## OHIO RIVER VALLEY WATER SANITATION COMMISSION

# POLLUTION CONTROL STANDARDS
# (September 13, 1984 Revision)

## NOTICE OF REQUIREMENTS

ESTABLISHED BY POLLUTION CONTROL STANDARDS
FOR DISCHARGES TO THE OHIO RIVER
September 13, 1984 Revision

You are hereby notified that, having considered all the evidence presented at public hearings, the Ohio River Valley Water Sanitation Commission, at its regularly held meeting on September 13, 1984, acting in accordance with and pursuant to the authority contained in Article VI of the Ohio River Valley Water Sanitation Compact, adopted and promulgated, subject to revision as changing conditions require, Pollution Control Standards (September 13, 1984 Revision) for the modification or treatment of all sewage from municipalities or other political subdivisions, public or private institutions, corporations, or watercraft, and for the modification or treatment of all industrial wastes discharged or permitted to flow into the Ohio River from the point of confluence of the Allegheny and Monongahela Rivers at Pittsburgh, Pennsylvania, designated as Ohio River mile point 0.0, to Cairo Point, Illinois, located at the confluence of the Ohio and Mississippi Rivers, and being 981.0 miles downstream from Pittsburgh, Pennsylvania.

Under terms and provisions of the Ohio River Valley Water Sanitation Compact all sewage from municipalities or other political subdivisions, public or private institutions, corporations or watercraft and all industrial wastes discharged or permitted to flow into the Ohio River will be required to be modified or treated to the extent specified in the standards established as above set forth.

The Commission at its September 13, 1984 meeting also rescinded both Pollution Control Standard No. 1-70 and Pollution Control Standard No. 2-70, which were established by Commission action November 13, 1970, including all definitions and application procedures appended to or incorporated therein, together with such other treatment standards and regulatory actions as have been heretofore adopted.

Leo Weaver
Executive Director and Chief Engineer

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The Ohio River Valley Water Sanitation Commission

An interstate Commission created by compact among: Illinois • Indiana • Kentucky • New York • Ohio • Pennsylvania • Virginia • West Virginia •
Headquarters: 414 Walnut Street, Cincinnati, Ohio 45202

# I. PREAMBLE[a]

Pollution control standards implement many decisions affecting water quality of the Ohio River and the uses made thereof. The Ohio River Valley Water Sanitation Compact provides the basis for assuring multipurpose uses of the Ohio River, and authorizes the Commission to promulgate standards of treatment for sewage or industrial wastes. It also states that: "The guiding principle of this Compact shall be that pollution by sewage or industrial wastes originating within a signatory state shall not injuriously affect the various uses of the interstate waters as hereinbefore defined."

The purpose of these regulations, therefore, is to recognize those uses to be protected in the Ohio River, establish stream criteria to assure that the uses will be achieved, and set Standards of Treatment needed to attain the established stream criteria and parameter levels. These regulations also implement the formal decisions of the Commission as they are concerned with pollution control activities, the granting of variances upon justification and recognize that individual states may adopt more stringent regulations.

Article IX of the Compact grants the Commission certain enforcement powers. These regulations must be implemented in the issuance of any permit to a discharger to the mainstem of the Ohio River (unless the state or the Federal government has a more stringent regulation).

# II. DEFINITIONS

A. *"Cooling Water"* means non-contact cooling water used as a heat transfer medium for once-through cooling or cooling tower blowdown to which no Industrial Wastes, Toxic Wastes, Residues from Potable Water Treatment Plants, untreated Sewage, or Other Wastes, exclusive of approved anti-fouling agents (e.g., chlorine) are added prior to discharge.

*B. *"Compact,"* as used in these regulations, means the Ohio River Valley Water Sanitation Compact and is an agreement entered into by and between the states of Indiana, West Virginia, Ohio, New York, Illinois,

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[a] Specific Standards of Treatment are established in these regulations and must be incorporated into discharge permits upon issuance or reissuance when they are more stringent than:

1. applicable US EPA technology-based effluent guidelines required under Section 301 of the Federal Clean Water Act, or
2. any state treatment requirements, effluent standards, or water quality based effluent limitations.

In the absence of promulgated Federal effluent guidelines pursuant to Section 301 of the Clean Water Act, the Compact signatory states have the responsibility to establish effluent limitations to be included in any discharge permit, consistent with the standards contained herein using Best Professional Judgment on a case by case basis.

Kentucky, Pennsylvania, and Virginia, which pledges each to the other of the signatory states faithful cooperation in the control of future pollution and abatement of existing pollution from the waters in the Ohio River basin. This compact created the Ohio River Valley Water Sanitation Commission (ORSANCO).

*C. *"Industrial Wastes"* means any liquid, gaseous, solid materials or waste substances or combination thereof other than Cooling Water as herein defined, resulting from any process or operation including storage and transportation, manufacturing, commercial, agricultural, and government operations.

D. *"Mixing Zone"* means that portion of the water body receiving a discharge where effluent and receiving waters are not totally mixed and uniform with the result that the zone is not representative of the receiving waters and may not meet all ambient water quality standards or other requirements of any signatory state applicable to the particular receiving waters.

E. *"Net Discharge"* is determined by excluding the amount of pollutant in an influent when determining the quality of an effluent if both the intake and discharge are from and to the same body of water.

F. *"96 hour $LC_{50}$"* as used in these standards means the concentration that kills 50 percent of the test organisms within 96 hours. The test organisms shall be Representative Important Species indigenous to the Ohio River.

G. *"Non-Cumulative Substances"* means compounds which have a biological half-life of less than four days. All other compounds are cumulative substances.

*H. The *"Ohio River,"* as used in these regulations, extends from the point of confluence of the Allegheny and Monongahela Rivers at Pittsburgh, Pennsylvania, designated as Ohio River mile-point 0.0 to Cairo Point, Illinois, located at the confluence of the Ohio and Mississippi Rivers and being 981.0 miles downstream from Pittsburgh.

*I. *"Ohio River Valley Water Sanitation Commission"* (Commission) means a body corporate created by authority of the Compact and is the operating agency established to implement the Compact. It consists of three (3) representatives of each signatory state and three (3) representatives of the Federal government.

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*Terms contained in the Ohio River Valley Water Sanitation Compact

J. *"Other Wastes"* means any waste other than Sewage, Cooling Water, Residues from Potable Water Treatment Plants, Industrial Wastes or Toxic Wastes, which if discharged to the Ohio River could cause or contribute to any violations of these regulations, or of any water quality standards of any signatory state or which may be deleterious to the designated uses of those waters.

K. *"Primary Contact Recreation"* means recreational activities where the human body may come in direct contact with water to the point of complete body submergence and where ingestion of the water is probable.

L. *"Representative Important Species"* means those species of aquatic life whose protection and propagation will assure the sustained presence of a balanced indigenous community. Such species are representative in the sense that maintenance of suitable water quality conditions will assure the overall protection and sustained propagation of the balanced indigenous community.

M. *"Residues from Potable Water Treatment Plants"* means those wastes emanating from processes used in water purification. Such processes may include sedimentation, chemical coagulation, filtration, iron and manganese removal, softening and disinfection.

*N. *"Sewage"* means water-carried human or animal wastes from such sources as residences; industrial, commercial or governmental establishments; public or private institutions; or other places. The admixture of Sewage with Industrial Wastes, Toxic Wastes or Other Wastes, in amounts detrimental to the quality of the combined effluent shall also be regarded as Sewage.

*O. *"Standards of Treatment"* means the degree of processing of wastes necessary to meet the specific discharge limitations provided by these regulations but does not prescribe the methodology.

*P. *"Substantially Complete Removal"* means removal to the lowest practicable level attainable with current technology.

Q. *"Toxic Wastes"* means wastes containing substances or combinations of substances which might reasonably be expected to cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, including malfunctions in reproduction, or physical deformations in fish, other aquatic life, wildlife, livestock, or humans.

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*Terms contained in the Ohio River Valley Water Sanitation Compact

## III. DESIGNATED USES

The Ohio River, as hereinbefore defined, has been designated by the Compact for safe and satisfactory use as public and industrial water supplies after reasonable treatment, suitable for recreational usage, capable of maintaining fish and other aquatic life and adaptable to such other uses as may be legitimate.

## IV. STREAM CRITERIA

A. The stream criteria which these regulations are intended to achieve in the receiving waters outside the Mixing Zone are as follows:

1. Freedom from anything that will settle to form putrescent or otherwise objectionable sludge deposits which interfere with designated water uses;

2. Freedom from floating debris, scum, oil (in whatever state, i.e., free, emulsified, dispersed and dissolved), and other floating material in amount sufficient to be unsightly or deleterious;

3. Freedom from materials producing color or odors in such a degree as to create unaesthetic conditions or a nuisance;

4. Freedom from substances in concentrations which are toxic or harmful to humans, animals, or fish and other aquatic life; which would in any manner adversely affect the flavor, color, odor, or edibility of fish and other aquatic life, wildlife or livestock; or which are otherwise detrimental to the designated uses specified in Section III.

B. These criteria relate to the conditions of waters as affected by the direct and indirect discharges of Sewage, Industrial Wastes, Toxic Wastes, Other Wastes, Cooling Water or Residues from Potable Water Treatment Plants. They also include consideration of permanent alterations of the water body such as channeling, diversions, or impoundment. The natural waters of the Ohio River may have characteristics which do not meet the stream criteria and parameter levels set forth below.

C. To assure that the foregoing criteria will be attained, the following parameter levels shall be met outside the Mixing Zone:

1. DISSOLVED OXYGEN: Concentrations shall average at least 5.0 mg/1 per calendar day and shall not be less than 4.0 mg/1 at any time provided that a minimum of 5.0 mg/1 at any time is maintained during the April 15-June 15 spawning season.

2. TEMPERATURE: Allowable stream temperatures are:

| MONTH/DATE | PERIOD AVERAGE (°F) | INSTANTANEOUS MAXIMUM (°F) |
|---|---|---|
| January 1-31 | 45 | 50 |
| February 1-29 | 45 | 50 |
| March 1-15 | 51 | 56 |
| March 16-31 | 54 | 59 |
| April 1-15 | 58 | 64 |
| April 16-30 | 64 | 69 |
| May 1-15 | 68 | 73 |
| May 16-31 | 75 | 80 |
| June 1-15 | 80 | 85 |
| June 16-30 | 83 | 87 |
| July 1-31 | 84 | 89 |
| August 1-31 | 84 | 89 |
| September 1-15 | 84 | 87 |
| September 16-30 | 82 | 86 |
| October 1-15 | 77 | 82 |
| October 16-31 | 72 | 77 |
| November 1-30 | 67 | 72 |
| December 1-31 | 52 | 57 |

3. pH: No value below 6.0 nor above 9.0.

4. TOXIC SUBSTANCES:

   a. Non-Cumulative Substances — not to exceed one-tenth (0.1) of the 96 hour $LC_{50}$ of Representative Important Species indigenous to the Ohio River.

   b. Cumulative Substances — not to exceed one one-hundredth (0.01) of the 96 hour $LC_{50}$ of Representative Important Species indigenous to the Ohio River.

   c. Other limiting concentrations may be used when justified on the basis of available evidence and approved by the appropriate regulatory agency or agencies.

5. BACTERIA

   Maximum allowable level of fecal coliform for Primary Contact Recreation — Content (either MPN or MF count) shall not exceed 200/100 ml as a monthly geometric mean based on not less than five samples per month; nor exceed 400/100 ml in more than ten percent of all samples taken during the month; these limits are applicable to waters designated for recreational use during the recreation season (May through October).

   Maximum allowable level of fecal coliform for other uses — Fecal coliform content (either MPN or MF count) shall not exceed 2,000/100 ml as a monthly geometric mean based on not less than five samples per month.

6. DISSOLVED SOLIDS: Not to exceed 500 mg/1 as a monthly average value, nor exceed 750 mg/1 at any time. (Equivalent 25 deg. C specific conductance values are 800 and 1,200 micromhos/cm.)

7. AMMONIA: The concentration of un-ionized ammonia (as $NH_3$) shall not exceed 0.05 mg/1; un-ionized ammonia shall be determined from values shown in Appendix B for total ammonia-N, pH and temperature and the following equation:

$$Y = \frac{1.2 \text{ (Total ammonia-N)}}{[1 + 10^{(pk_a - pH)}]}$$

$$pk_a = 0.0902 + \frac{2730}{(273.2 + T)}$$

T = Temperature degree C.

Y = Un-ionized ammonia

8. CHEMICAL CONSTITUENTS: Not to exceed the concentrations in the following table at any time (dissolved limits, where applicable, are identified):

| CONSTITUENTS | CONCENTRATION (mg/1) |
|---|---|
| Arsenic | 0.05 |
| Barium | 1.0 |
| Cadmium | 0.01 |
| Chloride | 250 |
| Chromium (hexavalent) | 0.05 |
| Cyanide | 0.025 |
| Fluoride | 1.0 |
| Lead (dissolved) | 0.05 |
| Mercury | 0.0002 |
| Nitrite-N + Nitrate-N | 10 |
| Nitrite-N | 1.0 |
| Phenol (phenolic materials) | 0.01 |
| Selenium | 0.01 |
| Silver | 0.05 |
| Sulfate | 250 |

Copper:

| TOTAL HARDNESS AS CALCIUM CARBONATE (mg/l) | CONCENTRATION (mg/l) |
|---|---|
| 50 | 0.012 |
| 80 | 0.018 |
| 100 | 0.022 |
| 160 | 0.034 |
| 200 | 0.043 |

Zinc:

| Total Hardness As Calcium Carbonate (mg/1) | Concentration (mg/1) |
|---|---|
| 0-80 | 0.040 |
| 81-120 | 0.055 |
| 121-160 | 0.070 |
| 161-180 | 0.095 |
| 181-200 | 0.115 |

9. Radionuclides: Gross total alpha activity (including radium-226 but excluding radon and uranium) shall not exceed 15 picocurie per liter (pCi/1) and combined radium-226 and radium-228 shall not exceed 5 pCi/1; provided that specific determinations of radium-226 and radium-228 are not required if gross particle activity does not exceed 5 pCi/1. Concentration of total gross beta particle activity shall not exceed 50 pCi/1; the concentration of tritium shall not exceed 20,000 pCi/1; the concentration of total strontium-90 shall not exceed 8 pCi/1.

# V. STANDARDS OF TREATMENT

## A. General

1. No discharge of any Sewage, Industrial Wastes, Toxic Wastes, Other Wastes, Cooling Water or Residues from Potable Water Treatment Plants shall cause or contribute to a violation of these regulations, shall preclude the attainment of any designated use of the mainstem waters of the Ohio River or shall interfere with the attainment of the stream criteria and parameter levels set forth in Section IV.

2. All discharge of Sewage, Industrial Wastes, Toxic Wastes, Other Wastes, Cooling Water or Residues from Potable Water Treatment Plants shall be treated or otherwise modified so as to provide:

   a. Substantially Complete Removal of settleable solids, which may form sludge deposits;

   b. Substantially Complete Removal of oil (in whatever state, including free, emulsified, dispersed and dissolved), debris, scum, and other floating material;

   c. Reduction of total suspended solids and other materials to such a degree that the discharge will not produce a substantial negative visible contrast to natural conditions in turbidity, color or odor of the river, or impart taste to the potable water supplies or cause tainting of fish flesh;

d. Reduction of all substances in amounts which, when concentrated or combined in the receiving stream, would result in conditions toxic or harmful to humans, animals, or fish and other aquatic life; which would in any manner adversely affect the flavor, color, odor, or edibility of fish and other aquatic life, wildlife or livestock; or which are otherwise detrimental to the designated water uses specified in Section III.

## B. Sewage

### 1. Minimum level of treatment

The minimum level of treatment required for sewage prior to discharge shall meet the following standards in addition to those contained in Section V.A.

a. Biochemical Oxygen Demand (five day)

i. The arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 30 milligrams per liter.

ii. The arithmetic mean of the values for effluent samples collected in a period of 7 consecutive days shall not exceed 45 milligrams per liter.

b. Suspended Solids

i. The arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 30 milligrams per liter.

ii. The arithmetic mean of the values for effluent samples collected in a period of 7 consecutive days shall not exceed 45 milligrams per liter.

c. pH

The effluent values for pH shall be maintained within the limits of 6.0 to 9.0.

d. Bacteria

Reduction of fecal coliform bacteria to such degree that (1) during the months of May through October fecal coliform density in the discharge does not exceed 200/100 ml as a monthly geometric mean (based on not less than ten samples per month), nor exceed 400/100 ml in more than ten percent of the samples examined during a month, and (2) during the months of November through April the den-

sity does not exceed 1,000/100 ml as a monthly geometric mean (based on not less than ten samples per month), nor exceed 2,000/100 ml in more than ten percent of the samples examined during a month.

2. ALTERNATIVE TREATMENT

Notwithstanding the requirements of Section V.B.1(a), (b), and (c), such facilities as oxidation ponds, lagoons and ditches, and trickling filters shall be deemed to provide effective treatment provided that the effluent does not cause a violation of the states' applicable water quality standards, or these regulations.

## C. Industrial Wastes, Toxic Wastes and Other Wastes

1. The treatment of Industrial Wastes, Toxic Wastes, and Other Wastes prior to discharge shall be in accordance with Section V.A.

2. In addition, a Net Discharge of the following toxic pollutants is hereby prohibited:

   a. Aldrin (1, 2, 3, 4, 10, 10-hexachloro-1, 4, 4a, 5, 8, 8a-hexahydro-1, 4-endo-5, 8-exo-dimethanonaphthalene)

   b. Dieldrin (1, 2, 3, 4, 10, 10-hexachloro-6, 7-epoxy-1, 4, 4a, 5, 6, 7, 8, 8a-octahydro-1, 4-endo-5, 8-exo-dimethano-naphthalene)

   c. DDT, including DDD and DDE

      1. DDT means 1, 1, 1-trichloro-2, 2-bis (p-chlorophenyl) ethane and some o, p′-isomers

      2. DDD (TDE) means 1, 1-dichloro-2, 2-bis (p-chlorophenyl) ethane and some o, p′-isomers

      3. DDE means 1, 1-dichloro-2, 2-bis (p-chlorophenyl) ethylene

   d. Endrin (1, 2, 3, 4, 10, 10-hexachloro-6, 7-epoxy-1, 4, 4a, 5, 6, 7, 8, 8a-octahydro-1, 4-endo-5, 8-endo-dimethano-naphthalene)

   e. Toxaphene - a material consisting of technical grade chlorinated camphene having the approximate formula of $C_{10}H_{10}Cl_8$ and normally containing 67-69 percent chlorine by weight

f. Benzidine - the compound benzidine and its salts as identified by the chemical name 4, 4-diaminobiphenyl

g. Polychlorinated Biphenyls (PCB) - a mixture of compounds composed of the biphenyl molecule which has been chlorinated to varying degrees

D. **Residues from Potable Water Treatment Plants**

The use of controlled discharge for Residues from Potable Water Treatment Plant processes of sedimentation, coagulation and filtration may be authorized provided that as a minimum the discharge meets all the requirements of Section IV. A. and V.A.

## VI. MIXING ZONE DESIGNATION

A. A Mixing Zone shall be deemed to exist for each discharge. When required, the specific numerical limits for any Mixing Zone shall be determined on a case by case basis, and shall include considerations for existing uses, linear distance (i.e., length and width) from the point of discharge, surface area involved, and volume of receiving water within the defined zone.

B. Conditions within the Mixing Zone shall not be injurious to human health, in the event of a temporary exposure.

C. Conditions within the Mixing Zone shall not be lethal to aquatic life or wildlife that may enter the zone.

D. The Mixing Zone shall be free from substances attributable to Sewage, Industrial Wastes, Toxic Wastes, Other Wastes, Cooling Water, or Residues from Potable Water Treatment Plants in quantities which:

1. Settle to form sludge deposits;
2. Float as debris, scum, or oil;
3. Contaminate natural sediments so as to cause or contribute to a violation of:
   a. appropriate stream criteria and parameter levels outside the Mixing Zone, or
   b. any condition of the designated uses of the water;
4. Impart a disagreeable flavor or odor to flesh of fish or other aquatic life, wildlife or livestock which are consumed by man and which ac-

## X. ANALYTICAL METHODS

Tests or analytical determinations to determine compliance or non-compliance with the Standards of Treatment, stream criteria and parameter levels established hereby shall be made in accordance with accepted procedures such as those contained in the most recent edition of (a) *Standard Methods for the Examination of Water and Wastewater* prepared and published jointly by the American Public Health Association (APHA), American Water Works Association (AWWA), and Water Pollution Control Federation; (b) *Annual Book of ASTM Standards Part 31 — Water* published by the American Society for Testing and Materials; (c) 40 CFR 136 — *Guidelines Establishing Test Procedures for the Analysis of Pollutants* by the U.S. Environmental Protection Agency; or (d) by such other methods as are approved by the Commission equal to or superior to or not available within methods in documents listed above, provided such other test methods are available to the public.

## XI. SEVERABILITY CLAUSE

Should any one or more of the Pollution Control Standards hereby established or should any one or more provision of the regulations herein contained be held or determined to be invalid, illegal or unenforceable, for any reason whatsoever, all other Standards and other provisions shall remain effective and shall be construed, applied and enforced as if the invalid, illegal or unenforceable language had not been included.

## APPENDIX A

CRITICAL FLOW VALUES

| River Reach | | |
|---|---|---|
| From | To | Critical Flow in cfs* |
| Pittsburgh | Montgomery Dam (MP 32.4) | 4,800 |
| Montgomery | Willow Island Dam (MP 161.8) | 5,800 |
| Willow Island | Gallipolis Dam (MP 279.2) | 6,800 |
| Gallipolis | Greenup Dam (MP 341.0) | 8,500 |
| Greenup | Meldahl Dam (MP 436.2) | 9,800 |
| Meldahl | McAlpine Dam (MP 605.8) | 11,000 |
| McAlpine | Uniontown Dam (MP 846.0) | 13,000 |
| Uniontown | Smithland Dam (MP 918.5) | 18,800 |
| Smithland | Cairo Point (MP 981.0) | 46,300 |

* Minimum 7 day, 10 year low flow based on calculations by the U.S. Corps of Engineers

quire such a flavor because of passage through or ingestion of the waters from the Mixing Zone.

E. The Mixing Zone shall be located so as not to interfere significantly with migratory movements and passage of fish, other aquatic life and wildlife. No waste discharge related to the Mixing Zone shall, outside the limits of the Mixing Zone, interfere with potable water supply intakes, bathing areas, reproduction of fish, other aquatic life and wildlife; or adversely affect fish or aquatic life normally inhabiting waters prior to addition of waste discharged; or result in any other violations of appropriate stream criteria and parameter levels relating to the designated use at or above critical river flow as shown in Appendix A.

## VII. ADDITIONAL TREATMENT

In order to protect the public health or the uses specified in Section III, such higher degrees of treatment or reduction in waste loads may be determined to be necessary by the Commission after investigation, due notice and hearing.

## VIII. LIMITATION

Nothing contained in these regulations shall be construed to limit the powers of any state signatory to the Compact to promulgate more stringent criteria, conditions and restrictions to further lessen or prevent the pollution of waters within its jurisdiction.

## IX. VARIANCE

A. The Commission may grant a variance from the provisions in Section V of these regulations, in accordance with the following procedures, provided that the uses set forth in Section III are maintained:

1. The burden of proof is upon the applicant to assure that the uses set forth in Section III are maintained;
2. Prior concurrence of the state where the applicant's discharge is located and those state(s) which may be affected must be obtained;
3. The specific reasons for the variance shall be clearly stated in writing;
4. Such additional information shall be provided to the Commission as it may request.

B. A variance may be granted for a period not to exceed the life of the applicable discharge permit; the applicant may apply for a variance renewal prior to the expiration of the permit.

# APPENDIX B

Concentrations of total Ammonia-N which contain an un-ionized ammonia concentration of 0.05 mg/1 $NH_3$

| Temp. (°C) \ pH | 6.7 | 6.8 | 6.9 | 7.0 | 7.1 | 7.2 | 7.3 | 7.4 | 7.5 | 7.6 | 7.7 | 7.8 | 7.9 | 8.0 | 8.1 | 8.2 | 8.3 | 8.4 | 8.5 | 8.6 | 8.7 | 8.8 | 8.9 | 9.0 | 9.1 | 9.2 | 9.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | | | | | | | | 13.2 | 10.5 | 8.4 | 6.6 | 5.3 | 4.2 | 3.4 | 2.7 | 2.1 | 1.7 | 1.4 | 1.1 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 |
| 6 | | | | | | | | 12.3 | 9.8 | 7.8 | 6.2 | 4.9 | 3.9 | 3.1 | 2.5 | 2.0 | 1.6 | 1.3 | 1.0 | 0.8 | 0.7 | 0.5 | 0.4 | 0.4 | 0.3 | 0.2 | — |
| 7 | | | | | | | | 11.2 | 8.9 | 7.1 | 5.7 | 4.5 | 3.6 | 2.9 | 2.3 | 1.8 | 1.5 | 1.2 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | |
| 8 | | | | | | | 13.2 | 10.5 | 8.4 | 6.6 | 5.3 | 4.2 | 3.4 | 2.7 | 2.1 | 1.7 | 1.4 | 1.1 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | |
| 9 | | | | | | | 12.0 | 9.6 | 7.6 | 6.1 | 4.8 | 3.8 | 3.1 | 2.4 | 1.9 | 1.6 | 1.2 | 1.0 | 0.8 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | — | |
| 10 | | | | | | | 11.2 | 8.9 | 7.1 | 5.7 | 4.5 | 3.6 | 2.9 | 2.3 | 1.8 | 1.5 | 1.2 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | | |
| 11 | | | | | | 13.2 | 10.5 | 8.4 | 6.6 | 5.3 | 4.2 | 3.4 | 2.7 | 2.1 | 1.7 | 1.4 | 1.1 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | | |
| 12 | | | | | | 12.1 | 9.6 | 7.6 | 6.1 | 4.8 | 3.8 | 3.1 | 2.4 | 1.9 | 1.6 | 1.2 | 1.0 | 0.8 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | — | | |
| 13 | | | | | | 11.2 | 8.9 | 7.1 | 5.7 | 4.5 | 3.6 | 2.9 | 2.3 | 1.8 | 1.5 | 1.2 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | | | |
| 14 | | | | | 13.2 | 10.5 | 8.4 | 6.6 | 5.3 | 4.2 | 3.4 | 2.7 | 2.1 | 1.7 | 1.4 | 1.1 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | | | |
| 15 | | | | | 12.1 | 9.6 | 7.6 | 6.1 | 4.8 | 3.8 | 3.1 | 2.4 | 1.9 | 1.6 | 1.2 | 1.0 | 0.8 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | — | | | |
| 16 | | | | | 11.2 | 8.9 | 7.1 | 5.7 | 4.5 | 3.6 | 2.9 | 2.3 | 1.8 | 1.5 | 1.2 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | | | | |
| 17 | | | | 13.2 | 10.5 | 8.4 | 6.6 | 5.3 | 4.2 | 3.4 | 2.7 | 2.1 | 1.7 | 1.4 | 1.1 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | | | | |
| 18 | | | | 12.3 | 9.8 | 7.8 | 6.2 | 4.9 | 3.9 | 3.1 | 2.5 | 2.0 | 1.6 | 1.3 | 1.0 | 0.8 | 0.7 | 0.5 | 0.4 | 0.4 | 0.3 | 0.2 | — | | | | |
| 19 | | | | 11.2 | 8.9 | 7.1 | 5.7 | 4.5 | 3.6 | 2.9 | 2.3 | 1.8 | 1.5 | 1.2 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | | | | | |
| 20 | | | 13.2 | 10.5 | 8.4 | 6.6 | 5.3 | 4.2 | 3.4 | 2.7 | 2.1 | 1.7 | 1.4 | 1.1 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | | | | | |
| 21 | | | 12.3 | 9.8 | 7.8 | 6.2 | 4.9 | 3.9 | 3.1 | 2.5 | 2.0 | 1.6 | 1.3 | 1.0 | 0.8 | 0.7 | 0.5 | 0.4 | 0.4 | 0.3 | 0.2 | — | | | | | |
| 22 | | | 11.5 | 9.2 | 7.3 | 5.8 | 4.6 | 3.7 | 2.9 | 2.3 | 1.9 | 1.5 | 1.2 | 1.0 | 0.8 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | | | | | | |
| 23 | | 13.5 | 10.8 | 8.5 | 6.8 | 5.4 | 4.3 | 3.4 | 2.7 | 2.2 | 1.7 | 1.4 | 1.1 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | | | | | | |
| 24 | | 12.6 | 10.0 | 8.0 | 6.3 | 5.1 | 4.0 | 3.2 | 2.6 | 2.0 | 1.6 | 1.3 | 1.0 | 0.8 | 0.7 | 0.5 | 0.4 | 0.4 | 0.3 | 0.2 | — | | | | | | |
| 25 | | 11.8 | 9.4 | 7.5 | 5.9 | 4.7 | 3.8 | 3.0 | 2.4 | 1.9 | 1.5 | 1.2 | 1.0 | 0.8 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | | | | | | | |
| 26 | 13.5 | 10.8 | 8.5 | 6.8 | 5.4 | 4.3 | 3.4 | 2.7 | 2.2 | 1.7 | 1.4 | 1.1 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | | | | | | | |
| 27 | 12.6 | 10.0 | 8.0 | 6.3 | 5.1 | 4.0 | 3.2 | 2.6 | 2.0 | 1.6 | 1.3 | 1.0 | 0.8 | 0.7 | 0.5 | 0.4 | 0.4 | 0.3 | 0.2 | 0.2 | | | | | | | |
| 28 | 11.8 | 9.4 | 7.5 | 5.9 | 4.7 | 3.8 | 3.0 | 2.4 | 1.9 | 1.5 | 1.2 | 1.0 | 0.8 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | — | | | | | | | |
| 29 | 11.0 | 8.7 | 7.0 | 5.5 | 4.4 | 3.5 | 2.8 | 2.2 | 1.8 | 1.4 | 1.1 | 0.9 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | | | | | | | | |
| 30 | 10.2 | 8.2 | 6.5 | 5.2 | 4.1 | 3.3 | 2.6 | 2.1 | 1.7 | 1.3 | 1.1 | 0.9 | 0.7 | 0.6 | 0.4 | 0.4 | 0.3 | 0.2 | 0.2 | | | | | | | | |



September 13, 1984 Revision

**Ohio River Valley Water Sanitation Commission**
**414 Walnut Street**
**Cincinnati, Ohio 45202**

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