COLORADO
Department of Public Health & Environment

January 28, 2020

Ms. Esther Vincent
Northern Colorado Water Conservancy District
220 Water Ave.
Berthoud, CO 80513

Re: Section 401 Colorado Water Quality Certification No.: 4395
US Army Corps of Engineers 404 Permit No.: NWO-2003-80509-DEN
Project Name: Northern Integrated Supply Project (NISP)
Location: Larimer and Weld Counties
Waterbody: South Platte River Basin (Cache la Poudre River, Big Thompson River, Middle South Platte River, St. Vrain River)
Reviewable Designation: COSPBT05, COSPBT09, COSPCP10a, COSPCP10b, COSPCP11, COSPCP12, COSPCP13a, COSPCP13b, COSPCP15, COSPCP21, COSPMS01b, COSPMS03a, COSPMS05a
Use-Protected Designation: COSPBT06, COSPCP22, COSPSV06

Dear Ms. Vincent:

The Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Division (Division) has completed its review of the Northern Integrated Supply Project Clean Water Act (CWA) Section 401 Certification Application. This review included an antidegradation determination conducted pursuant to Regulation No. 31 (5 CCR 1002-31) § 31.8(3) and Regulation No. 82 (5 CCR 1002-82) § 82.5(A)(1)(a). The Division developed condition to mitigate the predicted impacts of the project.

Regulation No. 82 Requirements

Regulation No. 82, (5 CCR 1002-82) which addresses certifications under Section 401 of the Clean Water Act, directs the Division to consider antidegradation requirements identified in the state's Procedural Regulation, Regulation No. 21 (5 CCR 1002-21), the Basic Standards and Methodologies for Surface Water, Regulation No. 31 (5 CCR 1002-31), and the 401 Certification Regulation, Regulation No. 82, as well as additional requirements contained in Regulation No. 31, the Basic Standards for Ground Water, Regulation No. 41 (5 CCR 1002-41), and appropriate classifications and water quality standards, effluent limits, control regulations, Best Management Practices (BMPs), water quality mitigation measures, and public comments. The Division is directed to provide either a regular certification, conditional certification, or to deny certification based upon review of the application and the applicable water quality requirements as listed in section 82.5(A)(1) of Regulation No. 82.

Project Background

The proposed Northern Integrated Supply Project (NISP) will provide 40,000 acre-feet (AF) of firm yield to a regional consortium of 15 participants that includes towns and water districts in

Larimer, Weld, Boulder and Morgan counties. The preferred alternative for the NISP, which is described as Alternative 2M in the US Army Corps of Engineers 2018 Final Environmental Impact Statement (FEIS), would involve hydrologic modifications in the Cache la Poudre River, the construction of two new forebays and reservoirs, the construction of two new diversion structures, increased diversions at the existing Poudre Valley Canal diversion, and new water rights exchanges with two irrigation companies. The affected portions of the Cache la Poudre River mainstem are segments 10a, 10b, 11, 12, 13a, 13b, 15, 21, and 22, the Middle South Platte River segments 1b, 3a, and 5a, the Big Thompson River segments 5, 6, and 9, and the St. Vrain River segment 6.

All of these segments except for Big Thompson 6, Cache la Poudre 22, and St. Vrain 6 are designated as "reviewable," meaning that an antidegradation review is required. The antidegradation review process requires a determination as to whether the activity is likely to result in significant degradation of the impacted waters. The Division's "significance determinations for reviewable waters under section 31.8(3)(c) shall be made with respect to the net effect of the new or increased water quality impacts of the proposed Project, taking into account any environmental benefits within the Project area, including any water quality improvements, or mitigation measures proposed to be implemented within the Project area." 5 CCR 1002-82, § 82.5(A)(1)(a).

Division Comments and Antidegradation Review

The Division reviewed the 401 certification application and the associated technical reports against the requirements of Regulation No. 82 and the other applicable regulations and policies cited herein for the NISP. The Division also considered the formal public comments submitted as part of this process. The construction activities described in the NISP 401 Certification Application and associated materials are expected to be only short-term in nature, and are therefore not significant in the context of an antidegradation review. *See* 5 CCR 1002-31, § 31.8(3)(c)(ii)(D).

Operation of the NISP does not involve the discharge of pollutants, but it does have the potential to cause or contribute to long-term water quality impacts. These potential impacts and the required conditions to mitigate such impacts are explained in detail in the attached *Rationale for Conditional 401 Certification of the Northern Integrated Supply Project*.

Certification Statement

The Division concludes that there is reasonable assurance that the project will be conducted in a manner that complies with all applicable water quality requirements. *See* 5 CCR 1002-82, § 82.5(A)(3); 40 CFR § 121.2(a)(3). This conclusion is based on the Division's analysis and evaluation, as further explained in the attached *Rationale for Conditional 401 Certification for the Northern Integrated Supply Project*. The Division also considered short-term impacts of construction activities, BMPs, the Colorado Parks and Wildlife *Fish and Wildlife Mitigation and Enhancement Plan*, and the conditions on construction and operation of the project as imposed by the Division, including the development of adaptive management practices in response to ongoing monitoring and assessed conditions. Therefore, this letter shall serve as official notification that the Division is issuing a "Conditional Certification" in accordance with 5 CCR 1002-82, § 82.5(A)(3). Conditions for this certification are included in the attached document, *Rationale for Conditional 401 Certification of Northern Integrated Supply Project*.

This 401 Water Quality Certification shall apply to both the construction and operation of the project for which a federal permit is required, and shall apply to the water quality impacts associated with the NISP. This certification does not constitute any relinquishment of the Division's additional authority over water quality protection as defined in the Colorado Water Quality Control Act, nor does it fulfill or waive any other local, state, or federal requirements.

If you have any questions or need additional information, please contact Scott Garncarz of my staff at (303) 692-2374.

Sincerely,

Patrick Pfaltzgraff
Director, Water Quality Control Division
Colorado Department of Public Health and Environment

Enclosures: *Rationale for Conditional 401 Certification of the Northern Integrated Supply Project*
Regulation 82.6 Certification Requirements

CC: Matt Montgomery, US Army Corps of Engineers, Denver Regulatory Office,
Kiel Downing, US Army Corps of Engineers, Denver Regulatory Office,
Judy Bloom, US EPA Region 8

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List of Acronyms

AF: Acre-feet

BAI: Baseline Available Increment

C-BT: Colorado-Big Thompson

CFS: Cubic Feet per Second

CPW: Colorado Parks and Wildlife

CTP: Common Technical Platform

CWA: Clean Water Act

DM: Daily Maximum

FCA: Fish Consumption Advisory

FEIS: Final Environmental Impact Statement

FWMEP: Fish and Wildlife Mitigation and Enhancement Plan

M&E List: Monitoring and Evaluation List

MLOW: Multilevel Outlet Works

MMI: Multimetric Index

MWAT: Maximum Weekly Average Temperature

NEPA: National Environmental Policy Act

NISP: Northern Integrated Supply Project

PRI: Poudre River Intake

PVC: Poudre Valley Canal

RFFA: Reasonably Foreseeable Future Action

SD: Significant Degradation

SPWCP: South Platte Water Conservation Project

TAC: Technical Advisory Committee

TMDL: Total Maximum Daily Load

USACE: United States Army Corps of Engineers

USEPA: United States Environmental Protection Agency

WOTUS: Waters of the United States

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Definitions

Adaptive Management: In the context of Division-issued 401 water quality certifications, describes an iterative process through which actions taken to address water quality impacts are modified based on the results of associated monitoring activities.

Acute and Chronic Adaptive Management Threshold Triggers: For the purposes of this certification, temperature values 1°C and 0.3°C *below* the acute (daily maximum) and chronic (maximum weekly average) temperature standards, respectively, that are applicable at the time that temperatures are measured. These triggers were originally defined in the Fish and Wildlife Mitigation and Enhancement Plan, but the definitions have been modified to meet the needs of the 401 certification. If either of these values is exceeded at the Canyon Gauge or at a nearby monitoring location, mitigation activities may be required to ensure that temperature standards are not exceeded.

Antidegradation Review *(or AD Review)*: Procedure to review regulated activities with new or increased water quality impacts that may degrade the quality of reviewable waters of the state (Regulation No. 31, Section 31.8(3)(a)). For the purposes of this certification, the antidegradation review requires calculation of the baseline available increment to determine whether significant degradation is predicted to occur as a result of NISP under the cumulative effects modeling scenario.

Baseline Available Increment *(or BAI)*: Difference between low-flow pollutant concentrations and the relevant standards for critical constituents for that portion of the segment impacted by the proposed project (Regulation No. 31, Section 31.8(3)(c)(ii)(B)). The 401 certification application for NISP provides a detailed description of how the BAI was determined in the context of the antidegradation review for temperature, since Regulation No. 31 does not provide clear guidance regarding the definition of the BAI for this parameter.

Category 4b Demonstration Plan *(or Category 4b Plan)*: An alternative to 303(d) listing and TMDL development which establishes pollution control requirements that will ensure attainment of all applicable water quality standards (40 CFR 130.7(b)(1)) within a reasonable time period (USEPA, Guidance for 2006 Assessment, Listing and Reporting Requirements, 2005). Category 4b Plans must be accepted by the Division and by the USEPA. More information concerning the circumstances under which a Category 4b Plan may be accepted, and the specific elements that must be included, is provided in the Division's 2020 303(d) Listing Methodology.

Common Technical Platform: Hydrologic model developed to ensure that environmental impact analyses for three water supply projects (NISP, Halligan Water Supply Project, Seaman Water Supply Project) planned for the Cache La Poudre River basin are based on consistent assumptions for current and future flows. The basis for all modeled scenarios was "naturalized stream flows," or historical gaged stream flows adjusted to remove the influence of human activities, measured between 1950 and 2000. Demands, infrastructure, and operations from 2010 and those predicted for 2050 were then applied to the naturalized stream flows to establish current and future condition baseline scenarios, respectively. Changes to demands, infrastructure, and operations associated with all Project alternatives

and RFFAs were then incorporated to develop scenarios with the Project under both baseline conditions. Only the model scenarios that include the preferred alternative were considered for the 401 Certification. The CTP model is an element unique to the three water supply projects for which it was developed.

Cumulative Effects (*Model Scenario*): For the purposes of this certification, CTP modeling scenario that determines stream flows assuming the preferred alternative for NISP, all RFFAs, and both the Halligan and Seaman water supply projects are operating under the future condition baseline. The Division relied primarily on the Cumulative Effects scenario to determine potential water quality impacts and to develop conditions.

Fish and Wildlife Mitigation and Enhancement Plan *(or FWMEP)*: For the purposes of this certification, plan developed by Northern Colorado Water Conservancy District, the NISP Applicant, for actions that must be taken to mitigate impacts to fish and wildlife resources or provide enhancement to said resources. The plan satisfies the requirements of C.R.S. 37-60-122.2, and is enforceable via an Intergovernmental Agreement between Northern Integrated Supply Project Water Activity Enterprise, on behalf of all Project participants, and the State of Colorado, acting through the Department of Natural Resources, for the use and benefit of Colorado Division of Parks and Wildlife.

Full Buildout Conditions: For the purposes of this certification, defined in the FWMEP as a period following full or nearly full storage in Glade Reservoir and Galeton Reservoir (the new reservoirs proposed as part of NISP), and the consistent delivery of full or nearly full NISP yield to a majority of NISP participants for a period of five years. Where the achievement of full buildout conditions is referenced in this certification, it refers to the end of the five-year period during which full or nearly full NISP yield is delivered.

Impairment: An exceedance of a water quality standard in a given waterbody that was identified using the water quality assessment protocols outlined in the Division's most recent 303(d) Listing Methodology. In the context of this certification, formal listing in Regulation No. 93 is not required to conclude that a waterbody is impaired.

Impairment Investigation Report: In the context of this certification, a report, prepared by Northern Water, that evaluates NISP's contribution to a documented impairment. The report must, at a minimum, identify the magnitude and duration of the observed impairment, potential contributing sources, and contributions from NISP, if any. Impairment investigation reports must be submitted to the Division within 12 months after the impairment is reported. If the Division determines, based on the results of an impairment investigation report, that NISP is contributing to an impairment, further action is required.

Load Reduction Measures: In the context of this certification, specific actions that Northern Water commits to implement in order to reduce existing loads of constituents for which impacted waterbodies are already impaired, since NISP operation is predicted to contribute to some of those impairments.

Mitigation: In the context of this certification, specific actions that Northern Water commits to implement in order to address those impacts that are predicted to occur as a result of NISP operation.

Positive Net Effect: Occurs when the Division determines that the collective result of new or increased water quality impacts predicted for the operation of NISP and any environmental benefits (including water quality improvements or mitigation measures) that Northern Water is required to implement in the NISP project area will result in improvement to water quality relative to current conditions. This term is consistent with Regulation No. 82, Section 82.5(A)(1)(a), which provides guidance for making significance determinations for USACE Section 404 permits and Federal Energy Regulatory Commission licenses on reviewable waters under Regulation No. 31, Section 31.8(3)(c)

Practicable: In the context of this certification, describes the circumstances under which a particular action can be taken both safely and successfully. Specific definitions for this term are provided as footnotes to the text where the term is used in conditions to initiate mitigation or monitoring activities.

Water Quality Improvement *(or Improvements)* **Measures**: In the context of this certification, these are actions that Northern Water shall implement in order to improve water quality conditions in the future relative to current conditions in impacted waterbodies. These are usually termed "enhancement" measures in the context of FWMEP commitments, but are referred to in most instances in this certification as "water quality improvement measures" to ensure consistency with Regulation No. 82, Section 82.5(A)(3). When used without reference to a specific condition or other requirement, the term "water quality improvement measures" should be understood to encompass any measure intended to improve future water quality conditions relative to current conditions, including those referred to elsewhere as enhancement or load reduction measures.

Rationale for Conditional 401 Certification of the Northern Integrated Supply Project (NISP)

Introduction

The Northern Colorado Water Conservancy District (Northern Water or Applicant) is required to obtain a United States Army Corps of Engineers (USACE) Section 404 individual permit for the Northern Integrated Supply Project (NISP or Project). As defined in the Water Quality Control Commission's (Commission) Regulation 82.2(3), "404 Permit means that individual permit issued by the U.S. Army Corps of Engineers for the discharge of dredged and fill material as described in Section 404 of the Federal Act." Under Section 401 of the Federal Clean Water Act (CWA) and in accordance with the Colorado Water Quality Control Act, it is the responsibility of the Water Quality Control Division (Division) to determine whether to certify, conditionally certify or deny certification for a project. Federal regulations at 40 CFR 121.2 and the Commission's Regulation No. 82 (5 CCR 1002-82) provide further direction to the Division concerning the nature and scope of the evaluation of potential water quality impacts.

The proposed NISP will provide 40,000 acre-feet (AF) of firm yield to a regional consortium of 15 participants, including towns and water districts in Larimer, Weld, Boulder and Morgan counties. The preferred alternative for NISP (the Project), which is described as Alternative 2M in the USACE 2018 Final Environmental Impact Statement (FEIS), would involve hydrologic modifications in the Cache la Poudre (Poudre) River basin, including the construction of two new reservoirs, two new diversion structures, increased diversions at the existing Poudre Valley Canal diversion, and new water rights exchanges with two irrigation companies (Figure 1). Each element of the Project is described in further detail below:

- Poudre Valley Canal (PVC) Diversion: The capacity of this existing diversion structure and approximately two miles of associated canal would be increased by 1,200 cubic feet per second (cfs) to accommodate increased diversions for the Project. Project water diverted at the PVC diversion would be stored in Glade Reservoir.
- Glade Reservoir: This off-channel reservoir would have a capacity of 170,000 AF, and its construction would include a new forebay and pump station. About two-thirds of the water released would be delivered directly to Project participants through a system of pipelines, while the remaining third would be released to the Poudre River before being diverted to the pipelines at the Poudre River Intake, a new diversion located about 11.5 miles downstream of the Glade Reservoir release.
- Poudre River Intake (PRI): This new diversion structure would be used to divert the water released to the Poudre River from Glade Reservoir to new pipelines for delivery to Project participants. It would be located in segment 11 of the Poudre River upstream of the Mulberry Water Reclamation Facility and would have the capacity to divert approximately 14,000 AF every year.

- South Platte Water Conservation Project (SPWCP) Diversion: This new diversion structure would be used to divert water from the South Platte River near its confluence with the Poudre River to a forebay, from which the water would then be pumped to Upper Galeton Reservoir via a new pump station.
- Upper Galeton Reservoir: This off-channel reservoir would have a capacity of 45,624 AF, and represents a component of the SPWCP. Water stored here would be delivered to the Larimer-Weld and New Cache irrigation companies via the Galeton pipelines. These deliveries would be made in exchange for the portion of Poudre River water that these companies currently use, which would be diverted at the PVC for storage in Glade Reservoir during the high flow season.

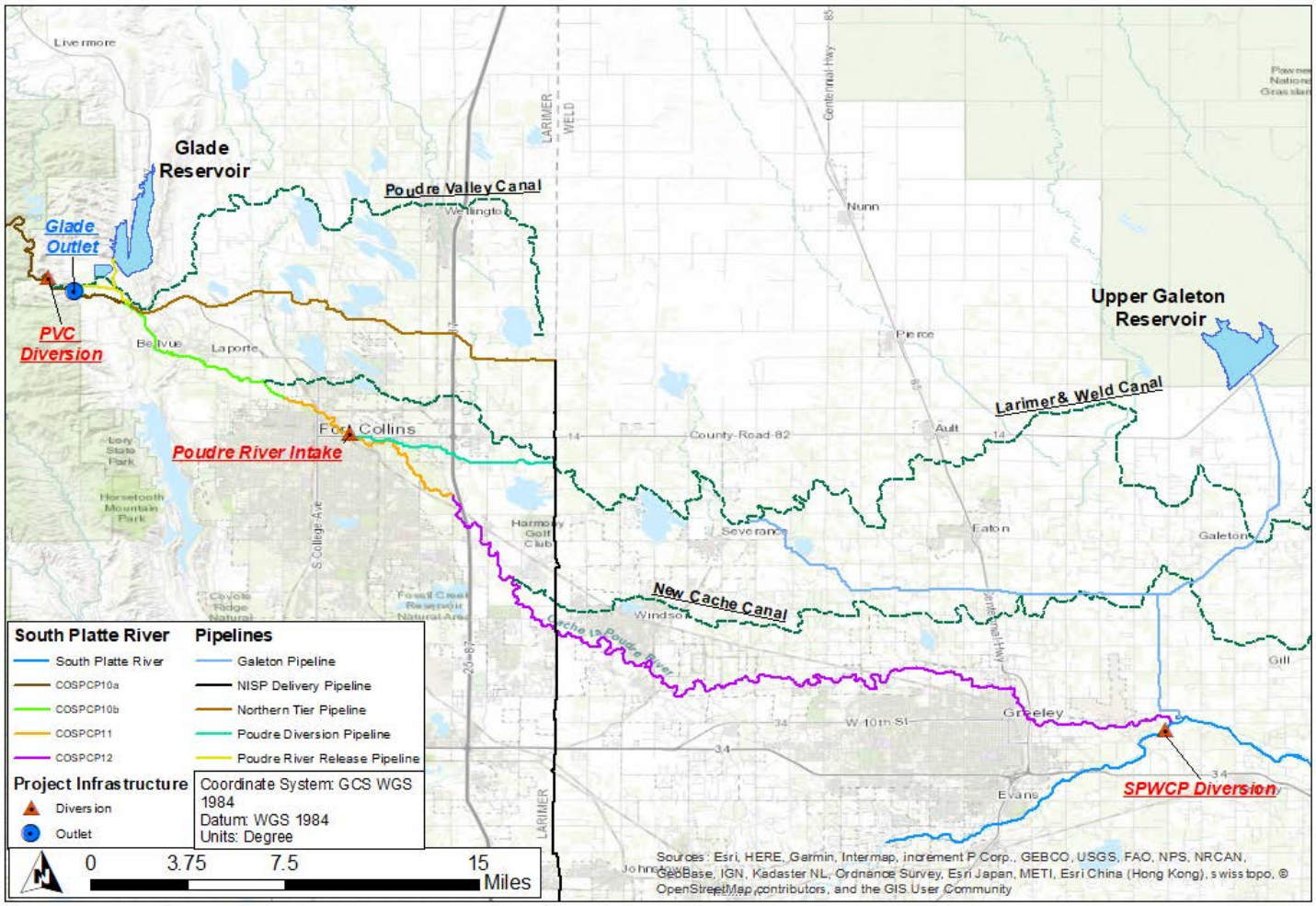

FIGURE 1. MAP HIGHLIGHTING APPROXIMATE LOCATIONS OF NEW PROJECT INFRASTRUCTURE, INCLUDING RESERVOIRS, DIVERSIONS, INTAKES, AND PIPELINES.

Water will be diverted to Glade Reservoir via the Poudre Valley Canal (PVC) diversion. About two-thirds of this water will then be released directly to the Northern Tier Pipeline, and the remaining third will be released to the Poudre River via the Glade Outlet before being diverted to the Northern Tier Pipeline via the Poudre River Intake and the Poudre Diversion Pipeline. Diversions from the South Platte via the SPWCP Diversion will be used to fill Upper Galeton Reservoir, from which water will then be delivered to the Larimer & Weld and New Cache canals via the Galeton Pipeline as a source of substitute supply for diversions by exchange at the Poudre Valley Canal.

The Project will have both temporary and permanent impacts to waters of the United States (WOTUS), as defined in 40 C.F.R. § 122.2, and "state waters," and although the operation of the project does not involve a discharge of pollutants, it does involve hydrologic modifications related to the Applicant's exercise of water rights, which will alter flows in the Poudre River[1]. The primary impacts of the Project would be associated with reduced flows, which would impact both water quality and aquatic habitat. The following sections explain predicted Project impacts in terms of specific water quality parameters, the conditions that the Applicant will be required to meet in order to avoid, minimize, and/or mitigate those impacts, and the Division's technical basis and regulatory authority for imposing these conditions. The evaluation of predicted impacts, including associated modeling efforts and data analyses, were provided in the 401 certification application, technical reports, and relevant appendices.

Regulatory Documents and Other Associated Materials

Section 82.5(A) of Regulation No. 82 specifies the Division's procedures and determinations for 401 certifications. The Division considers the following documents in its determinations for 401 certifications: the National Environmental Policy Act (NEPA) documents, the 401 certification application and associated technical reports, other Commission regulations, and public comments associated with the 401 certification application. The following documents were used or referenced in the determination of the 401 certification for the Project:

- Regulation No. 82, 401 Certification Regulation (5 CCR 1002-82);
- Regulation No. 31, Basic Standards and Methodologies for Surface Water (5 CCR 1002-31);
- Regulation No. 38, Classifications and Numeric Standards for South Platte River Basin, Laramie River Basin, Republican River Basin, Smoky Hill River Basin (5 CCR 1002-38);
- Antidegradation Significance Determination for New or Increased Water Quality Impacts guidance;
- Colorado 303(d) Listing Methodology (2020);
- Policy Statement 10-1, Aquatic Life Use Attainment;
- Clean Water Policy 12, Colorado Water Quality Selection of Best Management Practices;
- Northern Integrated Supply Project Fish and Wildlife Mitigation and Enhancement Plan;
- Section 401 Water Quality Certification Application and Technical Report;
- Public Comments received on the 401 application;
- Response to Public Comments received from Northern Water

The analyses used in the 401 certification application are described in detail in the technical reports that were included as appendices to the application. The 401 Water Quality

[1]Note that although the Project also includes a new diversion on the South Platte River, modeling analyses using the Common Technical Platform (CTP) show that impacts to South Platte River flows are small, with a maximum decrease of 6.1% in the runoff month of June. Therefore, the South Platte River is considered a non-impacted waterbody.

Certification Technical Report (401 Technical Report) provides a thorough characterization of water quality impacts and an extensive catalog of the commitments the Applicant has made to mitigate those impacts or otherwise improve water quality and reduce pollutant loads in the affected project area. The Division agrees with the Applicant's characterization of impacts and also recognizes the value of the many commitments the Applicant has made to improve water quality. In order to issue a water quality certification for this project, the Division must have "reasonable assurance" that the proposed mitigation will minimize or eliminate predicted impacts and that water quality improvement measures will benefit water quality as expected (40 C.F.R. 121.2(a)(3) and Regulation No. 82, Section 82.5(A)(3)). To meet the "reasonable assurance" threshold, the Division will impose conditions on the certification as a means of formally documenting and assessing the performance of these mitigation and water quality improvement measures.

Process for Developing Conditions

Regulation No. 82 authorizes the Division to impose conditions on a federal license or permit requiring a 401 certification if it concludes that such conditions are necessary to provide "reasonable assurance that the Project…will comply with all applicable requirements" (Regulation No. 82, 82.5(A)(3)). This authority stems from the CWA, Section 401, as implemented through U.S. Environmental Protection Agency (USEPA) regulations (40 CFR 121.2). In order to develop conditions that fulfill this purpose, the Division must first evaluate the potential for the proposed activity to violate applicable requirements in the absence of such conditions. For the Project, the Division thoroughly reviewed the Applicant's 401 certification application and technical reports (2019), the FEIS (2018), and associated appendices and technical documents to identify impacts that could result in violations of water quality standards and/or provisions of the antidegradation rule (Regulation No. 31, Section 31.8). The Division also considered concerns raised by other entities during the Division's public comment period for Northern Water's 401 certification application, Northern Water's response to those public comments, and the Division's draft conditional certification, including the preliminary antidegradation determination for the Project. The 401 application, draft conditional certification and preliminary antidegradation review were published in the Division's Water Quality Bulletin on March 1, 2019. As a result of this analysis, the Division has concluded that conditions are required to meet the "reasonable assurance" threshold for identified impacts. Detailed information concerning these impacts is provided in the rationales presented for each set of conditions (Table 1).

The conditions developed for the 401 certification are consistent with C.R.S 25-8-104 of the Water Quality Control Act, as specified in Regulation No. 82. Although it is beyond the Division's authority to unilaterally impose a condition inconsistent with C.R.S. 25-8-104, such a condition could be included if the Applicant finds it acceptable.

TABLE 1. SUMMARY OF ALL 401 CERTIFICATION CONDITIONS.		
Set of Conditions	*Number*	*Summary*
Temperature	1	Real-time monitoring and adaptive management for adaptive management threshold triggers at Canyon Gage and PR-GLDU
	2	Development and maintenance of Baseline and Project versions of dynamic temperature model
	3	Monitoring net effects of Project and mitigation measures from PVC to Glade Release to support adaptive management
	4	Monitoring effectiveness of MLOW operations and making adjustments to MLOW decision tree as needed
	5	Monitoring net effects of Project and mitigation measures from Glade Release to Lincoln Street to support adaptive management
	6	Monitoring net effects of Project and mitigation measures at Boxelder Gage to support adaptive management
	7	Immediate, annual and five-year reporting, including Category 4b Plan /other corrective action if impairments occur or persist
General Monitoring in New Reservoirs	8	Routine monitoring in Glade Reservoir, Upper Galeton Reservoir, and their forebays
	9	Development of a Category 4b Plan to address impairments in any of the new reservoirs and/or forebays
	10	Routine monitoring at PR-GLDU and GLD-PRU; Calculation of concentrations downstream of Glade release
	11	Investigation of calculated impairments downstream of Glade release; Development of Category 4b Plan, if appropriate
Internal Release - Glade Reservoir	12	Additional in-reservoir vertical profiling and sampling if hypoxia (DO < 2 mg/L) is observed during routine monitoring of Glade Reservoir
	13	Implementation of Division-approved MLOW decision tree modifications if in-reservoir concentrations are high (elevated threshold) and significant degradation expected in Poudre River (based on samples for **Condition 10**)
	14	Monitoring effectiveness of MLOW decision tree modifications; Category 4b plan if decision tree modification is not successful
	15	Annual and 5-year reporting, for which content depends on which conditions have been triggered
Arsenic and Copper	16	Targeted monitoring in segments 10b and 11 for As and Cu to address potential water supply standards and existing reservoirs
	17	Participation as stakeholder to TMDL process, if appropriate; Pursuit of Category 4b Plan, if appropriate
E. coli	18	Placement of $1.5M in escrow for implementation of load reduction measures (at least 80%) and water quality studies to support project location/design (not to exceed 20%)
	19	Monitoring effectiveness of each load reduction measure to support adaptive management
	20	Targeted monitoring in segments 11 and 12 to address uncertainty in predicted *E. coli* impacts
	21	Additional investigation and load reduction measures if Project contributes to *E. coli* impairments

TABLE 1. SUMMARY OF ALL 401 CERTIFICATION CONDITIONS.		
Set of Conditions	*Number*	*Summary*
Nutrients	22	Placement of $925,000 in escrow for water quality / feasibility studies to identify primary sources of loading to the Poudre River ($425,000) and implementation of load reduction measures ($500,000)
	23	Monitoring effectiveness of each load reduction measure to support adaptive management
	24	Targeted monitoring in Fossil Creek Reservoir and segments 11 and 12 to address uncertainty in predicted impacts
	25	Additional investigation and load reduction measures if Project contributes to nutrient impairments
Fish Tissue Mercury	26	Monitoring in Glade Reservoir for fish tissue mercury; Fish Consumption Advisory posting, if appropriate
	27	Monitoring in Glade and Upper Galeton forebays and Upper Galeton Reservoir if open to the public; Fish Consumption Advisory posting, if appropriate
Aquatic Life	28	Monitoring in segments 10a and 10b to establish pre-Project conditions and identify potential Project impacts
	29	Investigation of impairments for macroinvertebrates and development of a Category 4b Plan, if appropriate
Conveyance Pipeline	30	Submission of relevant portions of other required permits to the Environmental Data Unit; Monitoring around construction areas and annual reporting of monitoring results

Mitigation and Monitoring

After determining that conditions are required, the Division must develop conditions that "mitigate the water quality impacts of the construction and operation of the project," including water quality monitoring where appropriate "to ensure that BMPs are performing as designed and that the Project complies with all applicable conditions" (82.5(A)(3), 5 CCR 1002-82). In doing so, the Division considers any existing commitments to provide such mitigation that may already be in place at the time of certification. For example, the Fish and Wildlife Mitigation and Enhancement Plan (FWMEP), completed in 2017[2], includes aquatic habitat enhancement and restoration requirements as well as operational strategies, such as

[2]During the Division's public comment period, one commenter indicated that the 2017 FWMEP is outdated because it is based on an earlier proposal for the Project that incorporated a Colorado-Big Thompson (C-BT) exchange to provide 10,000 AF of water to some NISP participants. The C-BT exchange was a component of the conveyance system in the preferred alternative presented in the 2015 Supplementary Environmental Impact Statement; however, it was presented alongside a very similar alternative that excluded C-BT exchanges. The latter, with the addition of an operational commitment to conveyance refinement described in the 2017 FWMEP, was ultimately selected as the preferred alternative because it was deemed less environmentally damaging. Furthermore, none of the mitigation and enhancement measures proposed in the 2017 FWMEP are dependent upon the C-BT exchange. Since the C-BT exchange is not required for successful implementation of the FWMEP, and given that the preferred alternative without the C-BT exchange is less environmentally damaging, the Division does not consider the 2017 FWMEP to be outdated, and will therefore continue to refer to and rely upon the mitigation and enhancement measures presented therein.

curtailment of diversions at the PVC in response to increases in temperature above standards-based adaptive management threshold triggers, that are likely to address some of the Project's potential water quality impacts. Commitments from other agreements likely to mitigate Project-related water quality impacts and/or provide environmental benefit are adopted as provisions of relevant conditions, sometimes through the use of adaptive management, and are taken into account in making the significance determination required under the antidegradation rule.

Where the Division has concluded that existing commitments are not sufficient to address water quality impacts, additional mitigation requirements are imposed. The Division recognizes that opportunities for additional mitigation may be limited given that impacts are generally associated with hydrologic modifications rather than release of pollutants, and the Division does not have the authority to impose conditions that conflict with the water rights provisions of C.R.S. 25-8-104. Nevertheless, it is important to apply conditions for mitigation where such activities can be effective and are consistent with C.R.S. 25-8-104. Details concerning all mitigation strategies, including both existing commitments and additional actions required through this certification, are provided in the relevant conditions.

Monitoring requirements must be designed to ensure compliance with applicable conditions. Meeting this goal requires that the Division consider how monitoring plans should be designed such that the performance of mitigation and load reduction measures can be evaluated once they are implemented. The Applicant's approach to identifying impacts included quantitative analyses in most cases. There is some degree of uncertainty in certain aspects of the analysis, however, such as the modeling performed for new reservoirs to be constructed as part of the Project or any qualitative analysis conducted where there was a lack of data or appropriate quantitative methods. Accordingly, in those instances, monitoring aimed at confirming the results of the analysis is warranted. In most instances, however, the Applicant is only required to monitor where sample results will allow the Division to confirm that mitigation or load reduction measures are functioning as intended. This is particularly important for those measures, such as in-stream restoration and improvement projects and the implementation of nutrient and *E. coli* load reduction measures that were not included in the Applicant's own analysis.

To the extent possible, the Division has specified the initiation, frequency, and termination of monitoring requirements, as well as sampling locations (Figure 2; Table 2) and parameters to be analyzed. Preference was given to sites where historic data are available and that were used to assess Project-related impacts in the 401 certification application. The Division has also carefully considered the timing and frequency of required monitoring to ensure that the full range of potential Project impacts is captured, since the types and magnitude of impacts will likely change through time as the Project is constructed and developed. In selecting initiation and termination dates for this type of monitoring, the Division also accounted for the expected severity of predicted impacts. For example, the Division applied earlier termination dates, with the possibility of extension, for less severe potential impacts. Where monitoring is required to evaluate the effectiveness of mitigation or load reduction measures but specific actions have not been identified (usually because further investigation is needed

to optimize their design and location), the Division will require that the Applicant submit a monitoring plan for review once individual measures have been selected.

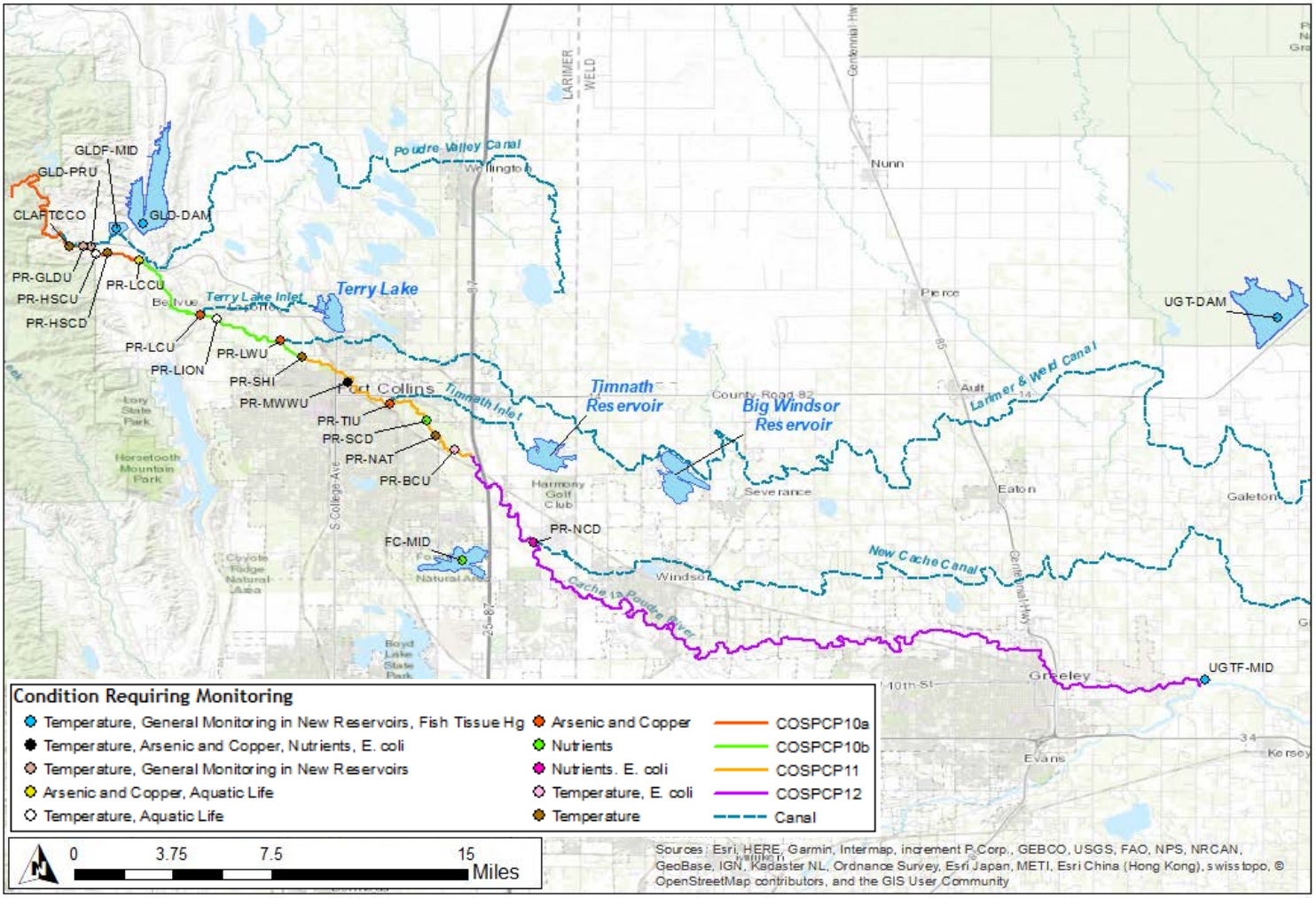

FIGURE 2. MAP SHOWING APPROXIMATE LOCATIONS OF SITES AT WHICH MONITORING IS REQUIRED.
The color of each site corresponds to the set, or sets, of conditions that require monitoring. The approximate footprints of both proposed reservoirs, along with key canals and existing reservoirs, are shown to provide context for the required monitoring sites. See Figure 1 for a complete map of all Project-related infrastructure.

TABLE 2. SPECIFIC SAMPLING LOCATIONS* AT WHICH CONDITIONS REQUIRE MONITORING.

Site ID	*Site Description*	*Latitude*	*Longitude*	*Set(s) of Conditions Requiring Site*
CLAFTCCO	Poudre River at Canyon Gauge	40.6644	-105.2242	Temperature
PR-GLDU	Poudre River upstream of Glade Reservoir release	40.664	-105.2161	Temperature General Monitoring in New Reservoirs

TABLE 2. SPECIFIC SAMPLING LOCATIONS* AT WHICH CONDITIONS REQUIRE MONITORING.				
Site ID	*Site Description*	*Latitude*	*Longitude*	*Set(s) of Conditions Requiring Site*
GLDF-MID	Glade Reservoir forebay at deepest location (approximate)	40.6742	-105.1979	Temperature General Monitoring in New Reservoirs Fish Tissue Hg**
GLD-DAM	Glade Reservoir near dam (approximate)	40.6769	-105.1834	Temperature General Monitoring in New Reservoirs Fish Tissue Hg**
GLD-PRU	Glade Reservoir release just upstream of Poudre River (approximate)	40.6639	-105.2118	Temperature General Monitoring in New Reservoirs
PR-HSCU	Poudre River upstream of Hansen Supply Canal, below Glade Reservoir release	40.6601	-105.2095	Temperature Aquatic Life
PR-HSCD	Poudre River downstream of Hansen Supply Canal	40.6606	-105.2032	Temperature
PR-LCCU	Poudre River upstream of Larimer County Canal	40.6564	-105.1857	Aquatic Life Arsenic and Copper
PR-LCU	Poudre River upstream of Cache La Poudre ditch, also called Little Cache Canal, which flows to Terry Lake	40.6259	-105.1517	Arsenic and Copper
PR-LION	Poudre River at Lions Park	40.6243	-105.1425	Temperature Aquatic Life
PR-LWU	Poudre River upstream of Larimer & Weld Canal, which flows to Big Windsor Reservoir	40.6122	-105.1072	Arsenic and Copper
PR-SHI	Poudre River at Shields St	40.6031	-105.0958	Temperature
PR-MWWU	Poudre River upstream of Mulberry Water Reclamation Facility	40.5890	-105.0700	Temperature Arsenic and Copper Nutrients *E. coli*
PR-TIU	Poudre River upstream of Timnath Inlet	40.5769	-105.0472	Arsenic and Copper
PR-SCD	Poudre River downstream of Spring Creek	40.5678	-105.0269	Nutrients
PR-NAT	Poudre River at Nature Center	40.5599	-105.0216	Temperature
PR-BCU	Poudre River upstream of Boxelder Creek	40.5519	-105.0114	Temperature *E. coli*

TABLE 2. SPECIFIC SAMPLING LOCATIONS* AT WHICH CONDITIONS REQUIRE MONITORING.				
Site ID	*Site Description*	*Latitude*	*Longitude*	*Set(s) of Conditions Requiring Site*
FC-MID	Fossil Creek Reservoir at deepest location (approximate)	40.4911	*-105.0073*	Nutrients
PR-NCD	Poudre River downstream of New Cache Canal	40.5008	-104.9680	Nutrients *E. coli*
UGT-DAM	Upper Galeton Reservoir near dam (approximate)	40.6248	-104.5572	Temperature General Monitoring in New Reservoirs Fish Tissue Hg**
UGTF-MID	Upper Galeton Reservoir forebay at deepest location (approximate)	40.4247	-104.5967	Temperature General Monitoring in New Reservoirs Fish Tissue Hg**

*The geographic coordinates specified here may change slightly once samples are collected and coordinates are measured in the field; however, the general locations specified in this table must be preserved.
**Sampling for fish tissue mercury in these waterbodies is required, but will not be performed at the sampling locations specified here. Sampling locations and methodologies for fish tissue mercury must conform to Division and CPW protocols.

Conditions for which monitoring requirements are specified also include provisions that permit the Applicant to request modifications to the details of the sampling program. Implementation of the proposed modifications is contingent upon the Division's approval; the approval process is described in the subsequent section and further qualified, where necessary, in individual conditions. The Division will consider a variety of proposed changes to sampling programs, including, but not limited to, sampling locations, sampling frequencies, parameters to be analyzed, and/or the waterbodies that must be sampled (e.g., reservoir forebays). However, the applicant must provide sufficient technical and/or administrative justification for any request to modify a sampling program detailed in the certification conditions. Examples of sufficient justification include, but are not limited to, evidence suggesting that a different sampling location could better capture the effects of the Project and/or water quality improvement measures, collection of enough data to completely characterize regular water quality conditions in a given waterbody, and barriers to access at a site specified in the certification conditions.

The Applicant will be required to implement mitigation measures to address the Project's predicted impacts. Certain mitigation measures, if successful, will address multiple predicted impacts, and some may also act as water quality improvement measures that improve water quality and/or aquatic habitat in the Poudre River relative to conditions without the Project. Load reduction measures are actions that the Applicant takes to address current impairments where they exist and where future mitigation for project-related impacts may not be possible. Mitigation, improvement, and load reduction measures, taken together, can offer environmental benefits to the Poudre River if completed through an adaptive management framework and, where appropriate, in accordance with the FWMEP.

In contrast, reasonably foreseeable future actions (RFFAs) considered as part of the FEIS, such as the Halligan Water Supply Project (Halligan) and the Milton Seaman Water Supply Project (Seaman), are not considered environmental benefits of the Project, even where the Applicant's analysis suggests that such actions will result in incidental mitigation of Project-related impacts. Nevertheless, the Division considers analyses that include these RFFAs in order to determine the likelihood that the Project will cause water quality impacts in the future. Where these impacts are likely, the Division develops conditions that address the portion of those impacts that can be attributed solely to the Project. The application affords this opportunity by presenting analyses performed using hydrologic models that predict flow conditions under current and future expected conditions without the Project, with the Project, and with the Project as well as the Halligan and Seaman projects (Table 3).

TABLE 3. HYDROLOGIC SCENARIOS CONSIDERED TO ANALYZE POTENTIAL PROJECT IMPACTS.

Description	*Abbreviation*	*Baseline Hydrology*	*NISP Included?*	*Halligan / Seaman Included?*
Current Conditions	CC	Current (2010)	N	N
Future Conditions	FC	Future (2050)	N	N
Current Conditions + NISP	CC+NISP	Current (2010)	Y	N
Future Conditions + NISP	FC+NISP	Future (2050)	Y	N
Cumulative Effects	CE	Future (2050)	Y	Y

Reporting and Responding to Impairment

Conditions that involve monitoring and mitigation and/or load reduction measures also include reporting requirements. In general, monitoring results, including both laboratory analyses[3] and field notes, must be compiled annually and provided to the Division in electronic format by April 1 following each calendar year of sampling. For any monitoring condition, Northern Water may coordinate with other entities to meet sampling requirements in order to avoid duplicative monitoring efforts; however, the Applicant is responsible for complying with these requirements regardless of the participation of others. In addition, all sample results used to satisfy monitoring requirements must be submitted as directed in this certification. Additional information, such as calculated water quality parameter values and modeling results, are also required for some conditions, including those related to temperature impacts and the potential for internal release resulting from oxygen depletion in Glade Reservoir. In addition to annual reporting requirements, more comprehensive reports are required every five years for certain conditions where, for example, more than one year

[3]Laboratory analyses must include an empirical determination of the method detection limit (MDL), and readings below the MDL are to be treated as non-detects. Readings between the MDL and the reporting limit must be reported as estimated concentrations and flagged as estimated values, in.

of data will likely be necessary to evaluate the effectiveness of a particular mitigation measure. Detailed reporting requirements are specified for each set of conditions.

If any of these reports identify new or exacerbated water quality impairments after the proposed mitigation or load reduction strategies have been implemented, conditions outline a course of action that the Applicant must take to address changes in water quality. Improvements are required to the extent that the Applicant is responsible for the observed impairment, and that such actions are feasible and consistent with the water rights provisions of C.R.S. 25-8-104. In most cases, the first step in this process is for the Applicant to investigate the sources of the water quality issue and the mechanisms through which it occurs; the goal of the investigation is to identify the extent to which the Project causes or contributes to the observed impairment. The Applicant will have one year following the reporting of the issue to prepare an investigation report that identifies the Project's contribution; however, if more time is required to complete the report, the Applicant may request an extension, in writing, from the Division no later than two months prior to the one-year deadline. The investigation report may be prepared with contractor support or in collaboration with other parties interested in the observed impairment. The Division expects that, in most cases, investigation reports will include data and analyses beyond what has been presented in annual and five-year reports, such as additional sampling results, flow data, and/or modeling.

If, based on the investigation report, the Division concludes that operation of the Project is not the primary cause of an exceedance of water quality standards, the Division will use the results of the impairment investigation report to facilitate development of a Total Maximum Daily Load (TMDL). If, however, the Division concludes that operation of the Project is primarily responsible for an impairment, the Division will require, in most cases, that the Applicant actively explore preparation of a Category 4b Plan that will define the actions necessary to bring water quality back to attainment of the standard within a specified period of time.

A Category 4b Demonstration Plan addresses water quality impairments in a manner that makes the TMDL process unnecessary. The plan must identify agreed upon pollution control mechanisms that are expected to result in attainment of applicable water quality standards within a reasonable time period, must be consistent with C.R.S. 25-8-104, and must be submitted to the Division no more than two years after the Division's determination that the plan is applicable. If more time is required to complete the Category 4b Plan, the Applicant may request an extension, in writing, from the Division no later than two months prior to the one-year deadline. If it becomes apparent that a Category 4b Plan cannot ensure attainment with all applicable water quality standards through agreed upon pollution control mechanisms within a reasonable time period, or if such plan is not accepted by the Division or USEPA, or is precluded by or inconsistent with the water rights provisions in C.R.S. 25-8-104, then the Division anticipates a 303(d) listing and the development of a TMDL. The Division may request that the Applicant participate as a stakeholder in the TMDL process. The Applicant may voluntarily agree to remedial actions to restore water quality that are inconsistent with C.R.S. 25-8-104.

Some reports required through 401 certification conditions may include proposed actions, such as plans for specific mitigation and/or load reduction measures, requests to adjust sampling requirements, and/or conclusions regarding a documented impairment, that the Division must approve or reject before the Applicant can proceed. Except where otherwise specified, the Division will respond to such requests by December 1 of the year in which the request was received. If the Division fails to respond to a particular proposed action by the specified deadline, that proposal shall be considered approved. However, if a proposed action is approved due to lack of Division action, the Applicant must inform the Division that it plans to proceed with the proposed action because of the Division's failure to respond.

Modification of the Certification

Conditions are generally written within an adaptive management framework that requires the Applicant to use the results of monitoring activities to modify its mitigation strategies, where possible, to achieve the desired environmental benefits. Employing adaptive management strategies will allow the Applicant to respond as necessary to the actual environmental conditions observed when the Project is operating. In this way, adaptive management provides an additional layer of environmental protection even if major assumptions underlying the prediction of Project impacts, such as flows modeled using the Common Technical Platform (CTP), do not match future observations. Similarly, conditions are *not* tied to the standards in place at the time of the certification; rather, the Division intends for conditions to account for potential "future changes in applicable water quality classifications and standards" (Regulation No. 82, Section 82.5(A)(3)), and has endeavored to include language in conditions that makes this clear. For example, adaptive management threshold triggers used to prompt action to prevent exceedances of temperature standards are "within 0.3°C of the MWAT [mean weekly average] chronic [temperature] standard" and "within 1°C of the DM [daily maximum] acute [temperature] standard," rather than specific temperature values that could be well below or well above future temperature standards.

Given these elements of the conditional certification that are adaptive in nature, the Division does not envision a situation with the proposed Project as presented in Northern Water's 401 certification application in which the certification would need to be modified in order to provide reasonable assurance that the Project will comply with water quality standards or, in the case of reviewable waters, satisfy the applicable antidegradation requirements. However, if the Applicant anticipates changes to the Project itself that could result in water quality impacts not considered in this certification, the Division must be notified in advance so that it can determine whether the proposed changes are significant (Regulation No. 82, Section 82.6(A)(4)). Changes to the Project that the Division deems significant may require re-examination and, potentially, modification of the 401 certification.

Role of Adaptive Management in Certification

Adaptive management is a way to make decisions regarding modifications to mitigation measures and operational aspects of a given project to ensure adequate water quality protection over time. As described in Regulation No. 82, "The Division may condition water quality certification on adaptive management to address changes in the Project's predicted impacts and/or future changes in applicable water quality classifications and standards" (Section 82.5(A)(3)). The Statement of Basis and Purpose further clarifies that the use of adaptive management is specified as a potential component of conditional certifications "to allow large water Projects to adjust mitigation based on the uncertainty of the water quality impacts that were modeled for the Project" (Section 82.22). The Division relies on this regulatory provision to incorporate adaptive management into conditional certifications in order to provide reasonable assurance that a given project will comply with applicable water quality requirements throughout all stages of its construction and operation.

The Division has included adaptive management as a requirement in many of the certification conditions for the Project. Throughout these conditions, adaptive management appears both as a general concept and as a process that will be formalized through the implementation of the FWMEP. As a concept, adaptive management refers to modification of those actions taken to address a particular water quality concern based on the results of associated monitoring activities or changes to key regulations or conditions on the ground. The concept of adaptive management also relates to the Division's decision to avoid tying numeric thresholds for triggering action to water quality standards that are currently in place; generalizing such references (e.g., referring to "the standard" rather than "the current standard") recognizes that water quality standards regularly change, and that Project impacts must be evaluated in the context of the water quality standards that are in place at the time of the evaluation.

The FWMEP incorporates adaptive management as a formal process through a NISP adaptive management program[4] under which an adaptive management committee, comprising Northern Water, CPW, and other interested stakeholders, will convene to propose, implement, monitor, and adjust mitigation and enhancement measures designed to mitigate for Project impacts and to provide additional benefits to the Poudre River system. According to the FWMEP, Northern Water and CPW will jointly lead the NISP adaptive management program, but details concerning other participants, governance, and decision-making will be memorialized with a charter (or alternative form of agreement) to be established between the lead entities at a later date. The FWMEP further specifies that the adaptive management

[4]In the FWMEP, this program is referred to as the Poudre River Adaptive Management Program. For the purposes of this certification and with concurrence of CPW and Northern Water, this program is referred to in general terms only, because a broader collaborative in the Poudre River watershed may be created in the future. If the NISP adaptive management program stakeholders rename the adaptive management program at any time, references made to it in this certification shall be understood as references to the same program under its new name.

committee will operate within the "bounds of the financial and resource commitments for NISP-related adaptive management efforts" (Northern Water, 2017).

Development of a NISP adaptive management program is consistent with the Commission 's recognition of "the critical importance of incorporating the concept of adaptive management as a condition for large, multi-year water Projects" (Regulation No. 82, Section 82.22), and can serve the purposes of the Division's certification as outlined in certain conditions, such as those related to Poudre River temperatures, where the FWMEP already defines clearly what role the adaptive management program will play. The Applicant will inform the Division of adaptive management activities and results of the NISP adaptive management program as specified in the certification conditions through reporting requirements. In addition, the Division will serve as a member of the governance committee for the NISP adaptive management program, and will make final decisions on all matters related to the 401 certification.

The NISP adaptive management program may also play a role in the conditions presented for *E. coli*, nutrients, and those parameters for which the multilevel outlet works (MLOW) to be constructed for Glade Reservoir (see below) is a key component of mitigation. However, in these conditions, the Division does not specifically reference the NISP adaptive management program because further information concerning the details of proposed load reduction measures (*E. coli* and nutrients) and the actual water quality effects of operating the MLOW must be gathered before likely external stakeholders can be identified. These stakeholders may or may not consent to participation in a formal adaptive management process or may not see a need for their involvement, and the Division cannot compel or require organizations other than the Applicant to take action through this certification. The Division will encourage the Applicant to work with interested stakeholders under the adaptive management program framework to develop effective mitigation, water quality improvement, and load reduction measures wherever necessary and possible.

The Applicant is responsible for all monitoring, mitigation, and water quality improvements specified in this certification regardless of the participation of other entities in any adaptive management program or committee. Similarly, the Applicant will be required to mitigate for any Project-related impacts that occur despite the implementation of mitigation and water quality improvement measures, as described in specific conditions, even if other entities choose not to continue to participate.

Role of Multilevel Outlet Works

Glade Reservoir will be a new reservoir that will release water directly to an existing waterbody. Consequently, among the Division's major concerns in this certification is the management of these releases to ensure that they do not adversely impact the Poudre River and that, where possible, they provide an environmental benefit to the river. Towards this end, the Applicant has committed to constructing an MLOW that will allow for selective withdrawals/releases from specific depths in the reservoir water column.

Construction of the MLOW will afford the Applicant some degree of control over the physical and chemical characteristics of the water it releases from Glade Reservoir to the Poudre

River. For example, if Poudre River temperatures indicate potential warming above established adaptive management threshold triggers at key locations, the Applicant may use the MLOW to release cooler water to the river from deeper in the reservoir, rather than warmer water from near the surface. Similarly, the Applicant may use the MLOW to avoid releases from near the bottom of the reservoir if monitoring results indicate low dissolved oxygen concentrations in that portion of the water column. The MLOW will also give the Applicant the ability to adjust release depths as needed to account for year-to-year differences in reservoir water levels and chemistry. These examples illustrate the operational flexibility that construction of the MLOW will offer, as well as the key role the MLOW can play in adaptive management; selecting appropriate release depths based on new information exemplifies the utility of this process.

Successful operation of the MLOW relies on a suite of complex decisions involving current water levels, water temperatures in the reservoir and in the river, and the chemistry of reservoir release water and its potential effects on the river. Simultaneous consideration of all of these factors is made more complicated by differences in the times at which key data are available. For example, while river temperature data will be available in real time at some locations, vertical profiles of dissolved oxygen data will only be available during monitoring events, and there will be considerable lag time between when samples are collected and when chemical concentrations are available following laboratory processing and analysis. Therefore, the development of a consistent approach to using the MLOW is crucial to ensure smooth operation of the reservoir and to avoid causing large changes to Poudre River water quality over short time periods that could result from less predictable MLOW operations.

To provide this consistency, the Applicant has established an initial iteration of the decision tree[5] for the MLOW (Figure 3). Originally developed for modeling the effects of the Project, the decision tree outlines which of four planned reservoir outlet elevations (5480 ft, 5445 ft, 5410 ft, 5310 ft, NAVD88; See Figure 4) would be used under specific reservoir water level and temperature conditions. For modeling exercises, the goals of the decision tree included selecting depths that would cool the Poudre River while limiting over-cooling, particularly during summer months at times of low flow. However, once Glade Reservoir is constructed and the Project begins operating, the Division expects that the Applicant will continue to optimize the MLOW decision tree, including consideration of other water quality parameters, such as dissolved oxygen, nutrients, and/or redox-sensitive metals, as deemed necessary from the results of monitoring. These adjustments to the decision tree will be ongoing, and the Applicant will have flexibility to make operational adjustments as needed to preserve or improve water quality conditions in the river. The procedures for effectuating such adjustments will also need to include, to the extent practicable, methods for avoiding abrupt

[5]This decision tree is provided in the certification to better explain the meaning of this term. However, because the decision tree is likely to change over time, this figure should be viewed as an example of future MLOW decision trees and not as a version that will necessarily be used once operation of the Project begins.

changes to Poudre River water quality that might result from suddenly switching between outlets.

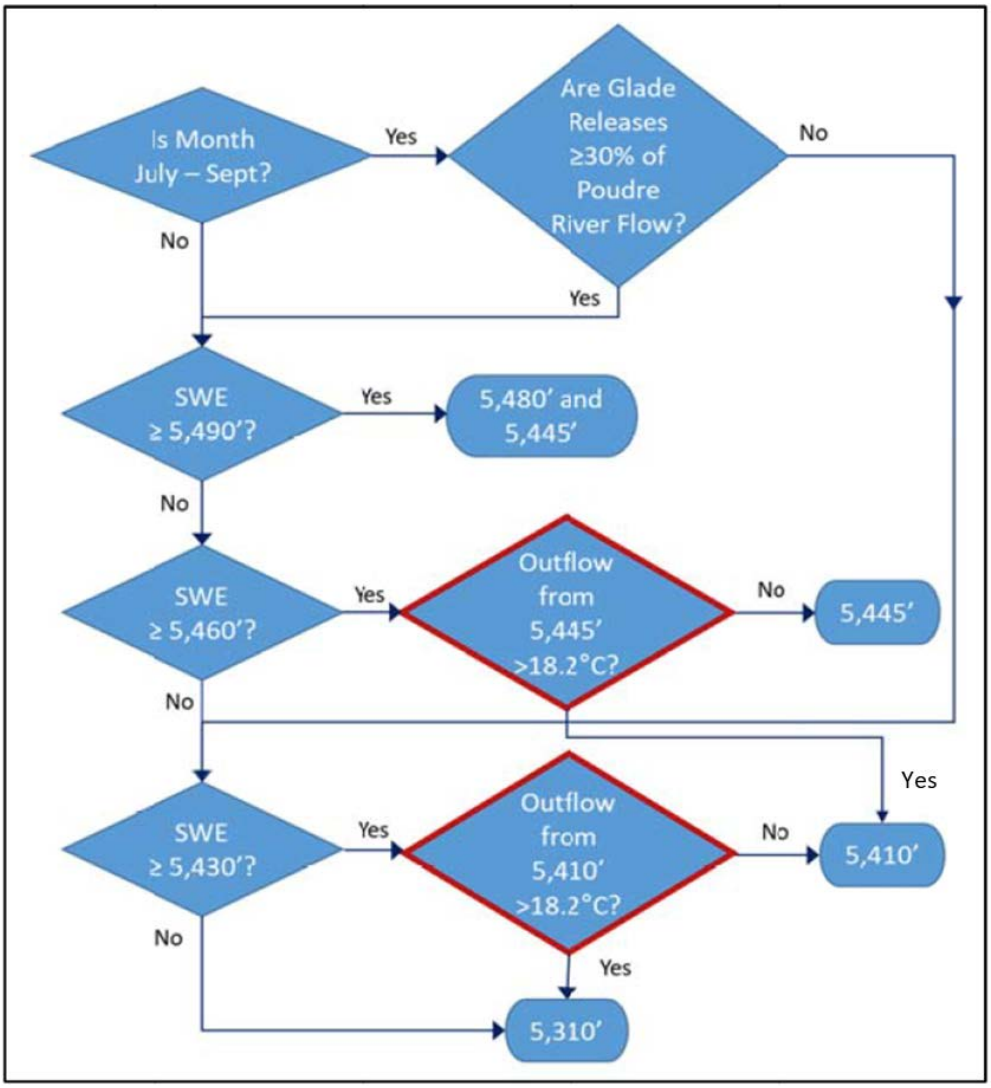

FIGURE 3. INITIAL PROPOSED DECISION TREE FOR GLADE RESERVOIR MLOW (APPENDIX Q, 401 WATER QUALITY CERTIFICATION TECHNICAL REPORT).
This diagram provides the conditions for temperature and reservoir surface water elevation (SWE) that would trigger releases from particular outlets. Refinement and revision based on data collected once the reservoir is operating may change these conditions or add new ones, such as dissolved oxygen concentrations.

The Applicant will document all adjustments to the MLOW decision tree, and expects the effectiveness of those adjustments to be determined using data collected from the release and from the river. However, the process for making decision tree modifications may differ for different parameters. For example, the Applicant will have the ability to use the MLOW to respond immediately to warming Poudre River temperatures, while decision tree modifications driven by oxygen depletion and the associated release of certain chemical constituents will likely not be effected until the subsequent field season, given when oxygen depletion is most likely to occur (August-October) and the time required to process and

analyze samples in the laboratory. These differences are accounted for in conditions pertaining to each potential impact through different reporting requirements and timelines for enacting decision tree modifications that respond to particular impacts.

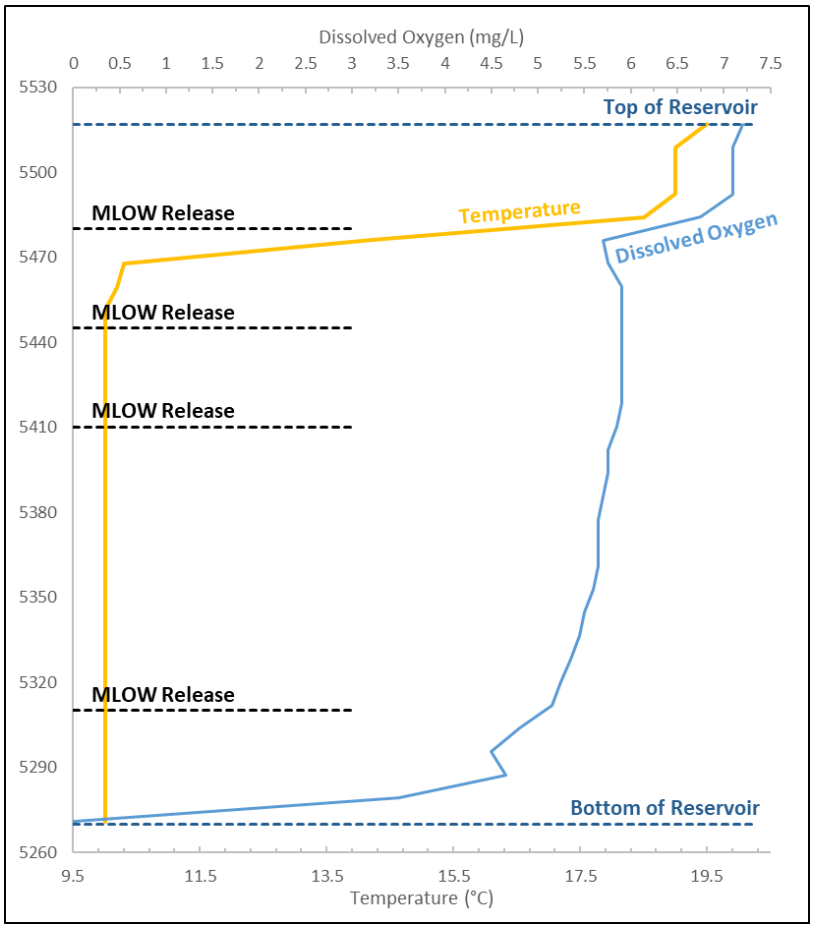

FIGURE 4. SCHEMATIC OF PROPOSED OUTLETS TO BE INCLUDED IN MLOW.
The plot shows modeled temperatures and dissolved oxygen values for September, 1998, which were approximated from the figures presented in Appendix M of the 401 Water Quality Certification Technical Report. Note that although hypoxia occurs at the bottom of the reservoir, relatively cool water is available throughout the water column about 50 ft below the top of the reservoir.

At the same time, any alteration to the MLOW decision tree must balance potential consequences for multiple water quality parameters and Project operations. For example, it may not be possible to satisfy operational needs, mitigate warming river temperatures, and avoid hypoxic releases with every iteration of the decision tree, particularly when modifications are made in real time to respond to immediate concerns. For these reasons, conditions that refer specifically to altering the decision tree to address particular water quality concerns are secondary to the overall goal of optimizing usage of the MLOW to provide the greatest benefit to Poudre River water quality.

Balancing the need for temperature mitigation with the potential for hypoxic releases is the most likely situation in which a NISP adaptive management team will need to make difficult decisions that could involve trading one impact for another. Under most operational

conditions, Glade Reservoir modeling results suggest that hypoxic releases can be avoided by releasing from gates that are not at the very bottom of the reservoir, as relatively cool water temperatures will likely persist for tens of feet above the hypoxic region of the water column (see Figure 4). When water levels are low, however, the Applicant may be forced to choose between releasing warm water and releasing hypoxic, nutrient-rich and/or metals-laden water. In the long term, operational experience will inform the development of an MLOW decision tree that is optimized to address both issues. However, when response to a short-term concern, such as high summer temperatures, is required, a strong adaptive management program that involves all interested parties will likely be critical to ensuring the successful operation of the MLOW.

Conditions

Temperature

Rationale

Temperature effects of the Project are driven by three primary hydrologic modifications: (1) the diversion from the Poudre River at the Poudre Valley Canal to the Glade Forebay and Glade Reservoir, (2) releases of water from Glade Reservoir to the Poudre River just upstream of the Hansen Supply Canal delivery structure, and (3) diversion of Project water via the proposed Poudre River Intake upstream of the Mulberry Water Reclamation Facility. Thermal impacts of the Project resulting in degradation include an increased number of days with warming in excess of allowable levels[6] for Maximum Weekly Average Temperatures (MWATs) at various locations from the Poudre Valley Canal diversion downstream to the Boxelder Gage. The predicted loss of assimilative capacity represents significant degradation in all river segments evaluated (Segments 10a, 10b and 11) for the cumulative effects (CE) scenario (see Table 3), which is the basis for the antidegradation review. Evaluation of current and future scenarios with the Project (CC+NISP and FC+NISP, respectively) show that operation of the Project would be responsible, in part, for the degradation.

Although operation of the Project will have adverse temperature effects at times due to diversions that reduce flows in the Poudre River, the releases of water from Glade Reservoir back to the river in the summer and early fall will have beneficial effects at times of the year when the river is susceptible to warming due to low flows and warm air temperatures. Environmental benefits from operation of the Project are anticipated due to release of colder water from Glade Reservoir, which is expected to reduce temperatures in the reach from the Glade Reservoir release structure upstream of the Hansen Supply Canal to the proposed Poudre River Intake. Under the Cumulative Effects scenario, the number of days with significant cooling exceeds the number of days with significant warming at all locations except the Boxelder Gage at the downstream end of segment 11. In addition to the predicted changes in assimilative capacity, the modeling analyses showed decreases in the number of days exceeding temperature standards for CC+NISP, FC+NISP, and CE from the Canyon Gage to the Boxelder Gage.

Conclusions related to the Project's adverse and beneficial temperature effects are based on results produced by a dynamic river temperature model developed by the Applicant's consultant, Hydros. Model development and calibration are described in detail in the FEIS. Hydros developed a linked dynamic temperature and hydrodynamic (flow simulation) model to provide output with the temporal resolution necessary to calculate acute and chronic regulatory metrics – Daily Maximum (DM) temperatures and MWATs. The model simulates

[6] "Allowable levels" for warming are relative to the Baseline Available Increment (BAI), which, in the NISP application, is the difference between modeled baseline temperatures and the chronic temperature standard (MWAT). Warming in excess of 15% of the BAI is considered significant degradation. Similarly, "significant cooling" is determined when the magnitude of cooling is greater than 15% of the BAI.

temperature in the mainstem of the Poudre River from the Poudre Valley Canal to the Boxelder Gage. The model was calibrated using observed flows, meteorology, and in-stream temperatures from three years. Calibration is described in Section 3.2 of the Temperature Model Calibration Report, and targeted errors of less than 1.5 °C between predicted and observed values for daily mean, minimum and maximum temperatures. After the temperature model was calibrated, it was run with CTP hydrology and 2012 (warm year) meteorology in order to simulate instream temperatures for the operational scenarios evaluated for the FEIS and the 401 certification application. The Applicant met with the Division to discuss the methodology for its temperature antidegradation analysis, and the Division reviewed the temperature modeling work at multiple stages during the pre-application process. The Division has determined that the Applicant's temperature analysis is credible.

The Applicant has made commitments to address potential adverse temperature effects anticipated from operation of the Project, which are described in detail in the FWMEP (Appendix B, 401 Technical Report). These commitments are referenced by the alphanumeric labels (e.g., FW-01) used in the FWMEP. They include measures to mitigate impacts and to enhance temperature conditions in the Poudre River, such as avoiding diversions during critical low flow periods (FW-01, FW-02 and FW-03), introducing cooler water into the river via releases from Glade Reservoir (FW-04), and performing mitigation activities for temperature in critical reaches of the river as identified in the Stream Channel and Habitat Improvement Plan, the development of which is a requirement of the FWMEP.

The formal NISP adaptive management program, led by Northern Water and CPW and including other stakeholders, will play a critical role in responding when monitoring indicates that temperatures in the Poudre River are approaching standards. A NISP adaptive management program is a requirement of the FWMEP, but will also serve the purposes of this certification as outlined in the conditions that follow.

Commitments made in the FWMEP facilitated development of the Division's conditional certification of the Project. Conditions related to those commitments are being imposed to evaluate their effectiveness for mitigating temperature impacts and/or improving temperature conditions in the river for aquatic life. Mitigation measures in the FWMEP are associated with two of the three main hydrologic modifications by which the Project affects flows in the Poudre River – diversions at the Poudre Valley Canal and releases from Glade Reservoir. Each can be adjusted in response to concerns about ambient temperatures. The mechanics of the mitigation measures, including triggers and responses, are relevant to understanding the capacity to change temperatures and the limitations on implementation of those measures.

To monitor Project impacts and effectiveness of mitigation, the Applicant has committed, through the FWMEP, to collecting real-time temperature data at the Canyon Gage, and has established acute and chronic adaptive management threshold triggers[7] for temperature that

[7]Definitions of the acute and chronic adaptive management threshold triggers are provided in **Condition 1** (pg. 39) and in the *Definitions* section of this certification (pp. 5-7).

are below the respective standards and that, if exceeded, prompt adaptive management with the intent to avoid exceedances. In addition to the Canyon Gage, the Division will require real-time monitoring to trigger a response based on the same adaptive management threshold triggers at a location on the Poudre River just upstream of the Glade Reservoir release (PR-GLDU). PR-GLDU is downstream of Greeley's Bellvue Filter Plant Intake diversion (Bellvue Intake diversion) and is a location that is more likely to approach or exceed temperature standards than the Canyon Gage due to the additional diverted flow and additional stream distance downstream of the Poudre Valley Canal diversion. The Division recognizes that removing water at the Bellevue Intake diversion may also influence temperatures at PR-GLDU; however, PR-GLDU is located directly below the Bellvue Intake diversion, reducing the potential for warming due to withdrawals from that diversion given the short distance between it and the monitoring location. The intent of adding PR-GLDU is to provide a monitoring location that can trigger adaptive management in the most sensitive section of segment 10a: just upstream of the Glade Release and Hansen Supply Canal inflows.

The Applicant's current Poudre River sampling program includes routine monitoring at PR-HSCU, which is located approximately 0.5 miles downstream of the proposed location for PR-GLDU. Before releases from Glade Reservoir begin, there are no factors located in between these sites that would be expected to substantially influence Poudre River water temperatures. Thus, the Division will allow the Applicant to perform real-time monitoring of temperatures at PR-HSCU as a surrogate for monitoring at PR-GLDU until releases from Glade Reservoir begin.

If real-time monitoring at the Canyon Gage or PR-GLDU signals that the acute or chronic adaptive management threshold trigger is exceeded, the Applicant will initiate immediate discussions within the NISP adaptive management program. If the adaptive management program parties determine that operation of the Project may be contributing to the elevated temperatures, the Applicant will initiate actions under the NISP adaptive management program to mitigate the contribution. Potential "management actions by the Applicant include, but are not limited to, a reduction or curtailment of NISP diversions, or other changes in NISP operations that do not affect NISP yield or the ability to make NISP deliveries to [NISP] Participants [i.e., are consistent with the water rights provisions in C.R.S. 25-8-104]" (FWMEP WQ-01). In the event that the NISP adaptive management program is expanded or modified by CPW or the Applicant in the future, the 401 certification will still require that the adaptive management functions of the NISP adaptive management program for this Project be retained so that, at a minimum, Northern Water will respond, in a manner consistent with the 401 certification conditions, if action is triggered by real-time temperature monitoring.

Releases from Glade Reservoir can be used to adjust temperatures in the Poudre River. The Applicant has committed to constructing an MLOW that would allow selective withdrawals from specific depths in the reservoir water column. To the extent possible, release of flows from the reservoir to the Poudre River as part of conveyance refinement (described in Section 5.2.2.4 of the FWMEP) would be made from depths in Glade Reservoir that would benefit water temperature downstream of the release point. These releases would not only minimize increases in temperatures during certain times of the year due to Project operations, but

would improve stream temperatures relative to existing conditions at times. Based on observed records from 2002 through 2017, temperatures at the Canyon Gage can approach or exceed water quality standards that are protective of aquatic species from July through early September, as well as during the shoulder seasons (late March and early November). Releases from the MLOW also "may be managed to mitigate potential adverse impacts to the narrative temperature criteria and avoid unseasonal cooling effects" (FWMEP WQ-01).

Operation of the MLOW to mitigate adverse temperature effects of the Project will be guided by a decision tree (see Figure 3). The goal of the MLOW decision tree is to help to select appropriate depths that will cool the Poudre River while also avoiding potential over-cooling of the river or abrupt changes to temperature, particularly in summer months at times of low flow.

Continued optimization of the MLOW decision tree during Project operations is anticipated, including consideration of other water quality parameters, and is expected to take place in coordination with a NISP adaptive management program. Optimization will begin once the Project is releasing water from Glade Reservoir to the river. Adjustments to the MLOW decision tree will be an ongoing process, and the Applicant will have flexibility to make operational adjustments that improve temperature and/or water quality conditions in the river. The Applicant will document all adjustments to the MLOW decision tree and the effectiveness of those adjustments as determined from data collected on an annual basis. In the five-year report, the Applicant shall discuss adjustments to the MLOW decision tree over the past five-year period as well as the results of those adjustments, and will recommend modifications to the decision tree as needed.

Modeling shows that the MLOW, operated in accordance with the decision tree, is expected to be an effective mitigation tool for temperature. However, water quality modeling in Glade Reservoir also suggests that there is potential for oxygen depletion in the hypolimnion. With hypoxia, there is potential for internal release of pollutants, such as phosphorus or certain metals, that could degrade water quality near the bottom of the reservoir. Depending on the depths affected, hypoxia could place additional constraints on the levels of the MLOW that could be used for temperature mitigation without having an adverse effect on water quality in the Poudre River. Under most operational conditions, the potential for water quality impacts due to hypoxia can likely be avoided by releasing from gates that are not at the very bottom of the reservoir (see Figure 4). When the depth of the reservoir is limited, however, options for the release of cold water may be limited to lower levels where hypoxia is more likely to occur, and aeration/oxygenation may be necessary to address the potential for internal release. Based on operational experience, the MLOW decision tree may be modified in the future to balance temperature mitigation functions with the potential for hypoxic releases, as discussed in the Glade Reservoir internal release conditions. A supporting condition for temperature monitoring of releases from Glade Reservoir is included below.

The analyses conducted in support of the FEIS and analyses specific to the 401 Certification demonstrate that some temperature degradation is unavoidable given the nature of the Project (diverting and storing streamflow). However, the operation of the Project and the proposed mitigation and water quality improvement measures, including operation of the

MLOW such that cooler water is released from Glade Reservoir during low flow periods (summer and fall), are expected to provide a net benefit to temperatures in the Poudre River relative to conditions in the absence of the Project.

The Applicant's mitigation and enhancement commitments in the FWMEP have considerable potential to address temperature impacts and to improve the temperature regime of the Poudre River, but there is no guarantee that performance will match predictions. Conditions requiring monitoring will lead to ongoing assessments of performance in order to optimize operation of the MLOW and other commitments. To provide reasonable assurance that expectations for mitigation and water quality improvement measures are realized, the Division will impose conditions that evaluate the performance of those measures. If those measures fall short of expectations, and responsibility for impacts is attributable in part or in full to operation of the Project, corrective action will be required, provided that any such action is consistent with the water rights provisions in C.R.S. 25-8-104.

Evaluating the performance of mitigation and water quality improvement measures involves some practical challenges presented by spatial and temporal overlap in the implementation of those measures. For example, the distance between the Poudre Valley Canal diversion and the Hansen Supply Canal is less than two miles, and both channel/habitat improvements and the Glade release will be constructed along this reach. Thus, while it may be difficult to evaluate the performance of individual measures, monitoring at key locations in the Poudre River will allow for an overall assessment of the combined effectiveness of mitigation and water quality improvement measures. Useful evaluations of effectiveness therefore depend on having appropriate locations for these monitoring sites. Sites listed in the conditions include those required for testing the effectiveness of mitigation and water quality improvement measures, those necessary for supporting the temperature model, and three sites that inform Project operations (Table 5).

The FWMEP establishes an important role for a NISP adaptive management program that is incorporated in the temperature conditions for certification. Active involvement of this program has important implications for the initiation and duration of conditions. As soon as the Project begins diverting flows at the Poudre Valley Canal diversion, the NISP adaptive management program is on call to respond when adaptive management threshold triggers are exceeded at the Canyon Gage or at PR-GLDU. Although the adaptive management program will play a role once diversions to Glade begin, initially, the full suite of options for mitigation will not yet be available. For example, Northern Water may not be prepared to release water from Glade Reservoir as soon as diversion begin, and summer reservoir temperatures may not be significantly cooler than river water until the depth is sufficient to sustain persistent stratification. Thus, timelines for monitoring, evaluation, and adjustment of mitigation measures must be long enough to ensure that those measures are made as effective as possible, while remaining consistent with C.R.S. 25-8-104.

Although the schedule for operational development of the Project and for full implementation of mitigation measures is not known, it is safe to say that the potential for the available mitigation measures to offset Project-caused impacts to temperature will change over time. Similarly, Project-related impacts may not be known until the Project is operating

consistently from year to year. To allow adequate time for the adaptive management process to be successful, the duration for conditions evaluating effectiveness of mitigation will be linked to "full buildout operations," which is defined in the FWMEP as:

> *… a period following full or nearly full storage in Glade Reservoir and Galeton Reservoir, and the consistent delivery of full or nearly full NISP yield to a majority of the NISP participants for a period of 5 years.*

It is uncertain how many years will pass before the Project reaches full buildout operations. The effectiveness of mitigation measures will be reviewed at five-year intervals beginning prior to full buildout operations. At each five-year interval, the Applicant may recommend continuation or cessation of efforts related to monitoring the effects of mitigation measures being implemented through the NISP adaptive management program. In such cases, the Division may determine that conditions for evaluating mitigation measures have been met, depending on the observed effects. Fulfillment of these conditions will not alter the commitments made by the Applicant in the FWMEP.

In addition to monitoring at sites along the Poudre River, temperature monitoring is also necessary in the two new reservoirs and the associated forebays. Specific conditions for monitoring in reservoirs are detailed in the rationale and conditions for General Monitoring in New Reservoirs.

Conditions

Conditions have been developed for the portion of the Poudre River where temperatures may be affected by operation of the Project. The potential for Project impacts begins with the diversion of flow into the Poudre Valley Canal and extends downstream to the Boxelder Gage, which is the downstream end of the dynamic temperature model. The Project is not expected to have an impact on temperatures in segment 12 based on the conceptual understanding of the existing hydrology (including the dominance of groundwater inflows in key months) and the modeled Project flows as documented in the FEIS and supplemented with a detailed response to public comment. Based on modeling analysis by the Applicant, 93-99% of the flow in the river immediately upstream of the City of Greeley's Water Pollution Control Facility enters the river downstream of segment 11. The diversions associated with NISP are far upstream of this location, and there are 34 miles of river with multiple diversions and return flows between the end of segment 11 and the Greeley Water Pollution Control Facility. When NISP is exchanging water to divert at the PVC, the exchange is water that would have been diverted from the river anyway at a different location upstream of segment 12.

Given the anticipated project effects and proposed mitigation measures, the Division has developed seven conditions related to temperature, which are summarized in Table 4 and explained in detail below. The Division supports the Applicant's commitment to a NISP adaptive management program; given the dynamic nature of the Poudre River system, it makes sense to employ an adaptive management strategy to develop plans for channel/habitat improvements, for example, and to monitor the effectiveness of implemented mitigation and water quality improvement measures so that adjustments can be made as needed to optimize performance. At the same time, the Division requires that the

Applicant seek Division approval for any adjustments to the mitigation and improvement measures that are required in these conditions.

Results of temperature modeling presented in the Application have identified the anticipated magnitude and location of impacts, and this information, along with commitments made for temperature mitigation (WQ-06) in the FWMEP, shape the list of monitoring sites needed to meet the requirements of the conditions. These sites are identified in individual conditions, and the complete list appears in Table 5. The monitoring requirements will provide data that can be used to assess the effectiveness of mitigation and improvement measures, support modeling, and/or trigger changes in Project operation. Purposes for data collection at each site are identified in the table.

Temperature data shall be collected at 15-minute intervals. Data collection at all sites required by conditions shall begin no later than one year after issuance of the 404 permit, with the exception of GLD-DAM and GLD-PRU, where monitoring requirements will begin as specified in **Condition 8** and with the initiation of releases from Glade Reservoir to the Poudre River, respectively. Changes to site locations or timelines for sampling may be requested by the Applicant, but any requested changes must be approved by the Division.

TABLE 4. SUMMARY OF TEMPERATURE CONDITIONS.

Condition No.	*Summary*	*Start Date*	*End Date*	*Reporting*	*Notes*
1	Real-time Monitoring & Adaptive Management Threshold Triggers at Canyon Gage & PR-GLDU	1 year after issuance of the 404 permit	20 years after full buildout with Division approval; Monitoring may be extended in increments of 5 years if needed for continued evaluations of effectiveness.	Annual & Five-year	Need for continued monitoring will be revisited if no material causal relationship exists between NISP and any exceedances and/or if Canyon Gage and PR-GLDU are shown to provide redundant data
2	Baseline & Project Versions of Dynamic Temperature Model	1 year after issuance of the 404 permit for Baseline Version; as soon as Project diversions begin for Project Version	Monitoring to support model continues until at least 5 years after full buildout; May be extended in increments of 5 years if necessary to support continued modeling efforts.	Annual & Five-year	Baseline model validation with 2 years of additional data prior to Project diversions or implementation of mitigation measures

TABLE 4. SUMMARY OF TEMPERATURE CONDITIONS.					
Condition No.	*Summary*	*Start Date*	*End Date*	*Reporting*	*Notes*
3	Monitoring Net Effects of Project & Mitigation Measures from Poudre Valley Canal to Glade Release	1 year after issuance of the 404 permit	Until at least 5 years after full buildout conditions have been reached; Monitoring period may be extended in increments of 5 years if necessary to support continued evaluations of effectiveness	Annual & Five-year	
4	Monitoring Effects of MLOW	Data collection at GLD-DAM and GLD-PRU will begin when Glade Reservoir releases begin	Until at least 5 years after full buildout conditions have been reached; Monitoring period may be extended in increments of 5 years if necessary to support continued evaluations of effectiveness	Annual & Five-year	Annual reporting will describe how MLOW was operated in past year and present monitoring data; 5 year report will recommend MLOW decision tree modifications based on operational history and temperature data.
5	Monitoring Net Effects of Project & Mitigation Measures from Glade Release to Lincoln Street	1 year after issuance of the 404 permit for all stations except GLD-PRU, where monitoring will begin when Glade Reservoir releases begin		Annual & Five-year	
6	Monitoring Net Effects of Project & Mitigation Measures upstream of Boxelder Creek	1 year after issuance of the 404 permit		Annual & Five-year	May require temperature monitoring in 1 or more representative refugia, if refugia are created as part of channel/habitat improvements

TABLE 4. SUMMARY OF TEMPERATURE CONDITIONS.					
Condition No.	*Summary*	*Start Date*	*End Date*	*Reporting*	*Notes*
7	Reporting	End of first year of monitoring for annual reporting	May vary with condition, if some require more extended monitoring periods than others	Immediate, Annual & Five-year	Submit annual reports to Division by April 1 following each calendar year; Submit five-year reports by October 1 following end of the fifth consecutive calendar year.

TABLE 5. MONITORING LOCATIONS REQUIRED THROUGHOUT TEMPERATURE CONDITIONS.				
Site ID	*Site Description*	*Justification*		
		*Conditions**	*Model Support***	*Operations****
CLAFTCCO	Poudre River at Canyon Gauge	✓	✓	✓
PR-GLDU****	Poudre River upstream of Glade Reservoir release	✓	✓	✓
GLD-DAM	Glade Reservoir near Dam (ability to measure temperature with depth)	✓		✓
GLD-PRU	Glade Reservoir release just upstream of Poudre River	✓	✓	
PR-HSCU	Poudre River upstream of Hansen Supply Canal, below Glade Reservoir release	✓	✓	
PR-HSCD	Poudre River downstream of Hansen Supply Canal	✓	✓	
PR-LION	Poudre River at Lions Park		✓	
PR-SHI	Poudre River at Shields St	✓	✓	
PR-MWWU	Poudre River upstream of Mulberry Water Reclamation Facility	✓	✓	
PR-NAT	Poudre River at Nature Center	✓	✓	
PR-BCU	Poudre River upstream of Boxelder Creek	✓	✓	

*Sites in the "Conditions" column will support evaluation of mitigation and water quality improvement measures.

** Sites in the "Model Support" column will support Condition T2 and other conditions that rely on comparisons with models.

*** Sites in the "Operations" column require real-time monitoring to support operational decisions.

****Before the Applicant begins releasing water from Glade Reservoir, PR-HSCU may serve as a surrogate for temperature monitoring at this location.

Condition 1: Consistent with the FWMEP commitment (WQ-06), the Applicant shall be required to "ensure that continuous real-time instantaneous temperature monitoring

continues at the Canyon Gage" (CLAFTCCO). In addition, the Division will require real-time instantaneous temperature monitoring at a location just upstream of the Glade Reservoir release to the Poudre River (PR-GLDU). This location is specified because it is upstream of the Glade release and downstream of the Bellevue Intake diversion, representing a location at which diversions from NISP and others would be expected to have the most substantial effects on instream temperatures. Evaluating the Canyon Gage and PR-GLDU will allow for detection of potential temperature impacts at the downstream-most location in Segment 10a, located upstream of the Glade Reservoir release.

Data collection at the Canyon Gage and PR-GLDU must have real-time reporting capability in order to trigger a timely response to temperatures reaching or exceeding the following thresholds[8]:

- **Maximum Weekly Average Temperature (MWAT) Chronic Adaptive Management Threshold Trigger** - At such times as the WAT comes within 0.3°C of the MWAT chronic standard at the Canyon Gage or PR-GLDU, Northern Water will initiate discussions within the NISP adaptive management program for temperature mitigation. In the future, the 0.3°C adaptive management threshold trigger may be adjusted based on operational experience to improve compliance with the chronic standard[9], with approval of the Division.
- **Daily Maximum (DM) Acute Adaptive Management Threshold Triggers** - At such times as the DM temperature is within 1°C of the DM acute standard at the Canyon Gage or PR-GLDU, Northern Water will initiate discussions within the NISP adaptive management program for temperature mitigation. In the future, the 1°C adaptive management threshold trigger may be modified based on operational experience to improve compliance with the acute standard, with approval of the Division.

The Division requires continuous monitoring for the MWAT and DM adaptive management threshold triggers. When temperatures at the Canyon Gage or PR-GLDU exceed either of the adaptive management threshold triggers, discussions will be initiated immediately between the Applicant, CPW, and other parties in the NISP adaptive management program. The Division shall be notified at the same time and given the opportunity to participate in the discussions. The purpose of these discussions, as stated in the FWMEP, is "to determine potential causes for and contributions to temperature exceedances. If these discussions conclude that NISP diversions may be contributing to temperature exceedances, Northern Water will initiate actions under the [NISP adaptive management program] (Section 6.1.1.1) to mitigate the contribution. Management actions by NISP may include but are not limited to

[8]The FWMEP specified these adaptive management threshold triggers for the Canyon Gage. For this certification, the Division will also impose these adaptive management threshold triggers at PR-GLDU.

[9]The FWMEP specifically discusses a provision for adjusting the acute adaptive management threshold trigger, but does not include a similar provision for the chronic adaptive management threshold trigger. The Division will allow for modification of either of the adaptive management threshold triggers for temperature if such modifications can be justified and do not affect compliance with temperature standards.

a reduction or curtailment of NISP diversions, or other changes in NISP operations" that are consistent with water rights provisions in C.R.S. 25-8-104.

Although the FWMEP links the adaptive management threshold triggers to standards in place as of 2017, the Commission's Regulation 82 requires that applicants analyze water quality impacts for proposed projects using the water quality standards in place at the time of the application. Furthermore, Section 82.5(A)(3) states that the Division may conditionally certify a Project based on adaptive management to address the Project's predicted impacts and/or future changes in the applicable water quality classification and standards. The Division recognizes that the Applicant will have to re-evaluate mitigation responses to any new standards to determine if they are consistent with the water rights provisions of C.R.S. 25-8-104.[10]

Data collection at the Canyon Gage and PR-GLDU shall begin no later than one year after issuance of the 404 permit. Until the Applicant begins releasing water from Glade Reservoir, the Applicant's existing monitoring site at PR-HSCU may serve as a surrogate for temperature monitoring at PR-GLDU. The conditions for real-time data collection at these locations will terminate 20 years after full buildout conditions are reached, with the approval of the Division. The Division reserves the option to extend these monitoring requirements in increments of five years if needed for continued evaluation of effectiveness of mitigation measures. Annual and five-year reporting requirements are included in **Condition 7**.

If it is demonstrated through monitoring that "there is no material causal relationship between NISP operations and any exceedance of the MWAT Chronic [adaptive management] threshold [trigger] or DM Acute [adaptive management] threshold [trigger]" (WQ-04, FWMEP), the need for continued monitoring may be revisited with the Division. In addition, the Applicant may request to eliminate the requirement for real-time monitoring at PR-GLDU if it can be demonstrated that the data obtained at this site do not provide improved sensitivity for triggering adaptive management based on at least five years of data collected after the Project is diverting at 80% or more of maximum capacity.

Condition 2: The dynamic temperature model developed to support assessments for the FEIS and the Application is expected to serve two distinct purposes, requiring two versions of the model. The first purpose, which uses the model in a pre-Project configuration (Baseline Version), is to simulate temperatures expected in the Poudre River without operation of the Project or implementation of any mitigation or water quality improvement measures. The second purpose is to support the NISP adaptive management program by providing a model that simulates temperature conditions including the structural and operational changes associated with the Project (Project Version). The Project Version of the model will evolve with the Project and is expected to predict observed temperatures in the future. Comparisons between the Baseline Version and observed temperatures will be used to assess Project impacts relative to conditions without the Project. The Baseline Version of the model will be

[10]This limitation is consistent with the FWMEP (WQ-06) and, as noted frequently in Regulation No. 82, is necessary to protect against "material injury to water rights" as prohibited under C.R.S. 25-8-104.

created based on two years of suitable pre-Project data, and the Project Version will be created as soon as Project diversions begin. The Project Version of the model will need to represent transient conditions reflecting each stage of Project development until the Project reaches full buildout conditions.

The Baseline Version of the model will play a central role in evaluating the effectiveness of the mitigation and improvement measures described in **Conditions 3**, **5**, and **6**. Before the Baseline Version is used for evaluating effectiveness, it must be validated with new data. Testing will be based on at least two years of new data (meteorology, hydrology, and instream temperatures) for April through September, to be collected within a five-year window prior to any Project diversions at the Poudre Valley Canal or the implementation of any mitigation or water quality improvement measures. This may include data collected before formal issuance of the 404 permit.

Testing will be conducted using the same approach and assessed using the same numerical targets applied to initial model development for the FEIS (see Section 3.2 of the Temperature Model Calibration Report). If those targets are not met, the Applicant will update the calibration. Procedures and results for the calibration update will be summarized in a report to be submitted to the Division within one year after the monitoring data are obtained. Model performance will be reviewed with the Division, and Division approval is required before the Baseline Version of the model can be used to evaluate the effectiveness of mitigation and improvement measures.

Once the Project is operating, the Baseline Version of the model will be run annually with observed meteorology and observed flows, adjusted to exclude the effects of Project operations (diversions, releases, and exchanges) on flows. This is intended to simulate temperatures that would have occurred without operation of the Project or implementation of any mitigation or improvement measures. These simulations will provide the basis for ongoing evaluations of the net effect of Project operations after implementation of mitigation and water quality improvement measures, as both operations and offsets evolve over time. Comparison of observed instream temperatures with simulations of the Baseline Version of the model provide net temperature change estimates that support the evaluations of effectiveness required under **Conditions 3**, **5**, and **6**.

The Project Version of the model will be available to support the NISP adaptive management program when an immediate response is triggered by temperatures observed at the Canyon Gage or PR-GLDU. The model can be used to simulate temperature changes expected from the available operational actions, such as reduction or curtailment of diversions or release from Glade Reservoir, based on available data and, where real-time or near-real-time data are not available, assumptions made using the operational history of diversions.

Because physical and hydrologic conditions in the Poudre River will be evolving as the Project develops and conditions are implemented, periodic updates to the Project Version will be necessary to incorporate physical changes to the river that occurred subsequent to the previous update. The Applicant will test performance of the Project Version of the model and update the model annually for as long as necessary to support **Condition 1**. Annual updates may also involve testing and, potentially, recalibration to ensure that the model can

adequately simulate changing river conditions. Procedures and results for updates to the Project Version of the model will be summarized in a report to be submitted to the Division by December 15 of the year following each calendar year of monitoring. Model performance will be reviewed by the Division annually, and the Division may provide feedback on model application and recommended updates or refinements.

Updating the calibration of the Baseline Version and development and annual testing of the Project Version will be supported, in part, with temperature data from monitoring sites identified in Table 5 (excluding GLD-DAM). Data collection for sites listed in Table 5 (with the exception of sites contingent on the construction of Glade Reservoir) shall begin no later than one year after issuance of the 404 permit and shall continue for at least five years after the Project reaches full buildout conditions. The Division may extend monitoring requirements for this condition in increments of five years if necessary to support continued modeling efforts. Annual and five-year reporting requirements are given in **Condition 7**.

Condition 3: The net effect of the Project and mitigation measures implemented between the Poudre Valley Canal diversion and the Glade Reservoir release will be evaluated in aggregate. As described in the FWMEP, mitigation measures already agreed to by the Applicant will include curtailment of Project diversions (FW-02, FW-03) and conveyance refinement (FW-04; bypass flows). These mitigation measures also involve the design and construction of stream channel and habitat improvements (AG-01, AG-02), including along the reach of the Poudre River between the Poudre Valley Canal diversion and the Hansen Supply canal inflows; most of this area falls within the reach addressed by this condition.

If any of the above requirements of the FWMEP are no longer applicable, implementation of these measures will be required as a condition of the 401 certification. However, this requirement does **not** presuppose that any proposed stream channel and habitat improvements will be approved by other agencies, such as USACE, from which the Applicant may need to obtain additional permits, certifications, or authorizations depending upon the nature of the project. The Applicant is responsible for ensuring that all necessary permits, certifications, and authorizations are in place before any construction may begin. This includes compliance with Nationwide 404 permits that may be required if the project involves the discharge of dredged or fill material into WOTUS, or applying for and obtaining an individual 404 permit from USACE, if necessary.

Net effects will be evaluated above the Glade release based on a comparison of observed temperatures with temperatures simulated by the Baseline Version of the dynamic temperature model. This Baseline Version simulation will be conducted on an annual basis, and findings will be included in five-year reports as described in **Condition 7**. If an alternative assessment method is found to be better than modeling, the Applicant may request permission from the Division to use that method, which may be implemented if approved by the Division.

Monitoring sites for this reach are shown in Table 5 and include the Canyon Gage and PR-GLDU. Monitoring requirements for these sites that are included in **Condition 1** cover data needs for this condition. Data must be reported annually per **Condition 7**. Preliminary assessments of effectiveness must be included in each annual report; these will include, but

are not limited to, counts of observed exceedances of DM and MWAT standards compared on a seasonal basis to the number of exceedances observed in comparable years prior to the Project. These preliminary assessments may support efforts through the NISP adaptive management program to adjust mitigation and water quality improvement measures or to propose additional measures. Conclusions and recommendations concerning the performance of mitigation and water quality improvement measures must be addressed, per **Condition 7**, in each five-year report. Monitoring, evaluation, and reporting will continue until five years after full buildout. After this timeframe has ended, the Division may extend these requirements in increments of five years if necessary to support continued evaluations of effectiveness.

Condition 4: As described in the FWMEP, operation of the MLOW relies on selective withdrawals "to tailor the water quality of the releases from Glade Reservoir as they relate to the water quality in the Poudre River." If operation of the MLOW is no longer a requirement of the FWMEP for any reason, implementation of this measure will be required as a condition of the 401 certification. Decision-making for selective withdrawal operation will be supported by temperature profile data collected in Glade Reservoir near the outlet (GLD-DAM). Performance of selective withdrawals for temperature shall be monitored on the basis of continuous temperature data from two sites: PR-GLDU and the Glade Release below the aeration structure just before the water reaches the Poudre (GLD-PRU). The data collected at these sites will be used to perform a heat balance calculation of the resulting temperature downstream of the Glade Release based on an assumption of complete mixing.

Data collection at GLD-DAM and GLD-PRU will begin concurrent with the initiation of releases from Glade Reservoir to the Poudre River. Monitoring will continue until at least five years after the full buildout condition has been reached. Per **Condition** 7, data on how the MLOW is operated must be reported annually, and recommendations for modifying the decision tree (see Figure 3) based on operational experience, if necessary, will be submitted in a five-year report. In the event that adjustments to the MLOW decision-tree are necessary, the Division has the option to extend monitoring requirements in increments of five years.

Condition 5: The net effect of operating the Project and implementing mitigation and enhancement measures is expected to improve temperatures in the Poudre River between the Glade Reservoir Release and Lincoln Street. This part of the river spans all or part of two Cold Water segments (10a and 10b) and one Warm Water segment (11), terminating near the planned NISP diversion just above the Mulberry Water Reclamation Facility. Mitigation and enhancement measures will include the MLOW for the Glade Release (WQ-01) and stream channel and habitat improvements required by the FWMEP between the Poudre Valley Canal and the Hansen Supply canal inflows, as well as near Watson Lake (AG-01 and AG-02). Both of these areas fall, at least partially, within the reach addressed by this condition.

If any of the above requirements of the FWMEP are no longer applicable, implementation of these measures will be required as a condition of the 401 certification. However, this requirement does **not** presuppose that any proposed stream channel and habitat improvements will be approved by other agencies, such as USACE, from which the Applicant may need to obtain additional permits, certifications, or authorizations depending upon the

nature of the project. The Applicant is responsible for ensuring that all necessary permits, certifications, and authorizations are in place before any construction may begin. This includes compliance with Nationwide 404 permits that may be required if the project involves the discharge of dredged or fill material into WOTUS, or applying for and obtaining an individual 404 permit from USACE, if necessary.

Net effects will be evaluated at Shields Street and at Lincoln Street—ensuring that differences in Aquatic Life classification between Segments 10b and 11 are accounted for—based on a comparison of observed temperatures with temperatures simulated by the Baseline Version of the model. The evaluation of results will estimate the net effect of the Project plus mitigation and enhancement measures on temperature in this reach of the river. Simulations with the Baseline Version will be conducted on an annual basis, and findings will be included in each five-year report, as described in **Condition 7**. If an alternative assessment method is found to be better than modeling, the Applicant may request permission from the Division to use that method, which may be implemented if approved by the Division.

Monitoring sites for this condition are shown in Table 5 and include PR-GLDU, GLD-PRU, PR-HSCU, PR-HSCD, PR-LION, PR-SHI, and PR-MWWU. Monitoring requirements for all of these locations are adequately specified in **Conditions 1** through **4** to meet the needs of **Condition 5**. Data must be reported annually per **Condition 7**. Preliminary assessments of effectiveness must be included when possible in the annual report; these will include, but are not limited to, counts of observed exceedances of DM and MWAT standards compared on a seasonal basis to the number of exceedances observed prior to the Project. Per **Condition 7**, conclusions and recommendations concerning the performance of mitigation and enhancement measures must be addressed in each five-year report. Monitoring, evaluation, and reporting will continue until five years after full buildout. After this timeframe has ended, the Division may extend these requirements in increments of five years if necessary to support continued evaluations of effectiveness.

Condition 6: As presented in the Application, temperature simulations upstream of Boxelder Creek (PR-BCU) indicate that operation of the Project will eliminate occurrences of temperatures in excess of current standards but will cause a significant loss of assimilative capacity at times. Additional shading and/or channel/habitat improvements are measures that have potential for mitigating the loss of assimilative capacity (warming) attributed to operation of the Project. Additional shading is attractive because it would benefit other resources (e.g., riparian areas). Consequently, the Applicant modified the dynamic temperature model to provide a preliminary evaluation of the potential benefit of additional shading as part of the Application (Appendix H, 401 Water Quality Certification Technical Report, 2019). Modeling results suggest that shading provided by additional trees may cool the river and would have potential to benefit multiple resources, but the magnitude of cooling would likely be small. The Division does not discount the potential for benefits from additional shading, which may be increased if riparian restoration is combined with channel/habitat improvements. Increased bedform diversity and thermal refugia that take advantage of existing groundwater inflows may be important elements of designs that will benefit aquatic communities, but these benefits are local and may not fully offset temperature impacts predicted at PR-BCU.

The Applicant has committed to working with CPW and the City of Fort Collins[11] to develop a design for improvements to the stream channel and associated aquatic habitat for an approximately one-mile reach between Timberline Road and the Boxelder Ditch diversion; this reach is bordered by Fort Collins Natural Areas. The Division notes that this commitment is **not** included within the FWMEP, and must be planned and implemented using separate funds provided or obtained by the Applicant.

The goal of this improvement project will be to mitigate for the predicted loss of assimilative capacity for temperature at PR-BCU. Design objectives may include, but are not limited to, increasing shading through the establishment of appropriate riparian vegetation, modifying channel morphology to improve temperature regimes and maintain a healthy riparian zone, and/or creating thermal refugia for aquatic life. The Applicant shall develop a plan for the improvement project that will detail specific project components. The requirements for the plan include, but are not limited to, the specific location, the type of work that will be completed, construction methods, and the associated temporary impacts to the river reach. However, the requirement to complete this improvement plan does **not** presuppose that the plan will be approved by other agencies, such as USACE, from which the Applicant may need to obtain additional permits, certifications, or authorizations depending upon the nature of the project. The Applicant is responsible for ensuring that all necessary permits, certifications, and authorizations are in place before any construction may begin. This includes compliance with Nationwide 404 permits that may be required if the project involves the discharge of dredged or fill material into WOTUS, or applying for and obtaining an individual 404 permit from USACE, if necessary.

Once implemented, the Applicant shall assess the net effects of the improvement project on temperature. Net effects will be evaluated at PR-BCU based on a comparison of observed temperatures with temperatures simulated by the Baseline Version of the dynamic temperature model. The evaluation will estimate the net effect of the Project along with mitigation and water quality improvement measures on temperature in this reach of the river. Baseline Version simulations will be conducted on an annual basis, and findings will be included in five-year reports, as described in **Condition 7**. If an alternative assessment method is found to be better than modeling, the Applicant may request permission from the Division to use that method, which may be implemented if approved by the Division. If the plan for channel/habitat improvements focuses on creation of thermal refugia, additional monitoring shall be required in one or more representative refugia. The Division must review and approve the proposed sampling plan for refugia before refugia monitoring begins.

Monitoring sites associated with this condition are shown in Table 5 and include PR-NAT and PR-BCU. Monitoring requirements for these locations are adequately specified in **Condition 2** to meet the needs of **Condition 6**. Data must be reported annually per **Condition 7**. Preliminary assessments of effects must be included when possible in the annual report; these will include, but are not limited to, counts of observed exceedances of DM and MWAT

[11]CPW and the City of Fort Collins have no obligation to provide resources or funding toward the design, development, and/or implementation of the improvements discussed in this paragraph.

standards compared on a seasonal basis to the number of exceedances observed in comparable years prior to the Project. Per **Condition** 7, conclusions and recommendations concerning the performance of mitigation and water quality improvement measures must be addressed in each five-year report. Monitoring, evaluation, and reporting will continue until five years after full buildout conditions are reached. After this timeframe has ended, the Division may extend these requirements in increments of five years if necessary to support continued evaluations of effectiveness.

Condition 7: Compliance with temperature conditions requires the acquisition and analysis of a considerable volume of data, and decisions based on those data will be made on different time scales. To allow for timely reporting of data and adequate time for thoughtful decision-making, the Division will require reporting on three time scales – immediate, annual, and five-year – as described below.

Immediate Reporting

Real-time monitoring at the Canyon Gage and PR-GLDU signals when the stream temperatures are above adaptive management threshold triggers set relative to applicable standards. The response is to "initiate immediate discussions between Northern Water, [CPW], and other [NISP adaptive management program] parties to determine potential causes for and contributions to temperature exceedances" (FWMEP AG-03). The Division shall be notified and invited to participate in these discussions. Immediate discussions among NISP adaptive management program participants and the Division also will be required if operations of the MLOW must balance the release of cool water from lower depths of the reservoir with other water quality concerns, based on data from GLD-DAM, GLD-PRU and PR-GLDU.

Annual Reporting

Data collected at the sites listed in Table 5 will be submitted to the Division by April 1 following each calendar year of monitoring for as long as necessary to support individual conditions. Reporting on the Project Version of the model (**Condition 2**) is due by December 15 of the year following each calendar year of monitoring. The primary purpose of the annual reports is to present data and document operations of the Project. The following will be reported for each condition, at a minimum:

- **Condition 1** – The annual report will summarize and analyze data collected at the Canyon Gage and PR-GLDU, identify instances where temperature standards and/or adaptive management threshold triggers for temperature were exceeded, and discuss actions that were taken by Northern Water and/or the NISP adaptive management program in response.
- **Condition 2** – The annual report, due on December 15 following each calendar year of monitoring, will document the results of application of the Project Version of the model for the previous year, model testing and/or sensitivity analysis, adjustments to the model to improve performance, model recalibration, and recommendations to improve the utility of the model.

- **Condition 3** – The annual report will present data from the Canyon Gage and PR-GLDU, including summarizing the data from these sites along with counts of exceedances of DM and MWAT standards compared, on a seasonal basis, to the number of exceedances observed in comparable years prior to the Project. This report will also include an update on the status of any mitigation projects that are planned for or being implemented in relevant reaches of the Poudre River.
- **Condition 4** – The annual report will summarize and analyze data collected at GLD-DAM, PR-GLDU, and GLD-PRU and calculated Poudre River temperatures downstream of the Glade Release to demonstrate performance of selective withdrawals. The annual report will also describe any operational refinements to the MLOW decision tree, including the justification for adjustments and the observed effects. Note: The MLOW decision tree may be formally updated as a part of the five-year reporting and review process; the intent of documenting operational refinements and effects on an annual basis is to compile information that will guide decisions on formal updates to the decision tree every five years.
- **Condition 5** – The annual report will summarize and analyze data from monitoring stations PR-GLDU, GLD-PRU, PR-HSCU, PR-HSCD, PR-LION, PR-SHI, and PR-LINC. Temperature data presented from these stations will include counts of exceedances of DM and MWAT standards compared on a seasonal basis to the number of exceedances observed in comparable years prior to the Project. This report will also include an update on the status of any mitigation projects that are planned for or being implemented in relevant reaches of the Poudre River.
- **Condition 6** – The annual report will summarize and analyze data from monitoring stations PR-NAT and PR-BCU, including counts of exceedances of DM and MWAT standards compared on a seasonal basis to the number of exceedances observed in comparable years prior to the Project. Any thermal refugia data collected in the previous year must be reported and summarized annually. This report will also include an update on the status of any mitigation projects that are planned for or being implemented in relevant reaches of the Poudre River.

For all monitoring sites, when temperatures in excess of applicable standards are recorded, conditions related to gauged river flows, meteorology, and other relevant data collected by the Applicant must be documented and discussed in annual reports. The Division will review the annual reports and may initiate correspondence with the Applicant on any issues requiring further discussions or actions.

If temperatures at any monitoring site indicate an impairment, the Applicant will perform investigations to determine what contribution, if any, operation of the Project has made. The impairment investigation report and all supporting information will be submitted to the Division within 12 months after the impairment has been reported. If the Division concludes that operation of the Project is primarily responsible for the impairment, the Division will require that the Applicant actively explore preparation of a Category 4b Plan that will define the actions necessary to bring water quality back to attainment of the standard.

A Category 4b Plan must ensure attainment with all applicable water quality standards through agreed upon pollution control mechanisms within a reasonable time period, must be consistent with water rights provisions in Section C.R.S. 25-8-104, and must be submitted to the Division no more than 2 years after the Division's determination that the plan is applicable. If it becomes apparent that a Category 4b Plan cannot ensure attainment with all applicable water quality standards through agreed upon pollution control mechanisms within a reasonable time period, or if such plan is not accepted by the Division or USEPA, or is precluded by or inconsistent with the water rights provisions in Section C.R.S. 25-8-104, then the Division anticipates a 303(d) listing. The Division may request that the Applicant participate as a stakeholder in the TMDL process. The Applicant may agree to remedial actions to restore water quality that are inconsistent with the water rights provisions in C.R.S. 25-8-104.

If the Applicant requires more time to finish the impairment investigation report or the Category 4b Plan, the Applicant may request an extension from the Division. The Applicant must submit a written request for the extension at least two months prior to the relevant deadline and must explain the reason and need for the extension. The Division will review the request and determine whether to grant the extension.

Five Year Reporting

The Division requires reasonable assurance that the proposed mitigation measures will perform as expected for addressing Project impacts and that water quality improvement measures will improve temperature conditions. In general, reaching firm conclusions about the effectiveness of mitigation and improvement measures will require more than a year of monitoring. Every five years and in accordance with Table 4, Northern Water will report on the effectiveness of implemented measures and, if appropriate, recommend adjustments to mitigation and water quality improvement measures. The NISP adaptive management program may provide input on the five-year report and/or comments to the Division. While the primary purpose of the annual reports is to present data and document operations, the primary purpose of the five-year report is to draw conclusions about the effectiveness of mitigation measures and to make recommendations to enhance or supplement measures as needed. The five-year report will include comparison of results from the Baseline Version of the model with observed data. The five-year report will also discuss the operation of the MLOW and will provide recommendations for any adjustments to the MLOW decision tree.

If monitoring data indicate that Project mitigation and water quality improvement measures do not improve temperatures relative to predictions of the Baseline Version of the model, and that the Project causes or contributes to exceedances of the temperature standards, the Applicant shall provide a detailed evaluation to the Division in this report and shall meet with the Division to discuss potential corrective actions. The Applicant, through the NISP adaptive management program, then must plan and design corrective measures. Approval from the Division is required prior to implementation of any modifications to existing measures or addition of supplemental measures. The Division acknowledges that options for corrective actions may be limited, but expects a reasonable effort will be made to identify practical measures that are consistent with the water rights provisions of C.R.S. 25-8-104. The Division

may impose additional monitoring requirements for mitigation and improvement measures that fall short of expectations.

The effectiveness of adaptive management threshold triggers (**Condition 1**) and evaluating causal relationships between the Project, mitigation measures, and temperature measurements are important issues where thorough evaluations are required in the five-year report and which could lead to improvements in the basis for mitigating impacts or enhancing the temperature regime in the Poudre River. Approval from the Division is required prior to modification of adaptive management threshold triggers or cessation of measures that do not appear to provide expected benefits. The Division may impose additional monitoring requirements to evaluate the effects of any changes.

The five-year report will be submitted to the Division by October 1 following the end of the fifth consecutive calendar year of monitoring. Each report will include a detailed assessment of the effectiveness of Project mitigation measures for temperature in the Poudre River. The report may also include recommendations for changes to mitigation measures and/or monitoring to improve the temperature regime in the river, the ability to comply with conditions, or the utility of data collected.

The Division will respond to any requests for which approval is required within one year of receipt of the five-year report. If the Division fails to respond to a particular proposed action within the specified time period, that proposal shall be considered approved. However, if a proposed action is approved due to lack of Division action, the Applicant must inform the Division that it plans to proceed with the proposed action because of the Division's failure to respond.

General Monitoring in New Reservoirs

Rationale

When new reservoirs are proposed as part of a project that requires 401 certification, reservoir water quality is inferred from modeling efforts and/or water quality data from comparable existing reservoirs because pre-project data cannot be collected. In the past, these considerations have led the Division to impose comprehensive initial monitoring conditions within 401 certifications for projects involving new or substantially expanded reservoirs.

The Project will create two new reservoirs, as well as one new forebay for each new reservoir. Predictions of water quality in Glade and Upper Galeton reservoirs have been based largely on inferences drawn from comparisons with similar reservoirs[12]. In addition, modeling for Glade Reservoir has raised concerns about the potential for hypolimnetic hypoxia and other processes, such as aerobic decay of organic matter, to lead to internal loading of certain constituents. These considerations justify comprehensive monitoring in the new reservoirs as well as in the Glade Reservoir release, which provides a direct conduit from the reservoir to the Poudre River such that adverse water quality conditions observed in the reservoir could also be reflected in the river.

Although the use classifications and water quality standards applicable to the new reservoirs cannot be known until they are adopted by the Commission through a rulemaking hearing process, the 401 application made reasonable assumptions about these standards in order to predict which parameters would likely pose water quality problems. In Glade Reservoir, temperature and arsenic are considered likely to exceed the aquatic life and water supply table value standards, respectively, while Upper Galeton Reservoir and its forebay are predicted to exceed the interim standards for total nitrogen, total phosphorus, and chlorophyll *a*, the aquatic life standards for temperature, pH, and total iron, and the water supply standards for dissolved oxygen, arsenic, sulfate, and dissolved iron. Given these predictions and the uncertainty in the water quality analysis for new reservoirs discussed above, the Division will impose a condition that requires the Applicant to explore the development of a Category 4b plan if monitoring results indicate that a new waterbody is impaired.

In addition, direct releases from Glade Reservoir to the Poudre River result in the need for a similar condition for concentrations downstream of the release that are calculated based on sample results from upstream of and in the release[13]; the Applicant will be required to investigate and, potentially, respond to instances in which calculated concentrations suggest that the Project causes or contributes to an impairment in the Poudre River. However, note that a separate set of conditions (**12** through **15**) has been developed to address the potential

[12]A model was developed for some constituents in Glade Reservoir, but it could not be calibrated with data from the reservoir since it does not yet exist.
[13]Monitoring directly downstream of the release is not required because the distance between the release and the outlet of the Hansen Supply Canal is likely too short to ensure adequate mixing.

for significant degradation of Poudre River water quality related to hypoxia-driven internal release of certain constituents known to be sensitive to this biogeochemical process. The Division made this distinction since beyond routine reservoir monitoring, only limited additional monitoring will be required to identify when water quality problems arise in the river as a result of hypolimnetic hypoxia. In such cases, changes to the operation of the MLOW will provide a readily available opportunity to prevent the discharge of poor quality water to the Poudre River in the future.

In contrast, water quality issues in the river that appear to be driven by Glade Reservoir releases but that are not related to hypoxia are expected to be both harder to discern and more difficult to address, since the mechanism driving such issues will not be apparent. For example, concentrations of certain forms of nitrogen and phosphorus may increase as a result of hypoxic conditions when they occur, but aerobic decay of organic matter could augment the concentrations of other forms of these nutrients at different times of the year. Similarly, the concentrations of some metals, like arsenic, iron, and manganese, may be affected by hypoxic conditions, but seasonal variability in the concentrations of metals in the inputs to Glade Reservoir may also impact concentrations. Furthermore, changes in hardness that result from similar processes could cause hardness-dependent standards to fluctuate, which may increase (or decrease) the likelihood of an exceedance. In such instances, further investigation and analysis will likely be required to develop an effective mitigation strategy.

Detailed descriptions of each condition are provided in the next section, and Table 6 offers a brief summary of each condition.

TABLE 6. SUMMARY OF CONDITIONS FOR GENERAL MONITORING IN NEW RESERVOIRS.

Condition No.	*Summary*	*Start Date*	*End Date*	*Reporting*	*Notes*
8	Routine monitoring in Glade Reservoir, Upper Galeton Reservoir, and their forebays	As soon as "practicable and appropriate" after impoundment	5 years after the full buildout condition is reached; Monitoring may be extended in increments of 5 years if standards exceedances occur or data are inadequate to characterize water quality conditions	Annual	Applicant may request modifications to the sampling program in any annual report
9	Development of a Category 4b plan to address impairments in any of the new reservoirs and/or forebays	Begin plan development once an impairment is reported to the Division	Plan is due 2 years after Division determines it is applicable	As needed in annual reports	

TABLE 6. SUMMARY OF CONDITIONS FOR GENERAL MONITORING IN NEW RESERVOIRS.					
Condition No.	*Summary*	*Start Date*	*End Date*	*Reporting*	*Notes*
10	Routine monitoring upstream of the Glade Reservoir release (PR-GLDU) and in the release (GLD-PRU) and calculation of concentrations downstream of the release	As soon as "practicable" after 404 permit is issued	5 years after the full buildout condition is reached; Monitoring may be extended in increments of 5 years if standards exceedances occur or data are inadequate to characterize water quality conditions	Annual	Applicant may request modifications to the sampling program in any annual report
11	Investigation of calculated impairments downstream of the release and development of a Category 4b plan, if appropriate	Begin impairment investigation once calculated impairment is reported to Division; Begin Category 4b plan once Division concludes that the Project is primarily responsible for the impairment	Impairment investigation report due 1 year after calculated impairment is reported to Division; Category 4b plan due 2 years after Division determines that it is applicable	As needed in annual reports	Potential degradation related to hypolimnetic hypoxia is addressed in a separate set of conditions

Conditions

Condition 8: The Applicant will monitor water quality in Glade Reservoir, Glade Forebay, Upper Galeton Reservoir, and Upper Galeton Forebay. Monitoring for each reservoir and forebay will begin as soon as practicable and appropriate after impoundment and will continue for five years after full buildout conditions are reached for the Project. The Division may extend these monitoring requirements in increments of five years if the available data are insufficient to characterize water quality conditions or water quality standards exceedances are documented in a given water body.

The term “practicable” refers to the Applicant’s ability to collect samples safely, and therefore includes the ability to launch a boat and other potential safety issues. The term “appropriate” captures the Division’s intent that the Applicant collect only representative samples; for these waterbodies, a sample should not be considered representative until the waterbody is deep enough to experience persistent summer stratification, since water quality conditions are expected to differ markedly before and after this depth is attained.

Furthermore, delaying sample collection until after this depth is reached does not pose a risk to downstream users of water stored in these reservoirs, as the Applicant is not likely to release Project water until after this point. The data will be submitted annually to the Division along with a report documenting any water quality concerns and any exceedances of applicable water quality standards. The report is due by April 1 following each calendar year of sampling.

The frequency and analytical scope of the monitoring in the new reservoirs and forebays will generally match that employed now by Northern Water for East Slope lakes in the Colorado-Big Thompson system. For the reservoirs, samples will be taken at one site near the dam, and for the forebays, samples will be collected from the deepest location. For the winter sampling events[14] and in the months of May through October, analyses will include general field parameters, major ions, nutrients and biological collections, and metals (Table 7). In June, October, and one winter sampling event, analysis will also include expanded lists for major ions and metals[15]. Samples should be collected according to the proposed sampling schedule provided that safety issues and/or ice cover during winter do not prevent access.

Samples for laboratory analysis are to be collected at two depths: 1 meter below the surface and approximately 1 meter above the bottom. Profiles of the field parameters are taken at one-meter intervals from the surface to a depth of 25 meters, below which the increment increases to every 5 meters until a depth of one meter above the bottom of the waterbody is reached. Chlorophyll *a* and phytoplankton samples are collected by sampling the water column from 0 to 2 meters below the surface. Zooplankton samples are collected from the surface to the lesser of 10 meters or within one meter of the bottom. Secchi depth is collected at each sampling site both with and without a viewscope.

Sampling protocols and procedures that are not specified above or in Table 7 should follow those outlined in the Applicant's standard operating procedures (SOPs), provided that they are consistent with the requirements for water quality assessments that are described in the most current version of the Division's 303(d) Listing Methodology. The Applicant will submit these SOPs to the Division by April 1 of the year prior to that in which monitoring begins; subsequently, the Applicant need only submit SOPs to the Division if updates or changes have been made. If the Applicant wishes to modify the sampling program outlined here, it must submit a request for modifications for the next year of monitoring to the Division no later than April 1. Beyond routine modifications, such as changes to the analyte list or sampling frequency for any waterbody, the Division will also consider requests to remove monitoring requirements for specific waterbodies if sample results to date are adequate to describe water quality conditions. Any request to modify the sampling program may be incorporated into the annual results and exceedances report.

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[14]The Division generally expects that samples will be collected in January and in March to represent winter conditions, but recognizes that this may not be possible due to safety concerns. If sampling can be performed safely one or more times during winter (December through March), the Applicant should collect the required samples.

[15] "Metals" are defined broadly to include selenium (a non-metal) and arsenic (a metalloid). This is consistent with Regulation No. 31, Table III ("Metal Parameters").

TABLE 7. INITIAL MONITORING REQUIREMENTS FOR GLADE RESERVOIR, GLADE FOREBAY, GALETON RESERVOIR, AND GALETON FOREBAY.		
Sampling Frequency	*Parameter*	
Two winter sampling events (January and March, if possible), and monthly May through October	Field Parameters (vertical profiles)	Temperature
		Dissolved Oxygen
		pH
		Specific Conductance
		Turbidity
		Secchi Depth
	Major Ions	Total Organic Carbon
		Total Suspended Solids
		Calcium
		Magnesium
	Nutrients and Biological Collections	Total Kjeldahl Nitrogen
		Ammonia as N
		Nitrate + Nitrite
		Orthophosphate
		Total Phosphorus
		Chlorophyll a
		Phytoplankton
		Zooplankton
	Metals	Arsenic (Total)
		Iron (Dissolved)
		Iron (Total)
		Manganese (Dissolved)
One winter sampling event (January, if possible), June, October	Additional Ions	Potassium
		Chloride
		Sulfate

TABLE 7. INITIAL MONITORING REQUIREMENTS FOR GLADE RESERVOIR, GLADE FOREBAY, GALETON RESERVOIR, AND GALETON FOREBAY.		
Sampling Frequency	*Parameter*	
One winter sampling event (January, if possible), June, October	Additional Ions	Sodium
		Total Alkalinity
	Additional Metals	Arsenic (Dissolved)
		Cadmium (Dissolved)
		Cadmium (Total)
		Chromium (Dissolved)
		Chromium (Total)
		Copper (Dissolved)
		Lead (Dissolved)
		Lead (Total)
		Molybdenum (Total)
		Nickel (Dissolved)
		Nickel (Total)
		Selenium (Dissolved)
		Silver (Dissolved)
		Zinc (Dissolved)

Condition 9: If an impairment in Glade Reservoir, Upper Galeton Reservoir, or their forebays is documented in any annual report, the Applicant will perform investigations to determine what contribution operation of the Project has made. The impairment investigation report and all supporting information will be submitted to the Division within one year after the impairment has been reported. If the Division concludes that operation of the Project is primarily responsible for the impairment, the Division will require that the Applicant actively explore preparation of a Category 4b Plan that will define the actions necessary to bring water quality into attainment of the standard.

A Category 4b Plan must ensure attainment with all applicable water quality standards through agreed upon pollution control mechanisms within a reasonable period of time, must be consistent with C.R.S. 25-8-104, and must be submitted no more than two years after the Division's determination that the plan is applicable. If it becomes apparent that a Category 4b Plan cannot ensure attainment of all applicable water quality standards through agreed upon pollution control mechanisms within a reasonable time period, or if such plan is not accepted

by the Division or USEPA, or is precluded by or inconsistent with the water rights provisions in section C.R.S. 25-8-104, then the Division anticipates a 303(d) listing. The Division may request that the Applicant participate as a stakeholder in the TMDL process. The Applicant, at its discretion, may agree to remedial actions to restore water quality that are inconsistent with the water rights provisions of C.R.S. 25-8-104.

If the Applicant requires more time to finish the impairment investigation report or the Category 4b Plan, the Applicant may request an extension from the Division. The Applicant must submit a written request for the extension at least two months prior to the relevant deadline and must explain the reason and need for the extension. The Division will review the request and determine whether to grant the extension.

Condition 10: The Applicant will monitor water quality in the Glade Reservoir release below the aeration structure (GLD-PRU) and in the Poudre River immediately upstream of the Glade Reservoir release (PR-GLDU). Monitoring at these sites will begin as soon as practicable[16] after issuance of the 404 permit and will continue for five years after the Project achieves full buildout conditions. In addition, the Applicant will use the concentrations measured at PR-GLDU and GLD-PRU, in combination with flow measurements from each site, to calculate expected concentrations in the Poudre River downstream of the release. This calculation will be performed for each sampling event so that appropriate assessment statistics can be calculated for comparison against standards, and any parameter for which water quality standards exist *and* such a calculation is appropriate should be included[17]. The Division may extend these requirements in increments of five years if the available data are insufficient to characterize water quality conditions or calculations predict water quality standards exceedances downstream of the Glade Reservoir release.

The raw data and calculated concentrations will be submitted annually to the Division along with a report documenting any water quality concerns and any measured or calculated exceedances of applicable water quality standards. The report is due by April 1 following each calendar year of sampling.

The frequency and analytical scope of the monitoring at these two sites will generally match that employed now by Northern Water for East Slope streams in the Colorado-Big Thompson system. The scope and schedule for sampling field parameters, major ions, nutrients, and metals are given in Table 8. For *E. coli*, samples will be collected from April through October, and the sampling frequency will be designed to fulfill the minimum data requirements for 303(d) listing of *E. coli* as specified in the Division's most recent Listing Methodology. Samples are to be collected according to the proposed sampling schedule except where prevented by safety issues or problems with access.

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[16]In this case, the term "practicable" primarily refers to the completion and use of the Glade Reservoir release, which are expected to occur after or concurrent with the conditions that would render Glade Reservoir sampling practicable and appropriate.

[17]This includes all parameters listed in Table 3 *except* temperature (addressed through **Condition 4**), specific conductance, turbidity, total alkalinity, total organic carbon, potassium, and sodium.

Sampling protocols and procedures that are not specified in Table 8 should follow those outlined in the Applicant's SOPs, provided that they are consistent with the requirements for water quality assessments that are described in the most current version of the Division's 303(d) Listing Methodology. The Applicant will submit these SOPs to the Division by April 1 of the year prior to that in which monitoring begins; subsequently, the Applicant need only submit SOPs to the Division if updates or changes have been made. If the Applicant wishes to modify the sampling program outlined here, it must submit a request for modifications for the next year of monitoring to the Division no later than April 1. Beyond routine modifications, such as changes to the analyte list or sampling frequency for any waterbody, the Division will also consider requests to remove the monitoring requirements for these sites if sample results to date are adequate to describe water quality conditions and relevant requirements of **Conditions 12** through **15** have not been triggered. Any request to modify the sampling program may be incorporated into the annual results and exceedances report.

TABLE 8. MONITORING REQUIREMENTS FOR GLADE RESERVOIR RELEASE (GLD-PRU) AND THE POUDRE RIVER UPSTREAM OF THE GLADE RESERVOIR RELEASE (PR-GLDU).

Sampling Frequency	*Parameter*	
Monthly: Twice during winter months (February and March, if possible), October, November 2x/Month: April through September	Field Parameters	Temperature
		Dissolved Oxygen
		pH
		Specific Conductance
		Turbidity
	Major Ions	Chloride
		Sulfate
		Calcium
		Magnesium
	Nutrients	Total Kjeldahl Nitrogen
		Ammonia as N
		Nitrate + Nitrite
		Orthophosphate
		Total Phosphorus
	Metals	Arsenic (Dissolved)
		Arsenic (Total)
		Copper (Dissolved)

TABLE 8. MONITORING REQUIREMENTS FOR GLADE RESERVOIR RELEASE (GLD-PRU) AND THE POUDRE RIVER UPSTREAM OF THE GLADE RESERVOIR RELEASE (PR-GLDU).		
Sampling Frequency	*Parameter*	
Monthly: Twice during winter months (February and March, if possible), October, November 2x/Month: April through September	Metals	Iron (Dissolved)
		Iron (Total)
		Manganese (Dissolved)
		Manganese (Total)
		Selenium (Dissolved)
		Zinc (Dissolved)
April through October (*see text for details*)	Biological	*E. coli*
Monthly: Once during winter (February, if possible), June, September	Additional Ions	Potassium
		Sodium
		Total Alkalinity
		Total Organic Carbon
	Additional Metals	Cadmium (Dissolved)
		Cadmium (Total)
		Chromium (Dissolved)
		Chromium (Total)
		Lead (Dissolved)
		Lead (Total)
		Molybdenum (Total)
		Nickel (Dissolved)
		Nickel (Total)
		Silver (Dissolved)

Condition 11: If any calculated exceedance of water quality standards in the Poudre River downstream of the Glade Reservoir release is documented in any annual report, the Applicant will perform investigations to determine what contribution operation of the Project has made. If water quality standards are exceeded for a particular parameter upstream of the Glade Reservoir release, the Applicant will only be required to investigate the impairment if calculations indicate that water from the release increases concentrations downstream. The impairment investigation report and all supporting information will be submitted to the

Division within one year after the calculated impairment has been reported. If the Division concludes that operation of the Project is primarily responsible for the impairment, the Division will require that the Applicant actively explore preparation of a Category 4b Plan that will define the actions necessary to bring water quality back into attainment of the standard.

A Category 4b Plan must ensure attainment with all applicable water quality standards through agreed upon pollution control mechanisms within a reasonable time period, must be consistent with C.R.S. 25-8-104, and must be submitted to the Division no more than two years after the Division's determination that the plan is applicable. If it becomes apparent that a Category 4b Plan cannot ensure attainment with all applicable water quality standards through agreed upon pollution control mechanisms within a reasonable time period, or if such plan is not accepted by the Division or USEPA, or is precluded by or inconsistent with the water rights provisions in section C.R.S. 25-8-104, then the Division anticipates a 303(d) listing. The Division may request that the Applicant participate as a stakeholder in the TMDL process. The Applicant, at its discretion, may agree to remedial actions to restore water quality that are inconsistent with the water rights provisions of C.R.S. 25-8-104.

If the Applicant requires more time to finish the impairment investigation report or the Category 4b Plan, the Applicant may request an extension from the Division. The Applicant must submit a written request for the extension at least two months prior to the relevant deadline and must explain the reason and need for the extension. The Division will review the request and determine whether to grant the extension.

Internal Release - Glade Reservoir

Rationale

As described in Appendix M to the 401 Technical Report, the Applicant employed a modeling approach to simulate dissolved oxygen concentrations throughout the water column of the proposed Glade Reservoir; the Division determined that this approach was credible. These simulations indicate that dissolved oxygen concentrations will likely decrease in the hypolimnion during summer stratification, which is normal for most stratified reservoirs. In 19 of the 26 simulated years, concentrations near the bottom fell below 2 mg/L, which is generally considered the threshold for hypoxia. When hypoxia occurs in water close to underlying sediments, the release of some constituents that would normally be retained in the sediment, such as arsenic, iron, manganese, and phosphorus, becomes more likely; the result of the underlying biogeochemical processes is known as *internal release*.

In the 401 Technical Report, the Applicant notes that the modeling results are not a precise prediction of Glade Reservoir water quality because they are not calibrated to observed data; instead, general comparisons to a conceptual understanding of the reservoir and to water quality data from Horsetooth Reservoir were used to qualitatively assess the modeling results. Furthermore, the model did not predict in-reservoir concentrations of metals, some of which could be strongly affected by internal release.

In addition to modeling, the water quality of two nearby reservoirs—Horsetooth and Carter—also shapes expectations for Glade Reservoir water quality. Horsetooth Reservoir routinely experiences hypoxia in late summer, and the evidence for internal release is clear in the temporal pattern of concentrations of iron, manganese, arsenic, and phosphorus. Carter Reservoir, in contrast, does not experience hypoxia, although redox conditions still permit some internal release of iron and phosphorus. Therefore, while not a foregone conclusion, it is reasonable to expect hypoxia and internal release in Glade Reservoir. However, the water quality implications of these processes, particularly in the Poudre River downstream of the Glade Reservoir release, cannot be conclusively determined. To address the potential for Poudre River water quality issues related to hypoxia-driven internal release, the Division will require that the Applicant implement Division-approved mitigation strategies if this process is identified as a mechanism by which concentrations of key constituents (arsenic, iron, manganese[18], nitrogen[19], and total phosphorus) are elevated in the Poudre River.

For concentrations to be considered elevated by hypoxia-driven internal release, they must reach a threshold late in the stratification season (August - October) that is reliably distinguishable from concentrations measured at the beginning of the stratification season (April). Ideally, it would be possible to develop a threshold based on water quality data collected directly from Glade Reservoir. However, the reservoir has not yet been constructed, and collecting enough data to establish such a threshold with confidence will require multiple years of monitoring during which internal release could already present a threat to water

[18] Both dissolved and total fractions of arsenic, iron, and manganese are to be analyzed.
[19] Analysis is required for three forms of nitrogen – ammonia, nitrate+nitrite, and total nitrogen.

quality in the Poudre River. Because of these issues, the Division has developed an initial threshold based on statistical characteristics of water quality data from Horsetooth Reservoir, the most similar to Glade of the two analogous reservoirs (Horsetooth, Carter) considered in the 401 application.

Horsetooth Reservoir exhibits considerable interannual variation in the concentrations of key constituents measured in bottom samples collected during April; for those constituents measured in more than 10 samples since 2008, the coefficient of variation (CV)[20] ranges between about 70% and 90% at two sampling locations[21]. These data suggest that even if concentrations late in the stratification season are 1.5 to 2 times greater than those measured early in the season, their potential effects on Poudre River water quality could also result from natural variability that is unrelated to internal release. To avoid imposing mitigation requirements in response to water quality changes that could be reasonably expected to occur as a result of natural variability, the Division will consider Glade Reservoir bottom sample concentrations of key constituents measured late in the stratification season to be elevated due to internal release *only if* they are more than two times greater than concentrations measured early in the stratification season (i.e., a ratio of 2:1). Examining the data available for Horsetooth Reservoir indicates that this ratio was exceeded for at least one key constituent in every recent year during which hypoxia was observed at a given site (Table 9). While this analysis provides reasonable assurance that this threshold will be sufficiently protective, the Division has imposed a condition requiring reexamination of the threshold once sufficient data from Glade Reservoir are available.

TABLE 9. RATIO OF LATE STRATIFICATION (SEPTEMBER / OCTOBER) AVERAGE CONCENTRATIONS OF KEY CONSTITUENTS* TO EARLY STRATIFICATION (APRIL) AVERAGE CONCENTRATIONS IN HORSETOOTH RESERVOIR IN YEARS DURING WHICH HYPOXIA OCCURRED.

Site: HT-DIX							
Constituent	Ratio (Late to Early Stratification)						
	2012	2013	2014	2015	2016	2017	2018
Iron (Dissolved)	1.03	0.78	1.29	**2.04**	1.97	**3.98**	1.02
Manganese (Dissolved)	**33.36**	**60.31**	**22.55**	**12.04**	**18.12**	**1644.39**	**54.73**
Total Phosphorus	**2.02**	1.53	1.70	**2.03**	**2.52**	**4.78**	**2.97**
Nitrate + Nitrite	**66.20**	**3.09**	**2.69**	**26.50**	**128.50**	**27.17**	**21.13**

[20] The coefficient of variation (CV) is the standard deviation of a dataset divided by its mean, and is usually expressed as a percentage.
[21] Samples collected at the bottom of the reservoir near Soldier Canyon (HT-SOL) and Dixon Canyon (HT-DIX) dams were considered separately for this analysis.

TABLE 9. RATIO OF LATE STRATIFICATION (SEPTEMBER / OCTOBER) AVERAGE CONCENTRATIONS OF KEY CONSTITUENTS* TO EARLY STRATIFICATION (APRIL) AVERAGE CONCENTRATIONS IN HORSETOOTH RESERVOIR IN YEARS DURING WHICH HYPOXIA OCCURRED.

Site: HT-SOL							
Constituent	Ratio (Late to Early Stratification)						
	2012	2013	2014	2015	2016	2017	2018
Iron (Dissolved)	**2.31**	Hypoxia not observed at HT-SOL	**2.99**	**4.14**	**3.97**	**6.17**	**2.46**
Manganese (Dissolved)	**6.02**		**90.38**	**15.52**	**149.65**	**21.07**	**46.39**
Total Phosphorus	**2.38**		**2.65**	1.87	**2.27**	**2.63**	**2.44**
Nitrate + Nitrite	**33.50**		**3.17**	**23.10**	**108.00**	**19.82**	**13.76**

*Arsenic was excluded because only three samples from early stratification were available at each site.

If hypoxia-driven internal release does elevate concentrations of key constituents, sample results from the Glade Reservoir release and from the Poudre River upstream of the release, collected and analyzed as part of **Condition 10**, will be examined to determine whether Poudre River water quality is adversely impacted. This implies that a second threshold—one that signals the potential for Poudre River water quality degradation—should be exceeded before the Applicant is required to implement mitigation specifically targeting hypoxia-driven internal release. To assign this threshold, the Division recognized that adjusting operations of the MLOW proposed for Glade Reservoir is likely to be an effective strategy for avoiding releases of metals-laden and/or nutrient-rich water to the Poudre River. Because this remedy will already be in place when the reservoir is constructed, the Division expects that the Applicant will likely be able to prevent impairment before it occurs. Therefore, the threshold for making changes to the operation of the MLOW is based on an evaluation of the potential for *significant degradation*. Although the Applicant did not predict that significant degradation, relative to historic conditions, would occur downstream of the Glade Reservoir release, the Division will use this approach to discern the potential for Project-related significant degradation of water quality relative to constituent concentrations measured upstream of the Glade Reservoir release. This will restrict potential influences on downstream water quality to flows from the release itself, thereby ensuring that any determination of impacts specifically captures the effects of this new input.

If modifications to the operation of the MLOW made in response to hypoxia-driven internal release fail to correct any observed degradation of Poudre River water quality, an impairment investigation report will be required. In such instances, the Division expects that the investigation will conclude that hypoxia-driven internal release is either not the primary cause of the impairment or causes changes in water quality that are too large to be corrected through changes to the MLOW decision tree alone. If this report determines that the Project is still primarily responsible for the observed degradation and the magnitude of degradation is

large enough to cause an exceedance of water quality standards, the Applicant will be required to explore development of a Category 4b plan.

The conditions presented herein are based on the concept of adaptive management in that action is required in response to monitoring and the results of specific analyses. Accordingly, the Division has developed graphic and tabular summaries of these conditions (Figure 5; Table 10) that help explain the relationships among them and their interaction with general water quality monitoring required under conditions **8** and **10**. Note that conditions **8** and **10** govern the initiation and duration of conditions **12** through **15**.

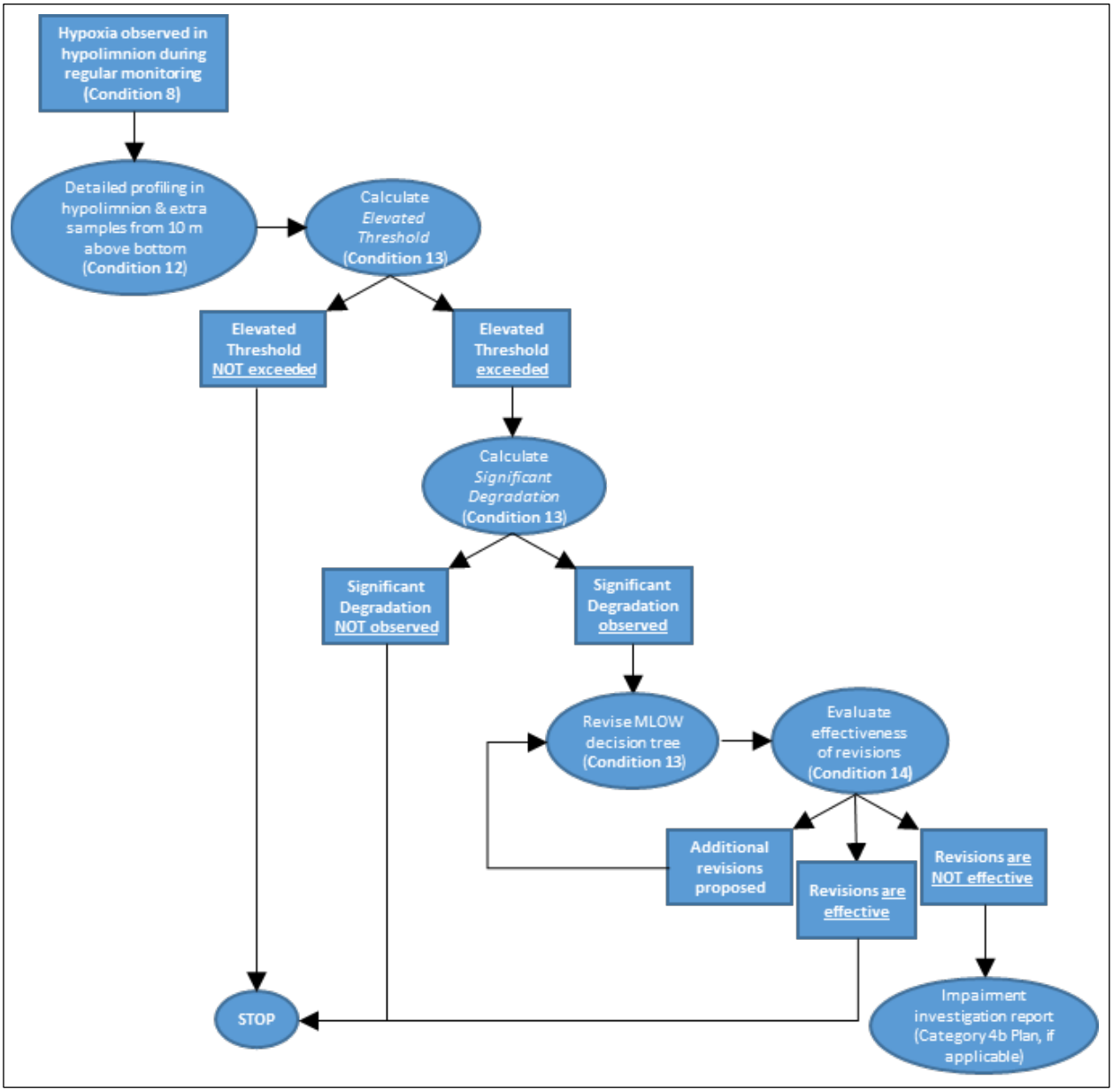

FIGURE 5. FLOWCHART DEMONSTRATING RELATIONSHIPS AMONG CONDITIONS FOR INTERNAL RELEASE - GLADE RESERVOIR.
The chart shows how specific monitoring results and/or analyses trigger further action, including those results collected under the conditions for General Monitoring in New Reservoirs (**Conditions 8** through **11**).

TABLE 10. SUMMARY OF INTERNAL RELEASE – GLADE RESERVOIR CONDITIONS.					
Condition No.	*Summary*	*Start Date*	*End Date*	*Reporting*	*Notes*
12	Additional in-reservoir vertical profiling and sampling	Whenever hypoxia is observed in Glade Reservoir during routine monitoring	5 years after the full buildout condition is reached; Relevant monitoring requirements in **Conditions 8** and **10** may be extended in increments of 5 years as described in those conditions	Annual	Data will be used for calculations required under **Condition 13**
13	Calculate Elevated Threshold and Significant Degradation based on in-stream and release sample results	Any year in which Condition 12 is triggered		Annual & Five-year	If both thresholds are exceeded, MLOW decision tree modifications will be proposed in next annual report; Elevated threshold to be reviewed and revised, if necessary, in first five-year report
14	Monitor the effectiveness of implemented revisions to the MLOW decision tree	If MLOW decision tree modifications are proposed under Condition 13			*If further decision tree modifications required:* Continue monitoring and evaluating effectiveness every five years; *If decision tree modifications are not successful:* Investigative report and proposal for alternative solutions (if required) or Category 4b Plan (if applicable)
15	Reporting	End of first year of monitoring for annual reporting			See Table 11. Summary of reporting requirements for Internal Release - Glade Reservoir conditions (**Condition 15**).

Conditions

Condition 12: If vertical profiling completed as part of general water quality monitoring (**Condition 8**) reveals that dissolved oxygen concentration falls below 2 mg/L in the hypolimnion, the Applicant will perform additional dissolved oxygen profiling (**12a**) and water quality sampling (**12b**) as part of the standard monitoring protocol on that date and on all

subsequent sampling events during that stratification season (April – October). The same decision process is to be applied in subsequent years.

a) In addition to the requirements outlined in **Condition 8**, the Applicant will measure dissolved oxygen at 1-m intervals between the bottom sample and a depth of 10m above the bottom (i.e., adding measurements from 2 to 10 m above the bottom). These depths correspond roughly to the depth range in which the Glade Reservoir model predicts hypoxia may occur.

b) In addition to the top and bottom samples required by **Condition 8** for water quality analyses, the Applicant will collect a water quality sample for key constituents from approximately 10 m above the bottom of the reservoir. This additional sample will provide information regarding the vertical distribution of those constituents known to be responsive to hypoxia. The bottom sample is expected to have higher concentrations of these constituents than the additional sample.[22]

The results of these additional analyses, as well as a discussion of the information they provide regarding hypoxia-driven internal release in Glade Reservoir, will be presented in annual reports (**Condition 15**).

Condition 13: In any year during which **Condition 12** is triggered, the Applicant will perform the two analyses described below:

1. *Elevated Threshold*: First, the Applicant will determine whether hypoxic conditions result in elevated concentrations of any of the key constituents in the bottom sample or in the additional sample analyzed under **Condition 12b.** Initially, concentrations will be considered elevated due to hypoxic conditions if the ratio of concentrations observed late in stratification (September or October) to those observed early in stratification (April) exceeds 2:1 for key constituents measured in bottom samples. This threshold will be reevaluated after five years of data collection, as described in the **Condition 15**.
2. *Significant Degradation*: Next, if the elevated threshold discussed above is exceeded, the Applicant will use the load calculations required under **Condition 10** to evaluate the potential for releases from Glade Reservoir to result in significant degradation of Poudre River water quality. For this purpose, changes in the concentrations of key constituents, as defined in the rationale, will be considered *significant degradation* (SD) if the concentration calculated downstream of the Glade Reservoir release is greater than the measured concentration upstream of the release by more than 15% of the difference between the upstream concentration and the water quality standard for that constituent (Figure 6a). If water quality standards for a key constituent are exceeded upstream of the Glade Reservoir release, the Division will consider SD to have occurred if the calculated concentration downstream of the release is greater than the concentration measured upstream by at least 15% of the upstream concentration (Figure 6b).

[22]Internal release causes iron concentrations, for example, to increase initially at the sediment-water interface. Transport of iron higher in the hypolimnion is slow because the main driver is diffusion. Consequently, observed concentrations will generally decrease with distance above the sediment.

If *both* of the thresholds described above are exceeded in any given year, the Applicant will notify the Division in the annual report (**Condition 15**) due by April 1 of the following year. In this report, the Applicant will also propose revisions to the decision tree for operation of the MLOW to avoid depths in the hypolimnion that are affected by internal release. The Division will work with the Applicant to determine and approve appropriate revisions to the MLOW decision tree by no later than July 1 of the same year to ensure that the revised decision tree can be implemented as soon as practicable before concentrations are expected to peak due to hypoxia.

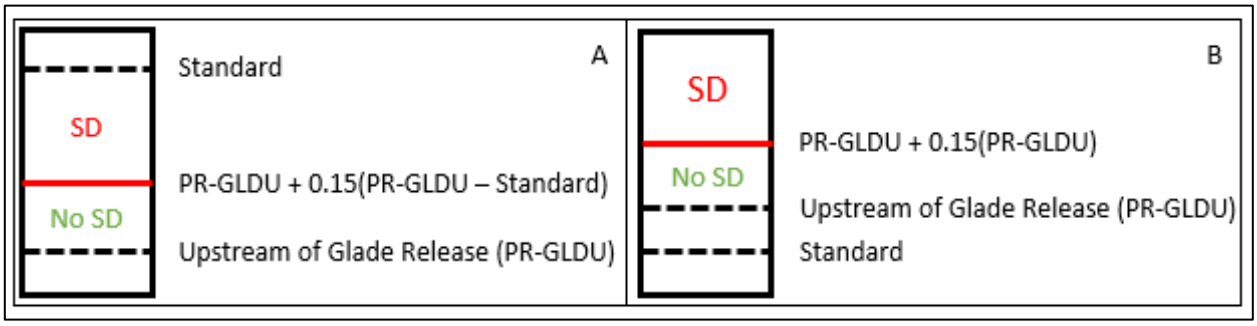

FIGURE 6. ILLUSTRATIONS OF THE CALCULATIONS THAT WILL BE USED TO DETERMINE WHETHER THE SIGNIFICANT DEGRADATION (SD) THRESHOLD HAS BEEN CROSSED.
(a) If the concentration measured at PR-GLDU is below the standard, SD occurs if the calculated concentration downstream of the release exceeds 15% of the difference between the concentration at PR-GLDU and the standard. (b) If the concentration at PR-GLDU is above the standard, SD occurs if the downstream concentration is greater than the concentration at PR-GLDU by at least 15% of that concentration.

Condition 14: If a revised decision tree is required under **Condition 13**, the effectiveness of those revisions will be evaluated based on data obtained during the first five years after the revisions have been implemented. This evaluation will determine whether the revised decision tree has been successful in avoiding significant degradation of Poudre River water quality due to internal release that results from hypoxic conditions. If the report concludes that the revised decision tree has not been effective, the Applicant should also include a discussion of whether further revisions to the decision tree may be more successful. The Applicant will submit this evaluation to the Division with the annual or five-year report due in the year after sufficient data are available. If, based on this report, the Division concludes that further modifications to the decision tree suggested by the Applicant may improve the effectiveness of this mitigation strategy, the Applicant will implement those modifications as soon as practicable, and will continue to monitor their effectiveness for another five years. This process may be repeated any time that the Division approves a revised decision tree under this condition.

In contrast, if the Division concludes that the revised decision tree has not been successful and that further modifications will not improve its effectiveness, due either to the mitigating power of the strategy itself or to challenges in optimizing the decision tree to address other parameters and/or operational concerns, the Applicant will complete an investigative report to determine the causes of calculated significant degradation in the Poudre River. The report will consider factors in the watershed that may play a role in creating conditions conducive to

internal release driven by hypoxic conditions, as well as the extent to which operation of the Project is responsible for the calculated impacts. The report may also identify and/or propose mechanisms other than hypoxia-driven internal release that may be contributing to those impacts. The investigative report and all supporting information will be submitted to the Division within one year after the Division has determined that further decision tree modifications will not correct for the reported degradation. Depending on the results of the report, the Division may require that the Applicant propose practicable alternative solutions, such as oxygenation of the Glade Reservoir hypolimnion or the installation of structures to reduce sources to the reservoir or concentrations in the release. The Division will determine deadlines for the Applicant to submit a proposal for alternative solutions in the event that such a proposal is required. The Applicant may collaborate with other interested parties if such solutions are required, but if no other entity wishes to participate, the Applicant will still be held to the requirements of this condition.

If the Division concludes, on the basis of the Applicant's investigative report, that operation of the Project is primarily responsible for an exceedance of the water quality standards for any of the key constituents to which these conditions apply, the Division will require that the Applicant actively explore preparation of a Category 4b Plan that will define the actions necessary to bring water quality back into attainment of the standard[23].

A Category 4b Plan must ensure attainment with all applicable water quality standards through agreed upon pollution control mechanisms within a reasonable time period, must be consistent with C.R.S. 25-8-104, and must be submitted to the Division no more than two years after the Division's determination that the plan is acceptable. If it becomes apparent that a Category 4b Plan cannot ensure attainment with all applicable water quality standards through agreed upon pollution control mechanisms within a reasonable time period, or if such plan is not accepted by the Division or USEPA, or is precluded by or inconsistent with the water rights provisions in section C.R.S. 25-8-104, then the Division anticipates a 303(d) listing. The Division may request that the Applicant participate as a stakeholder in the TMDL process. The Applicant, at its discretion, may agree to remedial actions to restore water quality that are inconsistent with the water rights provisions of C.R.S. 25-8-104.

If the Applicant requires more time to finish the investigative report or the Category 4b Plan, the Applicant may request an extension from the Division. The Applicant must submit a written request for the extension at least two months prior to the relevant deadline and must explain the reason and need for the extension. The Division will review the request and determine whether to grant the extension.

Condition 15: The Applicant will prepare annual and five-year reports for the Glade Reservoir release conditions. Annual reports will be submitted to the Division by April 1 following each

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[23]This requirement parallels **Condition 11**, which requires that the Applicant actively explore preparation of a Category 4b Plan if an impairment investigation report concludes that the Project is primarily responsible for any calculated impairment downstream of the Glade Reservoir release. The difference is that while **Condition 11** could be triggered at any time, **Condition 14** can only be triggered after hypoxia-driven internal release has been identified and the Applicant has attempted to correct for its effects using a revised MLOW decision tree.

calendar year of monitoring and/or mitigation efforts, while five-year reports will be submitted by October 1 following every five years of these efforts. Both reports involve regularly required elements and elements that may be triggered as a result of monitoring (Table 11).

Raw data, load calculations, and calculated exceedances downstream of the Glade Reservoir release must be included in annual reports required under **Condition 10**. While this information for key constituents need not be repeated to satisfy the reporting requirements of conditions **12** through **15**, the Division expects that annual reports may reference this material when discussing hypoxia-driven internal release, particularly if significant degradation and/or impairments are calculated or detected.

TABLE 11. SUMMARY OF REPORTING REQUIREMENTS FOR INTERNAL RELEASE - GLADE RESERVOIR CONDITIONS (CONDITION 15).

Annual Reports		
Regularly Required Elements	*Trigger*	*Triggered Element*
Calculated concentrations downstream of Glade Reservoir release, including raw data and calculated in-river exceedances, for key constituents (**Condition 10**)	Hypoxia observed during regular monitoring (**Condition 8**)	Presentation and discussion of additional data collected in / around hypolimnion (**Condition 12**); Calculation of Elevated Threshold and Significant Degradation (**Condition 13**)
	Elevated Threshold and Significant Degradation (**Condition 13**) are exceeded	Proposed revisions to MLOW decision tree
	Revisions to MLOW decision tree are implemented	Preliminary evaluation of the effectiveness of MLOW decision tree modifications
Five-Year Reports		
Regularly Required Elements	*Trigger*	*Triggered Element*
Discussion of data collected to date, including any patterns or trends that have emerged; First five-year report must include review of Elevated Threshold using data collected from Glade Reservoir	Division accepts revisions to Elevated Threshold, if proposed	Reevaluation of new threshold in next five-year report, if required by the Division
	Division accepts revisions to MLOW decision tree, if proposed	Evaluation of effectiveness of revised decision tree (*May occur outside of regular five-year reports*)
	Division concludes that modifications to MLOW decision tree are not effective	Investigative Report (Proposal for alternative solutions, if Division requires it; Category 4b Plan, if applicable)

If **Condition 12** is triggered, annual reports must include the raw data as well as a brief discussion of the additional information collected. If **Condition 13** is triggered, annual reports must discuss the evaluations of one or, if applicable, both thresholds, and must also include all raw data used to perform those calculations. If both thresholds are exceeded, the

Applicant must include a proposal for revising the decision tree for operation of the MLOW. Once modifications to the MLOW decision tree are implemented under **Condition 13**, annual reports should include preliminary assessments of the effectiveness of those modifications, including any adjustments made since the initial implementation.

Every five-year report should include a synthesis of the information presented in previous annual reports, including a brief discussion of any patterns or trends that may have emerged, such as the ambient conditions that promote hypoxia or characteristics of years in which significant degradation (**Condition 13**) is likely to occur. In the first five-year report, the Applicant must evaluate data from Glade Reservoir itself to determine whether the elevated threshold presented in **Condition 13** should be revised. The Division will require this evaluation even if **Condition 13** is not triggered during the first five years of monitoring, since sufficient data will be available to perform the evaluation and given that **Condition 13** may be triggered in subsequent years. If the Division approves a proposed revision to the elevated threshold, it *may* require the Applicant to evaluate the revised threshold in the next five-year report.

If revisions to the MLOW decision tree are triggered under **Condition 13**, the Applicant must include an evaluation of the effectiveness of the revised decision tree in the next report required after five years of data collection following implementation (**Condition 14)**. Note that this evaluation may not appear in a regularly scheduled five-year report because the evaluation must be performed five years after revisions to the decision tree are implemented, which could occur in any year. Any time that the Division approves further adjustments to the decision tree based on this evaluation, the effectiveness of those adjustments will be evaluated for another five years, after which another report will be required.

In the first five-year report and in any subsequent annual or five-year report, the Applicant may request that obligations under the Glade Reservoir Release conditions be terminated. However, such requests must be justified by data that address the potential for Glade Reservoir releases to result in significant degradation (**Condition 13**) of Poudre River water quality.

For five-year reports, the Division will respond to any requests for which approval is required within one year of receipt of the report. If the Division fails to respond to a particular proposed action within the specified time period, that proposal shall be considered approved. However, if a proposed action is approved due to lack of Division action, the Applicant must inform the Division that it plans to proceed with the proposed action because of the Division's failure to respond.

Arsenic and Copper

Rationale

There are two mechanisms through which the Project has the potential to impact Poudre River water quality. The first mechanism—releases from Glade Reservoir—is considered in the sets of conditions for General Monitoring in New Reservoirs and Internal Release in Glade Reservoir. The second mechanism—flow reductions and changes in local hydrographs as a result of additional hydromodification—is more difficult to address because its potential effects on constituent concentrations are relatively subtle and will depend on interactions among numerous diversions from and inputs to the river. These factors may confound the Applicant's ability to identify the contributions of the Project to any observed degradation of water quality in the future; nevertheless, the Division must consider whether these aspects of the Project could cause significant degradation, and must develop conditions accordingly.

The Applicant's mass balance model predicts small changes (increases and decreases) in the concentrations of many parameters throughout the affected segments of the Poudre River under Cumulative Effects (CE) and Future Conditions with the Project (FC+NISP) scenarios. The low magnitude of these predicted changes is likely related to the high quality of water that will be diverted to Glade Reservoir, the restriction of increased diversions at the Poudre Valley Canal to periods of high flow, and the releases from Glade Reservoir under conveyance refinement, the benefits of which extend from the reservoir release to the proposed Poudre River Intake at the downstream end of segment 11. The predicted changes are small enough, in most cases, to conclude that the Project will not cause significant degradation of Poudre River water quality. However, when the potential for adoption of a water supply use in segment 11 of the Poudre River and the possibility for impacts to existing reservoirs are considered, quantitative and qualitative analyses presented in the 401 Technical Report do indicate potential for Project-related degradation of copper and arsenic concentrations.

This set of conditions will address these two metals; however, note that Project-related hydromodification also has the potential to impact nutrient and *E. coli* concentrations, especially at the downstream end of segment 11 and the upstream end of segment 12. These parameters are addressed in separate sets of conditions, as non-Project-related sources are better understood, and practicable measures exist to address existing and/or future impairments for these parameters.

Water Supply Use in Segment 11

Segments 10a and 10b of the Poudre River have been included on the Division's 303(d) List for exceedance of the water supply standard for total arsenic since 2016. Although the Applicant predicts increases in arsenic concentration in segment 10a under CE, these increases are likely related to increased contributions from the North Fork of the Poudre River rather than the Project, as decreases in arsenic concentration are predicted under FC+NISP. However, under CE and FC+NISP, arsenic concentrations would increase by 30% and 50% of the most stringent water supply standard (0.02 ug/L), respectively, at the Lincoln Street Gauge in segment 11 of the Poudre River (Tables 18 and A10, Appendix E, 401 Technical Report, 2019). Note that no sites in segment 10b were included as focus locations in the application.

While there is no water supply standard in segment 11 currently, the Project involves construction of a new intake structure (the PRI) in segment 11 upstream of the Mulberry Water Reclamation Facility's outfall that will provide drinking water, among other uses, to the public throughout the service areas for Project participants. Installation of the PRI will represent a new beneficial use of Poudre River water that is likely to lead to the Commission's adoption of a water supply use classification for all or part segment 11 (Regulation No. 31, Section 31.6). In light of the potential for exceedances of the arsenic water supply standard[24], and given that implementation of the Project makes the Commission's designation of a water supply use classification for segment 11 more likely, the Division will impose a condition requiring monitoring for arsenic in segments 10b and 11.

During discussions with the Division, the Applicant suggested that the Commission may change the current segmentation of the Poudre River such that a new water supply use classification is applied only to the portion of segment 11 that is upstream of the new Poudre River Intake. The Division agrees that the portion of segment 11 upstream of the proposed intake is the most critical in terms of compliance with water supply standards. Thus, the Division will restrict segment 11 monitoring to account for the potential adoption of a water supply use classification to this area.

Existing Reservoirs

The Applicant completed a qualitative analysis of the potential for Project-related impacts to constituent concentrations in some existing reservoirs, including Terry Lake, Big Windsor Reservoir, and Timnath Reservoir[25], based on projected changes in residence time for these waterbodies and in the water quality of their inputs. There is considerable uncertainty in this analytical method, both because there is no recent water quality data available for any of the three reservoirs and given the potential for changes in water quality during travel from the river to the reservoir. Given this uncertainty, the Division considers it prudent to impose a condition that requires monitoring at key locations in the Poudre River for a limited set of constituents. The Division will not require direct monitoring of the reservoirs because potential Project impacts are only likely to occur if the water quality of diversions from the Poudre River to these reservoirs is impacted. Moreover, the Applicant does not manage any of these reservoirs and does not have permission to access them for monitoring purposes.

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[24]The potential for exceedances of the arsenic water supply standard assumes that the water supply use classification is adopted in segment 11 without making changes to the current class 1 aquatic life designation. Alternatively, this standard could apply if the Commission downgrades the current aquatic life designation to class 2 while adopting a water supply use classification, but also designates water + fish ingestion standards if appropriate for this segment (Regulation No. 31, Section 31.16, Table III, Footnote (7)).

[25]Watson Lake and Fossil Creek Reservoir were also analyzed; however, sufficient data were available for quantitative analysis in Watson Lake for most parameters, and modeling results indicated no potential for significant degradation. Fossil Creek Reservoir is a use-protected segment and thus is not subject to antidegradation review; however, there is potential for the Project to contribute to existing exceedances of the interim total nitrogen standard, an impact addressed in the conditions for nutrients (**Conditions 22** through **25**).

To determine an appropriate list of constituents for which monitoring will be required, the Division examined the Applicant's analysis under CE and FC+NISP. Under CE, increased concentrations of numerous parameters (e.g., arsenic, total nitrogen, total phosphorus, copper, dissolved iron) in all three reservoirs are predicted. However, only copper and mercury in Terry Lake and Big Windsor Reservoir and arsenic, dissolved iron, and mercury in Timnath Reservoir are considered likely to increase[26] under FC+NISP. Since antidegradation review requirements are not applicable to secondary water supply standards (Regulation 31, Section 31.8(1)(b)(i)) and the magnitude of increases in dissolved iron concentrations is not expected to be large enough to cause exceedances of this standard, the Division will not require monitoring for dissolved iron. Monitoring for mercury will not be required because average predicted increases in Poudre River concentrations under CE and FC+NISP (0.11 ng/L and 0.18 ng/L, respectively) are nearly two orders of magnitude less than the standard (10 ng/L), suggesting very limited potential for increases in existing reservoirs.

In contrast, data from the Water Quality Analysis Effects Report completed for the FEIS suggests that copper concentrations could increase by up to 11%[27] of the hardness-based standard in some months under future conditions including the Project at the boundary of segments 10a and 10b. The dependency of the copper standard on hardness is also an important consideration given the potential for Project-related decreases in hardness at times when copper concentrations in the Poudre River are expected to be highest, as explained in the 401 Technical Report, and the lack of data concerning hardness values in the existing reservoirs. Given the magnitude of the potential increase in copper concentrations and the dependency of copper standards on hardness, monitoring will be required in areas of the Poudre River where changes to copper concentrations could impact Terry Lake or Big Windsor Reservoir. Monitoring will also be required for total arsenic where potential changes could impact Timnath Reservoir. This monitoring requirement is justified given the potential for contribution to an existing impairment in segment 11 (assuming the adoption of a water supply standard) and the existing water supply use classification in segment 21 of the Poudre River basin, which includes Timnath Reservoir.

Practical Considerations

The Division recognizes that responding to new impairments revealed through the required monitoring depends on the Applicant's ability to link specific changes in water quality to the Project, and that even where such links can be identified, the only effective mitigation strategies would very likely conflict with the water rights provisions of C.R.S. 25-8-104. In light of these practical considerations, the following conditions do not require that the

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[26]Because this analysis is qualitative and was performed on a monthly basis, the Division assumed that concentrations of a particular parameter are only likely to increase if the analysis predicted that concentrations will increase in more months than they will decrease.

[27]The 401 Technical Report generally reports smaller increases because it focuses on statistics that the Division uses to perform water quality assessments (85th percentile or median) and does not report differences in the predicted changes in concentration for each month. The higher resolution data presented in the FEIS is used here because, for dissolved copper, the primary concern is the potential for degradation of water quality in existing reservoirs, which will depend on the actual concentrations of inputs rather than the assessment status of the river.

Applicant commit to a specific action to address future impairments. Instead, the Applicant will be required to cooperate with the Division in the event of a new 303(d) listing, and to participate as a stakeholder in the TMDL process, if appropriate. Conditioning in this manner will help ensure that any contributions of the Project to a future impairment are considered without presupposing that the Project is the primary cause of that impairment.

A summary of the conditions that will be imposed is presented in Table 12. Detailed descriptions of the requirements of each follow below.

TABLE 12. SUMMARY OF ARSENIC AND COPPER CONDITIONS.

Condition No.	*Summary*	*Start Date*	*End Date*	*Reporting*	*Notes*
16	Monitoring at key Poudre River locations to address uncertainty in predicted impacts and potential contributions to arsenic water supply / copper aquatic life standard exceedances	Within 1 year of issuance of 404 permit	Five years after Project begins releasing water from Glade Reservoir	Annual	Requirements may be extended in increments of 5 years if results suggest increasing concentrations and/or new exceedances
17	Participation as a stakeholder in TMDL development process	Condition 16 is still in effect and TMDL process is initiated		N/A	May be required to perform additional sampling if any of three existing reservoirs is added to the Division's Monitoring & Evaluation List

Conditions

Condition 16: Within one year of the issuance of the 404 permit, the Applicant will begin collecting samples for dissolved copper and/or total arsenic (Table 13) from selected locations in the Poudre River (Table 14). Sampling will be performed monthly, except where winter conditions prevent safe access, and will continue for at least five years after the Project begins releasing water from Glade Reservoir. The monitoring initiation and termination dates were selected to ensure that sufficient baseline data are available and that the effects of the Project are evaluated once the Project is both diverting to and releasing from Glade Reservoir.

TABLE 13. METALS FOR WHICH POUDRE RIVER MONITORING IS REQUIRED.		
Parameter	*Analytical Method*	*Justification*
As_t	USEPA 200.8	Potential for contribution to an existing impairment in segment 11 if a water supply use is adopted, and potential for degradation in Timnath Reservoir
Cu_d	USEPA 200.7	Potential for degradation in Terry Lake and Big Windsor Reservoir

TABLE 14. MONITORING SITES FOR AS, CU IN THE POUDRE RIVER.			
Site ID	*Site Description*	*Parameters**	*Justification*
PR-LCCU	Poudre River upstream of Larimer County Canal	As_t, Cu_d	Provides upstream reference point at upstream end of segment 10b, downstream of Glade Reservoir release and Hansen Supply Canal
PR-LCU	Poudre River upstream of Cache La Poudre ditch, also called Little Cache Canal, which flows to Terry Lake	As_t, Cu_d	Impacts to Cu at this location could suggest impacts to Terry Lake; Monitoring for Project-related impacts to As towards the middle of segment 10b
PR-LWU	Poudre River upstream of Larimer & Weld Canal, which flows to Big Windsor Reservoir	As_t, Cu_d	Impacts to Cu at this location could suggest impacts to Big Windsor Reservoir; Monitoring for Project-related impacts to As at downstream end of segment 10b
PR-MWWU	Poudre River upstream of Mulberry Water Reclamation Facility	As_t	Represents As concentrations in segment 11 upstream of the PRI, where Commission is most likely to adopt a water supply use classification
PR-TIU	Poudre River upstream of Timnath Inlet	As_t	Impacts to As at this location could suggest impacts to Timnath Reservoir

*Samples analyzed for dissolved copper must also be analyzed for calcium and magnesium in order to determine hardness, which is required to calculate the aquatic life standard.

Monitoring results will be submitted annually to the Division by April 1 following each calendar year of sampling. With these results, the Applicant will also submit a report documenting any exceedances of the applicable standards and/or any temporal patterns (e.g., increasing or decreasing trends) that can be discerned. The report may also include chemical results and/or flow data from other sampling sites in the Poudre River or its tributaries that aid in the interpretation of results from the required sampling sites. The Applicant may also include requests to modify the required sampling program, including changes to the analyte list, sampling frequency, and/or sampling locations. Any changes to the sampling program must be approved by the Division before they are implemented.

If, at the end of the prescribed monitoring period, the Applicant has documented neither new exceedances of the applicable copper standards in segment 10b nor increasing trends in arsenic (segments 10b, 11) or copper (segment 10b only) concentrations since commencement of Project operations, the Division will terminate these monitoring requirements. If the sample results indicate new exceedances of applicable copper standards and/or increasing

trends in arsenic or copper concentrations, the Division may extend these monitoring requirements in increments of five years as long as such patterns continue. However, at any time following the end of the initial monitoring period, the Applicant may submit evidence suggesting that the Project is not responsible for the observed standard exceedances and/or increasing concentrations. If the Division concurs with the Applicant's findings, these monitoring requirements will be terminated.

Condition 17: The Applicant will be required to participate as a stakeholder in future TMDL development processes for total arsenic and/or dissolved copper in segment 10b, 11 or 21 (Big Windsor Reservoir, Terry Lake, or Timnath Reservoir) of the Poudre River basin if **Condition 16** is still in effect.

If data suggest that the Project is primarily responsible for new exceedances of dissolved copper or total arsenic standards, or for substantial increases in total arsenic concentration in the already listed segments (10b and 11), the Division may request that the Applicant actively explore the preparation of a Category 4b plan, in lieu of a TMDL, to address the impairment.

If, after the Project begins operating, Big Windsor Reservoir or Terry Lake is added to the Monitoring & Evaluation (M&E) List for dissolved copper, or Timnath Reservoir is added to the M&E List for total arsenic, the Division *may* request that the Applicant perform additional sampling to identify any potential Project contributions. The Division will only request additional sampling if the results of monitoring performed under **Condition 16** suggest that the Project may be partially responsible for any observed increases in concentration that may have led to the M&E listing.

E. coli

Rationale

High levels of *Escherichia coli* (*E. coli*) in segments 11 and 12 of the Poudre River heighten concerns about the potential for operation of the project to cause or contribute to exceedances of the standard. Segments 11 and 12 were previously placed on the 303(d) List for exceeding the recreational water quality standard for *E. coli*. Those segments receive *E. coli* contributions from urbanized areas, wastewater treatment plants, agricultural runoff, stormwater runoff, and return flows, as well as from an unknown number of septic systems in the area. Although the Project is not expected to be an important source of *E. coli*, the actual contribution from the Glade Reservoir release is uncertain; this uncertainty, as well as the potential for impacts to *E. coli* concentrations in segments 10a and 10b, are addressed through monitoring and response to impairment conditions presented earlier (**Conditions 10** and **11**). The primary mechanism by which operation of the Project may elevate *E. coli* levels in segments 11 and 12 is through reduction of flows available to dilute the contributions from other sources with higher *E. coli* loading, such as Spring Creek or Fossil Creek.

A quantitative assessment of Project impacts was not completed as part of the 401 application. Modeling the fate and transport of *E. coli* cannot be accomplished satisfactorily with the mass balance approach usually taken with conservative substances. The non-conservative nature of *E. coli* creates a challenge for assessing project impacts to *E. coli* concentrations in the Poudre River. Compounding this challenge is the importance of incompletely understood external sources that are contributing *E. coli* to the system via tributaries and urban runoff (Appendix D, 401 Technical Report).

The Applicant developed a qualitative basis for estimating the potential impacts of the Project on *E. coli* concentrations in the Poudre River. Load duration curves[28] were constructed to determine the likely direction of change based on the change in flow resulting from operation of the Project (Appendix D, 401 Technical Report). The analysis extends from the Poudre Valley Canal diversion to the confluence with the South Platte River. The Applicant's qualitative analysis, which is focused on the role of the Project, is summarized in Appendix D to the 401 Technical Report as follows:

> *The findings … show the potential for adverse effects at high flow rates for both* [Current and Future] *comparisons. This is a result of the NISP diversions reducing peak flows. At low flows, no appreciable changes are anticipated due to NISP (Future*

[28]Because the load duration curves were based on daily flows and grab samples for E coli, the qualitative forecasts of increase or decrease apply to individual E coli measurements rather than assessed values. In other words, these are not forecasts of potential exceedances. The term "excursion" was used in the application to refer to the likelihood of individual measurements being higher than the standard (126 CFU/mL). Although the term excursion has a specific meaning for temperature in the Listing Methodology, it remains an apt term in this situation. Note that the division's Listing Methodology considers an exceedance of the standard to have occurred if the geometric mean of at least five samples collected over rolling 61-day intervals exceeds the standard.

Conditions vs. Future Conditions with NISP), with the exception of the Lincoln St. location. At Lincoln St., there is the potential for beneficial effects [during low flows]*, primarily due to releases from Glade Reservoir and minimum instream flow requirements in Segments 10b and 11.*

The Division acknowledges that existing exceedances of *E. coli* standards are not due to the Project, and that the Applicant is not solely responsible for investigating the problem or implementing *E. coli* load reduction measures[29]. Furthermore, predicted impacts in segments 11 and 12 are due to Project-related hydromodification, and the Division does not have the authority to impose conditions that conflict with the water rights provisions of C.R.S. 25-8-104. Nevertheless, it is important to pursue load reduction measures that are consistent with the Applicant's exercise of water rights where possible. The Applicant has thus committed funds to address existing *E. coli* loads to the Poudre River, and will direct the majority of these funds towards the implementation of load reduction measures that have the potential to yield considerable environmental benefit. Accordingly, the first condition (**Condition 18**) is the requirement to allocate funds to these efforts (Table 15). As with other mitigation and water quality improvement measures, the Division is also imposing a condition for monitoring to evaluate the effectiveness of the *E. coli* load reduction measures (**Condition 19**).

A third condition (**Condition 20**) addresses uncertainty surrounding project impacts to *E. coli* concentrations in Segments 11 and 12. If this additional monitoring suggests that the Project may be contributing to observed impairments, the Applicant will be required to prepare an impairment investigation report to confirm or refute the Project's role in the impairment. If the impairment investigation report suggests that the Project is contributing to the observed impairments, the Applicant may be required to pursue additional load reduction measures if the Division concludes that such measures can be effective and remain consistent with the water rights provisions of C.R.S. 25-8-104. Note that the Division will not require pursuit of a Category 4b Plan because the Project is very unlikely to represent the primary cause of any future impairments given the strong influence of other factors, such as stormwater runoff and point source dischargers, on *E. coli* concentrations in the Poudre River. However, the omission of this pathway for addressing impairments from these conditions does not preclude the Applicant from pursuing it in the future should the data indicate that the Project is the primary cause of observed impairments in segments 11 and/or 12.

In 2018, the Division initiated the development of a TMDL to address the existing *E. coli* impairments to segments 11 and 12. As a part of TMDL development, new and existing *E. coli* data will be collected and analyzed, and point (Load) and non-point (Waste Load) load allocations will be calculated. The TMDL may also include recommendations on reductions in *E. coli* in the impacted area. While it is expected that the Applicant shall participate in the

[29]Note that, for the purposes of these conditions, the term "load reduction measures" refers to specific actions that the Applicant will implement to reduce existing *E. coli* loads to the Poudre River. It does *not* imply direct mitigation of project impacts, as in general, the Division expects that these actions will be taken before the Project begins operating.

stakeholder process for the TMDL, the conditions herein are not tied to the completion or execution of a TMDL.

TABLE 15. SUMMARY OF *E. COLI* CONDITIONS.

Condition No.	*Summary*	*Start Date*	*End Date*	*Reporting*	*Notes*
18	Commitment of $1.5M to implementation of load reduction measures and water quality studies (no more than 20%)	Within 60 days of all final unappealable agency authorizations or commencement of Project construction (whichever occurs first)	Load reduction measures must be implemented before Project reaches full buildout conditions	N/A	N/A
19	Monitoring effectiveness of load reduction measures	To be determined for each selected load reduction measure	For each load reduction measure, at least three years after completion	Annual	Must submit monitoring plans for each measure six months before monitoring is expected to begin
20	Monitoring in segments 11 and 12 to address uncertainty in predicted impacts	Within 1 year of issuance of 404 permit	Five years after Project begins releasing water from Glade Reservoir	Annual	Depending on sampling results, requirements may be extended in increments of 5 years
21	Investigation of Project contributions to observed impairments and implementation of additional load reduction measures, if necessary and feasible	If triggered by preliminary assessment of Project contributions based on monitoring requirements (Condition 20)		Investigation report and proposal for load reduction measures due one year after either is required by the Division	Applicant may request relief from these requirements if additional measures will not be effective and/or are not feasible

Conditions

Condition 18: Within 60 days of all final unappealable agency authorizations for the Project, including the 404 permit and Larimer County 1041 authorization, or commencement of Project construction, whichever occurs first, the Applicant shall place $1,500,000 in escrow to be spent exclusively on measures and/or water quality studies that will address existing *E. coli* loading to segments 11 and 12. No more than 20% of this funding will be used for water quality studies; the remainder must fund the implementation of *E. coli* load reduction measures. The Applicant shall work with the Division and other stakeholders in the region to target sources of *E. coli* and/or areas where *E. coli* load reduction measures can most

effectively address the existing impairments. The Applicant may share the cost of these activities with other entities in order to contribute towards multiple projects that address the *E. coli* impairments; however, costs incurred by other entities will not be counted towards the $1,500,000 specified above. The applicant must implement all *E. coli* load reduction measures before the Project reaches full buildout conditions. Potential studies and *E. coli* load reduction measures may include, but are not limited to, source identification studies, stormwater facility maintenance and improvement, construction of retention ponds or wetlands to remove *E. coli* before it enters the river, and/or signage or public education campaigns to promote proper waste management.

Regardless of the participation of other entities, the Applicant will expend a total of $1,500,000 to fulfill the requirements of this condition.

Condition 19: The effectiveness of each *E. coli* load reduction measure financed, in whole or in part, using the funds specified in **Condition 18** shall be assessed through targeted monitoring efforts. The applicant may coordinate with partnering agencies to perform these investigations, which will focus on the extent to which the *E. coli* load reduction measures in question achieved the *E. coli* load reductions expected based on design criteria and literature reviews. The Division expects that appropriate monitoring programs will vary with the specific *E. coli* load reduction measures in question; therefore, the Applicant will submit a monitoring plan to the Division for each *E. coli* load reduction measure to which this condition applies. The monitoring plan may include elements such as pre- and post- implementation monitoring, sampling upstream and downstream of the selected load reduction measure, or other strategies sufficient to evaluate the effectiveness of the measure; however, every monitoring plan should require at least three years of post-implementation monitoring. Monitoring plans should be submitted to the Division at least 6 months in advance of the first proposed sampling event.

All sample results, including those collected by other entities to satisfy this requirement, will be submitted annually to the Division along with a report describing observed *E. coli* concentrations and the effectiveness of load reduction measures. The first report is due on April 1 after one year of data is available and after at least one load reduction measure is implemented. Should the results of monitoring suggest that one or more load reduction measures have failed to meet expected load reductions, the Applicant shall work with project partners to identify and implement appropriate remedies. Information concerning the failure of load reduction measures and proposed or implemented solutions will be included in the annual reports described above.

Condition 20: The Applicant will perform monitoring to address uncertainty related to the extent to which Project-related hydromodification will contribute to the existing impairments for *E. coli* in segments 11 and 12. *E. coli* levels shall be monitored at three sites (Table 16); however, the Applicant may submit a request to the Division to modify the selected sample sites if alternate sites are determined to be more appropriate for identifying Project contributions to *E. coli* impairments in these segments. Monitoring at these locations will begin no later than one year after issuance of the 404 permit and will continue for no less than 5 years following the first release of Project water from Glade Reservoir (referred to

herein as "post-release"). Samples shall be collected from April through October, and the sampling frequency will be designed to fulfill the minimum data requirements for 303(d) listing of *E. coli* as specified in the Division's most recent Listing Methodology.

TABLE 16. *E. COLI* MONITORING SITES TO CONFIRM PREDICTED IMPACTS OF PROJECT-RELATED HYDROMODIFICATION.

Site ID	*Site Name*	*Justification*
PR-MWWU	Poudre River upstream of Mulberry Water Reclamation Facility	Records changes in concentrations upstream of the Poudre River Intake in segment 11
PR-BCU	Poudre River upstream of Boxelder Creek	Captures potential Project-related impacts resulting from reduced dilution of other *E.* coli sources, such as the Mulberry Water Reclamation Facility, in segment 11
PR-NCD	Poudre River downstream of New Cache Canal	Likely maximum extent of Project-related impacts resulting from reduced dilution of other *E. coli* sources, such as Boxelder Creek, in segment 12

All sample results, along with a report documenting instances in which *E. coli* concentrations are above the applicable standard, will be submitted to the Division by April 1 of each year following the commencement of monitoring. The report will include sufficient data analyses (e.g., statistical comparison of *E. coli* concentrations before Project operations begin and post-release) for the Division to determine if the Project may be contributing to exceedances of the applicable standard. There are several factors could cause increased *E. coli* concentrations during the required monitoring period, such as increased contributions of poor quality water from urbanized or agricultural areas, and that an observation of post-release increases in *E. coli* concentrations alone is not conclusive evidence that the Project is causing the increases. Compounding these complexities is the large degree of natural variability in *E. coli* concentrations due, in part, to high *E. coli* levels in stormwater, which only contributes flow to the Poudre River during precipitation events. Given these complexities, any additional information relevant to observed *E. coli* concentrations may be considered in the Division's evaluation of potential Project impacts may be included in the Applicant's annual reports, along with requests to modify the sampling locations specified in this condition.

After the end of the monitoring period specified above, the Applicant may request relief from the sampling requirements if the Division concludes that either of the following is true:

(1) Based on comparisons of data collected before Project operations began and post-release, it is unlikely that the Project causes statistically significant increases in *E. coli* concentrations that would contribute to impairments in segments 11 and 12, OR

(2) Additional data collection is not likely to result in a determination of Project contributions because the results of samples collected to date are inconclusive.

If the Division concludes that the available data record strongly suggests that the Project contributes to *E. coli* impairments but is not sufficient to make this determination, these

monitoring requirements will be extended in increments of 5 years. After at least 3 years of additional monitoring have been completed, the Applicant may request relief from these sampling requirements if the extended data record demonstrates that either (1) or (2), as described above, is true.

Condition 21: If the Division concludes that the Project likely contributes to existing *E. coli* impairments in segments 11 or 12 based on the results of monitoring required under **Condition 20**, the Applicant will perform investigations to determine the extent to which the Project is responsible for the observed impairments. The investigation report and all supporting information will be submitted to the Division within one year after the Division communicates to the Applicant that this report is required. In addition to the investigation report, monitoring requirements specified under Condition 20 will be extended in increments of 5 years.

If the Division concludes that operation of the Project is contributing to existing impairments in segments 11 or 12, the Applicant will utilize the processes described in **Condition 19** to implement, monitor, and assess load reduction measures beyond those already constructed using the funds committed in **Condition 18**. A proposal for additional load reduction measures must be submitted to the Division within one year after the Division's determination that such measures are necessary, and implementation of load reduction measures must take place as soon as practicable following the Division's approval of the Applicant's proposal. However, if the Applicant can provide evidence that the implementation of further load reduction measures cannot address the Project's contribution to the observed impairments, or that the only potentially effective measures will conflict with the water rights provisions of C.R.S. 25-8-104, the Applicant may submit a written request to the Division for relief from this requirement in lieu of a proposal for additional load reduction measures.

If the Applicant requires more time to finish the investigation report or the proposal for additional load reduction measures, the Applicant may request an extension from the Division. The Applicant must request the extension at least two months prior to the applicable deadline and must explain the reason and need for the extension. The Division will review the request and determine whether to grant the extension.

Nutrients

Rationale

In 2012, the Commission adopted numerical standards for phosphorus that apply upstream of domestic discharges, cooling tower discharges, and non-domestic discharges that are subject to Regulation No. 85 effluent limits in accordance with Regulation No. 31 (Section 31.17). Section 31.17(b) establishes interim standards for phosphorus on segments upstream of domestic and non-domestic discharges. Section 31.17(c) establishes interim nitrogen standards, but those do not take effect until 2027. The delayed adoption of these standards is intended to allow time for permitted wastewater dischargers, which represent major sources of nutrients, to make any treatment plant upgrades or modifications that may be necessary to comply with the new nutrient effluent limits. Because water quality standards for both total phosphorus (TP) and total nitrogen (TN) are expected to be adopted in most waterbodies within the next 10 years, the Applicant performed an antidegradation review for these nutrients against the interim water quality standards.

Although the Project is not expected to be an important source of nutrients, the actual contribution from the Glade Reservoir release is uncertain; this uncertainty and the potential for impacts to nutrient concentrations in segments 10a and 10b are addressed through **Condition 10** and **Conditions 12** through **15**. The primary mechanism by which operation of the Project may elevate nutrient concentrations in segments 11 and 12 is through reduction of flows available to dilute the contributions from other sources with higher nutrient loads, such as Boxelder Creek or Fossil Creek.

The Applicant's analysis of baseline water quality conditions found no exceedances of the standards for TP, TN, or associated nitrogen sub-species in segment 11 of the Poudre River. Moreover, the Applicant's modeling analysis did not indicate that significant degradation will occur in this segment under cumulative effects (CE), current conditions with the Project only (CC+NISP), or future conditions with the Project only (FC+NISP) scenarios. In segment 12, however, baseline TN concentrations exceed future water quality standards at the Greeley Gage, and baseline TP concentrations may exceed future standards at all focus locations (below the Fossil Creek outlet, above Jones Ditch, Greeley Gage). Under CE, TN and TP concentrations are expected to decrease at all segment 12 locations, primarily due to the reasonable assumption that wastewater effluent concentrations will be reduced to comply with water quality-based effluent limits (WQBELs) calculated to ensure that water quality standards are met downstream of a given outfall. Under the CC+NISP and FC+NISP, TN concentrations are not expected to increase or decrease substantially (less than about 1% of the water quality standard). However, TP concentrations would increase under these Project only scenarios, suggesting that that the Project could contribute to future standard exceedances. Under FC+NISP, the predicted increase in TP below the Fossil Creek outlet at the upper end of Segment 12 is 0.003 mg/L (0.5% of the baseline), while the expected increases further downstream in Segment 12 are smaller (0.001-0.002 mg/L). Under CC+NISP, the predicted increase in TP concentrations below the Fossil Creek outlet is 0.041 mg/L (6.9% of the baseline).

The Applicant also evaluated the potential to cause or contribute to nutrient standard exceedances in Fossil Creek Reservoir. Note that because this reservoir is designated as Use Protected, it is not subject to antidegradation review requirements. The reservoir discharges to segment 12 of the Poudre River and currently exceeds both TP and TN interim water quality standards for warm water reservoirs. The Applicant's qualitative analysis suggests the potential for the Project to increase TN concentrations in the reservoir, but the increase could not be quantified due to the limited amount of available data.

The Division acknowledges that existing exceedances of interim nutrient standards are not due to the Project, and that the Applicant is not solely responsible for investigating these issues or implementing nutrient load reduction measures[30]. Furthermore, predicted impacts in segment 12 are due to Project-related hydromodification, and the Division does not have the authority to impose conditions that conflict with the water rights provisions of C.R.S. 25-8-104. Nevertheless, it is important to pursue load reduction measures that are consistent with the Applicant's exercise of water rights where possible. The Applicant has thus made financial commitments to investigate sources of nutrients to segment 12 of the Poudre River and implement load reduction measures that have the potential to yield considerable environmental benefit. Accordingly, the first condition is the requirement to allocate funds to these efforts (Table 17). As with other mitigation and water quality improvement measures, the Division is also imposing a condition for monitoring to evaluate the effectiveness of the selected nutrient load reduction measures.

In addition, the Division will require that the Applicant perform limited monitoring of TN and TP concentrations at the downstream end of segment 11, the upstream end of segment 12, and in Fossil Creek Reservoir (**Condition 24**). Two factors motivate the imposition of these requirements. First, concerns about potential increases in TP concentrations in segment 12 were raised during the public comment period, and, more generally, there is considerable interest among relevant stakeholders throughout the state concerning new regulations for nutrient concentrations. To ensure that these concerns are sufficiently addressed, it is important to confirm that the Project plays a limited role, if any, in any future increases in TN or TP concentrations in areas of the Poudre River where other stakeholders may be required to mitigate for those increases in order to comply with new regulations for nutrients. Data collected to assuage these concerns will be even more critical if the Project begins operating before dischargers have reduced nutrient concentrations in their effluent to comply with the interim water quality standards, since pre-Project TP and TN concentrations in the Poudre River would be higher in this case.

Second, there is uncertainty in the predicted impacts to TN and TP from the Project, particularly in Fossil Creek Reservoir, for which the Applicant could perform only qualitative analysis due to limited flow and water quality data. This uncertainty could also impact predicted concentrations in the Poudre River, to which Fossil Creek discharges, particularly

[30]Note that, for the purposes of these conditions, the term "load reduction measures" refers to specific actions that the Applicant will implement to reduce existing nutrient loads to the Poudre River or Fossil Creek Reservoir. It does *not* imply direct mitigation of project impacts, as in general, the Division expects that these actions will be taken before the Project begins operating.

given predicted increases in the relative contribution of Fossil Creek to the river in the future (Table 14 of the 401 Technical Report). Compounding this uncertainty is the use of a mass balance model to predict the concentrations of non-conservative constituents like TP, TN, and associated subspecies, which are affected by in-river biogeochemical processes that are partially governed by other parameters, such as temperature, and reach-scale flow patterns that could also change in the future, partially as a result of Project operations or associated restoration and water quality improvement activities. Given this uncertainty and the existing exceedances in Fossil Creek Reservoir and in segment 12, additional monitoring to confirm the Project's predicted impacts is warranted.

If this additional monitoring suggests that the Project may be contributing to observed impairments, the Applicant will be required to prepare an investigation report to confirm or refute this suspicion. If the investigation report suggests that the Project is contributing to the observed impairments, the Applicant *may* be required to pursue additional load reduction measures if the Division concludes that such measures can be effective and remain consistent with the water rights provisions of C.R.S. 25-8-104. Note that the Division will *not* require pursuit of a Category 4b Plan because the Project is very unlikely to represent the primary cause of any future impairments given the strong influence of other factors, such as point source dischargers and runoff from agricultural lands, on nutrient concentrations in the Poudre River. However, the omission of this pathway for addressing impairments from these conditions does not preclude the Applicant from pursuing it in the future should the data indicate that the Project is the primary cause of observed impairments in either segment 12 or Fossil Creek Reservoir.

TABLE 17. SUMMARY OF NUTRIENT CONDITIONS.

Condition No.	*Summary*	*Start Date*	*End Date*	*Reporting*	*Notes*
22	Commitment of $925,000 to implementation of load reduction measures and water quality studies / development of feasibility study (no more than $425,000)	Within 60 days of all final unappealable agency authorizations or commencement of Project construction (whichever occurs first)	Load reduction measures must be implemented before Project reaches full buildout conditions	SOW for water quality studies due one year after placement of funds in escrow; Final report on water quality studies due three years after Division approves SOW; Feasibility study due one year after Division approves final report on water quality studies	N/A

TABLE 17. SUMMARY OF NUTRIENT CONDITIONS.					
Condition No.	*Summary*	*Start Date*	*End Date*	*Reporting*	*Notes*
23	Monitoring effectiveness of load reduction measures	To be determined for each selected load reduction measure	For each load reduction measure, at least three years after completion	Annual	Must submit monitoring plans for each measure six months before monitoring is expected to begin
24	Poudre River / Fossil Creek Reservoir monitoring to address uncertainty in predicted impacts	Within 1 year of issuance of 404 permit	Five years after Project begins releasing water from Glade Reservoir	Annual	Depending on sampling results, requirements may be extended in increments of 5 years
25	Investigation of Project contributions to observed impairments and implementation of additional load reduction measures, if necessary and feasible	If triggered by preliminary assessment of Project contributions based on monitoring requirements (Condition 24)		Investigation report and proposal for load reduction measures due one year after either is required by the Division	Applicant may request relief from these requirements if additional measures will not be effective and/or are not feasible

Conditions

Condition 22: Within 60 days of all final unappealable agency authorizations for the Project, including the 404 permit and Larimer County 1041 authorizations, or commencement of Project construction, whichever occurs first, the Applicant shall place $925,000 in escrow to be spent exclusively on measures and water quality studies that will address existing nutrient (TP and TN) loading to segment 12. These activities will focus on the upper five miles of the segment between the confluence with Boxelder Creek and just downstream of the Fossil Creek outlet, where Project impacts are expected to be greatest. Water quality studies should aim to identify major nutrient sources to this stretch of the Poudre River and, to the extent necessary, the processes that control observed nutrient concentrations. These studies should also consider nutrients in Fossil Creek Reservoir and, to the extent possible, should be designed to evaluate if impacts to the Poudre River and the reservoir could be addressed simultaneously. Other elements, such as recommendations for priority sites to target for load reduction measures, may also be included. Following completion of these studies, the Applicant will prepare a feasibility study that describes the load reduction measures that are expected to provide the greatest reduction in nutrient loading to the Poudre River, including

the locations where such measures should be implemented. Potential load reduction measures include constructed wetlands[31], vegetative buffer strips, and/or in-channel or off-channel biochar systems; in general, the Division anticipates that these measures will focus on non-point sources of nutrients given the administrative difficulties and high costs likely associated with working directly with point source dischargers of nutrients, like wastewater treatment plants. Once the Division has approved the Applicant's planned load reduction measures, the Applicant will use the remaining funds to implement the selected measures.

Within one year of having placed the required funds in escrow, the Applicant will submit a proposed scope of work (SOW) for water quality studies to the Division for its review and approval. Following the Division's approval of the SOW, the Applicant will have three years to perform the studies and to prepare and submit a report describing its tasks, methods, and findings to the Division. Once the Division approves this report, the Applicant will have another year to prepare and submit the feasibility study to the Division. No more than $425,000 of the committed funds will be spent on water quality studies and development of the feasibility study. The Applicant should begin implementation of the identified load reduction measures as soon as practicable following the Division's approval of the feasibility study, and will spend all remaining funds dedicated to nutrient load reduction measures, including any portion not spent on water quality studies and/or the feasibility study, on implementation of these measures. The Division expects that implementation of the proposed load reduction measures will be completed before the Project achieves full buildout conditions.

During the certification process, the Applicant indicated to the Division that nutrient load reduction measures implemented directly within the Fossil Creek Reservoir system likely represent the greatest opportunity to reduce nutrient loading to the Poudre River. The Division concurs that this area is a strong candidate, especially given that data from 2015 through 2018 suggest median increases in TN and TP equal to about 16% and 87%, respectively, of the interim water quality standards downstream of the Fossil Creek outlet relative to upstream of the outlet. Furthermore, load reduction measures implemented in the Fossil Creek system have the potential to address the predicted Project-related increases in TN in Fossil Creek Reservoir while simultaneously reducing loads to the Poudre River. However, without a comprehensive understanding of the numerous point and nonpoint sources of nutrients to the area of segment 12 in question, the Division cannot determine with certainty whether load reduction measures in the Fossil Creek system represent the best opportunity, from both technical and practical perspectives, for reducing loads to the Poudre River. The Division therefore expects that the water quality studies and/or feasibility study performed to fulfill the requirements of this condition will provide sufficient data and reasoning either to confirm that the Fossil Creek system is the best option for focusing load

[31]The Applicant previously committed to constructing a 10 acre wetland along Eaton Draw (WQ-03, FWMEP, Appendix B, 401 Technical Report), which may be an important source of nutrient loading to the downstream end of segment 12. However, the availability of targeted properties in this area is uncertain. The Applicant may choose to include this proposed wetland, regardless of changes in its location or configuration, in its feasibility study provided that water quality studies indicate that it will provide nutrient load reductions comparable to other prioritized projects presented in the study.

reduction measures, or to suggest that reducing loads from another area will offer greater benefit.

The Applicant may work with other stakeholders in the region to identify nutrient sources and target priority areas for the implementation of load reduction measures, and may share the full cost of the activities prescribed in this condition with other entities in order to contribute towards multiple projects that reduce nutrient loads; however, costs incurred by other entities will not be counted towards the $925,000 specified above. Regardless of the participation of other entities, the Applicant will expend a total of $925,000 to fulfill the requirements of this condition.

Condition 23: The effectiveness of each nutrient load reduction measure financed, in whole or in part, using the funds specified in **Condition 22** shall be assessed through targeted monitoring efforts. The applicant may coordinate with partnering agencies to perform these investigations, which will focus on the extent to which the nutrient load reduction measures in question achieved the TN and TP load reductions expected based on design criteria and literature reviews. The Division expects that appropriate monitoring programs will vary with the specific nutrient load reduction measures in question; therefore, the Applicant will submit a monitoring plan to the Division for each nutrient load reduction measure to which this condition applies. The monitoring plan may include elements such as pre- and post-implementation monitoring, sampling upstream and downstream of the selected load reduction measure, or other strategies sufficient to evaluate the effectiveness of the measure. Every monitoring plan should include at least three years of post-implementation monitoring, however. Monitoring plans should be submitted to the Division at least 6 months in advance of the first proposed sampling event.

All sample results, including any from samples that may be collected by other entities if the Applicant uses them to satisfy this requirement, will be submitted annually to the Division along with a report describing observed TN and TP concentrations and the effectiveness of the completed load reduction measure(s). The first report is due on April 1 after one year of data is available, after at least one load reduction measure is implemented. Should the results of monitoring suggest that one or more load reduction measures have failed to meet expectations, the Applicant shall work with project partners to identify and implement appropriate remedies. Information concerning the failure of load reduction measures and proposed or implemented solutions will be included in the annual reports described above.

Condition 24: The Applicant will perform monitoring to address uncertainty in the extent to which Project-related hydromodification will contribute to TN impairments in Fossil Creek Reservoir and to TP impairments in segment 12. The Applicant will collect samples at a total of four locations, though both TN and TP analyses will not be required at all locations (Table 18). The Applicant may submit a request to the Division to modify the selected sample sites if alternate sites are determined to be more appropriate for identifying Project contributions to TN and TP impairments in these areas of the Poudre River watershed. Monitoring at these locations will begin no later than one year after issuance of the 404 permit and will continue for no less than 5 years following the first release of Project water from Glade Reservoir

(referred to herein as "post-release"). Samples shall be collected monthly, except where winter conditions prevent safe access.

TABLE 18. NUTRIENT MONITORING SITES TO CONFIRM PREDICTED IMPACTS OF PROJECT-RELATED HYDROMODIFICATION.

Site ID	*Site Description*	*Parameters*	*Justification*
PR-MWWU	Poudre River upstream of Mulberry Water Reclamation Facility	TN, TP	Records changes in concentrations upstream of the Poudre River Intake and the Mulberry Water Reclamation Facility
PR-SCD	Poudre River downstream of Spring Creek	TN, TP	Captures potential Project-related impacts resulting from reduced dilution of other nutrient sources, such as the Mulberry Water Reclamation Facility; Represents changes to nutrient concentrations in input to Fossil Creek Reservoir
FC-MID*	Fossil Creek Reservoir at deepest location (approximate)	TN	Tracks changes in concentrations in Fossil Creek Reservoir
PR-NCD	Poudre River downstream of New Cache Canal	TP	Likely maximum extent of Project-related impacts resulting from reduced dilution of other nutrient sources, such as Boxelder Creek

*If the Applicant cannot secure access to Fossil Creek Reservoir for routine monitoring, the Applicant may instead collect samples at the Applicant's existing sampling site downstream of Fossil Creek Reservoir. The Applicant will notify the Division in advance if/when such a modification to the sampling program is required.

All sample results, along with a report documenting instances in which measured TP and TN concentrations exceed the interim water quality standard, will be submitted to the Division by April 1 of each year following the commencement of monitoring. The report will include sufficient data analyses (e.g., statistical comparison of nutrient concentrations before Project operations begin and post-release) for the Division to determine if the Project may be contributing to exceedances of the applicable standard. There are several factors could cause increased nutrient concentrations during the required monitoring period, and that an observation of post-release increases in nutrient concentrations alone is not conclusive evidence that the Project is causing the increases. Given these complications, any additional information relevant to observed TP and/or TN concentrations may be included in the Applicant's annual reports, along with requests to modify the sampling locations specified in this condition.

After the end of the monitoring period specified above, the Applicant may request relief from the sampling requirements if the Division concludes that either of the following is true:

(1) Based on comparisons of data collected before Project operations began and post-release, it is unlikely that the Project causes statistically significant increases in TP and/or TN concentrations that would contribute to impairments in segment 12 or Fossil Creek Reservoir, respectively, OR

(2) Additional data collection is not likely to result in a determination of Project contributions because the results of samples collected to date are inconclusive.

If the Division concludes that the available data record strongly suggests that the Project contributes to TP and/or TN impairments but is not sufficient to make this determination, these monitoring requirements will be extended in increments of 5 years. After at least 3 years of additional monitoring have been completed, the Applicant may request relief from these sampling requirements. The Division will grant the Applicant's request if the extended data record demonstrates that either (1) or (2), as described above, is true.

Condition 25: If the Division concludes that the Project likely contributes to TP impairments in segment 12 or to TN impairments in Fossil Creek Reservoir based on the results of monitoring required under **Condition 24**, the Applicant will perform investigations to determine the extent to which the Project is responsible for the observed impairments. The investigation report and all supporting information will be submitted to the Division within one year after the Division communicates to the Applicant that this report is required. In addition to the investigation report, monitoring requirements specified under Condition 24 will be extended in increments of 5 years.

If the Division concludes that operation of the Project is contributing to TN and/or TP impairments, the Applicant will utilize the processes described in **Condition 23** to implement, monitor, and assess load reduction measures beyond those already constructed using the funds committed in **Condition 22**. A proposal for additional load reduction measures must be submitted to the Division within one year after the Division's determination that such measures are necessary, and implementation of load reduction measures must take place as soon as practicable following the Division's approval of the Applicant's proposal. However, if the Applicant can provide evidence that the implementation of further load reduction measures cannot address the Project's contribution to the observed impairments, or that the only potentially effective measures will conflict with the water rights provisions of C.R.S. 25-8-104, the Applicant may submit a written request to the Division for relief from this requirement in lieu of a proposal for additional load reduction measures.

If the Applicant requires more time to finish the impairment investigation report or the proposal for additional load reduction measures, the Applicant may request an extension from the Division. The Applicant must request the extension at least two months prior to the applicable deadline and must explain the reason and need for the extension. The Division will review the request and determine whether to grant the extension.

Fish Tissue Mercury

Rationale

The Proposed Action involves construction of two new reservoirs – Glade and Upper Galeton – each of which has an associated forebay. Although it is not possible to develop quantitative predictions for mercury in fish tissue in new reservoirs, the potential for a problem can be inferred based on information (such as location, basin morphometry, and source water) from nearby reservoirs. Also, the filling of a new reservoir tends to facilitate the biogeochemical processes by which methyl mercury – the form of mercury subject to bioaccumulation – eventually is assimilated into fish tissue. As a new reservoir is filled, decay of organic matter in the newly inundated area creates conditions conducive to the methylation of mercury. Methyl mercury then makes its way through the food chain over a period of several years[32]. Risk to humans arises through consumption of fish tissue in which methylmercury concentrations have been elevated through bioaccumulation.

Mercury is a ubiquitous environmental contaminant, and the mercury problem is too large in scale to be resolved in any one reservoir in Colorado. The importance of atmospheric dispersal and deposition of mercury and the complexity of the biogeochemical processes that influence concentrations in fish tissue require a broader strategy. Accordingly, the Division has developed a strategy to address the problem statewide through public education to minimize the pathways of exposure through human consumption. This is accomplished through monitoring and posting Fish Consumption Advisories (FCAs) when appropriate for the protection of human health.

Mercury in fish tissue was cited in the FEIS and in the 401 application as a likely problem for Glade Reservoir. Both analogous reservoirs – Carter and Horsetooth – currently are posted with FCAs. They are large, deep reservoirs that are filled with water of quality similar to the source water for Glade Reservoir. It is not clear that the Glade Forebay has the same potential for mercury problems because other small, shallow reservoirs in the area (e.g., Boyd, Loveland, Boedecker) are not impaired. In addition, it is unlikely that the public will have access to the Forebay because establishing such access would require a public crossing of habitat mitigation for Preble's Meadow jumping mouse. However, if the forebay is open to the public, monitoring will be required.

The potential for mercury problems in Upper Galeton Reservoir and its forebay is likely to be lower than that cited for Glade Reservoir. Other large off-channel reservoirs along the lower South Platte River to which Upper Galeton could be compared (e.g., Jackson, Prewitt, North Sterling) have been sampled and do not have FCAs for mercury. Since the Galeton Forebay will be smaller, shallower, and will have a shorter residence time than the reservoir, FCAs for mercury are even less likely. In addition, it is unlikely that either the reservoir or the forebay will have public access. However, since neither Upper Galeton nor its forebay is mentioned in connection with mercury in the FWMEP, the Division believes it is prudent to include both in a

[32]Lucotte, M, et al., 1999. Mercury in the Biogeochemical Cycle: Natural Environments and Hydroelectric Reservoirs of Northern Quebec. Berlin: Springer.

condition for monitoring and analysis of mercury in fish tissue if the applicant does open the reservoir or forebay to the public.

The Applicant will be required to support mercury monitoring and, if appropriate, posting of FCAs for the two reservoirs and two forebays to be constructed as part of the Proposed Action. Due to the nature and scope of the mercury problem, limiting the Applicant's role to monitoring and posting is a practical necessity. Further, if mercury impairment is detected through fish tissue analysis in Glade Reservoir, Upper Galeton Reservoir, or the associated forebays, the Applicant's responsibility for monitoring in that reservoir will be extended. Data obtained from all four sites will benefit the Division's effort to address mercury impairments statewide.

A summary of the conditions that will be imposed is presented in Table 19. Detailed descriptions of the requirements of each follow below.

TABLE 19. SUMMARY OF FISH TISSUE MERCURY CONDITIONS.

Condition No.	*Summary*	*Start Date*	*End Date*	*Reporting*	*Notes*
26	Biennial (every other year) monitoring of fish tissue mercury in Glade Reservoir	Division requires monitoring once CPW determines sampling is practicable if Division deems sampling appropriate, with a goal to sample approximately 1 year before waterbody is open to public	10 years after monitoring begins	Annual	General guidelines posted if reservoir is open to the public but monitoring is not practicable; If FCA is required, additional monitoring at least once every five years will be required. Monitoring can stop after levels are below thresholds for three consecutive events, or upon request no earlier than 10 years after full buildout conditions are achieved
27	Biennial (every other year) monitoring of fish tissue mercury in Upper Galeton Reservoir and forebays for both reservoirs, if Applicant plans to open one or more of these waterbodies to the public		After three sampling events are completed	Annual	General guidelines posted if reservoir is open to the public but monitoring is not practicable; If FCA is required, three additional monitoring events will be required

Conditions

Condition 26: The Applicant will support a program to monitor mercury in fish tissue in Glade Reservoir. Fish will be collected according to CPW protocols. The goal will be to obtain a representative sample of important fish species. Important species are those which are susceptible to capture under CPW's annual fish sampling protocol, including species at high trophic levels, game species, or other edible species likely to accumulate mercury.

Once reservoir filling has begun, the Applicant will consult with CPW annually regarding the practicability of sampling the reservoir; the Applicant will notify the Division if CPW determines that sampling may be practicable. The Division will require sampling to begin if CPW deems that sampling may be practicable[33], and once the Division confirms that sampling is appropriate. The goal will be to begin sampling approximately one year before the reservoir opens to the public so that data from the first sampling event will be available in time to anticipate an FCA, if appropriate. If there is public access to the reservoir before it is practicable to begin sampling, the applicant will be required to post statewide fish consumption guidelines as a precautionary measure.

Monitoring will continue every other year for ten years. All sample results, along with a report documenting any instances in which fish tissue mercury concentrations exceed the level of concern, will be submitted to the Division by April 1 of each year following a year in which monitoring was performed. If mercury in fish tissue exceeds the level of concern in Glade Reservoir, the obligation for monitoring will be extended, and samples will be collected at a frequency of at least once every five years or until mercury levels fall below the level of concern for three consecutive monitoring events. No earlier than 10 years after full buildout conditions are achieved, the Applicant may submit a request to the Division, in writing, that these monitoring requirements be considered fulfilled regardless of measured mercury levels. If fish tissue analyses show that an FCA is required for Glade Reservoir, the Applicant will work with the Division and the Colorado Fish Consumption Technical Advisory Committee (TAC) to provide public education including the posting of signs with associated consumption advisories. The TAC will determine the design of the signs and the information to be included. The Applicant will incur the costs of the signs and be responsible for proper posting of such signs for the duration of the monitoring obligation.

Condition 27: The Applicant will support a monitoring program for mercury in fish tissue in Glade Forebay, Upper Galeton Reservoir, and Galeton Forebay. Fish will be collected according to CPW protocols. The goal will be to obtain a representative sample of important fish species. Important species are those which are susceptible to capture under CPW's annual fish sampling protocol, including species at high trophic levels, game species, or other edible species likely to accumulate mercury.

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[33]Factors that may determine whether or not sampling is practicable to begin could include, but are not limited to, the following considerations: when it is safe to launch a boat and when it is likely that catchable size fish are in the reservoir.

Once reservoir/forebay filling has begun, the Applicant will consult with CPW annually regarding the practicability of sampling a given reservoir or forebay; the Applicant will notify the Division if CPW determines that sampling may be practicable. The Division will require sampling to begin after CPW deems that sampling may be practicable when the applicant plans to open any of these waterbodies to the public, and once the Division confirms that sampling is appropriate[34]. The goal will be to begin sampling approximately one year before public access is allowed so that data from the first sampling event will be available in time to anticipate an FCA, if appropriate. If public access is granted to any of these three waterbodies before it is practicable to begin sampling, the applicant will be required to post statewide fish consumption guidelines as a precautionary measure, if appropriate.

Monitoring will continue every other year until a total of three sampling events have been completed. All sample results, along with a report documenting any instances in which fish tissue mercury concentrations exceed the level of concern, will be submitted to the Division by April 1 of each year following a year in which monitoring was performed. If mercury in fish tissue exceeds the level of concern in any of these three water bodies, the obligation for monitoring in the affected water body will be extended so that sampling will continue every other year for three more sampling events.

If fish tissue analyses show that an FCA is required, the Applicant will work with the Technical Advisory Team (TAC) of the Colorado Fish Consumption Advisory Committee to provide public education including the posting of signs with associated consumption advisories. The TAC will determine the design of the signs and the information to be included. The Applicant will incur the costs of the signs and be responsible for proper posting of such signs for the duration of the monitoring obligation.

[34]The Division shall determine when it is appropriate to begin sampling based on, but not limited to, the following considerations: how the public uses the reservoir and whether FCA guidance would conflict with existing signage (e.g., “No Fishing” signs).

Aquatic Life

Rationale

In 2010, the Commission approved Policy Statement 10-1, Aquatic Life Use Attainment Methodology to Determine Use Attainment for Streams and Rivers (Policy 10-1). Policy 10-1 reflects the specific policy goals of the Colorado Water Quality Control Act, which include the "protection and propagation of wildlife and aquatic life." As described in Policy 10-1, the Division uses benthic macroinvertebrates as an indicator of the overall aquatic community health of the river or stream, because they are an appropriate surrogate for an entire aquatic community. Given their short life spans and limited migration patterns, they can serve as an excellent indicator of stream quality and any physical or chemical stressors that may be present.

Monitoring of the benthic macroinvertebrate community can provide the Division with another diagnostic tool to identify water quality impacts to the Poudre River from the Project. The Division uses a Multimetric Index (MMI) tool[35] to determine if a waterbody is impaired or attaining the aquatic life use based on the analysis of benthic macroinvertebrate data collected in the stream. The MMI tool uses several metrics that represent categories of community characteristics. These metrics were selected based on their ability to discriminate between reference and stressed sites (Policy 10-1). The MMI tool was not designed to identify specific stressors to a stream, but instead to detect impairments of the aquatic life use.

As identified in the FEIS, a qualitative analysis was conducted, and best professional judgement was used to predict the potential impacts of the Project to the benthic macroinvertebrate communities. While the FEIS analysis describes that benthic macroinvertebrate abundance could benefit from the changes in flow from the project, species composition changes could also occur. The FEIS states, "Species composition may change to species more suited for the altered flow regime." Composition is one of five metric categories used in calculating the MMI score, so a change in species composition can alter the MMI scores. The changes in flows and concentrations of water quality parameters could change the species composition, which could, in turn, lead to MMI scores below the impairment threshold.

The analysis conducted as part of the 401 application show predicted impacts to water quality in the Poudre River, and these predicted impacts, like temperature, can also impact benthic macroinvertebrate communities. The mitigation and conditions that are included in this certification, if successful, should not only mitigate the impacts of the Project on the other parameters, but should also mitigate impacts to the benthic macroinvertebrate communities. Similarly, if the proposed mitigation were to fail, impacts due to the Project should also be reflected in the benthic macroinvertebrate communities.

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[35]Policy Statement 10-1 Aquatic Life Use Attainment *Methodology to Determine Use attainment for Rivers and Streams*, Section IV(B), "multi-metric bioassessment tool for Colorado that is composed of separate indices calibrated to respond to stressors affecting aquatic communities in one of the three analytically defined Biotypes."

The Applicant has made numerous commitments in the FWMEP that include channel and habitat improvements along the Poudre River between the PVC and the Hansen Supply Canal inflow and in the Watson Lake area (AG-02), as well as riparian vegetation improvements in other areas of the river corridor (RV-01, RV-02). Additional reaches for the implementation of similar activities may also be identified as part of the requirement to develop a Stream Channel and Habitat Improvement Plan (AG-01). Together, these actions will mitigate impacts from the Project and, potentially, enhance current Poudre River conditions. The NISP adaptive management program will take multiple factors into account when determining the success and/or failure of these mitigation and enhancement projects. Benthic macroinvertebrates are a commonly used indicator for determining the success or failure of mitigation and enhancement projects.

A summary of the conditions that will be imposed is presented in Table 20. Detailed descriptions of the requirements of each follow below.

TABLE 20. SUMMARY OF BENTHIC MACROINVERTEBRATE CONDITIONS.

Condition No.	*Summary*	*Start Date*	*End Date*	*Reporting*	*Notes*
28	Annual monitoring for benthic macroinvertebrates and calculation of MMI scores at three locations	Construction completion of the Glade Forebay and/or Reservoir	Five consecutive years of sampling during Project operation, if changes in MMI scores are minimal	Annual	Sites can be temporarily adjusted to evaluate mitigation and enhancement projects; Additional monitoring required if continual decline in MMI scores is observed
29	Completion of an impairment investigation report and, potentially, Category 4b Plan	If MMI scores fall below attainment threshold or by more than 22 points (if applicable) after Project begins operating		Impairment investigation report due one year after impairment is reported; Category 4b Plan due within two years of the Division's determination that it is required	Impairment investigation report / Category 4b Plan may be combined with another parameter if it is identified as the cause of the aquatic life impairment

Conditions

Condition 28: The Applicant will ensure that monitoring for benthic macroinvertebrates will continue at the three primary sites (Table 21), which were chosen based on historical data and the potential to determine Project impacts. The health of the communities will be established by sampling benthic macroinvertebrates and calculating MMI scores. The benthic

macroinvertebrate sampling will be conducted using the Division's protocols, as described in Policy 10-1. The data collected will be assessed in accordance with the Division's most recent 303(d) Listing Methodology. The Applicant will provide the raw data and the associated subsample used to calculate the MMI score in annual monitoring reports, which are due on April 1 of each year following monitoring.

The benthic macroinvertebrate sampling will start as soon as the Glade forebay and/or Reservoir construction is completed. This will allow the Applicant to determine the condition of benthic macroinvertebrates in the Poudre River before the Project is initiated. The Applicant will continue to sample for benthic macroinvertebrates annually during the operation of the Project. If, after five consecutive years of sampling during the operation of the Project, the data show that there are minimal to no changes in the MMI scores, the Applicant may submit a request to the Division to discontinue benthic macroinvertebrate sampling at the three locations. The Applicant has committed to enhancement and mitigation projects in the FWMEP, which may include the selected permanent monitoring sites. The applicant may request that the sampling locations be temporarily adjusted, if it is determined, through the NISP adaptive management program, that other sampling locations in the proximity of the permanent sites are better suited to evaluating the enhancement or mitigation projects.

TABLE 21. BENTHIC MACROINVERTEBRATE MONITORING LOCATIONS.

Site ID	*Site Description*	*Justification*
PR-HSCU	Poudre River upstream of Hansen Supply Canal, below Glade Reservoir release	Near historic sampling location; Will reveal any impacts associated with Glade Reservoir before other inputs and/or diversions, such as the Hansen Supply Canal, exert influence on macroinvertebrate populations
PR-LCCU	Poudre River upstream of Larimer County Canal	Near historic sampling locations; Will help document downstream extent of impacts associated with the Project
PR-LION	Poudre River at Lions Park	

Condition 29: If the MMI scores are above the attainment threshold of 45 before the Project begins operating, but subsequently fall below the attainment threshold after Project operations begin, the Applicant will complete an impairment investigation report to determine if the Project is the cause or is contributing to the impairment. If an MMI score at any of the three sampling locations is greater than 56 prior to project operation, the waterbody will be considered a high scoring water per the Commission 's policy statement 10-1. High scoring waters are considered impaired if MMI scores decline by more than 22 points. If, after Project operation begins, there is a 22 point decline in MMI scores on a high scoring water, the Applicant will complete an impairment investigation report to determine if the

Project causes or contributes to the decline in the MMI score. The Applicant will complete the investigative report by April 1 of the year after the impairment was reported. The investigation report may be a component of other investigation reports if that parameter(s) affects the benthic macroinvertebrate community. If it is determined that the Project is primarily responsible for the impairment and there are practicable measures that could be taken to address the impairment without interfering with the water rights provisions of C.R.S. 25-8-104, the Division may require the Applicant to actively explore the preparation of a Category 4b Plan.

The Division will require a Category 4b Plan if the stressor impacting the benthic macroinvertebrate community is known and is caused by the Project. The Category 4b Plan must be submitted to the Division within two years of the Division's determination that such a plan is applicable. If a Category 4b Plan is precluded by C.R.S. 25-8-104, the Division anticipates a 303(d) listing. The Division may request that the Applicant participate as a stakeholder in the TMDL process. If the Applicant requires more time to finish the Category 4b Plan, the Applicant may request an extension from the Division. The applicant must request the extension at least two months prior to the two-year deadline and must explain the reason and need for the extension. The Division will review the request and determine whether to grant the extension.

Conveyance Pipelines

Rationale

The Project involves the construction of approximately 80-85 miles of new pipelines, which will be used to convey water to Project participants and to operate exchanges with the Larimer-Weld and New Cache irrigation companies. These pipelines can be divided into two systems:

- **NISP Delivery System**: This system encompasses the Poudre Delivery, Northern Tier, Poudre Diversion, and County Line pipelines. The Poudre Delivery Pipeline will transport water from Glade Reservoir to the Poudre River; this water will then be diverted from the Poudre River at the Poudre River Intake via the Poudre Diversion Pipeline, which will bring the water to the County Line Pipeline. The Northern Tier Pipeline will convey water from Glade Reservoir directly to the County Line Pipeline. The County Line Pipeline will bring all of this water to Northern Water's existing Southern Water Supply Pipeline just north of Mead, CO for delivery to NISP participants.

- **South Platte Water Conservation Project System**: This system represents a series of pipelines that connect Upper Galeton Reservoir, the Larimer-Weld Canal, the New Cache Canal, and the SPWCP diversion on the South Platte River. The pipelines will carry water diverted from the South Platte River to Upper Galeton Reservoir or directly to one or both canals, and bidirectional portions of the pipelines will allow for water to be delivered from the reservoir to these canals. These pipelines are necessary in order for the Project to effectuate exchanges of South Platte River water for the Poudre River water that will be delivered to NISP participants.

The pipelines will vary in diameter from 32 inches to 72 inches, depending on the necessary capacity, and will range in length from 1.3 to 29.3 miles.

While small adjustments are likely as the permitting process is completed and Project designs are finalized, the conveyance pipeline alignments shown on figures throughout this certification represent the Applicant's final preferred routes (Figure 7). According to the Division's analysis, these routes will involve up to 31 individual stream crossings, including 10 stream segments in the Big Thompson, Cache La Poudre, Middle South Platte, and Saint Vrain sub-basins of the South Platte River basin (Table 22). However, as noted earlier in this certification, Regulation No. 82 requires that the Applicant notify the Division of any "anticipated change[s] in discharge location and/or quantities associated with the Project which may result in water quality impacts not considered in the original certification." Regulation No. 82, § 82.6(A)(4)). If the Division determines that any such changes are significant it is required to acknowledge the proposed changes and approve or disapprove them. *Id.*

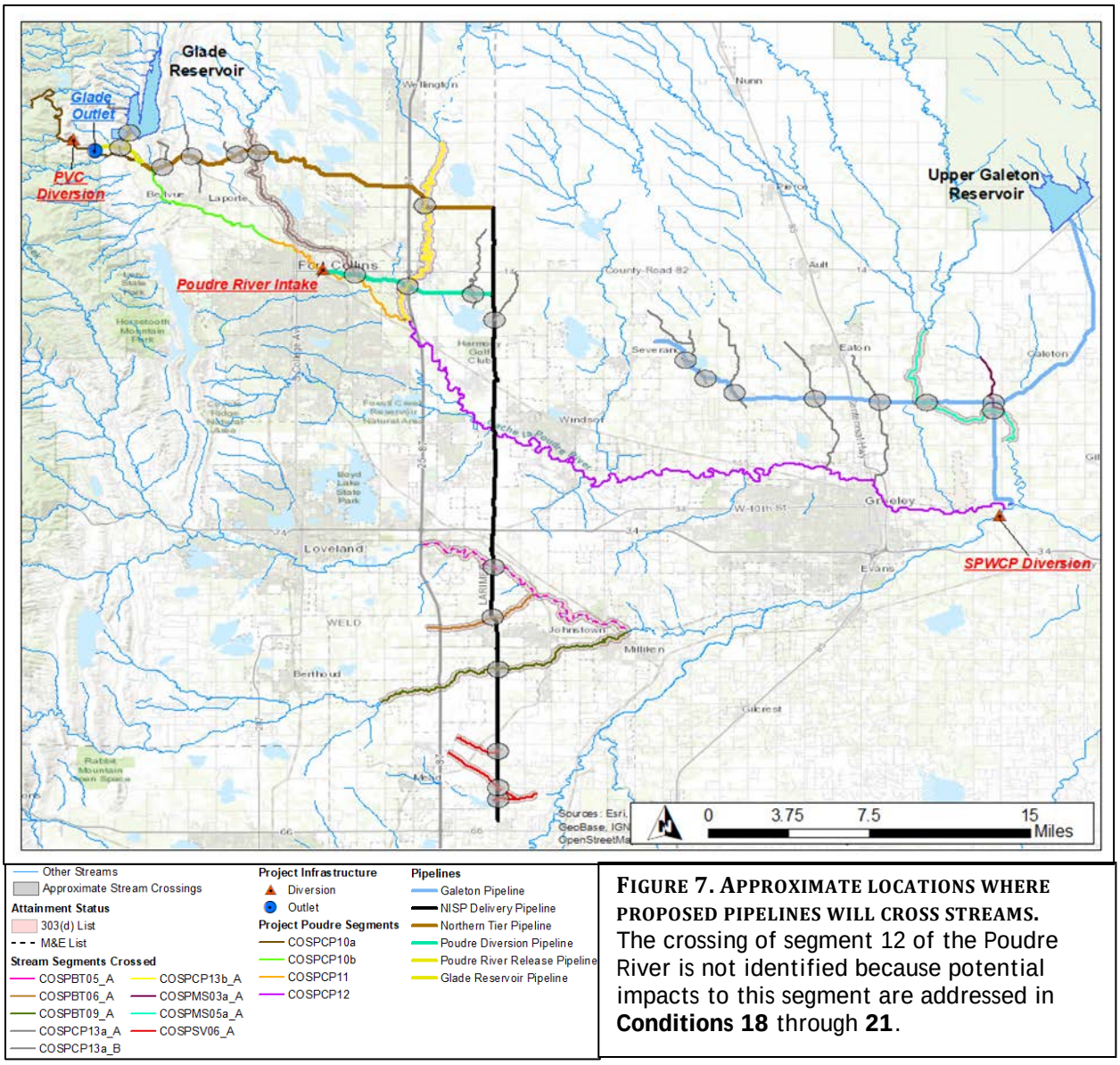

FIGURE 7. APPROXIMATE LOCATIONS WHERE PROPOSED PIPELINES WILL CROSS STREAMS. The crossing of segment 12 of the Poudre River is not identified because potential impacts to this segment are addressed in **Conditions 18** through **21**.

TABLE 22. PORTIONS OF STREAM SEGMENTS TEMPORARILY IMPACTED BY CONVEYANCE PIPELINE CONSTRUCTION.

Segment	*Portion Crossed*	*Portion Description*	*Designation*
COSPBT05	COSPBT05_A	Mainstem of the Big Thompson River from I-25 to the confluence with the South Platte River.	Reviewable
COSPBT06	COSPBT06_A	All tributaries to the Big Thompson River, including all wetlands, from the Home Supply Canal diversion to the confluence with the South Platte River; excluding Dry Creek	Use Protected

TABLE 22. PORTIONS OF STREAM SEGMENTS TEMPORARILY IMPACTED BY CONVEYANCE PIPELINE CONSTRUCTION.			
Segment	*Portion Crossed*	*Portion Description*	*Designation*
COSPBT09	COSPBT09_A	Mainstem of the Little Thompson River from the Culver Ditch diversion to the confluence with the Big Thompson River.	Reviewable
COSPCP11	COSPCP11_A	Mainstem of the Cache La Poudre River from Shields Street in Ft. Collins to a point immediately above the confluence with Boxelder Creek.	Reviewable
COSPCP12	COSPCP12_A	Mainstem of the Cache La Poudre River from a point immediately above the confluence with Boxelder Creek to the confluence with the South Platte River.	Reviewable
COSPCP13a	COSPCP13a_A	All tributaries to the Cache La Poudre River, including all wetlands, from the Munroe Gravity Canal/North Poudre Supply canal diversion to the confluence with the South Platte River, except for specific listings in Segments 6, 7, 8, 13b, 13c, and Dry Creek, Spring Creek, and Fossil Creek.	Reviewable
COSPCP13a	COSPCP13a_B	Dry Creek and all tributaries.	Reviewable
COSPCP13b	COSPCP13b_A	Mainstem of Boxelder Creek from its source to the confluence with the Cache La Poudre River.	Reviewable
COSPMS03a	COSPMS03a_A	All tributaries to the South Platte River, including all wetlands, from a point immediately below the confluence with Big Dry Creek to the Weld/Morgan County line, except for specific listings in the subbasins of the South Platte River, and in Segments 3b, 5a, 5b, 5c, and 6.	Use Protected
COSPMS05a	COSPMS05a_A	Mainstem of Lone Tree Creek from the source to the confluence with the South Platte River.	Reviewable
COSPSV06	COSPSV06_A	All tributaries to St. Vrain Creek, including wetlands from Hygiene Road to the confluence with the South Platte River, except for specific listings in the Boulder Creek subbasin and in Segments 4a, 4b, 4c and 5; excluding Dry Creek	Use Protected

Because the Applicant will restore impacted waterbodies to their original, pre-construction conditions, the Division has determined that the conveyance pipeline construction will result in temporary impacts to water quality, and thus antidegradation review is not required. *See* Regulation 31, § 31.8(3)(c)(ii)(D). Similarly, the Applicant has described avoidance and

minimization measures, including adjusting proposed alignments away from waterbodies and implementing several best management practices (BMPs), that will reduce temporary impacts to water quality. Furthermore, selection and maintenance of appropriate BMPs in accordance with the Division's Clean Water Policy 12, Colorado Water Quality Selection of Best Management Practices, is a requirement for all projects that must obtain 401 Water Quality Certifications. *See* Regulation No. 82, § 82.6(B)(1). Therefore, the Division requires that appropriate BMPs be selected and maintained during all NISP-related construction activities. Proper selection and maintenance of appropriate BMPs will help ensure that temporary impacts to water quality are minimized.

It is expected that the construction of the conveyance pipeline will require additional permits. As required in Regulation No. 82, § 82.5(A)(1)(f), when the Division is issuing a 401 water quality certification, the Division will consider and review any associated documents, which includes Regulation No. 61 (5 CCR 1002-61) - Colorado Discharge Permit System Regulation. Although the Division is issuing a 401 water quality certification for the construction of the project, this certification does not supersede the requirements of any other permits, such as construction stormwater or dewatering permits.

In addition to the selection and maintenance of appropriate BMPs, the Applicant has committed to in-stream monitoring before and after construction is complete at locations upstream and downstream of the project area to identify any temporary water quality impacts. These monitoring activities will allow the Applicant to detect construction-related effects to water quality. In accordance with the Applicant's commitment, the Division will impose a condition requiring that the Applicant submit its stormwater management plan for stream crossings that will include BMPs that prevent the discharge of sediment to the streams (Table 23). If the project requires a dewatering permit, the Applicant will submit the discharge information that is required under a dewatering permit. The applicant will also be required to submit the results of all samples collected each year. The sample results submitted for the 401 certification are separate from any other permit requirements that the applicant may be required to obtain for the project.

TABLE 23. SUMMARY OF CONVEYANCE PIPELINE CONDITIONS.

Condition No.	*Summary*	*Start Date*	*End Date*	*Reporting*	*Notes*
30	Submission of stormwater management plan and dewatering permit requirements (if applicable); Sampling before and after construction and annual reporting; Notification of Division that DMRs were submitted, if applicable	Before construction begins	After construction ends	Annual	Only the sections of the stormwater management plan relevant to the water crossings need to be submitted; They must be sent at least six month prior to construction, or as soon as they are available

Conditions

Condition 30: In addition to the selection and maintenance of appropriate BMPs in accordance with the Division's Clean Water Policy 12, the Applicant will submit the sections of the stormwater management plan associated with its construction stormwater permit for the locations around the water crossings. The stormwater management plan sections should be submitted to the Division at least two months prior to construction or as soon as they are available. If the project receives a dewatering permit, the Applicant will submit to the Division, for the 401 certification, the permit requirements for the discharge.

For compliance of the dewatering permit, the Applicant is required to submit a monthly Discharge Monitoring Report (DMR). Since the DMRs are submitted electronically, the Applicant will notify the Division's Environmental Data Unit that the DMR was submitted. The Applicant will notify the Division if there are any discharges exceeding the permit limits.

The Applicant has also volunteered to sample impacted streams upstream and downstream of the construction areas in the waterways before and after construction. The Applicant will consult with the Division regarding the details of these monitoring activities, including the parameters that must be monitored, the number of samples that should be collected, specific sampling locations, and other relevant requirements, in advance of the commencement of sampling. The Applicant will submit these sample results annually to the Division, along with a report documenting any exceedances of applicable water quality standards. The report is due by April 1 following each calendar year of sampling, and may be combined with other reports submitted to fulfill conditions of this 401 certification.

Significance Determination

The antidegradation review process is guided by Regulation No. 31, which generally describes what is required to make a significance determination (Section 31.8(3)(c)). In the context of 401 certifications for 404 permits, the more specific requirements of Regulation No. 82 (Section 82.5(A)(1)(a)) apply to the Division's analysis. The first step is to determine if the Project will cause "significant degradation" of reviewable waters. As described in the preceding sections of the 401 certification, the Project is expected to cause significant degradation in some instances; however, the Applicant has also committed to the implementation of certain mitigation, load reduction, and water quality improvement measures that are projected to reduce these impacts or otherwise improve water quality. Accordingly, the next step in the significance determination is to evaluate the "net effect of the new or increased water quality impacts of the proposed Project, taking into account environmental benefits within the Project area, including any water quality improvements or mitigation measures proposed to be implemented within the project area" (Section 82.5(A)(1)(a)). Such water quality improvements and mitigation measures may be referred to as "offsets." To do this evaluation, the Division must first consider whether proposed offsets constitute direct mitigation of predicted impacts or measures for improvement of current water quality conditions. An action is considered direct mitigation if it will eliminate a specific impact predicted to occur as a result of the Project. In contrast, an action is considered a water quality improvement if it is likely to improve water quality conditions in general, regardless of whether impacts to the specific parameter(s) that the action will target were predicted. Unlike direct mitigation, water quality improvement actions may not improve water quality conditions at the same time and/or location as where impacts were predicted. Thus, in order for a project that is predicted to have negative impacts to ultimately have a "positive net effect," both mitigation and water quality improvement measures must be implemented as conditions.

After reviewing the proposed offsets for the Project, the Division concludes that four such actions will likely provide direct mitigation for Project impacts and/or improvement of current water quality conditions (Table 24). In addition, the Division notes elements common to many of the 401 certification conditions that offer a backstop in the event that the mitigation and water quality improvement measures, when implemented as certification conditions, are not successful. These are described in further detail below.

TABLE 24. MITIGATION AND WATER QUALITY IMPROVEMENT MEASURES FOR THE PROJECT THAT CONTRIBUTE ENVIRONMENTAL BENEFIT.

Action	*Area of Implementation*	*Time of Implementation*	*Relevant Condition*	*Impacted Parameter(s)*	*Direct Mitigation*	*Water Quality Improvement*
Curtailment of Project diversions; Conveyance Refinement	Poudre River between PVC diversion and PRI diversion (segments 10a, 10b, and 11)	Initiated once Project begins diverting; Continues throughout the life of the Project	3	Temperature	Reducing diversions and releasing water to increase river flows, protecting current temperature regime and water quality	Elimination of river dry-up points in the area of implementation will improve existing aquatic habitat
Glade Reservoir Releases from the MLOW	Poudre River between Glade Reservoir release and PRI diversion (segments 10a, 10b, and 11)	Initiated once Project deliveries begin; Continues throughout the life of the Project	4, 5		Selecting the outlet most likely to release water that will mitigate temperature impacts and water quality issues that occur due to in-reservoir processes	Reduction of temperature standard exceedances in segment 10a and adaptive management of Poudre River water quality downstream of the release
Channel and Habitat Improvements	From PVC to Hansen Supply Canal (segment 10a); Watson Lake Area (segment 10b); As identified in stream channel and habitat improvement plan; From Timberline Road to Boxelder Ditch (segment 11)	Before Project begins operating*	3, 5, 6		Potential for localized improvement to temperature regime from shading or deep pools	Improvement of aquatic habitat and stream functioning condition, which may benefit water quality

TABLE 24. MITIGATION AND WATER QUALITY IMPROVEMENT MEASURES FOR THE PROJECT THAT CONTRIBUTE ENVIRONMENTAL BENEFIT.

Action	*Area of Implementation*	*Time of Implementation*	*Relevant Condition*	*Impacted Parameter(s)*	*Direct Mitigation*	*Water Quality Improvement*
Load Reduction Measures - Nutrients and *E. coli*	To be determined through water quality studies	Before Project reaches full buildout conditions	18 - 21 (*E. coli*) 22 - 25 (Nutrients)	*E. coli*, Total Phosphorus, Total Nitrogen	Load reduction measures may offset predicted Project impacts	Reduction of existing nutrient / *E. coli* loads to the Poudre River

*While the Division anticipates that channel and habitat improvements will be completed before the Project begins operating, this timeline is **not** a condition of the 401 certification. The Division recognizes that coordination with other entities, project design, and other factors could delay the implementation of these projects. Such delays are not expected to reduce project efficacy or present new, significant environmental threats to the affected waterbodies.

Curtailment of Diversions and Conveyance Refinement

As described in the FWMEP (FW-02, FW-03, FW-04), the Applicant will employ curtailment of Project diversions and conveyance refinement to minimize impacts to Poudre River flows. These strategies, which are considered operational commitments in the FWMEP, were incorporated into the analysis of Project impacts presented in the 401 application. They will help keep flow in approximately 12.5 miles of river between the Poudre Valley Canal and the Poudre River Intake (segments 10a, 10b, and 11) at times when the river is most vulnerable to water quality concerns, particularly warmer temperatures.

Furthermore, under conveyance refinement, releases to the Poudre River will occur every year, at all times of the year, regardless of whether Project water is being diverted at the Poudre Valley Canal. These releases will thus increase flows between the Glade Reservoir release and the Poudre River Intake at all times of the year, particularly during dry years, relative to current conditions, including eliminating dry-up points that currently occur along this reach. Increased flows of relatively high quality water from Glade Reservoir, which will be filled using water diverted upstream of developed areas of the Poudre River basin, will improve water quality conditions and existing aquatic habitat throughout this reach of the river.

These commitments provide direct mitigation for Project-related significant degradation of Poudre River temperatures by minimizing the reduction in flow that occurs as a result of Project operations. While modeling suggests that the Project may still result in significant degradation of temperatures in portions of segments 10a and 11, it also indicates that the number of standard exceedances will be reduced in all modeled segments. In addition, minimizing flow reductions is likely to reduce the severity of impacts for other parameters, such as arsenic and nutrients. Finally, conveyance refinement increases flows and eliminates river dry-up points between the Glade Reservoir release and the Poudre River Intake, thus improving existing water quality and aquatic habitat. Furthermore, both strategies can be adjusted to account for unforeseen water quality impacts. Considering the sum of these effects, the Division concludes that curtailment of diversions and conveyance refinement both

mitigate for predicted impacts and result in water quality improvement relative to existing conditions, contributing to a positive net effect.

Glade Reservoir Releases from the MLOW

Releases from Glade Reservoir are a component of the conveyance refinement strategy discussed above. However, construction of the MLOW (WQ-01), which will be used to manage the depths from which water is released from Glade Reservoir, is another key aspect of the proposed mitigation and water quality improvement measures. The MLOW provides an opportunity to select the release outlet that will result in the least deleterious effects to Poudre River water quality. A decision tree, developed with consideration for reservoir operations and the effects on Poudre River water quality, will govern selection of the appropriate outlet. Operational experience, commitments in the FWMEP, and conditions of the 401 certification will drive future revisions to this decision tree.

The MLOW is critical to adaptive management of water quality in the Poudre River downstream of the release where, though Project impacts are likely, their magnitude is uncertain, given that Glade Reservoir has not yet been constructed. In this sense, the MLOW represents a well-defined strategy to provide direct mitigation for Project-related impacts. Furthermore, properly managed releases from the MLOW are necessary to achieve the improvements to the temperature regime in segments 10a, 10b, and 11 that are discussed above as an outcome of conveyance refinement and curtailment of diversions. The Division also notes that these releases are likely to reduce the number of standard exceedances that occur in segment 10a, which is currently on the 303(d) List for impairment of the aquatic life use due to temperature. Therefore, construction of the MLOW provides both direct mitigation of Project impacts and water quality improvement relative to existing conditions, contributing a positive net effect.

Channel and Habitat Improvements

The FWMEP identifies two reaches of the Poudre River along which Northern Water has committed to implementing channel and habitat improvement projects. These reaches are located between the Poudre Valley Canal and the Hansen Supply Canal (segment 10a) and in the Watson Lake area (segment 10b), and each is approximately 1.2 miles long (AG-02). The Division notes that impacts were not predicted in the targeted reach near Watson Lake. In addition to these specific reaches, the FWMEP requires the development of a stream channel and habitat improvement plan (AG-01) to identify and prioritize additional reaches for habitat improvement projects. The Division recognizes that this plan may recommend targeting other reaches along which Project impacts were not predicted. Finally, outside of the FWMEP framework and any associated funding, Northern Water will work with CPW and other stakeholders to implement habitat improvements over approximately one mile of the Poudre River between Timberline Road and the Boxelder Ditch diversion (segment 11). All habitat improvement projects will likely include a combination of constructing riffle-pool sequences, increasing channel depth in defined low-flow channels, and reconnecting the channel to its floodplain, among other activities. The Division expects most habitat improvement projects to be completed before operation of the Project begins (though this is not a requirement of the 401 certification).

These improvement projects will likely help mitigate significant degradation of Poudre River temperatures, particularly at the downstream end of segment 11 where MLOW releases will be less effective. However, their primary benefit lies in the improvement of existing aquatic habitat and, consequently, of stream functioning condition, which may serve to benefit water quality. Furthermore, the timing and location of proposed and potential improvement projects will likely differ from when and where NISP impacts occur; thus, to the extent that the benefits of these projects can be measured, they are most likely to show general improvements in stream health rather than mitigation for specific NISP impacts. For these reasons, the Division considers channel and habitat improvements to serve primarily as water quality improvement measures, which will contribute to a positive net effect.

Load Reduction Measures – Nutrients and E. coli

The 401 certification requires the Applicant to commit funds to the design and implementation of load reduction measures to address existing exceedances of *E. coli* standards (**Condition 18**) and of interim nutrient standards (**Condition 22**). Conditions also require the Applicant to monitor the effectiveness of these measures and to implement solutions in the event that they are not successful at reducing loads as designed (**Conditions 19** and **23**). In addition, mainstem monitoring requirements imposed for both *E. coli* (**Condition 20**) and nutrients (**Condition 24**) may trigger the implementation of additional load reduction measures (**Conditions 21** and **25**, respectively) if the Project contributes to persistent water quality impairments. While specific locations and strategies have not yet been identified, the Division expects that for both parameters, load reduction measures will be selected to maximize benefits to the Poudre River, whether or not the locations chosen match the reaches along which Project-related impacts were predicted.

These measures may considerably reduce nutrient and *E. coli* loading to the Poudre River at the locations where they are implemented. While the magnitude of the load reductions and corresponding decreases in concentration may be comparable to any increases attributable to the Project, they may not occur in the locations where Project impacts were predicted. Moreover, they will likely be implemented before the Project begins operating such that discernment of any direct mitigation of Project impacts may not be possible. Nevertheless, these measures, if successful, will ameliorate current water quality conditions in the Poudre River, and thus constitute water quality improvement measures.

Common Elements in 401 Certification Conditions

In addition to the mitigation and water quality improvement measures discussed above, certain aspects of the 401 certification conditions act as contingency measures in the event that the proposed mitigation and improvement measures do not perform as expected. These contingency measures could be considered as leading to a positive net effect insomuch as they would lead to improvement of water quality.

One measure is the requirement to develop a Category 4b Plan in the event that the Division concludes, following the Applicant's submission of an investigation report, that NISP is the primary cause of an impairment. A Category 4b Plan is an alternative to a TMDL that is designed to achieve attainment of all water quality standards using agreed-upon pollution

control mechanisms within a reasonable amount of time. In this certification, the Division intends for the development of a Category 4b Plan to follow a determination that any relevant mitigation measures did not have the predicted benefits. Thus, conditions requiring a Category 4b Plan allow the Division to account both for failures of the mitigation measures and for impacts that are more severe than expected. Furthermore, even if the investigation report indicates that NISP is not primarily responsible for a documented impairment, the work required to make this determination will be available to the Division for TMDL development. This would expedite the TMDL development process and the associated improvements in water quality.

Second, adaptive management—a strategy incorporated throughout the 401 certification conditions—provides for an iterative approach to addressing water quality impacts. In this sense, adaptive management helps provide reasonable assurance that Project-related impacts will be mitigated wherever mitigation is possible and likely to be effective, provided that mitigation activities do not conflict with the water rights provisions of C.R.S. 25-8-104. Adaptive management is not, in itself, a specific action that will lead to quantifiable benefits to water quality; rather, it is an evidence-based approach to managing water quality in which monitoring informs where, how, and to what extent documented impacts should be mitigated. Therefore, when triggered, offsetting measures selected through the adaptive management approach are expected to mitigate Project impacts and, in some cases, to improve water quality relative to current conditions.

Antidegradation Review Conclusion

The Division concludes that the conditions imposed on the Applicant provide reasonable assurance that the Project will comply with all applicable requirements, and that the commitments for mitigation and water quality improvement measures are sufficient to result in positive net effects such that significant degradation will not occur. Therefore, the Division's finding with regard to the significance determination is: no significant degradation.