treatment (and that a cost might be incurred).

Economic and Technological Feasibility

The necessary technology is available to effect the upgrades to the four facilities necessary to comply with the new standard. Likewise, the no-cost operational modifications to the two other facilities are also feasible, as are the monitoring requirements. Ammonia analysis is inexpensive and readily available. The costs of the upgrades and monitoring have been estimated above.

RURAL AREA FLEXIBILITY ANALYSIS (RAFA) STATEMENT FOR 2006

REVISION TO 6NYCRR PARTS 700 - 704

The Department has determined that the only regulatory impact is to facilities that are located on Long Island, within Nassau and Suffolk Counties or in the New York City Municipal Area. No other facilities in the state are affected. There are no designated rural areas on Long Island or in New York City. Therefore, the Department has determined that a Rural Area Flexibility Analysis is not required.

JOB IMPACT STATEMENT FOR 2006 REVISION TO 6NYCRR PARTS 700 - 704

The Department has determined that this rulemaking will not result in the loss of 100 or more jobs or entrepreneurial activities because this rulemaking will only affect nine facilities, and because of the construction and maintenance required to upgrade the POTWs, the effects upon jobs in the State is likely to be positive. Therefore, a Job Impact Statement is not being submitted.

Fact Sheet Date: April 2000

**NEW YORK STATE
- HUMAN HEALTH FACT SHEET -**

**Ambient Water Quality Value for
Protection of Human Health and Sources of Potable Water**

SUBSTANCE: Acetaldehyde

CAS REGISTRY NUMBER: 75-07-0

AMBIENT WATER QUALITY VALUE: 8 micrograms per liter (8 ug/L)

BASIS: Chemical Correlation (6 NYCRR 702.7)

Data on the potential health effects of exposure to acetaldehyde have been reviewed (Feron et al., 1991; IARC, 1985; US EPA, 1987). The selected ambient water quality value for acetaldehyde (8 ug/L) was derived using the available toxicological data and the procedures outlined in 6 NYCRR 702.2 through 702.7.

SPECIFIC MCL AND PRINCIPAL ORGANIC CONTAMINANT CLASS (702.3)

Acetaldehyde does not have a Specific MCL (maximum contaminant level) as defined in 700.1 and is not in a principal organic contaminant (POC) class as defined in 700.1. Consequently, an ambient water quality value cannot be derived under 702.3.

However, the New York State Department of Health (10 NYCRR Part 5) does have a MCL of 50 ug/L for acetaldehyde, based on its categorization as an unspecified organic contaminant (UOC). This DOH general MCL applies as a drinking water standard to any substance that is not in a POC class and does not have a Specific MCL. However, this UOC MCL is not used as the basis for an ambient water quality value under 702.3.

ONCOGENIC EFFECTS (702.4)

The human data are inadequate to evaluate the human carcinogenicity of acetaldehyde (IARC, 1985; US EPA, 1998a). Chronic exposure to inhaled acetaldehyde caused nasal cavity tumors in rats and hamsters and laryngeal tumors in hamsters (Feron et al., 1982; IARC, 1985; US EPA, 1998a; Woutersen et al., 1986). Data on the oncogenic effects of acetaldehyde in drinking water are limited to one study that found hyperplastic and hyperproliferative changes in the epithelia of the upper gastrointestinal tract (i.e., the tongue, epiglottis and forestomach) of 10 rats exposed via drinking water for 8 months (Homann et al., 1997). These changes included increased epithelial thicknesses and proliferation indices, but the incidences in control and dosed rats were not reported. Similar types of hyperplastic lesions, and more importantly, oncogenic lesions were found in the epithelial cells of the nasal passages of rats chronically exposed to acetaldehyde in air (Feron et al., 1982; Woutersen et al., 1986). Acetaldehyde also is active in short-term tests indicative of potential oncogenic activity, including tests of deoxyribonucleic acid (DNA) cross-linking (Ristow and Obe, 1978), sister chromatid exchanges, micronuclei formation, and chromosomal aberrations (Feron et al., 1991; IARC, 1985; US EPA, 1998a). Overall, there is **sufficient**¹ evidence for the animal carcinogenicity of acetaldehyde (IARC, 1985; US EPA, 1998a). Acetaldehyde is an oncogen under 700.1(a)(26)(ii) and (v).

The dose-response data from Homann et al. (1997) cannot be used for high-to-low dose extrapolation because data on the incidences of rats with hyperplastic or hyperproliferative changes were not provided. Dose-response data describing the relationship between air concentration and nasal tumor incidences in rats (Feron et al., 1982; Woutersen et al., 1986) were not considered appropriate for use in estimating potency via the oral route given the uncertainties associated with extrapolating the dose at the nasal epithelium to a dose at the stomach or intestinal epithelium. Moreover, oral doses of acetaldehyde may have oncogenic effects outside in the gastrointestinal tract. Thus, the dose-response data on the oncogenic effects of acetaldehyde are inadequate to estimate the oncogenic potency of acetaldehyde via the oral route.

NON-ONCOGENIC EFFECTS (702.5)

Chronic studies on the oral toxicity of acetaldehyde in laboratory animals were not found. Limited data from four oral subchronic toxicity of acetaldehyde in animals indicate that the organs/organ systems that appear to be most sensitive to exposure include the gastrointestinal tract, the liver, and the kidneys (Bankowski et al., 1993; Homann et al., 1997; Matysiak-Budnik et al., 1996; Til et al., 1988). The effects of acetaldehyde on the

¹ A causal relationship has been established between acetaldehyde and an increased incidence of malignant neoplasms or of an appropriate combination of benign and malignant neoplasms in (a) two or more species of animals or (b) in two or more independent studies in one species carried out at different times or in different laboratories or under different protocols (IARC, 1985).

liver is expected given that acetaldehyde is the first metabolite of ethanol and is thought to play a direct role in the hepatotoxicity of ethanol (Lieber, 1998; Matysiak-Budnik et al., 1996). There are no data on the reproductive/developmental toxicity of ingested (or inhaled) acetaldehyde (US EPA, 1998a), although there is evidence that intraperitoneal or intravenous injections of acetaldehyde are fetotoxic and teratogenic in rats and perhaps mice (IARC, 1985; US EPA, 1987).

Of the four subchronic oral studies (Table 1), the data from Bankowski et al. (1993) were used to derive a water quality value based on non-oncogenic effects. This study was selected because rats were exposed for 6 months and an adequate number of rats were evaluated (60 dosed and 60 control rats). Moreover, liver collagen is also induced by ethanol, and acetaldehyde is the first metabolite of ethanol. The effect also was detected at a dose lower than those associated with the other effects.

If an uncertainty factor of 3,000 is applied to 60 mg/kg/day, the lowest observed effect level identified in Bankowski et al. (1993), a potential acceptable daily intake of 20 ug/kg/day can be derived for acetaldehyde using procedures consistent with those outlined in paragraphs (a) and (b) of 702.5. Under 702.5(a), an uncertainty factor of 3 was used because the study used to derive the acceptable daily intake identified a minimal effect level rather than a NOEL. A factor of 3 was selected because the observed effects were mild (increased collagen content of the liver). Under 702.5(b)(3), an uncertainty factor of 1,000 was selected because the acceptable daily intake is based on the results from a subchronic animal study and neither experimental results from prolonged exposures of humans nor valid results of long-term ingestion studies on experimental animals are available. A water value of 140 ug/L is derived assuming a 70-kg adult drinks 2 liters of water per day and allowing 20% of the acceptable daily intake (20 ug/kg/day) to come from drinking water (702.2(c) and 702.5(c)).

CHEMICAL CORRELATION (702.7)

Qualitatively, the data on the oncogenic effects of acetaldehyde are sufficient to conclude that it is an oncogen under 700.1. Quantitatively, dose-response data on the oncogenic effects of oral doses of acetaldehyde are not sufficient to use as a basis for an estimate of the oncogenic potency of oral doses of acetaldehyde.

The chemical structure, metabolism, and toxic effects of acetaldehyde are similar to those of formaldehyde (Morris et al., 1996), an oncogen under 700.1 (NYS, 1999). Both chemicals are low-molecular weight, short-chain, aliphatic, saturated aldehydes. Both are highly reactive chemicals, and their reactivity is dependent on the electrophilic aldehyde group. Both are efficiently absorbed and distributed, and metabolized by the same enzymes (aldehyde dehydrogenases). Both chemicals induce toxicity at the site-of-contact in the respiratory tract after inhalation and in the digestive tract after ingestion. The general nature of the lesions are also similar: tumors and/or hyperplasia. Moreover, both chemicals are active in the same short-term tests indicative of oncogenic activity, including the

formation of protein-DNA cross-links, which may play an important role in their toxicity.

Available data, however, also suggest that the structural differences between formaldehyde and acetaldehyde lead to different responses in exposed animals. Qualitatively, for example, rats inhaling acetaldehyde develop nasal squamous cell carcinomas and adenocarcinomas whereas rats inhaling formaldehyde develop almost exclusively nasal squamous cell carcinomas (Woutersen et al., 1986). Quantitatively, acetaldehyde and formaldehyde may have different potencies to induce site-of-contact toxicity in the respiratory tract after lifetime exposure or in the gastrointestinal tract after less-than-lifetime exposures.

The potency of inhaled acetaldehyde to induce of nasal tumors appears less than that of formaldehyde (Table 2). However, the relative difference varies with potency index and ranges from 4-fold to 29-fold. Moreover, the uncertainties in understanding the route-specific differences in the pharmacokinetics and pharmacodynamics of inhaled versus ingested doses precludes confidently estimating the relative differences in the oncogenic potencies of oral doses of the two chemicals based on the relative differences in oncogenic potencies of inhaled doses.

Short-term studies indicate that ingested acetaldehyde may be five-times less potent stomach toxicant than ingested formaldehyde (Table 2, acetaldehyde LOELs/formaldehyde LOELs = 5). However, the use of these differences to estimate the relative differences between the oncogenic potencies of the two chemicals is precluded by the lack of understanding of the relationships between short-term effects and oncogenic effects.

The results of three other studies (Table 3) provide information useful for determining whether relative differences in the oncogenic potencies of ingested acetaldehyde and formaldehyde to induce gastrointestinal-tract tumors can be estimated from ingestion studies of pre-oncogenic, proliferative changes in the gastrointestinal tract. Rats in these studies were exposed for 8 to 12 months via drinking water and the epithelial cells lining the forestomach were examined for hyperplasia. Thus, the type and length of exposure and the type of lesions examined were similar to those of a long-term oral oncogenicity study. However, only the formaldehyde studies identified a NOEL (50 mg/kg/day) and a LOEL (82 mg/kg/day); the acetaldehyde study was a single-dose study that detected hyperplasia at the only dose tested (324 mg/kg/day). Without a dose-response curve for acetaldehyde, there is no direct evidence to quantify the differences in the relative potencies of ingested acetaldehyde and formaldehyde to induce stomach hyperplasia. Thus, these data are inadequate to assess the relative potencies of the two compounds to cause oncogenic effects in the gastrointestinal tract. In addition, confidence in any estimates would be limited because factors besides hyperplasia are involved in the oncogenic process and the correlation between potencies for hyperplasia and for gastrointestinal tumors are unknown.

Formaldehyde induces cancers (leukemias) at sites other than the site-of-contact (Soffritti et al., 1989). It is likely that the systemic effects of the formaldehyde and acetaldehyde would be similar given their qualitative similarities in chemical structure, metabolism, and toxic effects at point-of-contact. There are no data to dismiss concerns that acetaldehyde would be leukogenic when tested in a lifetime oral oncogenic study, and no data to assess the relative differences in the potency of the two chemicals to cause oncogenic effects beyond the site-of-contact. An ambient water quality value of 8 ug/L has been derived for formaldehyde based on its oncogenic effects (total leukemias in male and female rats) after oral lifetime exposures (NYS, 1999).

There is sufficient qualitative evidence to conclude that formaldehyde is a reasonable surrogate for acetaldehyde. Some toxicity data suggest that formaldehyde is a more potent toxicant than acetaldehyde, but the use of these data to estimate quantitative differences in the oncogenic potency of lifetime oral doses of acetaldehyde and formaldehyde are limited by concerns over extrapolating results from inhalation studies or short-term studies and by data gaps in the toxicity data on acetaldehyde. In the absence of good quantitative data on the differences in the oncogenic potencies of lifetime oral doses of formaldehyde or acetaldehyde, they were assumed to be equipotent. Thus, an ambient water quality value of 8 ug/L is derived for acetaldehyde based on its chemical correlation to formaldehyde.

SELECTION OF VALUE

According to 702.2(b), the selected ambient water quality value shall be the most stringent of the values derived using the procedures found in 702.3 through 702.7. This value is 8 ug/L (based on chemical correlation) and is the value selected as the water quality value for acetaldehyde.

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SEARCH STRATEGY

Toxline (1981 to April, 1998) was searched linking the CAS RN for acetaldehyde with the keywords chronic, cancer, subchronic, genotoxicity and drinking water. The search was updated in October, 1998 by searching Medline and Toxline (1997-May 1999) for papers on acetaldehyde.

Bureau of Toxic Substance Assessment
New York State Department of Health
kgb02

Table 1. Drinking Water Studies in Rats: NOELs and LOELs.

Study	Duration of Exposure	NOEL (mg/kg/day)	LOEL (mg/kg/day)	Effects*
Homann et al. (1997)	8 months	none	324**	hyperplastic and hyperproliferative changes in upper gastrointestinal tract
Bankowski et al. (1993)	6 months	none	60**	increased collagen content of liver
Matysiak-Budnik et al. (1996)	11 weeks	120	500	fatty liver and inflammatory changes in liver
Til et al. (1988)	4 weeks	125	675	hyperkeratosis of the forestomach
<p>* all changes statistically significant ($p < 0.05$)</p> <p>** only dose tested</p>				

Table 2. Relative Potency of Acetaldehyde Compared to Formaldehyde.

Response Parameter	Ratio of Acetaldehyde To Formaldehyde	Source
Air Exposure (nasal tumors in rats)		
US EPA unit risk factors	0.16 (acetaldehyde 6-times less potent)	US EPA, 1999a,b
LED ₁₀ ¹ (delivered dose) ²	4.3 (acetaldehyde dose 4-times higher)	See footnotes
LED ₁₀ ¹ (administered dose) ³	29 (acetaldehyde dose 29-times higher)	See footnotes
Oral Exposure		
LOELs (hyperkeratosis of rats stomach after 4-week drinking water exposure)	5.4 (acetaldehyde dose 5-times higher)	Til et al., 1988
Level of indirect estimator of DNA-protein cross-links after single oral dose	5 (the level of the indirect estimator induced by acetaldehyde was about 5-times lower)	Morris et al., 1996
¹ lower bound on the effective dose associated with a 10% incidence of nasal tumors in male rats (combined incidence of squamous cell carcinomas and adenocarcinoma for formaldehyde (Kerns et al., 1983) and acetaldehyde (Woutersen et al., 1986))		
² delivered doses (mg/cm ² nasal surface area/day) taken from Morris et al. (1996)		
³ administered doses are equal to experimental exposure levels (0, 750, and 1,500 ppm for acetaldehyde (Woutersen et al., 1986) and 0, 2, 5.6, and 14.3 ppm for formaldehyde (Kerns et al., 1983) for 6 hours/day, 5 days/week) corrected to continuous exposure		

Table 3. Chronic Drinking Water Studies on Rats: Forestomach Hyperplasia.

Chemical & Results	Dose (mg/kg/day)	Endpoint*	Length of Exposure	Study
<u>Acetaldehyde</u>				
epithelial hyperplasia (increased epithelial thickness of forestomach)	324	effect level**	8 months	Hodman et al. (1997)
<u>Formaldehyde</u>				
Squamous cell hyperplasia of forestomach	300	LOEL***	12 months	Tobe et al. (1989)
	50	NOEL		
<u>Formaldehyde</u>				
focal papillary epithelial hyperplasia of forestomach	82 - 109	LOEL***	12 months	Til et al. (1989)
	15 - 21	NOEL		
* significant differences ($p < 0.05$) at LOELs ** only dose tested *** highest dose tested				

Fact Sheet Date: DRAFT

**NEW YORK STATE
- AQUATIC FACT SHEET -**

**Ambient Water Quality Value
for Protection of Aquatic Life**

SUBSTANCE: Ammonia

CAS REGISTRY NUMBER: Not Applicable

		SALTWATER AMBIENT WATER QUALITY VALUE (ug/L):
TYPE:	BASIS:	
Chronic	Propagation	35*
Acute	Survival	230*

REMARK: * Applies to un-ionized ammonia as NH_3

INTRODUCTION

This value applies to the water column and is derived to protect aquatic life from the toxic effects of waterborne contaminants. Values for the protection of propagation of aquatic life are referred to as Aquatic (Chronic), or A(C), values. Values for the protection of survival of aquatic life are referred to as Aquatic (Acute), or A(A), values.

SUMMARY OF INFORMATION AND DERIVATION OF Value

U.S. EPA (1989) derived chronic and acute aquatic life criteria for ammonia in saltwater. The Department reviewed the criteria and determined that they are based on appropriate data and derived according to sound scientific procedures in 6 NYCRR Parts 702 and 706. The criteria derived by EPA (U.S. EPA, 1989) are determined to be appropriate ambient water quality values for protection of aquatic life for New York State.

Attachment A to this fact sheet provides U.S. EPA's derivation of their criterion. U.S. EPA's Criterion Continuous Concentration (CCC) and Criterion Maximum Concentration (CMC) are equivalent to New York's Aquatic (Chronic) and Aquatic (Acute) values, respectively. EPA did not use the term Criterion Continuous Concentration in the 1989 saltwater ammonia criteria document (U.S. EPA, 1989), but instead referred to the chronic criterion as the final chronic value.

Following the procedures described in 6NYCRR Part 706.1 and using the saltwater ammonia acute and chronic toxicity data from U.S. EPA (1989), the final acute value (FAV) for un-ionized

ammonia in saltwater was determined to be 0.465 mg NH₃/L. Dividing the FAV by two, converting to micrograms per liter (ug/L), and rounding to two significant digits results in an ambient water quality value for the protection of fish survival of 230 ug NH₃/L. When the FAV is divided by the saltwater ammonia acute to chronic ratio of 13.1, converted to ug/L and rounded to two significant digits, an ambient water quality value for the protection of fish propagation of 35 ug NH₃/L is derived. The concentrations of total ammonia, for ranges of temperature, pH, and salinity, that correspond to the aquatic life propagation value for un-ionized ammonia are listed in Table 1. The concentrations of total ammonia, for ranges of temperature, pH, and salinity, that correspond to the aquatic life survival value for un-ionized ammonia are listed in Table 2. The acute-chronic ratios used to determine the aquatic life propagation value are listed in Table 3.

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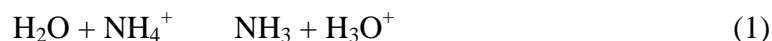
New York State Department of Environmental Conservation
Division of Water/Division of Fish, Wildlife and Marine Resources
TJS
July 25, 2002

ATTACHMENT A

The following information is from U.S. EPA (1989). The information discusses the behavior of ammonia in saltwater, explains the derivation of the saltwater ammonia acute-chronic ratio, and documents the data used to derive the saltwater ammonia acute and chronic water quality criteria.

INTRODUCTION

“In aqueous solutions, the ammonium ion dissociates to un-ionized ammonia and the hydrogen ion. The equilibrium equation can be written:



The total ammonia concentration is the sum of NH_3 and NH_4^+ .”

“The toxicity of aqueous ammonia solutions to aquatic organisms is primarily attributable to the un-ionized form, the ammonium ion being less toxic. It is necessary, therefore, to know the percentage of total ammonia which is in the un-ionized form in order to establish the corresponding total ammonia concentration toxic to aquatic life. The percentage of un-ionized ammonia (UIA) can be calculated from the solution pH and pK_a^* , the negative log of stoichiometric dissociation,

$$\% \text{ UIA} = 100 [1 + 10^{\text{pK}_a^* - \text{pH}}]^{-1} \quad (2)$$

The stoichiometric dissociation constant is defined:

$$\text{K}_a^* = \frac{[\text{NH}_3][\text{H}^+]}{[\text{NH}_4^+]} \quad (3)$$

where the brackets represent molal concentrations. K_a^* is a function of the temperature and ionic strength of the solution.”

“Whitfield (1974) developed theoretical models to determine the pK_a^* of the ammonium ion in seawater . . . Whitfield's models allow reasonable approximations of the percent un-ionized ammonia in sea water and have been substantiated experimentally . . . Hampson's (1977) program for Whitfield's full seawater model has been used to calculate the un-ionized ammonia fraction of measured total ammonia concentrations in toxicity studies conducted by EPA and

also in the derivation of most other acute and chronic ammonia values which contribute to the criteria. The equations for this model are:

$$\% \text{UIA} = 100 [1 + 10 (X + 0.0324 (298-T) + 0.0415 P/T - \text{pH})]^{-1} \quad (4)$$

where

P = 1 ATM for all toxicity testing reported to date;

T = temperature (K);

X = pK_a^S or the stoichiometric acid hydrolysis constant of ammonium ions in a saline water based on I,

$$I = 19.9273 S (1000 - 1.005109 S)^{-1} \quad (5)$$

where

I = molal ionic strength of the sea water;

S = salinity (g/kg).

The Hampson program calculates the value for I for the test salinity (Eq. 5), finds the corresponding pK_a^S , then calculates % UIA (Eq. 4)."

"The major factors influencing the degree of ammonia dissociation are pH and temperature. Both correlate positively with un-ionized ammonia. Salinity, the least influential of the three water quality factors that control the fraction of un-ionized ammonia, is inversely correlated."

". . . all quantitative ammonia data have been expressed in terms of mg/L un-ionized ammonia for ease in discussion and comparison, and since un-ionized ammonia is the principal toxic form. Ammonia concentrations reported by authors are given as reported if the author(s) provided data expressed as mg NH_3 /L, or converted to mg/L if reported in other units. If authors reported only total ammonia, or if they calculated NH_3 concentration by a unique method . . . the total ammonia value and reported pH, temperature, and salinity conditions were used to calculate mg NH_3 /L, per the Hampson (1977) program. This approach produces NH_3 values that are consistently derived."

ACUTE - CHRONIC RATIO DERIVATION

"Acute-chronic ratios are available for ten freshwater and two saltwater species . . . [Table 4]. Ratios for the saltwater species are 7.2 for the mysid and 21.3 for inland silversides. These saltwater species have similar acute sensitivities to ammonia, with LC_{50} s near the median for the 21 saltwater species tested. The acute-chronic ratios for the freshwater species vary from 1.4 to 53, so they should not be directly applied to the derivation of a Final Chronic Value. Guidance on how to interpret and apply ratios from tests with freshwater species to derive the freshwater criterion for ammonia has been detailed in U.S. EPA, 1985 which should be consulted. This document [U.S. EPA, (1989)] concludes that: (1) acute-chronic ratios of freshwater species appear to increase with decrease in pH; (2) data on temperature effects on the ratios are lacking; and (3) acute-chronic ratios for the most acutely and chronically sensitive species are technically

more applicable when trying to define concentrations chronically acceptable to acutely sensitive species. Therefore, mean acute-chronic ratios were selected from freshwater tests with species whose chronic sensitivity was less than or equal to the median conducted at pH > 7.7. These included the channel catfish, with a mean acute-chronic ratio of 10; bluegill, 12; rainbow trout, 14; and fathead minnow, 20. The mean acute-chronic ratios for these four freshwater and the two saltwater species are within a factor of 3. The geometric mean of these six values, 13.1, which divided into the Final Acute Value of 0.465 mg/L yields the Final Chronic Value of 0.035 mg NH₃/L.”

TABLES

Table 1: Ambient water quality values for the protection of saltwater aquatic life propagation based on total ammonia (mg/L); A(C) values.

Table 2: Ambient water quality values for the protection of saltwater aquatic life survival based on total ammonia (mg/L); A(A) values.

Table 3: Ranked Genus Mean Acute values with Species Mean Acute/Chronic Ratios.

Table 4: Acute and chronic toxicity data used to derive the U.S. EPA (1989) national saltwater criteria for ammonia.

Table 1. Ambient water quality values for the protection of saltwater aquatic life propagation based on total ammonia (mg/L); A(C) values.*

	Temperature (C)							
	0	5	10	15	20	25	30	35
pH	Salinity = 10 g/kg							
7.0	41	29	20	14	9.4	6.6	4.4	3.1
7.2	26	18	12	8.7	5.9	4.1	2.8	2.0
7.4	17	12	7.8	5.3	3.7	2.6	1.8	1.2
7.6	10	7.2	5.0	3.4	2.4	1.7	1.2	0.84
7.8	6.6	4.7	3.1	2.2	1.5	1.1	0.75	0.53
8.0	4.1	2.9	2.0	1.40	0.97	0.69	0.47	0.34
8.2	2.7	1.8	1.3	0.87	0.62	0.44	0.31	0.23
8.4	1.7	1.2	0.81	0.56	0.41	0.29	0.21	0.16
8.6	1.1	0.75	0.53	0.37	0.27	0.20	0.15	0.11
8.8	0.69	0.50	0.34	0.25	0.18	0.14	0.11	0.08
9.0	0.44	0.31	0.23	0.17	0.13	0.10	0.08	0.07
	Salinity = 20 g/kg							
7.0	44	30	21	14	9.7	6.6	4.7	3.1
7.2	27	19	13	9.0	6.2	4.4	3.0	2.1
7.4	18	12	8.1	5.6	4.1	2.7	1.9	1.3
7.6	11	7.5	5.3	3.4	2.5	1.7	1.2	0.84
7.8	6.9	4.7	3.4	2.3	1.6	1.1	0.78	0.53
8.0	4.4	3.0	2.1	1.5	1.0	0.72	0.50	0.34
8.2	2.8	1.9	1.3	0.94	0.66	0.47	0.31	0.24
8.4	1.8	1.2	0.84	0.59	0.44	0.30	0.22	0.16
8.6	1.1	0.78	0.56	0.41	0.28	0.20	0.15	0.12
8.8	0.72	0.50	0.37	0.26	0.19	0.14	0.11	0.08
9.0	0.47	0.34	0.24	0.18	0.13	0.10	0.08	0.07
	Salinity = 30 g/kg							
7.0	47	31	22	15	11	7.2	5.0	3.4
7.2	29	20	14	9.7	6.6	4.7	3.1	2.2
7.4	19	13	8.7	5.9	4.1	2.9	2.0	1.4
7.6	12	8.1	5.6	3.7	3.1	1.8	1.3	0.90
7.8	7.5	5.0	3.4	2.4	1.7	1.2	0.81	0.56
8.0	4.7	3.1	2.2	1.6	1.1	0.75	0.53	0.37
8.2	3.0	2.1	1.4	1.0	0.69	0.50	0.34	0.25
8.4	1.9	1.3	0.90	0.62	0.44	0.31	0.23	0.17
8.6	1.2	0.84	0.59	0.41	0.30	0.22	0.16	0.12

8.8	0.78	0.53	0.37	0.27	0.20	0.15	0.11	0.09
9.0	0.50	0.34	0.26	0.19	0.14	0.11	0.08	0.07

*Table 1 reproduced from U.S. EPA (1989, page 31

Table 2. Ambient water quality values for the protection of saltwater aquatic life survival based on total ammonia (mg/L); A(A) values.*

Temperature (C)								
	0	5	10	15	20	25	30	35
Salinity = 10 g/kg								
pH								
7.0	270	191	131	92	62	44	29	21
7.2	175	121	83	58	40	27	19	13
7.4	110	77	52	35	25	17	12	8.3
7.6	69	48	33	23	16	11	7.7	5.6
7.8	44	31	21	15	10	7.1	5.0	3.5
8.0	27	19	13	9.4	6.4	4.6	3.1	2.3
8.2	18	12	8.5	5.8	4.2	2.9	2.1	1.5
8.4	11	7.9	5.4	3.7	2.7	1.9	1.4	1.0
8.6	7.3	5.0	3.5	2.5	1.8	1.3	0.98	0.75
8.8	4.6	3.3	2.3	1.7	1.2	0.92	0.71	0.56
9.0	2.9	2.1	1.5	1.1	0.85	0.67	0.52	0.44
Salinity = 20 g/kg								
7.0	291	200	137	96	64	44	31	21
7.2	183	125	87	60	42	29	20	14
7.4	116	79	54	37	27	18	12	8.7
7.6	73	50	35	23	17	11	7.9	5.6
7.8	46	31	23	15	11	7.5	5.2	3.5
8.0	29	20	14	9.8	6.7	4.8	3.3	2.3
8.2	19	13	8.9	6.2	4.4	3.1	2.1	1.6
8.4	12	8.1	5.6	4.0	2.9	2.0	1.5	1.1
8.6	7.5	5.2	3.7	2.7	1.9	1.4	1.0	0.77
8.8	4.8	3.3	2.5	1.7	1.3	0.94	0.73	0.56
9.0	3.1	2.3	1.6	1.2	0.87	0.69	0.54	0.44
Salinity = 30 g/kg								
7.0	312	208	148	102	71	48	33	23
7.2	196	135	94	64	44	31	21	15
7.4	125	85	58	40	27	19	13	9.4
7.6	79	54	37	25	21	12	8.5	6.0
7.8	50	33	23	16	11	7.9	5.4	3.7

8.0	31	21	15	10	7.3	5.0	3.5	2.5
8.2	20	14	9.6	6.7	4.6	3.3	2.3	1.7
8.4	12.7	8.7	6.0	4.2	2.9	2.1	1.6	1.1

8.6	8.1	5.6	4.0	2.7	2.0	1.4	1.1	0.81
8.8	5.2	3.5	2.5	1.8	1.3	1.0	0.75	0.58
9.0	3.3	2.3	1.7	1.2	0.94	0.71	0.56	0.46

*Table 2 reproduced from U.S. EPA (1989),page 30

Table 3. Ranked Genus Mean Acute Values with Species Mean Acute/Chronic Ratios *

Rank ^a	Genus Mean Acute Value (mg/L NH ₃)	Species	Species Mean Acute Value (mg/L NH ₃)	Species Mean Acute-Chronic ratio
18	19.102	Eastern oyster, <u>Crassostrea virginica</u>	19.102	-
17	5.360	Quahog clam, <u>Mercenaria mercinaria</u>	5.360	-
16	3.08	Brackish water clam, <u>Rangia cuneata</u>	3.08	-
15	2.932	Three-spined stickleback, <u>Gasterosteus aculeatus</u>	2.932	-
14	2.737	Sheepshead minnow, <u>Cyprinodon variegatus</u>	2.737	-
13	2.21	Lobster, <u>Homarus americanus</u>	2.21	-
12	1.651	Grass shrimp, <u>Palaemonetes pugio</u>	1.651	-
11	1.544	Striped mullet, <u>Mugil cephalus</u>	1.544	-
10	1.117	Inland silverside, <u>Menidia beryllina</u>	1.317	21.3 ^b

Table 3. (Cont'd)

Rank ^a	Genus Mean Acute Value (mg/L NH ₃)	Species	Species Mean Acute Value (mg/L NH ₃)	Species Mean Acute-Chronic Ratio
		Atlantic silverside, <u>Menidia menidia</u>	1.050	-
9	1.04	Spot, <u>Leiostomus xanthurus</u>	1.04	-
8	1.021	Mysid, <u>Mysidopsis bahia</u>	1.021	7.2 ^c
7	1.012	Striped bass, <u>Morone saxatilis</u>	0.481	-
		White Perch, <u>Morone americana</u>	2.13	-
6	0.829	Copepod, <u>Eucalanus elongatus</u>	0.867	-
		Copepod, <u>Eucalanus pileatus</u>	0.793	-
5	0.826	Planehead filefish, <u>Monocanthus hispidus</u>	0.826	-
4	0.777	Prawn <u>Macrobrachium rosenbergii</u>	0.777	-
3	0.773	Sargassum shrimp,	0.773	-

Latreutes fucorum

Table 3. (Cont'd)

Rank ^a	Genus Mean Acute Value (mg/L NH ₃)	Species	Species Mean Acute Value (mg/L NH ₃)	Species Mean Acute-Chronic Ratio
2	0.545	Red drum <u>Sciaenops ocellatus</u>	0.545	-
1	0.492	Winter flounder, <u>Pseudopleuronectes americanus</u>	0.492	-

^aRanked from least sensitive to most sensitive based on Genus Mean Acute Values

^bAcute-Chronic Ratio calculated from tests with similar exposure parameters (salinity, temperature) and using the geometric mean of LC₅₀ values for pH 7 and 8.

^cAcute-Chronic Ratio calculated from tests with similar exposure parameters (salinity, pH, and temperature).

Saltwater Final Acute Value = 0.465 mg/L NH₃

Saltwater Criterion Maximum Concentration = 0.465 mg/L / 2 = 0.233 mg/L NH₃

Final Acute-Chronic Ratio = (see text)

Saltwater Final Chronic Value = 0.465 mg/L / 13.1 = 0.035 mg/L NH₃

*Table 3 reproduced from U.S. EPA (1989), pages 43-44

Table 4. Acute and Chronic toxicity data used to derive the U.S. EPA (1989) national saltwater criteria for ammonia.*

Acute - Chronic Ratio

Acute Value Chronic Value

Species	(mg/L NH ₃)	(mg/L NH ₃)	Ratio
<u>Freshwater Species</u>			
Cladoceran, <u>Ceriodaphnia acanthina</u>	1.05	0.304	3.5
Cladoceran, <u>Daphnia magna</u>	2.68	0.527	5.1
Cladoceran, <u>Daphnia, magna</u>	0.87	0.63	1.4
Cladoceran, <u>Daphnia magna</u>	4.6	1.2	3.9
Pink salmon, <u>Oncorhynchus gorbuscha</u>	0.090	0.0017	53
Pink salmo <u>Oncorhynchus gorbuscha</u>	0.090	0.0031	29
Rainbow trout, <u>Salmo gairdneri</u>	0.422	0.0311	14
Rainbow trout (ELS), <u>Salmo gairdneri</u>	0.35	0.016	22
Fathead minnow, <u>Pimphales promelas</u>	2.54	0.13	20

Table 4 (cont'd)

Species	Acute Value (mg/L NH ₃)	Chronic Value (mg/L NH ₃)	Ratio
Fathead minnow,	2.56	0.13	20

Pimphales promelas

Fathead minnow (ELS), 1.75 0.22 8.0

Pimphales promelas

Channel catfish, 2.42 0.103 15
Ictalurus punctatus

Channel catfish, 1.95 <0.25 8-34
Ictalurus punctatus

Channel catfish, 2.12 0.283 7.5
Ictalurus punctatus

Channel catfish, 1.58 0.18 8.8
Ictalurus punctatus

Green sunfish 2.05 0.33 6.3
Lepomis cyanellus

Bluegill, 1.08 0.0926 12
Lepomis macrochirus

Smallmouth bass 0.81 0.0437 19
Micropterus dolomieu

Smallmouth bass 1.14 0.148 7.7
Micropterus dolomieu

Smallmouth bass 1.30 0.599 2.2
Micropterus dolomieu

Table 4. (Cont'd)

Species	Acute Value (mg/L NH ₃)	Chronic Value (mg/L NH ₃)	Ratio
Smallmouth bass <u>Micropterus dolomieu</u>	1.77	0.612	2.9
<u>Saltwater species</u>			
Mysid, <u>Mysidopsis bahia</u>	1.70	0.232	7.2
Inland silverside, <u>Menidia beryllina</u>	1.30	0.061	21.3

 Geometric mean of acute-chronic ratios for channel catfish = 10.0

for bluegill = 12

for rainbow trout = 14 (18 if ELS study included)

for fathead minnow = 20 (15 if ELS study included)

for mysid = 7.3

for inland silverside = 21.3

*Table 4 reproduced from U.S. EPA (1989), pages 40-42

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**NEW YORK STATE
- HUMAN HEALTH FACT SHEET -**

**Ambient Water Quality Value for
Protection of Sources of Potable Water**

SUBSTANCE: Carbon disulfide

CAS REGISTRY NUMBER: 75-15-0

AMBIENT WATER QUALITY VALUE: 60 ug/L

BASIS: Non-oncogenic effects

INTRODUCTION

The ambient water quality value applies to the water column and is designed to protect humans from the effects of contaminants in sources of drinking water; it is referred to as a Health (Water Source) or H(WS) value.

Regulations (6 NYCRR 702.2) require that a water quality guidance value be based on the procedures in sections 702.3 through 702.7. Potential water quality values for carbon disulfide are derived below, and the value of 60 ug/L was selected as described under "Selection of Value."

PRINCIPAL ORGANIC CONTAMINANT CLASSES AND SPECIFIC MCL (702.3)

A. Discussion

Carbon disulfide does not have a Specific MCL for New York State as defined in 700.1. It is not considered to be an organic substance, so a determination as to whether it is in a principal organic contaminant class as defined in 700.1 is not relevant. US EPA does not regulate it under the Safe Drinking Water Act, nor have they issued a drinking water health advisory for it.

Under the State Sanitary Code, (10 NYCRR Part 5, Public Water Supplies), the New York State Department of Health (DOH) does not regulate carbon disulfide as either a principal organic contaminant (POC) or an unspecified organic contaminant (UOC) and has not established a specific maximum contaminant level (MCL) for carbon disulfide in drinking water.

B. Derivation of Water Quality Value

Because carbon disulfide does not have a Specific MCL and is not in a principal organic contaminant class, a water quality value cannot be derived based on 702.3.

ONCOGENIC EFFECTS (702.4)

Insufficient information was found to adequately assess the oncogenic potential for carbon disulfide. US EPA (1998) has not completely evaluated the evidence for human carcinogenic potential of carbon disulfide under its IRIS program. ATSDR (1996) found no studies in animals by any route of exposure and “no definitive evidence” in humans.

Genotoxicity studies of carbon disulfide in a number of tests including *Salmonella typhimurium* and *Escherichia coli*, both with and without metabolic activation, were negative (ATSDR, 1996). In human lymphocytes, Garry et al. (1990) did find a dose-related increase in sister chromatid exchanges ($p < 0.05$) but only with microsomal activation with S-9.

This substance does not meet the definition for an oncogen under New York State regulations (700.1); thus, a value based on oncogenic effects cannot be derived.

NON-ONCOGENIC EFFECTS (702.5)

A. Data

Adequate human data or data from long-term oral studies on animals that could serve as the basis for an ambient water quality value were not found. The results of some less-than lifetime animal studies are available; these and some human occupational results are described below.

Jones-Price et al. (1984a,b) studied the toxicity and teratogenicity of oral exposure to carbon disulfide in rats and rabbits. In the rat study (1984a) carbon disulfide was given in corn oil at 0, 100, 200, 400 and 600 mg/kg/day to CD rats on gestational days (gd) 6 through 15. Animals were terminated on gd 20. Dams (confirmed pregnant females) at all dose levels exhibited a significant reduction in gestational body weight gain. At dose levels of 200 mg/kg/day and above, mean fetal weight was significantly reduced. However, no significant differences were found in either fetal resorptions or malformations at any dose

level. Thus, maternal toxicity was exhibited at all dose levels tested, and fetal toxicity at and above 200 mg/kg/day.

In the rabbit study, carbon disulfide was given orally in corn oil at 0, 25, 75 and 150 mg/kg/day on gd 6 through 19. Animals were terminated on gd 30 and 23 - 28 dams per group evaluated. Data collected included gravid uterus weight, number of implantation sites, and live, dead or resorbed fetuses. Weight and malformations in live fetuses were assessed. In the two highest dosed groups, maternal weight gain was significantly below controls, and there were significant increases in both relative and absolute liver weights. Jones-Price et al. (1984b) concluded these changes were treatment-related. Thus, maternal toxicity was observed at both 75 mg/kg/day and 150 mg/kg/day.

All dosed groups showed significant ($p < 0.05$) increases in the percentage per litter of resorbed, nonlive (dead plus resorbed) or affected (nonlive plus malformed) fetuses. The incidences of resorptions were 12.30%, 32.47%, 41.60% and 61.16% in vehicle through 150 mg/kg/day groups. However, only the incidence of malformed fetuses per litter in the high-dosed group (19.51%) was significantly higher than the incidence in controls (5.72%). The low dose of 25 mg/kg/day carbon disulfide produced fetotoxicity but “no distinctive evidence” of toxicity to the dams. Thus, the lowest dose level of 25 mg/kg/day represents an effect level for this study.

Hardin et al. (1981) investigated the potential for teratogenic effects from inhalation exposure of rats and rabbits to carbon disulfide. Both species were exposed to 62.3 mg/m³ (20 ppm) for 6 hours/day and 124.6 mg/m³ (40 ppm) (exposure period not given) for 34 weeks before breeding and during the entire pregnancy period; no effects on fetal development were found. US EPA (1998) identified the highest exposure level of 124.6 mg/m³, equivalent to 11.0 mg/kg/day, as a no-observed-effect level (NOEL) for this study; a lowest-observed-effect level (LOEL) was not found.

Many studies have been done on workers exposed to carbon disulfide (ATSDR, 1996; US EPA, 1998). The critical effect identified in these studies is an extrapulmonary effect - peripheral nervous system dysfunction. The US EPA (1998) derived a benchmark concentration based on this critical effect and the data reported in Johnson et al. (1983). ATSDR (1996) utilized the same study as the basis for their Minimal Risk Level based on neurological effects via inhalation. Additional occupational studies have identified vision and the heart as other targets of carbon disulfide toxicity (Lee et al., 1996; Vanhoorne et al., 1996; Bortkiewicz et al., 1997; Drexler et al., 1996; Price et al., 1996; 1997).

B. Derivation of Value

The oral study of Jones et al. (1984b) on rabbits is the most appropriate basis for an ambient water quality value for non-oncogenic effects. It showed fetal toxicity at levels below that of the oral rat study (Jones-Price et al., 1984a). Thus, it is the more sensitive oral study and is preferred over the rat study because there are insufficient data to determine confidently which species (rats or rabbits) is a better surrogate for humans. It is preferred over the Hardin et al. (1981) inhalation study, which formed the basis for US EPA's (1998) oral reference dose (RfD), because it eliminates the need, and thus the uncertainties, associated with a route-to-route extrapolation. In addition, the oral LOEL identified in the Jones et al. (1984b) study on rabbits was lower than the estimated NOEL derived from the Hardin et al. (1981) inhalation study. Thus, the effect level of 25 mg/kg/day for fetal resorption in rabbits identified in Jones-Price et al. (1984b) is selected as the appropriate basis for the derivation of an ambient water quality value for the protection of sources of drinking water.

An acceptable daily intake (ADI) of 0.0083 mg/kg/day is calculated from the effect level (25 mg/kg/day):

$$\text{ADI} = \frac{\text{Effect Level}}{\text{UF}} = \frac{25 \text{ mg/kg/day}}{3,000} = 0.0083 \text{ mg/kg/day}$$

The total uncertainty factor (UF) of 3,000 consists of factors of 10 for intraspecies (human) variability, 10 for extrapolating between experimental animals and humans, 10 for the use of an effect level instead of a no-observed-effect level, and 3 to account for the lack of a complete database (particularly the lack of a chronic oral study). The regulations, 702.5(b), state that the magnitude of the total UF "... shall reflect the quantity and quality of the toxicologic data, the degree of confidence in the data and the nature of the effects of concern." The additional UF of 3 for the incomplete database is appropriate under this provision.

A potential ambient water quality value is calculated from the ADI (0.0083 mg/kg/day) using a human body weight of 70 kg, a daily water consumption rate of 2 L/day, and apportioning 20% of the ADI to drinking water:

$$\begin{aligned} \text{Water Quality Value} &= \frac{(0.0083 \text{ mg/kg/day}) (1000 \text{ ug/mg}) (70 \text{ kg}) (0.2)}{(2 \text{ L/day})} = \\ &= 58.1 \text{ ug/L, rounded to } 60 \text{ ug/L} \end{aligned}$$

CHEMICAL CORRELATION (702.7)

A potential water quality value for carbon disulfide using chemical correlation was not derived because values have not been derived for similar substances under 702.4 or 702.5.

SELECTION OF VALUE

The H(WS) value is designed to protect humans from oncogenic and non-oncogenic effects from contaminants in sources of drinking water. To protect for these effects, regulations [6 NYCRR 702.2(b)] require that the value be the most stringent of the values derived using the procedures found in sections 702.3 through 702.7. The non-oncogenic value of 60 ug/L (702.5) is the most stringent value derived from these procedures and is the ambient water quality value for carbon disulfide.

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New York State Department of Environmental Conservation
Division of Water
SJS
September 1, 1999

**NEW YORK STATE
- AQUATIC FACT SHEET -**

**Ambient Water Quality Value
for Protection of Aquatic Life**

SUBSTANCE: Dissolved Oxygen**CAS REGISTRY NUMBER:** Not Applicable**TYPE:****BASIS:**

**SALTWATER AMBIENT WATER
QUALITY VALUE (mg/L):**

Chronic

Propagation

Not less than a daily average of 4.8¹

Acute

Survival

Not less than 3.0 at any time

REMARKS:

¹ The DO concentration may fall below 4.8 mg/L for a limited number of days, as defined by:

$DO_i = \frac{13.0}{2.80 + 1.84e^{-0.1t_i}}$ where DO_i = DO concentration in mg/L between 3.0 - 4.8 mg/L and t_i = time in days. This equation is applied by dividing the DO range of 3.0 - 4.8 mg/L into a number of equal intervals. DO_i is the lower bound of each interval (i) and t_i is the allowable number of days that the DO concentration can be within that interval. The actual number of days that the measured DO concentration falls within each interval (i) is divided by the allowable number of days that the DO can fall within interval (t_i). The sum of the quotients of all intervals (i...n) cannot exceed 1.0: i.e.,

$$\sum_{i=1}^n \frac{t_i(\text{actual})}{t_i(\text{allowed})} < 1.0$$

The DO concentration shall not fall below the acute standard of 3.0 mg/L at any time.

INTRODUCTION

These values are derived to protect saltwater aquatic life (also referred to as marine life or marine organisms) from the effects of low concentrations of dissolved oxygen. Values for the protection of propagation of aquatic life are referred to as Aquatic (Chronic) or A(C) values, which are analogous to the CCC, or criterion continuous concentration in EPA water quality criteria documents. Values for the protection of survival of aquatic life are referred to as Aquatic (Acute) or A(A) values, which are analogous to the CMC, or criterion maximum concentration in EPA water

quality criteria documents.

SUMMARY OF INFORMATION AND DERIVATION OF VALUE

The EPA published final national chronic and acute aquatic life criteria for dissolved oxygen (DO) in saltwater (U.S. EPA, 2000) which were reviewed by the Department. EPA's chronic criterion was determined to be based on appropriate data and derived according to the scientific procedures consistent with 6NYCRR Parts 702 and 706, although there were some variations to those procedures as allowed by 6NYCRR Part 702.9(g) (see U.S. EPA, 2000). The Department believes that the EPA chronic criterion is the appropriate A(C) value for the protection of saltwater aquatic life in New York State. However, the Department does not believe that the EPA's acute criterion is adequately protective. The DO standards for Class SA, SB, SC, I and SD waters apply to all water column depths. DO measurements at different depths are not averaged. The lowest measured DO in the water column represents the low DO concentration for the entire water column.

Acute Value

The U.S. EPA used survival of juvenile and adult organisms as the basis for acute criterion. Following procedures described in U.S. EPA 1994 (which are equivalent to the methodologies described in 6NYCRR Part 706.1), they evaluated 23 laboratory-DO mortality tests to establish the acute criterion of 2.3 mg/L. The Department acknowledges that the scientific methodology used to derive this criterion is consistent with U.S. EPA Guidance and methodologies typically employed for deriving criteria for toxic chemicals. However, the Department is not satisfied that DO mortality studies conducted under carefully controlled laboratory conditions accurately estimates the threshold for acute low DO effects to organisms in the field. Field studies have shown that the population biomass of whiting, striped searobin, little skate, and rock crab is reduced when exposed to low DO concentrations between 3.0 and 4.8 mg/l (Simpson et al., 1996). In terms of aggregate finfish abundance, data indicate that dissolved oxygen becomes a limiting factor at levels of 3.7 mg/l, 3.5 mg/l, 3.1 mg/l and 2.6 mg/l for demersal finfish abundance (biomass), demersal species richness, species richness, and demersal finfish abundance (numbers), respectively (Simpson et al. 1995). These dissolved oxygen values are well above the proposed U.S. EPA acute criterion of 2.3 mg/l and suggest that a higher standard would be necessary to be adequately protective of most marine life in Long Island Sound. U.S. EPA (2000) states that acute risks are limited to adult and juvenile life stages only, and do not address risks of larval mortality. The explanation for this limitation is inadequately discussed and completely undocumented. However, studies show that lethality begins to occur in larval fishes and crustaceans at dissolved oxygen values of less than 3.0 mg/L (Poucher and Coiro 1997), again suggesting that 3.0 mg/L is a better threshold criterion for low DO impacts than the proposed criterion of 2.3 mg/L.

Laboratory tests alone do not take into account natural stressors that are likely to be present when low DO events occur in the natural marine habitat. The EPA acknowledges that their acute criterion does not take into consideration other accompanying stressors such as water temperature, extremes of salinity, and the presence of toxicants (U.S. EPA, 2000). Although EPA reviewed a limited number of field studies to validate their acute criterion, their laboratory-derived value does not

satisfactorily address behavioral responses to low DO that might make organisms more susceptible to predation, less competitive, impair hunting and feeding, or inhibit other survival-related activities. The Department believes that to protect juvenile and adult organisms from mortality due to hypoxia, given the range of natural stressors likely to be in effect in the marine environment during a low DO event, the appropriate acute aquatic life value for the minimum DO level should be 3.0 mg/L rather than the 2.3 mg/L derived by the EPA (Figure 1).

U.S. EPA's proposed acute DO criterion of 2.3 mg/L is applicable to the entire Virginian Province, a geographically expansive area from Cape Cod to Cape Hatteras. The Simpson et al. (1995, 1996) studies were focused exclusively on organisms living in Long Island Sound and are thus more representative of the species, and their concomitant DO requirements, that inhabit marine waters of New York State.

Chronic Value

For deriving a chronic criterion, the EPA examined 37 tests of the impact of low DO on growth. They found that DO levels below 4.8 mg/L resulted in impaired growth of larval stages of marine organisms. Adult and juvenile stages were less sensitive. Following appropriate procedures (U.S. EPA, 1994) the value of 4.8 mg/L DO was calculated to be the chronic criterion (Figure 1).

The EPA also demonstrated that populations of marine organisms could tolerate short excursions below 4.8 mg/L DO, and that these short excursions were unlikely to have any detectable impact on the population as measured by larval recruitment. To estimate the duration and magnitude of DO excursions below 4.8 mg/L that could be tolerated with minimal predicted impact to larval recruitment (i.e., 5%), the EPA employed a larval recruitment model to evaluate hypoxia dose-response effects on the recruitment of larvae from 9 genera of marine water column organisms representing a range of sensitivities to hypoxia. The model was used to calculate the maximum number of days larval cohorts could be exposed to a range of different low DO concentrations and still maintain a larval recruitment rate 95% or better of the larval recruitment rate expected when DO concentrations were maintained above 4.8 mg/L. From the four most sensitive genera of the nine genera tested, an equation for a curve was derived that illustrated the number of days at which different DO concentrations below 4.8 mg/L could persist without impairing larval recruitment (Figure 1). The equation is:

$$DO_i = \frac{13.0}{280 + 184e^{-0.16 t_i}}$$

where DO_i = Allowable DO concentration in mg/L;

t_i = Time interval in days at that DO concentration.

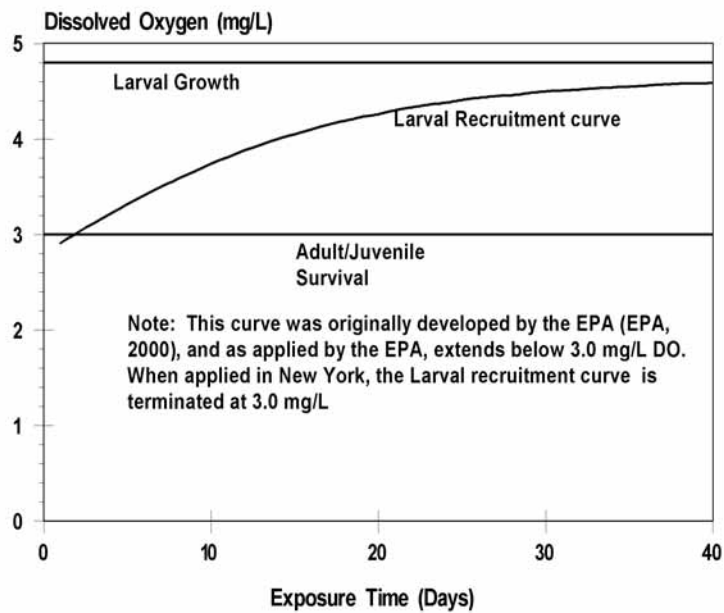


Figure 1. Graphic water quality values for dissolved oxygen in saltwater. Shown are the Larval recruitment curve produced by equation 1, the saltwater chronic (Larval growth) water quality value, and the saltwater acute (Adult/Juvenile survival) water quality values for DO.

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Division of Water / Division of Fish, Wildlife & Marine Resources

TJS

January 14, 2003

**NEW YORK STATE
- HUMAN HEALTH FACT SHEET -**

**Ambient Water Quality Value for
Protection of Human Health and Sources of Potable Water**

SUBSTANCE: Formaldehyde

CAS REGISTRY NUMBER: 50-00-0

AMBIENT WATER QUALITY VALUE: 8 micrograms/liter (8 ug/L)

BASIS: Oncogenic effects (6 NYCRR 702.4)

The health effects of exposure to formaldehyde have been reviewed (ATSDR, 1997; Restani and Galli, 1991; IARC, 1995; US EPA, 1998). Data on the health effects in laboratory animals from chronic exposure to formaldehyde in drinking water (Soffritti et al., 1989; Takahashi et al., 1986; Til et al., 1989; Tobe et al., 1989) were reviewed and critically evaluated. The selected ambient water quality value for formaldehyde (8 ug/L) was derived using the available toxicological data and the procedures outlined in 6 NYCRR 702.2 through 702.7.

SPECIFIC MCL AND PRINCIPAL ORGANIC CONTAMINANT CLASS (702.3)

Formaldehyde does not have a Specific MCL (maximum contaminant level) as defined in 700.1 and is not in a principal organic contaminant class as defined in 700.1. Therefore, a water quality value cannot be derived under 702.3.

ONCOGENIC EFFECTS (702.4)

The human data suggest, but do not establish, a causal relationship between occupational exposure to formaldehyde and certain forms of respiratory tract cancer, including

nasopharyngeal cancer (IARC, 1996; US EPA, 1998). Thus, there is **limited**¹ evidence for the human carcinogenicity of formaldehyde (IARC, 1996; US EPA, 1998).

Chronic exposure to inhaled formaldehyde induces nasal cavity cancers in male and female rats (Kerns et al., 1983; Sellakumar et al., 1985; Tobe et al., 1985). Chronic exposure to formaldehyde in drinking water causes leukemias and gastrointestinal tract tumors in male and female Sprague-Dawley (SD) rats (see below, Soffritti et al., 1989) and forestomach papillomas in male Wistar rats (Takahashi et al., 1986).

Incidences of Cancers in Rats after Chronic Exposure to Formaldehyde in Drinking Water (Soffritti et al., 1989)

Water Concentration (mg/L)	Estimated Dose (mg/kg/day)	Incidence in Rats			
		Total Leukemias			GI Tract
		Females	M & F	M & F	
<u>Exposed for 104 weeks starting at 7 weeks of age</u>					
0	0	4/100	3/100	7/200	0/200
10	1.3	1/50	2/50	3/100	3/100*
50	6.5	5/50	4/50	9/100*	2/100
100	13	5/50	4/50	9/100*	0/100
500	65	8/50*	4/50	12/100*	0/100
1,000	130	6/50	7/50*	13/100*	2/100
1,500	195	11/50*	7/50*	18/100*	8/100*
<u>Exposed for 104 weeks starting at 25 weeks of age</u>					
0	0	0/20	1/20	1/40	0/40
2,500	325	2/18	2/18	4/36	2/36
<u>Exposed for 104 weeks starting as 12-day embryos (transplacental exposure)</u>					
0	0	3/59	3/49	6/108	0/108
2,500	325	4/36	0/37	4/73	8/73*
* p < 0.05 (Fisher's exact test)					

In two other chronic studies in Wistar rats, formaldehyde in drinking water induced hyperplasia in cells lining the stomach, but the incidences of stomach tumors or tumors at other sites did not differ significantly between treated and control groups (Til et al., 1989; Tobe et al., 1989).

¹A positive association has been observed between exposure to formaldehyde and cancer for which a causal interpretation is considered to be credible, but chance, bias or confounding could not be ruled out with reasonable confidence (IARC, 1996).

There is **sufficient**² evidence for the animal carcinogenicity of formaldehyde (IARC, 1996; US EPA, 1998). Formaldehyde is active in short-term tests indicative of potential oncogenic activity, including tests for gene mutations, deoxyribose nucleic acid (DNA) cross-linking, sister chromatid exchanges, and chromosomal aberrations (ATSDR, 1997; IARC, 1996; Ma and Harris, 1988; US EPA, 1998). Formaldehyde is an oncogen under 700.1(a)(26)(iii) and (v).

The dose-response data (see Table) for total leukemias (i.e., incidence of rats with lymphoblastic leukemias, lymphosarcomas, immunoblastic lymphosarcomas, other leukemias or hemolymphoreticular sarcomas) in male and female SD rats chronically ingesting formaldehyde (Soffritti et al., 1989) were used to derive a water quality value based on oncogenic effects. The incidence data on male and female rats were combined because the incidences in controls and exposed groups did not differ substantially between sexes.

The rats were given drinking water (ad libitum) for 2 years starting at 7 weeks of age. Data on average body weight or water consumption during the study were not provided; thus, values recommended by the US EPA (1987) for SD rats in chronic studies were used to estimate the average daily intake of formaldehyde during the course of the study (Exhibit 1). The Soffritti et al. (1989) study was selected because the route of exposure was oral (drinking water), the study length and sample sizes were adequate for a chronic oncogenicity study, and the survival rates of dosed rats were similar to those of the control rats. The dose-response data for leukemias were selected over the data for gastrointestinal tumors because the dose-response relationship was stronger. Dose-response data for the incidences of rats with a specific leukemia and/or a gastrointestinal tumor were not provided.

A cancer potency factor of 4.2×10^{-3} per milligram body weight per day (4.2×10^{-3} (mg/kg/day)⁻¹) was derived using procedures consistent with those outlined in paragraphs (a) through (e) of 702.4 (Exhibit 1). Without sufficient evidence to support the use of an alternative high-to-low dose extrapolation model or an alternative animal-to-human extrapolation model, the linearized multistage model for extra risk (702.4(a)) and a trans-species scaling factor based on the assumption that human and animal lifetime cancer risks are equal when daily administered doses are in proportion to body weights raised to the 3/4 power (702.4(e)) were used. Assuming a 70-kg adult drinks 2 liters of water per day for an exposure period of 70 years (702.2(c) and 702.4(f)), the water value corresponding to the lower bound estimate on the dose associated with an excess lifetime human cancer risk of one-in-one-million is 8 ug/L (rounded from 8.4 ug/L).

² A causal relationship has been established between formaldehyde and an increased incidence of malignant neoplasms or of an appropriate combination of benign and malignant neoplasms in (a) two or more species of animals or (b) in two or more independent studies in one species carried out at different times or in different laboratories or under different protocols (IARC, 1996).

NON-ONCOGENIC EFFECTS (702.5)

Formaldehyde in drinking water damages the stomach and kidney of laboratory animals (ATSDR, 1997; IARC, 1995; Til et al., 1989; US EPA, 1998). In 1990, the US EPA established an oral reference dose (equivalent to an acceptable daily intake) of 200 micrograms per kilogram body weight per day (ug/kg/day) formaldehyde (Exhibit 2, taken from US EPA, 1998), using procedures consistent with those outlined in paragraph (a) and (b) of 702.5. This reference dose, which was rounded from a value of 150 ug/kg/day (US EPA, 1998) was derived by application of a 100-fold uncertainty factor to a no-observed-effect level (NOEL) of 15 mg/kg/day for stomach toxicity (histopathological changes in the lining of the stomach) and reduced weight gain in rats exposed through drinking water daily for 2 years (Til et al., 1989). In developing the reference dose, the US EPA noted that additional chronic bioassays and reproductive and developmental studies support the critical effect and study. ATSDR (1997) derived a chronic oral minimal risk level (also equivalent to an acceptable daily intake) of 200 ug/kg/day, based on the same study and using the same uncertainty factor. A potential ambient water quality value of 1,400 ug/L is derived assuming a 70-kg adult drinks 2 liters of water per day and allowing 20% of the acceptable daily intake (200 ug/kg/day) to come from drinking water (6 NYCRR 702.2(c) and 702.5(c)).

CHEMICAL CORRELATION (702.7)

A value based on chemical correlation was not derived because the toxicity data are sufficient to derive a value based on both oncogenic effects (702.4) and non-oncogenic effects (702.5).

OTHER STANDARDS AND GUIDELINES

Under the New York State Department of Health drinking-water regulations (10 NYCRR Part 5), formaldehyde is an unspecified organic contaminant (UOC) and has a maximum contaminant level (MCL) of 50 ug/L. The World Health Organization (WHO) derived a guideline value of 900 ug/L for formaldehyde in drinking water, assuming a 60-kg adult drinks 2 liters of water per day and allocating 20% of the WHO reference dose (150 ug/kg/day) to drinking water (WHO, 1996). The guideline was based on the same NOEL and study (15 mg/kg/day, Til et al., 1989) as the US EPA reference dose.

SELECTION OF VALUE

According to 702.2(b), the selected ambient water quality value shall be the most stringent of the values derived using the procedures found in 6 NYCRR 702.3 through 702.7. This value is 8 ug/L (based on oncogenic effects) and is the value selected as the water quality value for formaldehyde.

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SEARCH STRATEGY

Toxline (1981 to October, 1998) was searched linking the CAS RN for formaldehyde with the keywords "chronic", "cancer", "reproductive", "developmental" and "drinking water."

Bureau of Toxic Substance Assessment
New York State Department of Health
kgb02

EXHIBIT 1. WORKSHEET FOR DERIVATION OF ONCOGENIC VALUE FOR FORMALDEHYDE

1. References

Soffritti, M., C. Maltoni, F. Maffei and R. Biagi. 1989. Formaldehyde: An experimental multipotential carcinogen. *Toxicol. Ind. Health.* 5: 699-730.

2. Dose-Response Data for High-to-Low Dose Extrapolation Using TOX_RISK Software

Oncogenic Effect	Total leukemias (see text for types) in male and female SD (Sprague-Dawley) rats
Dose Regime	0, 10, 50, 100, 500, 1,000 and 1,500 mg/L in drinking water for 104 weeks
Rat Body Weight	0.43 kg (average of males (0.52 kg) and females (0.34 kg)) ¹
Water Consumption	0.13 L/kg/day (average of males (0.062 L/0.52 kg/day) and females (0.045 L/0.34 kg/day)) ¹
Daily Doses	0, 1.3, 6.5, 13, 65, 130 and 195 mg/kg/day in drinking water
Incidence ²	7/200, 3/100, 9/100, 9/100, 12/100, 13/100, and 18/100

¹ Recommended values for Sprague-Dawley rats over the course of a chronic study (US EPA, 1987. Recommendations for and Documentation of Biological Values for Use in Risk Assessment. EPA/600/6-87/008. Cincinnati, OH: Environmental Criteria and Assessment Office.)

² Denominator is number of animals at the start of the experiment.

3. Derivation of Cancer Potency Factor

Lower Bound on Dose Corresponding to Excess Lifetime Risk of One-in-One Million	
Rat daily dose	= 0.86 ug/kg/day (TOX_RISK (linearized multistage model) estimate of 95% lower bound on dose associated with 1×10^{-6} incidence)**
Human daily dose	= 0.24 ug/kg/day = 0.86 ug/kg/day x (0.43 kg/70 kg) ^{0.25}
Cancer potency factor	= 1×10^{-6} risk level/ 1×10^{-6} human dose (0.24 ug/kg/day) = 4.2×10^{-6} per ug/kg/day = 4.2×10^{-3} per mg/kg/day

**using a simple linear model gives 0.90 ug/kg/day for dose associated with an 1×10^{-6} incidence (i.e., 95% lower bound on dose (90,000 ug/kg/day) associated with a 0.1 incidence / 100,000).

4. Derivation of Ambient Water Quality Value

Water value = (0.24 ug/kg/day x 70 kg)/2 L/day = 8 ug/L

EXHIBIT 2: ORAL REFERENCE DOSE SUMMARY FOR FORMALDEHYDE (CAS REGISTRY NUMBER 50-00-0): TAKEN FROM THE WORLDWIDE WEBSITE FOR THE INTEGRATED RISK INFORMATION SYSTEM OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY (AS OF DECEMBER 1998)

___I.A. REFERENCE DOSE FOR CHRONIC ORAL EXPOSURE (RfD)

Substance Name -- Formaldehyde
CASRN -- 50-00-0
Last Revised -- 09/01/90

___I.A.1. ORAL RfD SUMMARY

Critical Effect	Experimental Doses*	UF	MF	RfD
Reduced weight gain, histopathology in rats	NOAEL: 15 mg/kg/day LOAEL: 82 mg/kg/day	100	1	2E-1 mg/kg/day

Rat 2-Year Bioassay
Til et al., 1989

* Conversion Factors: none

___I.A.2. PRINCIPAL AND SUPPORTING STUDIES (ORAL RfD)

Til, H.P., R.A. Woutersen, V.J. Feron, V.H.M. Hollanders, H.E. Falke and J.J. Clary. 1989. Two-year drinking water study of formaldehyde in rats. Food Chem. Toxicol. 27: 77-87.

Formaldehyde was administered daily in drinking water to Wistar rats (70/sex/dose) for up to 24 months at mean doses of 0, 1.2, 15, or 82 mg/kg/day for males and 0, 1.8, 21, or 109 mg/kg/day for females. Up to 10 rats/sex/dose were sacrificed and examined after 12 months and 18 months of treatment; the remainder was sacrificed and examined at 24 months. Mean body weights of the high-dose group were decreased in males from week 1 and in females from week 24 through termination. Food intake was significantly decreased in all high-dose males with females showing a similar but less consistent decrease in food intake. A 40% decrease in drinking water intake was reported in all high-dose animals while those rats receiving the middle dose showed a slight but generally insignificant decrease in liquid intake. Changes in urinalyses, and hematological and clinical chemistry parameters, were not dose-related, so were not considered to be related to formaldehyde intake. Among the high-dose males, significant decreases were seen in the absolute heart and liver weights at 18 months and at termination; in testes weights at 18 months; and in kidney weights at termination. High-dose females showed significant increases in the relative kidney weights at 12 and 24 months.

Relative brain weights were significantly increased in high-dose males at all three examination periods and in females at termination only. Relative testes weights were significantly increased in high-dose males at termination. These relative organ weight increases were generally ascribed to the decreased body weights observed. A significant increase in mortality among males receiving the 15 mg/kg/day dose was not considered toxicologically significant.

Gross examination at 12, 18, and 24 months revealed a raised, thickening of the limiting ridge of the forestomach in most high-dose rats and in some rats of both sexes from other groups. Irregular mucosal thickening of the forestomach and glandular stomach were seen in several rats of the high-dose group and in occasional rats of other groups. The incidence of discoloration and irregularity of the kidney surface and atrophy of the testes was lower in the high-dose group as compared with controls.

Significant histopathological changes of the gastrointestinal tract were found in high-dose males and females and included chronic atrophic gastritis of the glandular stomach from week 53 on, as well as focal ulceration and glandular hyperplasia at the terminal examination. The incidence of focal papillary epithelial hyperplasia and focal hyperkeratosis of the forestomach was significantly increased in both sexes at the terminal examination. These effects of formaldehyde on the gastric mucosa were considered cytotoxic in nature. A significant increase in the incidence of papillary necrosis of the kidneys was reported in both sexes of high-dose rats at the terminal examination. No treatment-related gastric tumors were observed in this study. The incidence and type of tumors observed in other organ systems were common to this strain and similar to those found in aging rats, 30 were not considered toxicologically significant. A NOAEL of 15 mg/kg/day in male rats was indicated in this study.

___ I.A.3. UNCERTAINTY AND MODIFYING FACTORS (ORAL RfD)

UF -- An uncertainty factor of 100 was used to account for the inter- and intraspecies differences.

MF -- None

___ I.A.5. CONFIDENCE IN THE ORAL RfD

Study -- High

Data Base -- Medium

RfD -- Medium

Confidence in the critical study is high since it consisted of adequate numbers of animals of both sexes, as well as a thorough examination of toxicological and histological parameters. Confidence in the data base is medium as several additional chronic bioassays and reproductive and developmental studies support the critical effect and study. Medium confidence in the RfD follows.

___I.A.6. EPA DOCUMENTATION AND REVIEW OF THE ORAL RfD

Source Document -- U.S. EPA, 1989

Other EPA Documentation -- None

Agency Work Group Review -- 11/17/89, 05/17/90, 06/20/90

Verification Date -- 06/20/90

**NEW YORK STATE
HUMAN HEALTH FACT SHEET**

**Ambient Water Quality Value for
Protection of Human Health and Sources of Potable Water**

SUBSTANCE: Metolachlor*

CAS REGISTRY NUMBER: 51218-45-2

AMBIENT WATER QUALITY VALUE: 9 micrograms/liter (9 ug/L)*

BASIS: Oncogenic effects (6 NYCRR 702.4)

***REMARKS:** Value applies to the sum of the four isomers of the metolachlor molecule, specifically two S-enantiomers (CGA-77102) and two R-enantiomers (CGA-77101)

INTRODUCTION

Metolachlor (2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide, Dual) is a chloroacetanilide herbicide. Other herbicides in the family are acetochlor, alachlor, butachlor, and propachlor (US EPA, 2001). There are four isomers of metolachlor: two S-enantiomers (named CGA-77102 by Ciba-Geigy Corporation, the US registrant of the pesticide products containing metolachlor) and two R-enantiomers (named CGA-77101 by the registrant) (Figure 1). Technical grade metolachlor (named CGA-24705 by the registrant) is a manufactured 50:50 mixture of the S- and R-enantiomers. S- or alpha-metolachlor (named CGA-77102 by the registrant) is a manufactured 80:20 mixture of the S- and R-enantiomers.

The structural similarity of the R- and S-enantiomers and the compositional similarity of metolachlor and S-metolachlor suggest that the toxicological properties of metolachlor and S-metolachlor may be similar. The limited comparative metabolic and toxicological data on metolachlor and S-metolachlor (US EPA, 1997a,b; Ciba-Geigy, 1996a,b,c,d; Novartis, 1998) are consistent with this proposal. Therefore, the selected ambient water quality value for metolachlor applies to all four isomers of the metolachlor molecule.

Data on the health effects of exposure to metolachlor, including data on chronic (oncogenic and non-oncogenic), developmental, and reproductive effects observed in animals were reviewed and critically evaluated. The selected ambient water quality value for metolachlor (9 ug/L) was derived using the available toxicological data (see bibliography) and the procedures outlined in 6 NYCRR 702.2 through 702.7.

SPECIFIC MCL AND PRINCIPAL ORGANIC CONTAMINANT CLASS (702.3)

Metolachlor does not have a Specific MCL (maximum contaminant level) as defined in 700.1 and is not in a principal organic contaminant (POC) class as defined in 700.1. Consequently, an ambient water quality value cannot be derived under 702.3.

However, the New York State Department of Health (DOH) drinking-water regulations (10 NYCRR Part 5) does have a MCL of 50 ug/L for metolachlor, based on its categorization as an unspecified organic contaminant (UOC). This DOH general MCL applies as a drinking water standard to any organic compound that is not in a POC class and does not have a Specific MCL. However, this UOC MCL is not used as the basis for an ambient water quality value under 702.3.

ONCOGENIC EFFECTS (702.4)

Data on the oncogenic potential of metolachlor in humans were not found. Chronic ingestion of metolachlor induced liver tumors in female rats (two independent studies) and male rats (one study) (Table 1) (US EPA, 1985, 1991, 1993, 1994, 1995, 1997c). No oncogenic effects were observed in male and female mice after two years of dietary ($\leq 3,000$ ppm) exposure to metolachlor (US EPA, 1995, 1999). Male and female mice showed a reduced body weight gain at the highest dose level tested (3,000 ppm in diet), which indicates that the maximum tolerated dose was achieved (US EPA, 1985, 1991). Based on the results of the oncogenicity studies in rats, metolachlor is an oncogen under 700.1(a)(26)(iii).

Data on the activity of metolachlor in short-term tests indicative of oncogenicity are equivocal. Metolachlor was inactive in many short-term tests submitted in support of federal

and state registration (US EPA, 1995; CA EPA, 1997). These tests included point mutation tests in bacteria (Salmonella, with and without metabolic activation by rat liver homogenate, i.e., S9 activation) and in mouse lymphoma cells (in vitro, with and without S9 activation), two in vivo / in vitro unscheduled DNA synthesis (UDS) tests in rat hepatocytes, UDS tests in human fibroblasts (in vitro, without S9 activation) and in rat hepatocytes (in vitro), and tests for chromosome aberrations in Chinese hamster (nucleus anomaly test, in vivo) and in mice (dominant lethal test, in vivo). However, the dominant lethal study in mice and UDS test in human fibroblasts (in vitro) were considered “unacceptable” by federal (US EPA, 1991) and state (California, CA EPA, 1997) toxicologists largely because of concerns that the experimental conditions of the studies did not maximize the potential for detecting genotoxic effects. The US EPA also considered the UDS test in rat hepatocytes (in vitro) and one of the in vivo / in vitro UDS tests in rat hepatocytes as unacceptable for the same reason. Published reports on the activity of metolachlor in other short-term tests provide some evidence on the genotoxicity of metolachlor. A commercial formulation of metolachlor induced point-mutation tests in two of five Salmonella strains and in yeast (Saccharomyces) (Plewa et al., 1984). Specifically, it was mutagenic in Salmonella TA1538 (without S9 activation) and in Salmonella TA100 and yeast (only after S9 activation). Metolachlor (with or without S9 activation) was inactive in all Salmonella strains and in yeast (Plewa et al., 1984). Slamenova et al. (1992) reported that a commercial formulation of metolachlor (Dual) was inactive in cell transformation assays with BHK 21 cells and Syrian hamster embryo cell. Grisolia and Ferrari (1996) reported that metolachlor was inactive in a micronuclei test in mice and an in vitro test for chromosome aberrations with human lymphocytes. Roloff et al. (1992), however, found that metolachlor induced chromosome damage in human lymphocytes (in vitro, without S9 activation) at concentrations that did not inhibit cell growth.

Metabolic activation of the parent compound to genotoxic metabolites may be an important step in the oncogenicity of chloroacetanilide herbicides such as alachlor, acetochlor, and metolachlor). A plausible process underlying the oncogenicity is the metabolic activation of the parent herbicides to electrophilic 2,6-dialkylquinonimine metabolites that readily bond to macromolecules and are genotoxic (US EPA, 2001). Jefferies et al. (1998) found stable metolachlor metabolites that were indicative of the in vivo production of ethylmethylquinonimine (the expected 2,6-dialkylquinonimine metabolite of metolachlor) in rats

exposed to metolachlor. Moreover, Hill et al. (1997) showed that ethylmethylquinonimine induced sister chromatid exchanges in cultured human lymphocytes. These data suggest that metolachlor metabolism may produce genotoxic metabolites.

The preferred approach to assess the human oncogenic risks of low-dose exposures to metolachlor from the results of high-dose studies in animals is to use biologically-based models or case-specific models for humans and animals. These models have not been developed for metolachlor. In the absence of such models, the choice of approach is based on evidence of the oncogenic mode-of-action (i.e., the fundamental obligatory step in the oncogenic process, see Butterworth et al. (1995)). A linear model is used to extrapolate from high to low doses when the evidence on mode-of-action is supportive of linearity at low doses, or alternatively, is insufficient to support a non-linear mode-of-action at low doses (6 NYCRR, 1999; US EPA, 1996a, 1998).

Genotoxicity is strong evidence for a mode-of-action involving direct interaction with DNA and thus, it is strong evidence for the use of a linear model to estimate risks at low doses. Metolachlor was inactive in several, but not all, short-term tests of genotoxicity. Plewa et al. (1984) and Roloff et al. (1992) both reported that metolachlor was active in tests of point mutations and chromosome aberrations. In addition, two recent studies (Jefferies et al., 1998; Hill et al., 1997) provided experimental evidence supportive of the genotoxicity of metolachlor metabolites. Thus, some data are consistent with a genotoxic mode-of-action for metolachlor oncogenicity.

Data on other possible modes-of-action for the oncogenicity of metolachlor are sparse. Metolachlor induced foci of cellular alterations (i.e., small, focal proliferative areas) in the livers of male and female rats (Table 2) and induced cell proliferation in rat liver cells in three different short-term tests (Table 3). These changes may play a role in the oncogenicity of metolachlor because increased cell proliferation increases the opportunity for the transformation of normal cells to malignant cells. However, several areas of uncertainties in the data on cell proliferation preclude a firm conclusion that the mode-of-action for metolachlor oncogenicity is cell proliferation.

First, the data from three short-term tests of liver cell proliferation in rats are inconsistent (Table 3) and do not adequately characterize the dose-response relationship and dose-timing relationship for liver cell proliferation in male and female rats. Results of a single study across doses are inconsistent. In study one, cell proliferation (measured as the percentage of cells in S-phase at 2 or 15 hours) was detected in female rats given a dose of 500 mg/kg, but not in female rats given a higher dose of 1,000 or 1,500 mg/kg). Results from different studies at a given dose are also inconsistent. In females given 500 mg/kg, cell proliferation was detected in two studies (the percentage of cells in S-phase at 15 hours [study one] and at 24 and 48 hours [study two]) but was not detected in study three (BrdU incorporation at 72 hours). In female rats given 1,000 mg/kg, however, cell proliferation was not detected in study one (the percentage of cells in S-phase at 2 or 15 hours) but was detected in study three (BrdU incorporation at 72 hours). In male rats given 500 mg/kg, cell proliferation was not detected in study two (the percentage of cells in S-phase at 24 or 48 hours) but was detected in a study three (BrdU incorporation at 72 hours).

Second, liver cell proliferation tests in female rats were not done at the dose level (150 mg/kg/day) that unequivocally caused liver tumors in females rats chronically exposed (Table 1), thus, there is no direct observational evidence of active cell proliferation after acute exposures to carcinogenic doses. Nor is there metolachlor-specific evidence on other factors (e.g., apoptosis or mitogenesis) that may have a role in the proliferative responses of rats chronically exposed to metolachlor.

Third, even if metolachlor induces cell proliferation at dose levels that induce a carcinogenic response, this does not, in itself, provide sufficient evidence that cell proliferation is the primary the mode-of-action for metolachlor oncogenicity. Empirical evidence on the relationship between cell proliferation and oncogenicity does not support the hypothesis that proliferation itself causes or promotes cancer (Hoel et al., 1988; Huff, 1993; Tennant et al, 1991; Ward et al., 1993). Moreover, there are no data to support a proposal that the dose-response curve for a metolachlor-induced oncogenic process, even if it involves cell proliferation, is non-linear at low doses (Gaylor and Zheng, 1996).

In summary, metolachlor is a liver oncogen whose mode-of-action is unknown. The data

for metolachlor and its metabolites are inadequate to dismiss the role of genotoxicity in the oncogenic process or accept the hypothesis that the mode-of-action for the oncogenic process is non-linear at low doses. Thus, a linear model (i.e., the linearized multistage model for extra risk) was used as the high-to-low dose extrapolation model (702.4(a)).

The dose-response data (see Table 1) for liver tumors (combined incidence of adenomas and carcinomas in male and female rats) from the Hazleton chronic study (data from US EPA, 1993) were used to derive a water quality value based on oncogenic effects (Exhibit 1). These data were chosen because the dose-response in males and females were similar and because the IBT study, although classified by the US EPA as a valid study on the oncogenicity of metolachlor, had deficiencies that led the US EPA to conclude it was a poorer study than the Hazleton study for use in dose-response assessment (US EPA, 1985, 1987, 1991). An important deficiency of the IBT study was inadequate documentation on diet preparation that prevented the US EPA from verifying the dietary dose levels used in the study (US EPA, 1987).

Without sufficient evidence to support the use of an alternative animal-to-human extrapolation model, a trans-species scaling factor based on the assumption that human and animal lifetime cancer risks are equal when daily administered doses are in proportion to body weights raised to the 3/4 power (702.4(e)) was used to estimate the cancer potency of metolachlor. A cancer potency factor of 3.8×10^{-3} per milligram per kilogram body weight per day ($3.8 \times 10^{-3} \text{ (mg/kg/day)}^{-1}$) was derived using procedures consistent with those outlined in paragraphs (a) through (e) of 702.4 (Exhibit 1). Assuming a 70-kg adult drinks 2 liters of water per day for an exposure period of 70 years (702.2(c) and 702.4(f)), the water value corresponding to the lower bound estimate on the dose associated with an excess lifetime human cancer risk of one-in-one-million is 9 ug/L.

NON-ONCOGENIC EFFECTS (702.5)

Metolachlor damaged the liver and kidney and reduced the body weight gain of adult laboratory animals (US EPA, 1995, 1997c). The liver effects (histopathological lesions, increased absolute and relative weights) were more severe than the kidney effects (increased absolute and relative weights). Several studies provide information important and relevant to the

derivation of an acceptable daily intake for metolachlor.

In a two-year study (Ciba-Geigy, 1983) with CD rats fed diets containing metolachlor at 0, 30, 300, or 3000 ppm for 2 years (0, 1.5, 15, or 150 mg/kg/day assuming 1 ppm in diet is equivalent to 0.05 mg/kg/day), the no-observed effect level (NOEL) was 15 mg/kg/day. The study lowest-observed effect level (LOEL) was 150 mg/kg/day based on an increased incidence of liver lesions (foci of cellular alternation) in males and females (see Table 2) and a decreased body weight gain in females. This study also detected an oncogenic effect in females (see Table 1).

In a developmental toxicity study in CD rats given oral metolachlor doses of 0, 30, 100, 300, or 1,000 mg/kg on gestation days 6 through 15, the highest dose but no others induced maternal toxicity (death, salivation, lacrimation, convulsions, reduced body weight gain and food consumption) and reproductive/fetal toxicity (reduced implantations/dam, increased resorptions/dams and post-implantation losses, decreased litter size, and reduced mean fetal body weight) (US EPA, 1995, 1997c). Thus, the no-observed-effect level (NOEL) and lowest-observed-effect level (LOEL) of the study for systemic and reproductive/fetal toxicity are 300 mg/kg/day and 1,000 mg/kg/day, respectively.

In a two-generation reproduction study of male and female CD rats consuming diets containing 0, 30, 300, or 1,000 ppm of metolachlor before, during, and after pregnancy, developmental effects (i.e., decreased pup body weight during lactation) were observed at a dose level (1,000 ppm in diet, adult dose of 76 mg/kg/day) that did not induce systemic toxicity in the adult males and females (US EPA, 1995, 1997c). The mechanism of the decreased pup body weight was not assessed. It could involve the direct effects of metolachlor exposure on the pups, which could occur in utero or post-natally when the pups consume maternal milk, diet, or feces (i.e., coprophagia). Alternatively, it could reflect the effects of metolachlor on maternal behavior or nursing capability. Thus, it is not possible to evaluate the relative sensitivities of the adults and pups to the same daily dose of metolachlor. Nevertheless, the study showed effects in pups when none were seen in adults. Thus, the US EPA Office of Pesticide Programs concluded that the reproductive/developmental NOEL (300 ppm in diet, adult dose of 24 mg/kg/day) was lower than the parental (systemic) toxicity NOEL (1,000 ppm in diet, adult dose \geq 76 mg/kg/day, the highest dose tested).

The US EPA Reference Dose (RfD) Work Group responsible for the metolachlor file on the Integrated Risk Information System (IRIS) had a slightly different interpretation of the study results (US EPA, 2002). The Workgroup concluded, as did the staff of the Office of Pesticide Programs, that the study NOEL for reproductive/developmental effects was 300 ppm in the diet. However, the Workgroup concluded that the parental NOEL was also 300 ppm, not 1,000 ppm as indicated by the Office of Pesticide Programs, because a parental effect (reduced food consumption) was observed at the dietary dose level of 1,000 ppm (Table 3). This reduction did not cause a reduction in body weight gain.

These differing interpretations are not unusual when different scientists review the same data. More importantly, both the US EPA Office of Pesticides and the IRIS Workgroup identified the study NOEL as 24 mg/kg/day.

In a more recent dog study, metolachlor was fed to beagle dogs at dietary dose levels of 0, 100, 300, or 1,000 ppm for up to one year (US EPA, 1995). There are three different interpretations of the study (Table 4). The US EPA and the California EPA both identified the NOEL and LOEL of the study as 300 ppm (9.7 mg/kg/day) and 1,000 ppm (33 mg/kg/day), respectively. The US EPA conclusion was based on the findings of decreased body weight gain (females) at 33 mg/kg/day (US EPA, 1995, 1997c). The California EPA conclusion was based on the findings of significantly increased mean serum alkaline phosphatase levels (females) and significantly decreased body weight gain and food consumption (males and females) at 33 mg/kg/day (CA EPA, 1997). The WHO identified the lowest dose in the study (3.5 mg/kg/day) as the NOEL and based their determination on an "apparent decrease in kidney weight" at the two highest dose levels (9.7 mg/kg/day and 33 mg/kg/day) of the study (WHO, 1996). This conclusion contradicts those of the US EPA Office of Pesticide Programs and the California EPA. Moreover, the effect (decreased kidney weights) was not observed in any other study with metolachlor (US EPA, 1995, 1997c). Given these differing interpretations, the NOEL and LOEL from the dog study of 300 ppm (9.7 mg/kg/day) and 1,000 ppm (33 mg/kg/day), respectively, appear (based on the data) to have greater support.

The rat studies and the dog study are comparable in quality. The one-year dog study is

preferred over the rat studies as the basis of the reference dose because it is a more sensitive assay. The NOEL from the dog study (9.7 mg/kg/day) is lower than the NOELs from the rat study (15 and 24 mg/kg/day); moreover, the values and spacing of the NOEL (9.7 mg/kg/day) and the LOEL (33 mg/kg/day) from the dog study do not exclude the possibility that female dogs could show effects at 15 or 24 mg/kg/day (the rat NOELs). Thus, the dog study is selected as the basis for the non-oncogenic water quality value.

If an uncertainty factor of 1,000 is applied to the NOEL of 9.7 mg/kg/day identified in the dog study, an acceptable daily intake of 0.0097 mg/kg/day (9.7 ug/kg/day) can be derived for metolachlor using procedures consistent with those outlined in paragraphs (a) and (b) of 702.5. Under 702.5(b)(2), an uncertainty factor of 100 is selected because the acceptable daily intake is based on a NOEL from a chronic animal study and experimental results from prolonged exposures of humans are unavailable. However, 702.5(b) also states that the magnitude of the uncertainty factor used to obtain an acceptable daily intake shall reflect the quantity and quality of the toxicological data, the degree of confidence in the data and the nature of the effects of concern. Consequently, an additional uncertainty factor of 10 is used because the acceptable daily intake is based on effects in adult dogs and data suggest that immature organisms (e.g., young dogs or children) may be more sensitive to the effects of metolachlor than adult organisms (e.g., adult dogs or humans). Specifically, the results of the two-generation reproduction study of metolachlor in rats showed that newborn rat pups were affected at a maternal dose level that did not affect the health of their mothers. This potential was not assessed in the dog study.

An ambient water quality value of 68 ug/L is derived assuming a 70-kg adult drinks 2 liters of water per day and allowing 20% of the acceptable daily intake (9.7 ug/kg/day) to come from drinking water (702.2(c) and 702.5(c)).

CHEMICAL CORRELATION (702.7)

A value based on chemical correlation was not derived because the toxicity data are sufficient to derive values based on oncogenic effects (702.4) and non-oncogenic effects (702.5).

OTHER WATER QUALITY GUIDELINES AND STANDARDS

The US EPA (1996b) has a lifetime health advisory of 70 ug/L for metolachlor. It is based on a NOEL of 9.7 mg/kg/day from a one-year dog study and an uncertainty factor of 1,000 (100 to compensate for interspecies differences and human variation and an additional 10 for possible carcinogenicity), assuming a 70-kg adults drinks 2 liters of water per day and allocating 20% of the reference dose to drinking water. The World Health Organization (WHO) derived a guideline value of 10 ug/L (rounded off value) for metolachlor in drinking water, assuming a 60-kg adult drinks 2 liters of water per day and allocating 10% of the their reference dose (0.0035 mg/kg/day) to drinking water (WHO, 1996). The guideline was based on the application of an uncertainty factor of 1,000 (100 to compensate for interspecies differences and human variation and an additional 10 because of some concern regarding carcinogenicity) to a NOEL (decreased kidney weights) of 3.5 mg/kg/day identified in a one-year study in dogs.

SELECTION OF VALUE

According to 702.2(b), the selected ambient water quality value shall be the most stringent of the values derived using the procedures found in 702.3 through 702.7. This value is 9 ug/L (based on oncogenic effects) and is the value selected as the ambient water quality value for metolachlor.

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SEARCH STRATEGY

Toxline (1981 to March 2002) was searched using metolachlor as the keyword.

Bureau of Toxic Substance Assessment
New York State Department of Health/KGB02
11/28/06 1:30 PM

EXHIBIT 1. WORKSHEET FOR DERIVATION OF ONCOGENIC VALUE FOR METOLACHLOR

1. References

Ciba-Geigy (Ciba-Geigy Corporation, Agricultural Division). 1983. Two-Year Chronic Oral Toxicity and Oncogenicity Study with Metolachlor in Albino Rats. Final Report Study No. 80030. Madison, WI: Hazleton Raltech, Inc., Hazleton Laboratories America, Inc.

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2. Dose-Response Data for High-to-Low Dose Extrapolation Using TOX RISK Software

Oncogenic Effect	Combined incidence of liver adenomas and carcinomas in male and female CD rats
Dose Regime	0, 30, 300, and 3,000 ppm in diet for 104 weeks
Rat Body Weight	0.57 kg (average weight (all doses) of females (0.43 kg) and males (0.71 kg); based average weights on weeks 20, 40, 60, 80, 100)
Daily Doses	0, 1.5, 15, and 150 mg/kg/day (assume 1 ppm in diet = 0.05 mg/kg/day)
Incidence*	3/116, 3/117, 5/117, and 14/117

* denominator is number of animals alive when first liver tumors was detected (week 53).

3. Derivation of Cancer Potency Factor

Lower Bound on Dose Corresponding to Excess Lifetime Risk of One-in-One Million (1×10^{-6})

Rat daily dose	= 0.88 ug/kg/day (TOX RISK (linearized multistage model) estimate of 95% lower bound on dose associated with a 1×10^{-6} incidence)
Human daily dose at 1×10^{-6} risk level)	= $0.88 \text{ ug/kg/day} \times (0.57 \text{ kg}/70 \text{ kg})^{0.25} = 0.26 \text{ ug/kg/day}$
Cancer potency factor	= $1 \times 10^{-6} \text{ risk level}/1 \times 10^{-6} \text{ human dose (0.26 ug/kg/day)}$ = $3.8 \times 10^{-6} \text{ per ug/kg/day} = 3.8 \times 10^{-3} \text{ per mg/kg/day}$

4. Derivation of Ambient Water Quality Value

Water value	= (human dose at 1×10^{-6} risk level x human body weight) / water consumption rate = $(0.26 \text{ ug/kg/day} \times 70 \text{ kg})/2 \text{ L/day}$ = 9 ug/L
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Table 1. Incidences of Liver Tumors in Rats after Chronic Ingestion of Metolachlor.

Dietary Concentration (ppm)	Estimated Dose ¹ (mg/kg/day)	Incidence ²		
		Males	Females	Both Sexes
IBT Study with CD Rats (US EPA, 1991)				
0 (control)	0	nd (no data)	1/54**	nd
30	1.5	nd	1/58	nd
300	15	nd-	3/60	nd
1,000	50	nd	3/60	nd
3,000	150	nd	11/60**	nd
Hazleton Study with CD Rats (US EPA, 1993)				
0 (control)	0	3/58*	0/58**	3/116**
30	1.5	2/57	1/60	3/117
300	15	3/59	2/58	5/117
3,000	150	7/60	7/57**	14/117**

¹ 1 ppm in diet = 0.05 mg/kg/day.

² Significance of trend (Cochran-Armitage trend test) denoted at control; significance of pair-wise comparison with control (Fisher's exact test) denoted at dose level: if * then $p \leq 0.05$, if ** then $p < 0.01$.

Table 2. Incidences of Liver Foci in Rats after Chronic Ingestion of Metolachlor.

Dietary Concentration (ppm)	Estimated Dose ¹ (mg/kg/day)	Incidence ²	
		Males	Females
<i>CD Rats (Ciba-Geigy, 1983)</i>			
0 (control)	0	19/59	13/60**
30	1.5	24/59	15/60
300	15	22/60	18/60
3,000	150	29/60*	34/60**

¹ 1 ppm in diet = 0.05 mg/kg/day.

² Significance of trend (Cochran-Armitage trend test) denoted at control; significance of pair-wise comparison with control (Fisher's exact test) denoted at dose level: if * then $p \leq 0.05$, if ** then $p < 0.01$.

Table 3. Dose-Response Data from Cell Proliferation Bioassays in Rat Liver Cells after Exposure to Single Oral Doses of Metolachlor.

Oral Dose (mg/kg)	Study One: Percentage of cells in S-phase at 2 or 15 hrs²	Study Two: Percentage of cells in S-phase at 24 or 48 hrs³	Study Three: BrdU¹ incorporation at 72 hrs⁴
<i>Females</i>			
3	nt (not tested)	- (no effect)	nt
30	nt	-	nt
150	nt	nt	nt
300	nt	+	nt
500	++** (15 hr only)	+	-
1,000	-	nt	++**
1,500	-	nt	nt
<i>Males</i>			
3	nt	-	nt
30	nt	-	nt
150	nt	nt	-
300	nt	-	nt
500	nt	-	++**
1,000	nt	nt	nt
1,250	-	nt	nt
2,500	-	nt	nt
4,000	-	nt	nt

*Increased, but results of statistical tests not reported.

**Increased, p<0.01.

¹Bromodeoxyuridine.

²Ciba-Geigy (1994a); US EPA (1994).

³Ciba-Geigy (1988); classified as “unacceptable” for FIFRA purposes by US EPA (1991).

⁴Ciba-Geigy (1994b); US EPA (1994); Novartis (1998).

NOTE: Dose levels used in Hazleton oncogenicity study **in bold print**.

Table 3. Identification of NOELs and LOELs in Reproductive Study in Rats fed Metolachlor.

US EPA	Dietary Concentration (ppm)		Effect
	NOEL	LOEL	
US EPA Office of Pesticide Programs (1995, 1997c)			
adult toxicity	1,000 (HDT)*		none
developmental toxicity	300	1,000	decreased pup body weight during lactation
US EPA (2002) IRIS			
adult toxicity	300	1,000	decreased food consumption
developmental toxicity	300	1,000	decreased pup body weight during lactation

*Highest dose tested

Table 4. Identification of NOEL and LOEL in One-Year Dog Study with Metolachlor.

Agency	Oral dose (mg/kg/day)		Effect
	NOEL	LOEL	
US EPA (1995)	9.7*	33**	decreased body weight gain (female dogs)
CA EPA (1997)	9.7*	33**	increased mean serum alkaline phosphatase level (female dogs); decreased body weight gain and food consumption (male and female dogs)
WHO (1996)	3.5***	9.7*	“apparent decrease in kidney weight”

*Daily dose at dietary level of 300 ppm.

**Daily dose at dietary level of 1,000.

***Daily dose at dietary level of 100 ppm.