DEQ/DWR
FACT SHEET

NPDES No. NC0000396, Duke Energy Progress, LLC
Asheville Steam Electric Plant

Facility Information	
Applicant/Facility Name:	Duke Energy Progress, Inc./ Asheville Steam Electric Plant
Applicant Address:	200 CP&L Drive, Arden, NC 28704
Facility Address:	(same)
Permitted Flow	Not applicable
Type of Waste:	100 % Industrial
Facility/Permit Status:	Major Modification
County:	Buncombe

Miscellaneous			
Receiving Stream:	French Broad River (001); UT to Frenche Broad River (101); Lake Julian (002)	Regional Office:	ARO
Stream Classification:	B (French Broad River and UT to French Broad River) C (Lake Julian)	Quad	F8NE
303(d) Listed?:	No	Permit Writer:	Sergei Chernikov, Ph.D.
Subbasin:	040302 (French Broad)	Date:	February 25, 2019
Drainage Area (mi2):	655 (French Broad River discharge, 001)		
Summer 7Q10 (cfs) Winter 7Q10 (cfs)	306 409 winter		
30Q2 (cfs):	631		
Average Flow (cfs):	1769		
IWC (%):	Est., 1.75% (Based on a flow of 3.52 MGD)		
Primary SIC Code:	4911		

SUMMARY

This is a Major Modification of the NPDES wastewater permit for Asheville Steam Electric Plant (Asheville Plant). The Asheville Plant is a coal fired steam electric generating plant (2 Units; 2 internal combustion turbines). This facility is subject to EPA effluent guideline limits per 40 CFR 423 - Steam Electric Power Generating Point Source Category. The facility is located in the Mountain area of the state; the applicable state water quality temperature standard is 29°C (84.2 F).

The Major Modification is proposed to incorporate changes necessary to convert this facility to a Combined Cycle Plant powered by natural gas. The new plant is ready to begin power production and the coal-fired units were shut-down in January 2020. The new plant will consist of 2 combined cycle power blocks with a summer/winter net electrical generation capacity of 250MW/280 MW per block (500 MW/560 MW total), the plant will employ cooling towers. The facility will be adding 4 new internal outfalls to incorporate wastewater from the new combined cycle unit: 001A, 001B, 001C, and 001D.

The site has 1 new ash pond (built in 1982), 1 old ash pond (build in 1964) and a cooling pond (Lake Julian). The facility has excavated all ash from the 1982 pond, the ash is currently being removed from the 1964 pond. The state law requires all the ash to be removed by August 1, 2022. Lake Julian is a 320-acre waterbody constructed in 1963 by CP&L (original owner of the facility) to serve as a cooling water source, it is classified as "waters of the State". Discharge from Lake Julian to the French Broad River is extremely rare and any occurrence would be during periods of heavy rainfall. These discharges are routed through a spillway.

The facility has installed a new Reverse Osmosis (RO) system in 2010, it will be used in conjunction with alum coagulation/filtration to provide water for various plant processes. The reject stream from the RO unit is sent to the ash pond.

The EPA's contractor conducted a review of the stability of the ash pond dams at the site in 2010. The contractor determined that the embankment and spillway systems appeared to be structurally sound for both dams (old and new ash ponds). However, the contractor recommended that some studies be conducted on the 1964 dam, including a slope stability analysis. After conducting these studies, Progress Energy (owner of the facility at the time) decided to make the enhancements to the 1964 dam. In order to accommodate these enhancements, the facility had to move the existing Outfall 001 approximately 3,000 ft. downstream. Permission for this relocation was granted by DWQ on May 13, 2011. All the enhancements to the 1964 dam were completed in 2012.

<u>The proposed modification consists of the following changes:</u>

1). Removal of the Condenser Cooling Water (CCW) system that is currently discharges through NPDES Outfall 002 into Lake Julian. This waste stream is being removed due to the retirement of the coal units. The average flow from the CCW system was approximately 255 mgd.

2). Addition of the cooling water from the evaporator system for the Combustion Turbines to Outfall 002. This waste stream currently routed to the 64-ash basin, which discharges through NPDES Outfall 001. One of the initial decommissioning activities is to modify the evaporator system's cooling water flow path to discharge into the treatment pond that the CCW system currently discharges into and then exit Outfall 002 into Lake Julian.

The evaporator system is used to cool air at ambient temperatures by the water flowing across filter media into the Combustion Turbine Air Inlet. The cooling of the air increases the combustion efficiency and maintains megawatt production level in the warmer months. There are no chemicals added to the evaporator system. The source of water is service water (raw lake water) from Lake Julian.

The evaporator system is operated typically from May through October. The average flowrate from this system is estimated to be 0.08 mgd. The temperature of this discharge is close to ambient. The evaporator discharge will not begin to discharge to Outfall 002 until after the CCW flow has stopped. The future flow and heat load from the evaporator at Outfall 002 will be significantly less in comparison to the current CCW discharge.

3). The addition of chlorine at the intake structure has ceased. Therefore, chlorine monitoring will be removed from Outfall 002.

<u>Outfall 001.</u>
Outfall 001 discharges directly to the French Broad River. The ash pond/rim ditch receives ash transport water, coal pile runoff, storm water runoff, various low volume wastes (such as boiler blowdown, cooling tower blowdown, Heat Return Steam Generator (HRSG) blowdown, oil water separator wastewater, backwash from the water treatment processes, ash hopper seal water, plant drains), air preheater cleaning water and chemical metal cleaning wastewater discharged from Internal Outfall 004 (potentially). It also might contain some stormwater and groundwater seepage from an old ash pond. Historically, this flow has been allowed to evaporate and/or infiltrate. The enhancements to the old pond that were completed in 2011 require that this water level be managed and maintained below a certain elevation. Therefore, it may be necessary to periodically pump water from the old ash pond to the combined, relocated settling basin and Outfall 001.

<u>Outfall 002.</u>
Once through non-contact cooling water system. This waste stream is discharged directly to Lake Julian via Outfall 002. After the coal-fired facility is demolished, the cooling water discharges to Lake Julian will discontinue. However, the make-up water for the new plant cooling towers will be pumped from Lake Julian.

<u>Internal Outfall 004.</u>
Chemical Metal Cleaning Treatment System. This waste stream may occasionally be discharged via Internal Outfall 004 to the ash pond treatment system or to the old ash pond (with prior DWR approval). Generally chemical metal cleaning wastes are treated by evaporation in boilers.
This Outfall shall discontinue discharge on 02/01/2020.

<u>Internal Outfall 005.</u>
Flue Gas Desulfurization (FGD) wet scrubber wastewater treatment system. Currently, FGD wastewaters are discharged to the Buncombe County Water Reclamation Facility.
This Outfall shall discontinue discharge on 02/01/2020.

<u>Outfall 101.</u>
1964 pond toe drains (combined outfall for 3 toe drains). This outfall discharges to an Unnamed Tributary (UT) to French Broad River.

<u>Internal Outfall 001A.</u>
This Outfall will discharge to the secondary settling basin. It contains cooling tower blowdown and HRSG blowdown.

Internal Outfall 001B.
This Outfall will discharge to the secondary settling basin. It contains stormwater discharges from containment areas around fuel oil storage tanks, transformers, and other plant equipment. This stormwater/wastewater is treated in the oil water separator prior to the discharge through Internal Outfall.

Internal Outfall 001C.
This Outfall will discharge to the secondary settling basin. It contains cooling tower blowdown and HRSG blowdown.

Internal Outfall 001D.
This Outfall will discharge to the secondary settling basin. It contains stormwater discharges from containment areas around fuel oil storage tanks, transformers, and other plant equipment. This stormwater/wastewater is treated in the oil water separator prior to the discharge through Internal Outfall.

TOE DRAINS- OUTFALL 101.
The facility identified 3 unpermitted toe drains from the 1964 ash settling basin, wastewaters from the toe drains are collected in the same structure and discharged through a single pipe. The location of Outfall 101 is identified below and depicted on the map attached to the permit.

Table 1. Discharge Coordinates and Assigned Outfall Numbers

Seep ID	Latitude	Longitude	Outfall number
64 EO-01, 64 EO-02, and 64 EO-03	35.468	-82.549	Outfall 101

ASH POND DAMS
Seepage through earthen dams is common and is an expected consequence of impounding water with an earthen embankment. Even the tightest, best-compacted clays cannot prevent some water from seeping through them. Seepage is not necessarily an indication that a dam has structural problems, but should be kept in check through various engineering controls and regularly monitored for changes in quantity or quality which, over time, may result in dam failure.

REASONABLE POTENTIAL ANALYSIS(RPA)- OUTFALL 001
The Division conducted EPA-recommended analyses to determine the reasonable potential for toxicants to be discharged at levels exceeding water quality standards/EPA criteria by this facility. For the purposes of the RPA, the background concentrations for all parameters were assumed to be below detection levels. The RPA uses 95% probability level and 95% confidence basis in accordance with the EPA Guidance entitled "Technical Support Document for Water Quality-based Toxics Control." The RPA included evaluation of dissolved metals' standards, utilizing a default hardness value of 25 mg/L $CaCO_3$ for hardness-dependent metals. The RPA spreadsheets are attached to this Fact Sheet.

The interstitial concentration data was supplemented with data for a combined cycle plant discharges since both types of wastewater will be discharged simultaneously for several years before the removal of ash is completed. The calculations included: As, Be, Cd, Chlorides, Total Phenols, Cr, Cu, CN, Pb, Mo, Ni, Se, Ag, Zn, Al, Sb, and Tl (please see attached). The renewal application listed 3.52 MGD as a current flow. The discharge data on the EPA Form 2C was used for the RPA, it was supplemented by the analysis of the free standing water in the ash pond. The analysis indicates no reasonable potential to violate the surface water quality standards or EPA criteria.

The proposed permit requires that EPA methods 200.7 or 200.8 (or the most current versions) shall be used for analyses of all metals except for total mercury.

MERCURY EVALUATION

The State of North Carolina has a state-wide mercury impairment. The TMDL has been developed to address this issue in 2012. The TMDL included the implementation strategy, both documents were approved by EPA in 2012.

The mercury evaluation was conducted in accordance with the Permitting Guidelines for Statewide Mercury TMDL.

Year	2008	2009	2010	2011	2012
Annual average concentration (ng/L)	53.3	24.1	17.6	21.1	11.4
Maximum sampling result (ng/L)	173	56.4	83.2	49.2	43.3

The Water Quality-based allowable mercury effluent discharge concentration for this facility is 680.6 ng/L. All annual average mercury concentrations are below allowable. However, there are values that exceed TBEL of 47.0 ng/L. Based on the Permitting Guidelines for Statewide Mercury TMDL, the TBEL limit of 47.0 ng/L will be added to the permit.

CWA SECTION 316(a) TEMPERATURE VARIANCE AND FISH TISSUE MONITORING– OUTFALL 001, OUTFALL 002

There is a current Section 316(a) thermal variance for Lake Julian pending renewal. The facility conducts biological monitoring of Lake Julian to meet the requirements of the Section 316(a) CWA. The Water Sciences Section (WSS) of the DWR reviewed the biological monitoring report that was submitted to the DWQ in 2010. The WSS determined that "the fisheries community in Lake Julian currently meets the balanced and indigenous population (BIP) definition of Section 316(a) of the Clean Water Act". The WSS also imposed the additional monitoring requirements for the future BIP studies.

Lake Julian has been monitored since 1973. Monitoring encompasses water quality, water chemistry, phytoplankton, zooplankton, benthic macroinvertebrates, and fish. Prior to 2001 the monitoring was conducted annually; currently it is conducted triennially.

The 2007-2008 Monitoring Report also investigated fish tissue. Fish tissue of bass and channel catfish collected from Lake Julian were analyzed for As, Cd, Cu, Hg, and Se. All trace element concentrations in fish tissue were below detection level with an exception of Se. However, all Se values were well below the NC consumption advisory threshold of 50 μg/g dry weight.

In addition to Lake Julian, the facility conducts fish tissue sampling at 3 stations in French Broad River to determine potential impacts of the discharge. The latest fish tissue report was submitted to WSS in

2012. The WSS concluded: "2012 data demonstrates that there were no selenium issues noted at any of the three stations on the French Broad River and all selenium levels remain well below the North Carolina Department of Health and Human Services (NCDHHS) fish consumption advisory criteria of 10 ppm". The WSS also concluded: "In terms of mercury, a total of 91 total fish were collected from the three stations. From this total, seven individuals (8%) exceeded the 0.4 ppm NCDHHS mercury advisory criteria."

The WSS also reviewed that fish tissue data for 2014 and 2016. The WSS stated: "The review of the 2014 data demonstrates that there were no selenium issues noted at any of the three stations on the French Broad River and all selenium levels remain well below the North Carolina DHHS fish consumption advisory criteria of 10 mg/kg. For 2014, as was the case in previous years, there were exceedances of 0.4 mg/kg mercury criteria measured at all three monitoring locations (upstream, adjacent to the discharge and below the discharge). However, based on the Duke Energy data presented in the 2014 NPDES report (and past reports), we agree that these levels are not attributable to the discharge from the Asheville plant." The 2016 review states that "there have been no changes in Mercury and Selenium levels since the FGD system went operational".

Changes after Conversion

After conversion of the facility to the Combined Cycle power generation discharges of the cooling water to Lake Julian will cease. Cooling tower blowdown will be routed to Outfall 001 that discharges to French Broad River. The facility conducted CORMIX modeling of the thermal discharge and determined that the state temperature standard will be met 40.5 meters downstream of the outfall and the width of the thermal plume will be no wider than 7.5 meters. This Mixing Zone will be added to the permit and 2 instream compliance points will be established to demonstrate that the state temperature standard is not contravened. The size of the mixing zone is relatively small and does not prevent a free passage of fish in the receiving stream, the stream width at the point of discharge is approximately 67 meters.

INSTREAM MONITORING– OUTFALL 001, OUTFALL 002

The 2007-2008 Environmental Monitoring Report for Lake Julian concludes that – "Except for copper, all mean trace element mean concentrations surface waters remained below their respective reporting limits during 2007. All measured copper concentrations were relatively low and less than the North Carolina water quality standard". The same report provides data for Copper, Selenium, and Arsenic that were measured in two locations at Lake Julian, and in the French Broad River below the discharge from ash pond. The vast majority of samples were below detection level, the remaining samples were well below water quality standards. The only exception is one Se measurement in French Broad River (5.1 ug/L) that slightly exceeded the water quality standard of 5.0 μg/L.

The update to the permit renewal application submitted in 2014 provided instream sampling data for Oil & Grease, COD, Chlorides, Fluoride, Sulfate, Mercury, Aluminum, Barium, Boron, Calcium, Hardness, Iron, Magnesium, Manganese, Zinc, Antimony, Arsenic, Cadmium, Chromium, Copper, Lead, Molybdenum, Nickel, Selenium, Thallium, TDS, TSS, pH, Temperature, Specific Conductance, and Turbidity. The upstream monitoring station was located 5,500 ft. upstream of Outfall 001 and the downstream monitoring station was located 2,900 ft. downstream of the Outfall 001.

The following parameters were below detection level at both monitoring stations: Oil & Grease, COD, Fluoride, Mercury, Boron, Antimony, Arsenic, Cadmium, Chromium, Copper, Lead, Molybdenum, Nickel, Selenium, and Thallium. The rest of the parameters did not indicate a significant difference between the upstream and the downstream monitoring locations except for Specific Conductance.

The proposed permit will require monthly monitoring for total arsenic, total selenium, total mercury, total chromium, dissolved lead, dissolved cadmium, dissolved copper, dissolved zinc, total bromide, total hardness (as $CaCO_3$), temperature, turbidity, and total dissolved solids (TDS).

CWA SECTION 316(b)

The permittee shall comply with the Cooling Water Intake Structure Rule per 40 CFR 125.95. The permittee shall submit all the materials required by the 316(b) Rule 180 days before the planned commencement of cooling water withdrawals for the operation of the new unit.

Changes after Conversion

The combined cycle plant is defined as a "new unit" at an existing facility per 40 CFR 125.92(u). To meet the requirement of the 316(b) Section of the Clean Water Act the new unit will be equipped with closed-cycle recirculating mechanical draft cooling towers. The make-up water will be pumped from Lake Julian with design maximum withdrawal of 5.2 MGD and through-screen velocity of 0.049 feet/second.

Duke Energy submitted information demonstrating that the new unit meet BTA standards for entrainment and impingement in accordance with 40 CFR 125.94(e).

TOXICITY TESTING-OUTFALL 001

Current Requirement: Outfall 001 – Chronic P/F @ 1.8% using *Ceriodaphnia Dubia*
Recommended Requirement: Outfall 001 – Chronic P/F @ 1.8% using *Ceriodaphnia Dubia.*

This facility has passed all toxicity tests during the previous permit cycle, please see attached.

For the purposes of the permitting, the long term average flow was used in conjunction with the 7Q10 summer flow to calculate the percent effluent concentrations to be used for WET tests for each facility.

COMPLIANCE SUMMARY

During the last 5 years, the facility had no violations of the permit limits, please see attached.

PERMIT LIMITS DEVELOPMENT

- The temperature limits (Outfall 002 and 2 instream locations for Outfall 001) are based on the North Carolina water quality standards (15A NCAC 2B .0200) and 316(a) Thermal Variance.
- The Total Residual Chlorine Limit and Time of Chlorine Addition Limit (Outfall 002) were established in accordance with the 40 CFR 423.

- The limits for Oil and Grease and Total Suspended Solids (Outfall 001, Internal Outfall 001A, Internal Outfall 001B, Internal Outfall 001C, Internal Outfall 001D, and Outfall 101) were established in accordance with the 40 CFR 423.
- The pH limits (Outfall 001, Outfall 002, and Outfall 101) in the permit are based on the North Carolina water quality standards (15A NCAC 2B .0200).
- The turbidity limit in the permit (Outfall 001) is based on the North Carolina water quality standards (15A NCAC 2B .0200).
- The mercury limit in the permit (Outfall 001) is based on the North Carolina water quality standards (15A NCAC 2B .0200) and implementation strategy for Statewide Mercury TMDL.
- The Technology Based Effluent Limits for Total Arsenic, Total Mercury, Total Selenium, and Nitrate/nitrite as N (Outfall 005) are based on the requirements of 40 CFR 423.
- The Whole Effluent Toxicity limit (Outfall 001) is based on the requirements of 15A NCAC 2B .0500.
- The limits for Total Copper and Total Iron (Outfall 004) were established in accordance with the 40 CFR 423.
- The limits for Chlorides, Total Nickel, Total Selenium, and Total Zinc in the permit (Outfall 101) are based on the North Carolina water quality standards (15A NCAC 2B .0200).

PROPOSED CHANGES

- To accommodate changes required for conversion to Combined Cycle Plant, evaporator system discharge was added to Outfall 002 and once-through cooling water for coal units was removed.
- Measurement frequency for flow and temperature was reduced from Daily to Monthly due to the significant flow reduction (Outfall 002).
- Monitoring for the Total Residual Chlorine and the Time of Chlorine Addition was removed from Outfall 2 due to the cessation of Chlorine addition.
- Monitoring for Total Copper and Total Chromium were added to Outfall 002 based on the review of the effluent data provided by the facility.

PROPOSED SCHEDULE

Draft Permit to Public Notice: February 2, 2020 (est.)
Permit Scheduled to Issue: March 23, 2020 (est.)

STATE CONTACT

If you have any questions on any of the above information or on the attached permit, please contact Sergei Chernikov at (919) 707-3606 or sergei.chernikov@ncdenr.gov.

NPDES Implementation of Instream Dissolved Metals Standards – Freshwater Standards

The NC 2007-2015 Water Quality Standard (WQS) Triennial Review was approved by the NC Environmental Management Commission (EMC) on November 13, 2014. The US EPA subsequently approved the WQS revisions on April 6, 2016, with some exceptions. Therefore, metal limits in draft permits out to public notice after April 6, 2016 must be calculated to protect the new standards - as approved.

Table 1. NC Dissolved Metals Water Quality Standards/Aquatic Life Protection

Parameter	Acute FW, µg/l (Dissolved)	Chronic FW, µg/l (Dissolved)	Acute SW, µg/l (Dissolved)	Chronic SW, µg/l (Dissolved)
Arsenic	340	150	69	36
Beryllium	65	6.5	---	---
Cadmium	Calculation	Calculation	40	8.8
Chromium III	Calculation	Calculation	---	---
Chromium VI	16	11	1100	50
Copper	Calculation	Calculation	4.8	3.1
Lead	Calculation	Calculation	210	8.1
Nickel	Calculation	Calculation	74	8.2
Silver	Calculation	0.06	1.9	0.1
Zinc	Calculation	Calculation	90	81

Table 1 Notes:

1. FW= Freshwater, SW= Saltwater
2. Calculation = Hardness dependent standard
3. Only the aquatic life standards listed above are expressed in dissolved form. Aquatic life standards for Mercury and selenium are still expressed as Total Recoverable Metals due to bioaccumulative concerns (as are all human health standards for all metals). It is still necessary to evaluate total recoverable aquatic life and human health standards listed in 15A NCAC 2B.0200 (e.g., arsenic at 10 µg/l for human health protection; cyanide at 5 µg/L and fluoride at 1.8 mg/L for aquatic life protection).

Table 2. Dissolved Freshwater Standards for Hardness-Dependent Metals

The Water Effects Ratio (WER) is equal to one unless determined otherwise under 15A NCAC 02B .0211 Subparagraph (11)(d)

Metal	NC Dissolved Standard, µg/l
Cadmium, Acute	WER*{1.136672-[*ln* hardness](0.041838)} · *e*^{0.9151 [*ln* hardness]-3.1485}
Cadmium, Acute Trout waters	WER*{1.136672-[*ln* hardness](0.041838)} · *e*^{0.9151[*ln* hardness]-3.6236}
Cadmium, Chronic	WER*{1.101672-[*ln* hardness](0.041838)} · *e*^{0.7998[*ln* hardness]-4.4451}

Chromium III, Acute	WER*0.316 · *e*^{0.8190[*ln* hardness]+3.7256}
Chromium III, Chronic	WER*0.860 · *e*^{0.8190[*ln* hardness]+0.6848}
Copper, Acute	WER*0.960 · *e*^{0.9422[*ln* hardness]-1.700}
Copper, Chronic	WER*0.960 · *e*^{0.8545[*ln* hardness]-1.702}
Lead, Acute	WER*{1.46203-[*ln* hardness](0.145712)} · *e*^{1.273[*ln* hardness]-1.460}
Lead, Chronic	WER*{1.46203-[*ln* hardness](0.145712)} · *e*^{1.273[*ln* hardness]-4.705}
Nickel, Acute	WER*0.998 · *e*^{0.8460[*ln* hardness]+2.255}
Nickel, Chronic	WER*0.997 · *e*^{0.8460[*ln* hardness]+0.0584}
Silver, Acute	WER*0.85 · *e*^{1.72[*ln* hardness]-6.59}
Silver, Chronic	Not applicable
Zinc, Acute	WER*0.978 · *e*^{0.8473[*ln* hardness]+0.884}
Zinc, Chronic	WER*0.986 · *e*^{0.8473[*ln* hardness]+0.884}

General Information on the Reasonable Potential Analysis (RPA)

The RPA process itself did not change as the result of the new metals standards. However, application of the dissolved and hardness-dependent standards requires additional consideration in order to establish the numeric standard for each metal of concern of each individual discharge.

The hardness-based standards require some knowledge of the effluent and instream (upstream) hardness and so must be calculated case-by-case for each discharge.

Metals limits must be expressed as 'total recoverable' metals in accordance with 40 CFR 122.45(c). The discharge-specific standards must be converted to the equivalent total values for use in the RPA calculations. We will generally rely on default translator values developed for each metal (more on that below), but it is also possible to consider case-specific translators developed in accordance with established methodology.

RPA Permitting Guidance/WQBELs for Hardness-Dependent Metals - Freshwater

The RPA is designed to predict the maximum likely effluent concentrations for each metal of concern, based on recent effluent data, and calculate the allowable effluent concentrations, based on applicable standards and the critical low-flow values for the receiving stream.
If the maximum predicted value is greater than the maximum allowed value (chronic or acute), the discharge has reasonable potential to exceed the standard, which warrants a permit limit in most cases. If monitoring for a particular pollutant indicates that the pollutant is not present (i.e.

consistently below detection level), then the Division may remove the monitoring requirement in the reissued permit.

1. To perform a RPA on the Freshwater hardness-dependent metals the Permit Writer compiles the following information:
   - Critical low flow of the receiving stream, 7Q10 (the spreadsheet automatically calculates the 1Q10 using the formula 1Q10 = 0.843 (s7Q10, cfs) $^{0.993}$
   - Effluent hardness and upstream hardness, site-specific data is preferred
   - Permitted flow
   - Receiving stream classification

2. In order to establish the numeric standard for each hardness-dependent metal of concern and for each individual discharge, the Permit Writer must first determine what effluent and instream (upstream) hardness values to use in the equations.

   The permit writer reviews DMR's, Effluent Pollutant Scans, and Toxicity Test results for any hardness data and contacts the Permittee to see if any additional data is available for instream hardness values, upstream of the discharge.

   If no hardness data is available, the permit writer may choose to do an initial evaluation using a default hardness of 25 mg/L (CaCO3 or (Ca + Mg)). Minimum and maximum limits on the hardness value used for water quality calculations are 25 mg/L and 400 mg/L, respectively.

   If the use of a default hardness value results in a hardness-dependent metal showing reasonable potential, the permit writer contacts the Permittee and requests 5 site-specific effluent and upstream hardness samples over a period of one week. The RPA is rerun using the new data.

   The overall hardness value used in the water quality calculations is calculated as follows:
   Combined Hardness (chronic)

   $$= \frac{\text{(Permitted Flow, cfs *Avg. Effluent Hardness, mg/L) + (s7Q10, cfs *Avg. Upstream Hardness, mg/L)}}{\text{(Permitted Flow, cfs + s7Q10, cfs)}}$$

   The Combined Hardness for acute is the same but the calculation uses the 1Q10 flow.
3. The permit writer converts the numeric standard for each metal of concern to a total recoverable metal, using the EPA Default Partition Coefficients (DPCs) or site-specific translators, if any have been developed using federally approved methodology.

EPA default partition coefficients or the "Fraction Dissolved" converts the value for dissolved metal at laboratory conditions to total recoverable metal at in-stream ambient conditions. This factor is calculated using the linear partition coefficients found in *The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion* (EPA 823-B-96-007, June 1996) and the equation:

$$\frac{C_{diss}}{C_{total}} = \frac{1}{1 + \{ [K_{po}] [ss^{(1+a)}] [10^{-6}] \}}$$

Where:
ss = in-stream suspended solids concentration [mg/l], minimum of 10 mg/L used, and
Kpo and *a* = constants that express the equilibrium relationship between dissolved and adsorbed forms of metals. A list of constants used for each hardness-dependent metal can also be found in the RPA program under a

4. The numeric standard for each metal of concern is divided by the default partition coefficient (or site-specific translator) to obtain a Total Recoverable Metal at ambient conditions.

   In some cases, where an EPA default partition coefficient translator does not exist (ie. silver), the dissolved numeric standard for each metal of concern is divided by the EPA conversion factor to obtain a Total Recoverable Metal at ambient conditions. This method presumes that the metal is dissolved to the same extent as it was during EPA's criteria development for metals. For more information on conversion factors see the June, 1996 EPA Translator Guidance Document.

5. The RPA spreadsheet uses a mass balance equation to determine the total allowable concentration (permit limits) for each pollutant using the following equation:

$$Ca = \frac{(s7Q10 + Qw)(Cwqs) - (s7Q10)(Cb)}{Qw}$$

Where: Ca = allowable effluent concentration (µg/L or mg/L)
Cwqs = NC Water Quality Standard or federal criteria (µg/L or mg/L)
Cb = background concentration: assume zero for all toxicants except NH_3* (µg/L or mg/L)
Qw = permitted effluent flow (cfs, match s7Q10)
s7Q10 = summer low flow used to protect aquatic life from chronic toxicity and human health through the consumption of water, fish, and shellfish from noncarcinogens (cfs)
* Discussions are on-going with EPA on how best to address background concentrations

Flows other than s7Q10 may be incorporated as applicable:
1Q10 = used in the equation to protect aquatic life from acute toxicity

QA = used in the equation to protect human health through the consumption of water, fish, and shellfish from carcinogens
30Q2 = used in the equation to protect aesthetic quality

6. The permit writer enters the most recent 2-3 years of effluent data for each pollutant of concern. Data entered must have been taken within four and one-half years prior to the date of the permit application (40 CFR 122.21). The RPA spreadsheet estimates the 95th percentile upper concentration of each pollutant. The Predicted Max concentrations are compared to the Total allowable concentrations to determine if a permit limit is necessary. If the predicted max exceeds the acute or chronic Total allowable concentrations, the discharge is considered to show reasonable potential to violate the water quality standard, and a permit limit (Total allowable concentration) is included in the permit **in accordance with the U.S. EPA Technical Support Document for Water Quality-Based Toxics Control published in 1991.**

7. When appropriate, permit writers develop facility specific compliance schedules in accordance with the EPA Headquarters Memo dated May 10, 2007 from James Hanlon to Alexis Strauss on 40 CFR 122.47 Compliance Schedule Requirements.

8. The Total Chromium NC WQS was removed and replaced with trivalent chromium and hexavalent chromium Water Quality Standards. As a cost savings measure, total chromium data results may be used as a conservative surrogate in cases where there are no analytical results based on chromium III or VI. In these cases, the projected maximum concentration (95th %) for total chromium will be compared against water quality standards for chromium III and chromium VI.

9. Effluent hardness sampling and instream hardness sampling, upstream of the discharge, are inserted into all permits with facilities monitoring for hardness-dependent metals to ensure the accuracy of the permit limits and to build a more robust hardness dataset.

10. Hardness and flow values used in the Reasonable Potential Analysis for this permit included:

Parameter	**Value**	**Comments (Data Source)**
Average Effluent Hardness (mg/L) [Total as, $CaCO_3$ or (Ca+Mg)]	25.0	Default value
Average Upstream Hardness (mg/L) [Total as, $CaCO_3$ or (Ca+Mg)]	25.0	Default value
7Q10 summer (cfs)	0	Lake or Tidal
1Q10 (cfs)	0	Lake or Tidal
Permitted Flow (MGD)	2.1	For dewatering