



Association of Idaho Cities
3100 South Vista, Suite 201, Boise, Idaho 83705
Telephone (208) 344-8594
Fax (208) 344-8677
www.idahocities.org

April 1, 2022

Ms. Paula Wilson, Administrative Rules Coordinator
Idaho Department of Environmental Quality
1410 N Hilton
Boise, ID 83706

Re: Docket No. 58-0102-1801 Update to Human Health Criteria for Arsenic – March 2, 2022,
Administrative Bulletin Publication and Notice of Public Comment Opportunity

Dear Ms. Wilson/Paula,

The Association of Idaho Cities (AIC) serves to advance the interests of the cities of Idaho through legislative advocacy, technical assistance, training, and research. Idaho cities and their utilities play important roles as primary providers of drinking water and implementers of the Clean Water Act. Idaho cities represent over 70% of all Idaho residents. These stakeholders have significant interests in the development of water quality standards, rules, and guidance related to the protection of human and aquatic life.

The Idaho Department of Environmental Quality (IDEQ) initiated this rulemaking in 2018 in response to a Consent Decree between the Northwest Environmental Advocates and the US Environmental Protection Agency (EPA). This rulemaking will allow Idaho to adopt an updated human health criteria for arsenic; criteria that AIC sincerely hopes will be accepted and approved for use in Idaho by EPA.

AIC seeks criteria, rules, and policies that ensure effective protection of Idaho's human health and aquatic life. And, as AIC has commented previously, we appreciate how the Clean Water Act can be implemented by the IDEQ in such a way that supports enhanced effectiveness and compliance statewide.

The current rulemaking by the IDEQ was initiated to utilize Idaho-specific information on inorganic arsenic concentrations in fish and state waters to develop new arsenic human health water quality criteria. The utilization of Idaho-specific information allows the best science and most relevant environmental data to be used to develop arsenic water quality criteria for Idaho.

The attached comments seek to highlight a few key considerations relating to the proposed update to the inorganic arsenic criteria for Idaho. AIC has consulted with IACI over

the course of this rulemaking and have carefully reviewed their analysis and comments. AIC appreciates IACI's efforts, and believe their April 1, 2022, comments generally supplement our comments provided here.

AIC appreciates the efforts by all stakeholders, and especially IDEQ staff, as we continue to work together for the development and approval of the updated Idaho arsenic criteria. Should you have questions concerning these comments, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Bell', written in a cursive style.

Johanna Bell, Policy Analyst

Attachments

cc: Kelley Packer, AIC Executive Director
Mayor Kevin England, AIC President
Jess Byrne, IDEQ Director
AIC IPDES Task Force

ATTACHMENT

Proposed Criteria Comments

Idaho is proposing the following criteria for inorganic arsenic:

For the domestic water supply designated use:

- Water column criterion of 10 micrograms per liter.

For the primary or secondary recreation designated use:

- Water column criterion of 4.3 micrograms per liter.
- Fish tissue criterion of 8.0 micrograms per kilogram (wet weight) with the fish tissue value superseding the water column criteria.

AIC supports the proposed domestic water supply water column criterion of 10 micrograms per liter and suggests that the domestic water supply criteria should also include a fish tissue value of 8.0 micrograms per kilogram (wet weight).

AIC supports the primary or secondary recreation fish tissue criterion of 8.0 micrograms per kilogram (wet weight) but does not support the use of a water column criterion for use in Idaho. Our reasons for this position are outlined here, with the sincere hope that regulatory line staff will come to see the wisdom of fully supporting the application of fish tissue criteria to inorganic arsenic in Idaho.

First, it is the inorganic arsenic concentrations in fish tissue, not the water column, that may pose risks to human health. Additionally, the use of water column data instead of fish tissue data rests on a few assumptions, two of which are: (1) that there is a relationship between water column and fish tissue levels, and (2) that it can take a long period of time for the fish tissue concentrations in a waterbody to return to a “steady state.” However, as addressed in the IACI comments, there is no demonstrated relationship between arsenic water column and fish tissue levels. And, as also explained in those comments, fish reach a steady state quickly after variations in arsenic exposure.

These and other reasons are why AIC supports the use of an appropriate *water column screening threshold* value with the fish tissue criteria. However, if IDEQ leadership perceives there may be some benefit to Idaho from adopting a water column criterion, AIC supports a 13 micrograms per liter and a fish tissue criterion value of 8.0 micrograms per kilogram (wet weight).

General Comments

AIC has reviewed the proposed approach to the criteria and wishes to express our general support. However, AIC remains concerned regarding (1) current EPA assumptions about the toxicity or bioaccumulation of inorganic arsenic, (2) how a ‘weight of evidence’ review of the Idaho data shows that background concentrations of inorganic arsenic are higher than EPA’s current recommended human health criteria, and (3) the need for programmatic and regulatory support for the use of inorganic arsenic fish tissue criteria for designated recreational fish uses,

with a water column screening threshold value. Our specific comments touch upon our recommended strategies to address these general concerns.

Specific Comments

1. TRIGGER FOR APPLICATION OF REQUIREMENTS

The true determinant of whether there is a risk posed by arsenic is the level of arsenic in fish tissue. Therefore, the water quality standard itself should be phrased solely in terms of fish tissue levels, and water column concentrations should be used only as a screening mechanism, to determine whether fish tissue levels even need to be assessed. This approach has been used in other States for pollutants with a primary fish tissue component in their water quality standards. In essence, there would be a two-step process. First, one would assess the water quality data, to determine if arsenic levels exceed the specified water column screening level. If not, then no further inquiry is needed, and no effluent limits for arsenic would be imposed. If, on the other hand, the water column data are above the screening level, then one would proceed to the next stage: assessing the fish tissue data for the waterbody. If those data are at or below the fish tissue-based standard, then no limits would be required. If the data are above the fish tissue-based standard, then effluent limits could be imposed.

Note: AIC is providing a copy of a permit issued in Kentucky with these comments as an example of how other States also recognize the importance of having a screening threshold while implementing fish tissue criteria.

2. USE OF POLLUTANT MINIMIZATION PLANS

Instead of end-of-pipe limits, IPDES permittees that have a “reasonable potential to exceed” (RPE) for arsenic should receive a requirement to develop and implement a pollutant minimization plan (PMP). The PMP process has been used successfully for other pollutants, especially bioaccumulative substances with stringent water quality standards, such as mercury and PCBs. It has proven to be a more effective way for dischargers to make progress in reducing loadings, without subjecting those sources to end-of-pipe limits that cannot be met, giving rise to applications for use of variances and other relief tools. IDEQ has used this method in its own guidance for implementing mercury criteria,¹ EPA has required PMPs in its mercury guidance and in issuing TMDLs for waters impaired for mercury and PCBs, and various States have utilized this process in developing statewide approaches for regulating ubiquitous pollutants with bioaccumulation concerns.

3. NEW AND INCREASED DISCHARGES

There should be no special provisions for situations involving new or increased discharges, and IDEQ should rely on fish tissue results in determining the requirements that apply in those situations, just as with regard to existing discharges. Using water column data instead rests on two assumptions: that there is a relationship between water column and fish tissue levels, and that once a new/increased discharge occurs, it can take a long period of time for the waterbody to return to a “steady state” with regard to the fish tissue levels of arsenic in the waterbody. Neither of those assumptions is accurate for inorganic arsenic. As addressed in the IACI

¹ See <https://www2.deq.idaho.gov/admin/LEIA/api/document/download/4836>, Section 6.1.1 and Table 6-.1 Summary of Recommended Permit Conditions.

comments, there is no demonstrated relationship between arsenic water column and fish tissue levels. And, as also explained in those comments, fish reach a steady state quickly after variations in arsenic exposure. While EPA has addressed this “steady state” issue in developing criteria for selenium, the situation for arsenic is very much different than for selenium, and use of a “steady state” exception to use of fish tissue data is simply not supported by the science for arsenic.

If IDEQ continues to retain a special provision for new and increased discharges, in which water column results are used instead of fish tissue data, then it should modify that provision to make it more workable. It’s important to recognize that water column levels of arsenic will fluctuate over time – from year to year, from season to season, and even from day to day. Increases over one period of time, and decreases over the next period of time, should not mean that IDEQ veers from using fish tissue data, to water column data, and back again. Also, minor increases in discharge, which would not be expected to result in any lasting change in fish tissue levels, should not automatically trigger the jump from fish tissue to water column data. To address these concerns, IDEQ should make it clear that the only “new or increased” discharges that trigger use of water column data should be those that are significant and that are expected to result in changes to fish tissue levels in the waterbody.

4. FISHLESS WATERS

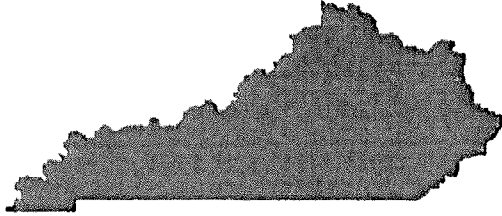
While IDEQ’s proposal reverts to using water column data in “fishless waters” situations, we believe that there is a significantly better solution to the “fishless” issue, which still retains the basic reliance on fish tissue data that is supported by the science. Instead of ignoring that it is the fish tissue concentration that is being regulated, the agency should simply utilize fish tissue data from the next reach downstream. Those data will, in fact, provide a conservative estimate of risk, since arsenic levels downstream could be higher due to other sources that are below the “fishless” reach at issue. It is often the case that a reach is “fishless,” not due to any contamination or high levels of arsenic, but due to physical or other factors that simply preclude having a viable fish population in the relevant reach. Those factors should not lead one to switch to using water column data that are less accurate as a predictor of risk. Fish tissue data should be relied on whenever possible, and data from the next downstream reach is fully adequate to use in assessing impairments and making permitting decisions.

5. MIXING ZONES

The restrictions placed by the EPA on mixing zones for bioaccumulative criteria are premised on there being a relationship between higher water column concentrations and higher fish tissue concentrations. That this relationship doesn’t exist for inorganic arsenic, suggests that this specific mixing zone restriction should not apply to inorganic arsenic, or at least it should not apply in Idaho. Additionally, whether a pollutant is “highly” bioaccumulative is ordinarily judged by EPA based on how high the BAF is. For example, in the Great Lakes Initiative EPA identifies that a BAF of 1000 or greater to be considered bioaccumulative.

AIC recognizes that this presents a new situation that has not previously been addressed by IDEQ guidance (e.g., in the 2016 Idaho Mixing Zone Implementation Guidance), and requests that the IDEQ take steps to correct this gap in guidance prior to the updated criteria effective date.

KPDES



**KENTUCKY POLLUTANT
DISCHARGE ELIMINATION
SYSTEM**

PERMIT

PERMIT NO.:
KY0000221
AI NO.: 2610

**AUTHORIZATION TO DISCHARGE UNDER THE
KENTUCKY POLLUTANT DISCHARGE ELIMINATION SYSTEM (KPDES)**

Pursuant to Authority in KRS 224,

**Kentucky Power Company
1 Riverside Plaza
Columbus, Ohio, 43215-2373**

is authorized to discharge from a facility located at

**Kentucky Power Company
Big Sandy Plant
U.S. Highway 23
Louisa, Lawrence County, Kentucky**

to receiving waters named

Big Sandy River

Blaine Creek

Unnamed Tributary of Blaine Creek

**in accordance with effluent limitations, monitoring requirements and other conditions set forth in
this permit.**

This permit shall become effective on.

This permit and the authorization to discharge shall expire at midnight,

{Signature}

Date Signed

**Peter T. Goodmann, Director
Division of Water**

**DEPARTMENT FOR ENVIRONMENTAL PROTECTION
Division of Water, 300 Sower Boulevard, Frankfort, Kentucky 40601**

Printed on Recycled Paper

TABLE 2.

EFFLUENT LIMITATIONS										MONITORING REQUIREMENTS	
Effluent Characteristic	STORET Code	Units	Loadings (lbs/dry)			Concentrations				Frequency	Sample Type
			Monthly Average	Daily Maximum	Minimum	Monthly Average	Daily Maximum	Maximum			
Cadmium, Total Recoverable	01113	µg/l	N/A	N/A	N/A	1.23	8.73	N/A	N/A	2/Month	Grab
Chromium, Total Recoverable	01118	mg/l	N/A	N/A	N/A	187	Report	N/A	N/A	2/Month	Grab
Copper, Total Recoverable	01119	µg/l	N/A	N/A	N/A	46.32	51.68	N/A	N/A	2/Month	Grab
Lead, Total Recoverable	01114	µg/l	N/A	N/A	N/A	21.9	477	N/A	N/A	2/Month	Grab
Mercury, Total Recoverable	71901	µg/l	N/A	N/A	N/A	0.051	1.4	N/A	N/A	2/Month	Grab
Nickel, Total Recoverable	01074	µg/l	N/A	N/A	N/A	257	1516	N/A	N/A	2/Month	Grab
Selenium, Total Recoverable	00981	µg/l	N/A	N/A	N/A	12.8 ⁵	20	N/A	N/A	2/Month	Grab
Total Recoverable Selenium (Fish Tissue)	01148	mg/Kg dry weight	N/A	N/A	N/A	N/A	N/A	N/A	8.6	(⁵)	(⁵)
Silver, Total Recoverable	01079	µg/l	N/A	N/A	N/A	Report	41.1	N/A	N/A	2/Month	Grab
Thallium, Total Recoverable	00982	µg/l	N/A	N/A	N/A	1.20	Report	N/A	N/A	2/Month	Grab
Zinc, Total Recoverable	01094	µg/l	N/A	N/A	N/A	388	388	N/A	N/A	2/Month	Grab
Chronic WET ³	03598	TU _c	N/A	N/A	N/A	N/A	2.56	N/A	N/A	1/Month	(⁴)

¹These limits are based on the operations as of now with the natural gas-fired operations discharging through outfall 001 (via fly ash pond).

²Once the wastewater from the unit 1 natural gas-fired operations are no longer discharging through outfall 001 (via fly ash pond) and is discharging through the new outfall 020 the permittee shall notify the DOW and Tier 2 limits should become effective.

³WET - Whole Effluent Toxicity

⁴Three (3) 24-hour composite samples with one each collected every other day for a period of five (5) days, i.e. days 1, 3, & 5

⁵Should the monthly average concentration of total recoverable selenium exceed 12.8 µg/l see Section 5.10 for additional requirements.

prior to the commencement of use of said biocides or chemicals to the Division of Water for review and establishment of appropriate control parameters.

5.9. Outfall Signage

The KPDES permit establishes monitoring points, effluent limitations, and other conditions to address discharges from the permitted facility. In an effort to better document and clarify these locations the permittee should place and maintain a permanent marker at each of the monitoring locations.

5.10. Additional Requirements for Total Recoverable Selenium

The monthly average discharge concentration for total recoverable selenium of 12.8 μ g/l is a trigger that once exceeded, requires the permittee to collect and analyze fish tissue for selenium residue.

5.10.1. Tissue Collection and Analysis

The following requirements apply:

- (1) Collection and analysis shall be performed within the calendar month following the calendar month the 12.8 μ g/l monthly average trigger was exceeded;
- (2) Fish tissue collection and analysis shall be performed in accordance with the DOW protocols specified in "Methods for the Collection of Selenium Residue in Fish Tissue Used to Determine KPDES Permit Compliance" (See Appendix A);
- (3) Results of the analysis shall be reported as Total Recoverable Selenium (Fish Tissue) on the Discharge Monitoring Report (DMR) for the month during which the analysis were performed.

5.10.2. Results of Analysis

The results of the fish tissue shall be interpreted as follows:

- (1) less than or equal to 8.6 mg/Kg dry weight selenium residue there is no permit violation;
- (2) greater than 8.6 mg/Kg dry weight selenium residue there is a permit violation; and
- (3) unable to obtain fish tissue, the 12.8 μ g/l trigger becomes the effluent limitation and there is a permit violation

5.11. Section 311, Clean Water Act Exclusion

The permittee is relieved of the reporting and liability requirements under Section 311 of the Clean Water Act for the following substances, consistent with Exclusion 2, authorized by Section 311(a)(a)(B) and 40 CFR 117.12 for: Ammonium Hydroxide, Sodium Hypochlorite, Ethylene Diaminetetracetic Acid (EDTA), Sodium Hydroxide, Sodium Nitrite, Sodium Phosphate (Dibasic), and Sulfuric Acid.

7. **Appendix A**

**Methods for the Collection of Selenium Residue
in Fish Tissue Used to Determine KPDES
Permit Compliance**

**Commonwealth of Kentucky
Energy and Environment Cabinet
Department for Environmental Protection
Division of Water**

7.1. Procedures

7.1.1. Scope and Applicability

This manual has been developed by the Kentucky Division of Water (KDOW) as guidance for the uniform collection of selenium residue in fish tissue for the purposes of compliance with KPDES permits. The methods set forth herein are required for all activities related to the collection of fish for the determination of selenium residue in fish tissue. Data submitted to KDOW for review will undergo QA/QC review and those data identified as not following the methods set forth in this document will be flagged and shall not be used for purposes of determining compliance with the KPDES permit.

The sources for the collection methods in this Standard Operating Procedure (SOP) document are based on the historical methods used by the Division of Water (KDOW 2008).

7.1.2. Definitions

CFR – Code of Federal Regulations

COC – Chain-of-Custody

DNR – Department for Natural Resources

DW – Dry Weight

EPA – U.S. Environmental Protection Agency

Headwater or Headwater Stream – Stream that is less than 6 square miles in catchment area.

KDFWR – Kentucky Department of Fish & Wildlife Resources

KDOW – Kentucky Division of Water

KPDES – Kentucky Pollutant Discharge Elimination System

QA – Quality Assurance

QC – Quality Control

Sample Reach – the specific length of the stream where fish survey collections are made; it includes the entire width of the stream within that stream length.

SOP – Standard Operating Procedure

WQB – Water Quality Branch

Wearable or Wadeable Stream – Stream that is equal to or greater than 6 square miles in catchment area.

7.1.3. Personnel Qualifications / Responsibilities

Individuals conducting fish tissue collections shall possess a valid KDFWR Scientific Wildlife Collecting Permit, if applicable. Field personnel conducting fish tissue collections must also have basic knowledge of aquatic organisms and their habitats, stream geomorphology and stream physical processes. Most importantly, field personnel must be able to properly identify the target species.

7.1.4. Recommended Equipment and Supplies

- Backpack Electrofishing Unit (including Probe, Ring and Rat Tail)
- Backpack Electrofishing Unit Battery
- Dip Nets (at least 3)
- Seine (Wadeable Streams)
- 5 Gallon Bucket
- Measuring Board (in mm)
- Sterile Whirl-pack Bags
- Gallon of De-ionized Water
- Waders and Boots
- First Aid Kit
- Polarized Sunglasses
- Waterproof Pen
- Permanent Marker
- Powderless Latex or Nitrile Gloves
- Chain-of-Custody Documents
- Cooler
- Ice

7.1.5. Methods

7.1.5.1. Purpose

In order to protect the aquatic life use from the bioaccumulative effects of selenium, KDOW has promulgated a chronic selenium water quality standard based on whole-body fish tissue DW concentration. Information obtained from the fish tissue survey will be used to determine compliance with the KPDES permit. The collection of fish tissue is required when the average effluent selenium concentration discharged from a permitted outfall exceeds 12.8 µg/L (KDOW 2013). Results of selenium residue in fish tissue samples will be used to determine compliance with the KPDES permit.

7.1.5.2. Precautions Before Sampling

While following the sampling methods outlined herein, it is important to keep the sampling reach intact and undisturbed. Field personnel shall not walk through the reach until sampling has occurred. If the sampling reach has been disturbed by other activities, sufficient time shall be allowed for the water to clear and fish to settle back into normal habitats. Electrofishing in turbid water can result in less effective sampling results. Polarized sunglasses are recommended when electrofishing, since they will cut down on the glare of the water. Optimal sampling conditions, such as high water clarity, normal ambient flow conditions and high ambient sunlight conditions, will enhance sampling efficiency. If sampling conditions are not adequate or practical, the survey should be postponed until conducive sampling conditions exist.

Electrofishing unit settings shall be set based on the conductivity of the water. To minimize stress and mortality, it is important to use the minimum amount of electrical energy needed to stun fish. Select initial voltage setting at 150-400 V for high conductivity conditions (>300 µS/cm), 500-800 V for medium conductivity (100 to 300 µS/cm), and 900-1100 V for low conductivity (<100 µS/cm). Set the pulse width between 2-6 ms and pulse frequency between 40-60 Hz. Adjust the voltage, pulse width and pulse frequency to efficiently capture fish without inducing excessive stress and mortality.

7.1.5.3. Headwater Streams

To determine selenium residue in fish tissue, a target species composite sample and one duplicate/replicate sample are required at each station. Two to five individuals of the target species shall be used to establish an individual whole-body composite or duplicate/replicate sample.

7.1.5.3.1. Target Species Composite Sample

A composite, whole-body sample shall consist of two to five (2-5) individuals selected from the taxa listed in Table 7. The composite sample may be of any taxa listed, but a composite sample shall consist of individuals of the same taxon. The individuals of a composite sample shall be, at a minimum, the size listed in Table 7 and shall be within 75% of the length of the longest individual. These fish lengths represent reproductive maturity for each of these target species. A duplicate/replicate sample shall be collected at each sampling station following the same guidelines as stated for the composite sample of the target species.

Fish Taxa	Minimum Length at Reproductive Maturity
<i>Campostoma spp.</i> (Stonerollers)	80 mm
<i>Catostomus commersonii</i> (White Sucker)	150 mm
<i>Chrosomus erythrogaster</i> (Southern Redbelly Dace)	50 mm
<i>Hypentelium nigricans</i> (Northern Hogsucker)	125 mm
<i>Rhinichthys atratulus</i> (Blacknose Dace)	60 mm
<i>Semotilus atromaculatus</i> (Creek Chub)	100 mm

7.1.5.3.2. Sample Reach

The first sample reach shall begin 5 meters below the outfall that exceeded the monthly average effluent selenium concentration of 12.8 µg/L and extend 100 meters downstream from that point in the receiving stream. Where the effluent receiving stream is a drainage ditch and not part of the upper-most channel-defined reaches (i.e., ephemeral or intermittent channels) of a watershed, the sample collection effort will commence in the uppermost receiving stream at the discharge point of the effluent ditch.

Field personnel shall measure out this sample reach before conducting the survey. Sampling shall begin at the downstream end of the reach and continue upstream until the most upstream end of the reach has been sampled. Every effort shall be made to obtain the composite and duplicate/replicate samples of the target species within the first sample reach. If a composite sample and the duplicate/replicate sample of the target species cannot be obtained within the first sample reach, field personnel shall proceed to sample the next downstream 100 meter reach. Every effort shall be made to obtain the composite sample and the duplicate/replicate sample of the target species within the second sample reach.

Field personnel shall continue downstream using successive 100-meter reaches until adequate target species composite and duplicate/replicate samples are obtained or the stream receiving the effluent empties into its receiving stream. In the event the effluent receiving stream is less than 100 meters in length every effort shall be made to collect fish from the available habitat of that stream, but when fish are not present in such streams the collection effort is extended into the next receiving stream. That collection effort will continue at the point the stream empties into its receiving stream with sampling conducted in successive downstream 100-meter reaches.

However, no more than a total of four 100-meter reaches shall be sampled; this is inclusive of all sampled reaches. Should the stream receiving the effluent discharge empty into its receiving stream less than four successive 100-meter reaches from the point of effluent discharge, then sampling shall continue in the receiving stream from that confluence until one has sampled linear reaches totaling no more than four successive (inclusive of all reaches sampled) 100-meter reaches.

Once two composite samples have been collected sampling may cease. If adequate composite and duplicate/replicate samples of the target species cannot be obtained then the 12.8 µg/L water column limit shall apply.

7.1.5.4. Target Species Composite Sample Collection

All members of the fish tissue collection crew shall don powderless latex or nitrile gloves. The sampling crew shall consist of a minimum of two members. Dip nets, seine and backpack electrofishing units are all instruments used in the collection of fish; the hydrological and physical characteristics of the stream to be sampled will determine what equipment is appropriate. If a backpack electrofishing unit is utilized, one individual operates the backpack electrofishing unit while the other(s) work the seine (if used) and dip nets, and carry the bucket used to transport captured fish. The backpack electrofishing unit operator shall also carry a dip net (Barbour et al. 1999) if using one probe and rat tail configuration. Backpack electrofishing sampling consists of working in an upstream direction in a side-to-side/bank-to-bank sweeping technique. Crew members with dip nets walk alongside and behind the electrofishing unit operator to collect stunned fish. If necessary, a seine can be used to sample deep pool habitat more efficiently after electrofishing. The seine can also be used to block off the width of stream while the electrofishing unit operator shocks fish downstream into the seine. This technique is especially useful when the water is slightly turbid. In shallow headwater streams, use of seine or dip nets may be the appropriate equipment utilized in procurement of fishes.

Collected fish shall be frequently transferred from dip nets to a bucket of water to lessen stress and mortality. In addition, water in the bucket shall be changed periodically (warmer water temperatures require more frequent water changes) to reduce stress and mortality of fish.

7.1.5.5. Target Species Composite Sample Processing

Once adequate composite and duplicate/replicate samples of the target species are collected, the processing procedure can begin. A sterile Whirl-pack bag shall be used to contain the samples. On the outside of the bags, the collectors shall write the following information with a permanent marker: station #, permit #, stream name, location, latitude and longitude (resolve to seconds or to five decimal places), county, date, time, species collected, number of individuals collected, the parameter or analyte to be tested and whether it is the composite sample or the duplicate/replicate sample of the target species. The longest individual in the bucket shall be measured in millimeters and placed in a sterile Whirl-pack bag. The length of the first individual shall be recorded on the COC sheet and the 75th percentile of that individual's length shall be calculated. Two to four other individuals within the 75th percentile shall be measured and placed in the Whirl-pack bag with the longest individual. These lengths are recorded on the COC sheet along with the first. The duplicate/replicate sample shall be processed in the same manner as the first sample. All other fish that are being held in the bucket can be released once the duplicate/replicate sample has been processed. The bucket and measuring board shall be triple rinsed with de-ionized water after processing the samples.

The samples shall be kept on ice in a cooler until transported to a freezer for long-term storage. Maximum holding time on ice in a cooler is 12 hours. Samples shall be processed and analyzed in the lab within 30 days of collection.

7.1.5.6. Wadeable Streams

To determine selenium residue in fish tissue, a composite sample and one duplicate/replicate sample of the target species are required at each station. Two to five individuals of the target species shall be used to establish an individual whole-body composite or duplicate/replicate sample.

7.1.5.6.1. Target Species Composite Sample

A composite, whole-body sample shall consist of two to five (2-5) individuals from the taxa listed in Table 8. The composite sample may be of any taxa listed, but a composite sample shall consist of individuals of the same taxon. The individuals of a composite sample shall be, at a minimum, the size listed in Table 8 and within 75% of the length of the longest individual of that species. These fish lengths represent reproductive maturity for each of these target species. A duplicate/replicate sample shall be collected at each sampling station following the same guidelines as stated for the target species composite sample.

Fish Taxa	Minimum Length at Reproductive Maturity
<i>Campostoma sp.</i> (Stonerollers)	80 mm
<i>Catostomus commersonii</i> (White Sucker)	150 mm
<i>Chrosomus erythrogaster</i> (Southern Redbelly Dace)	50 mm
<i>Hypentelium nigricans</i> (Northern Hogsucker)	125 mm
<i>Rhinichthys atratulus</i> (Blacknose Dace)	60 mm
<i>Semotilus atromaculatus</i> (Creek Chub)	100 mm
<i>Ambloplites rupestris</i> (Rock Bass)	100 mm
<i>Cyprinella spp.</i> (Shiners)	75 mm
<i>Etheostoma caeruleum</i> (Rainbow Darter)	45 mm
<i>Etheostoma flabellare</i> (Fantail Darter)	45 mm
<i>Lepomis spp.</i> (Sunfish)	70 mm
<i>Luxilus chrysocephalus</i> (Striped Shiner)	80 mm
<i>Lythrurus spp.</i> (Finescale Shiners)	45 mm
<i>Pimephales notatus</i> (Bluntnose Minnow)	60 mm

7.1.5.6.2. Sample Reach

The first sample reach shall begin 5 meters below the outfall(s) that exceeded the monthly average effluent selenium concentration of 12.8µg/L and extend 100 meters downstream from that point. If the discharge is into a drainage ditch, sampling should begin at the point the ditch discharges into the wadeable stream.

Field personnel shall measure out this sample reach before conducting the survey. Sampling shall begin at the downstream end of the reach and continue upstream until the most upstream end of the reach has been sampled. Every effort shall be made to obtain the composite and duplicate/replicate samples of the target species within the first sample reach. If a composite sample and the duplicate/replicate sample of the target species cannot be obtained within the first sample reach, field personnel shall proceed to sample the next downstream 100-meter reach. Every effort shall be made to obtain the composite sample and the duplicate/replicate sample of the target species within the second sample reach.

Field personnel shall continue downstream using successive 100-meter reaches until adequate target species composite and duplicate/replicate samples are obtained or the stream receiving the effluent empties into its receiving stream. In the event the effluent receiving stream is less than 100 meters in length every effort shall be made to collect fish from the available habitat of that stream, but when fish are not present in such streams the collection effort is extended into the next receiving stream. That collection effort will continue at the point the stream empties into its receiving stream with sampling conducted in successive downstream 100-meter reaches.

However, no more than a total of four 100-meter reaches shall be sampled; this is inclusive of all sampled reaches. Should the stream receiving the effluent discharge empty into its receiving stream less than four successive 100-meter reaches from the point of effluent discharge, then sampling shall continue in the receiving stream from that confluence until one has sampled linear reaches totaling no more than four successive (inclusive of all reaches sampled) 100-meter reaches.

Once two composite samples have been collected sampling may cease. If adequate composite and duplicate/replicate samples of the target species cannot be obtained then the 12.8 $\mu\text{g/L}$ water column limit shall apply.

7.1.5.6.3. Target Species Composite Sample Collection

All members of the fish-tissue collection crew shall don powderless latex or nitrile gloves. The sampling crew shall consist of a minimum of two members. One individual operates the backpack electrofishing unit while the other(s) work the seine (if used) and dip nets, and carry the bucket used to transport captured fish. The backpack electrofishing unit operator shall also carry a dip net (Barbour et al. 1999) if using one probe and rail rail configuration. Sampling consists of using a backpack electrofishing unit working in an upstream direction in a side-to-side/bank-to-bank sweeping technique. Crew members with dip nets walk alongside and behind the electrofishing unit operator to collect stunned fish. If necessary, a seine can be used to sample deep pool habitat more efficiently after electrofishing. The seine can also be used to block off the width of stream while the electrofishing unit operator shocks fish downstream into the seine. This technique is especially useful when the water is slightly turbid.

Collected fish shall be frequently transferred from dip nets to a bucket of water to lessen stress and mortality. In addition, water in the bucket shall be changed periodically (warmer water temperatures require more frequent water changes) to reduce stress and mortality of fish.

7.1.5.6.4. Target Species Composite Sample Processing

Once adequate composite and duplicate/replicate samples of the target species are collected, the processing procedure can begin. A sterile Whirl-pack bag shall be used to contain the samples. On the outside of the bags, the collectors shall write the following information with a permanent marker: station #, permit #, stream name, location, latitude and longitude (resolve to seconds or to five decimal places), county, date, time, species collected, number of individuals collected, the parameter or analyte to be tested and whether it is the composite sample or the duplicate/replicate sample of the target species. The longest individual in the bucket shall be measured in millimeters and placed in a sterile Whirl-pack bag. The length of the first individual shall be recorded on the COC sheet and the 75th percentile of that individual's length shall be calculated. Two to four other individuals within the 75th percentile shall be measured and placed in the Whirl-pack bag with the longest individual. These lengths are recorded on the COC sheet along with the first. The duplicate/replicate sample shall be processed in the same manner as the first sample. All other fish that are being held in the bucket can be released once the duplicate/replicate sample has been processed. The bucket and measuring board shall be triple rinsed with de-ionized water after processing the samples.

The samples shall be kept on ice in a cooler until transported to a freezer for long-term storage. The maximum holding time on ice in a cooler is 12 hours. Samples shall be processed and analyzed in the lab within 30 days of collection.

7.2. Quality Assurance/Quality Control

A field crew will consist of at least one person who is knowledgeable of the identification and nomenclature of Kentucky fishes. All members of the sampling crew will don powderless latex or nitrile gloves during collection and processing of the sample. After any sampling has been completed, all sampling gear will be thoroughly cleaned to remove all fish so that no fish are carried to the next site. The equipment shall be examined prior to sampling at the next site to ensure that no fish are present.

Field data must be complete and legible and entered on COC sheets and on the Whirl-pack bag. While in the field, the field team should possess sufficient copies of COC sheets for all anticipated sampling sites, as well as copies of all applicable SOPs. The following information shall be written on the COC sheet: station #, permit #, stream name, location latitude and longitude (resolve to seconds or to five decimal places), county, date, time, species collected, number of individuals collected, collectors, parameter to be tested and whether it is the target species composite sample or the duplicate/replicate sample. Each collector will also sign and date the Whirl-pack bag as well as the COC sheets.

When delivering a target species composite sample to the laboratory for processing, the proper COC sheet that corresponds with the sample must be delivered to the laboratory at the same time. When the collector relinquishes the sample to the sample lab custodian, the collector will sign and date the COC in the "Relinquished By" space and the lab sample custodian will sign and date the COC in the "Received By" space. All lab data submitted to KDOW for selenium compliance must be accompanied with corresponding COC sheets.

7.2.1. Procedures for the Preparation of Fish Tissue and Methods for the Determination of Selenium in Fish Tissue

For fish tissue preparation for the determination of total selenium, the following procedures shall be used by the laboratory.

7.2.1.1. Fish Tissue Processing SOP (Conducted by a Certified Wastewater Laboratory) (KDOW 2008)

Processing will be conducted in a certified "clean laboratory environment" with pre-cleaned stainless steel countertops and pre-cleaned stainless steel equipment:

1. Place composite samples in freezer when delivered from the field and allow to freeze.
2. Weigh composite sample to determine amount of dry ice to use during homogenization.
3. Remove frozen sample from freezer.
4. Remove frozen individual fish from plastic freezer bag using nitrile gloves.
5. Place each individual fish from one composite into a stainless steel industrial blender.
6. Place the equivalent amount of dry ice in the blender that was determined prior to freezing for the composite sample (Ex. If the composite sample weighed 110 grams, then you would add 110 grams of dry ice to the blender for homogenization).
7. Homogenize sample in blender.
8. Remove homogenized sample with stainless steel utensil and place in pre-cleaned glass jar with Teflon-lined lid.
9. Label jar with all of the composite sample information from the sample bag.

10. Place jar with homogenized sample into freezer until ready for analysis.
11. Clean all equipment and countertops between composite samples with the following cleaning process:
 - a. Wash with mild detergent
 - b. Rinse with hot tap water
 - c. Rinse with distilled water
 - d. Rinse with 10% nitric acid
 - e. Rinse with acetone
 - f. Allow to air dry

Analytical test methods and procedures shall be according to test procedures approved under 401 KAR 5:065, Section 2(8) unless another method is required under 401 KAR 5:065, Section 2(9) or (10).

7.3. References

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J. B. Stribling. 1999. Rapid Bioassessment protocols for use in streams and wadeable rivers: periphyton, benthic macroinvertebrates, and fish, second edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water, Washington, D.C.

Kentucky Division of Water (KDOW). 2013. 401 KAR 10:031. Kentucky Department for Environmental Protection. Division of Water. Frankfort, Kentucky.

Kentucky Division of Water (KDOW). 2008. Standard Methods for Assessing Biological Integrity of Surface Waters in Kentucky. Kentucky Department for Environmental Protection, Division of Water, Frankfort, Kentucky.

**7.4. Appendix A1
Selenium Fish Tissue Chain-of-Custody Sheet
SELENIUM FISH TISSUE
CHAIN-OF-CUSTODY**

Station #: _____ Date: _____
 Stream / Location: _____ Time: _____
 KPDES Permit#: _____
 County: _____ Lat/Long Upstream Reach: _____
 Lat/Long Downstream Reach: _____
 Outfall #: _____ Duplicate/Replicate (circle one): **yes** **no**
 Flow status (circle one): **runoff event** **high flow** **low flow** **normal** **other**

Fish #	Genus	Species	Length (mm)	Comments
001				
002				
003				
004				
005				
006				
007				

Length (mm) of 75%tile of Longest Fish: _____

Total # Fish Collected in Sample: _____

Collected by: _____	Date: _____	Time: _____
Relinquished by: _____	Date: _____	Time: _____
Received by: _____	Date: _____	Time: _____

7.5. Appendix A2

Example of a Filled Out Chain-of-Custody Sheet

SELENIUM FISH TISSUE

CHAIN-OF-CUSTODY

Station #: UTHF-001-Dup

Date: 5/23/13

Stream / Location: UT Horse Fork – Downstream Outfall

Time: 1234 CST

DNR Permit#: 745-2525

KPDES Permit#: KY0100000

County: Hancock

Lat/Long Upstream Reach: 37.770/-86.803

Lat/Long Downstream Reach: 37.771/-86.803

Outfall #: 003

Duplicate/Replicate (circle one): yes no

Flow status (circle one): runoff event high flow low flow normal other

Fish #	Genus	Species	Length (mm)	Comments
001	Semotilus	atromaculatus	120 mm	
002	Semotilus	atromaculatus	112 mm	
003	Semotilus	atromaculatus	104 mm	
004	Semotilus	atromaculatus	123 mm	Longest
005	Semotilus	atromaculatus	98 mm	
006				
007				

Length (mm) 75%tile of Longest Fish: 92 mm

Total # Fish Collected in Sample: 5

Collected by: John Johnson ABC Consulting	Date: 5/23/13	Time: 1234 CST
Relinquished by: John Johnson ABC Consulting	Date: 5/23/13	Time: 1536 CST
Received by: William Williamson DEF Laboratory	Date: 5/23/13	Time: 1536 CST