



STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN ELIAS BALDACCI
GOVERNOR

DAVID P. LITTELL
COMMISSIONER

July 25, 2007

Frank H. Dunlap
Senior Environmental Specialist
FPL Energy Maine Hydro LLC
160 Capitol Street
Augusta, ME 04330

RE: Comments on Pre-Application Document and Study Requests
Brassua Project
FERC No. 2615-035

Dear Frank:

The DEP has reviewed the March 29, 2007 Notice of Intent (NOI) of the Owners of Brassua Dam (FPLE Energy Maine Hydro LLC, Madison Paper Industries, and Merimil Limited Partnership) to file an application for a new license for the existing Brassua Project, FERC No. 2615. The project is located on the Moose River in the unorganized territories of Taunton & Raynham Academy Grant (T1 R1 NBKP), Rockwood Strip T1 R1, Tomhegan Township (T1 R2 NBKP), Sandwich Academy Grant (T2 R 1 NBKP), Rockwood Strip T2 R1, and Brassua Township (T2 R2 NBKP), Somerset County, Maine.

The original Federal Power Commission (now FERC) license for the constructed Brassua Storage Project was issued September 16, 1977 with an expiration date of December 31, 1993. On July 28, 19987, the license was amended to approve the construction and operation of a generating station at the project and to extend the license term by 19 years to a full 50-year term. The license is now set to expire on March 31, 2012.

The DEP understands that the Owners of Brassua Dam intend to use the new integrated licensing process for the relicensing of the project.

The DEP has also reviewed the Pre-Application Document (PAD) for the Brassua Project, as filed with FERC by the Owners of Brassua Dam on March 29, 2007. The purpose of the PAD is to provide participants in this relicensing proceeding with a summary of the available information necessary to identify project issues and related information needs, to develop study requests and study plans to address project-related issues, and to prepare documents analyzing the relicensing application, which must be filed with FERC on or before March 31, 2010.

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By letter dated May 24, 2007, DEP acknowledged receipt of the NOI and PAD and notified the Owners of Brassua Dam that a completed Request for Initial Stage Consultation for the relicensing of the Brassua Project was required, along with the requisite processing fee. The required form was subsequently received by the DEP on July 16, 2007.

The DEP attended a June 27, 2007 site visit to the Brassua Project and a FERC-led National environmental Policy Act (NEPA) scoping meeting on June 28, 2007 in Augusta, Maine.

Based on our review, we have the following initial consultation comments on the pre-application document and study requests.

Project Description

The Brassua Project consists of Brassua Dam and its impoundment (Brassua Lake), an intake structure, a penstock, a powerhouse with 4.18 megawatts of installed generating capacity, a transmission line, and appurtenant facilities.

The Brassua Dam is an earth embankment and concrete Ambursen structure with a crest elevation of 1,065 feet (USGS datum). From south to north, the dam consists of: (1) a 410-foot-long earth embankment with a concrete core wall; (2) a 342-foot-long concrete-faced earth embankment, including a concrete intake structure; (3) a 52-foot-high, 284-foot-long concrete Ambursen dam with four deep sluice gates and a log sluice; (4) a 19-foot-wide concrete fishway (currently inactive); and (5) a 734-foot-long earth embankment with a concrete core wall. The total length of the dam is 1,789 feet. The earth embankments are topped with 33-inch-high concrete wave barriers. The drainage area at the dam is 716 square miles.

The dam spillway (Ambursen dam section) is divided into 16 bays separated by concrete piers. Five bays are controlled by 9.5-foot-high steel slide gates, while the remaining bays are controlled by stoplogs.

The dam was originally built in 1927. The earth embankments were heightened by 2.5 feet in 1958. The existing generating facility was constructed in 1989.

The project generating facility consists of: a concrete intake structure; a 100-foot-long, 13-foot diameter penstock; a 32-foot-wide by 60-foot-long concrete powerhouse; a single 4.18 megawatt turbine-generator unit with a maximum hydraulic capacity of 1,600 cfs at a design head of 31.1 feet; a 60-foot-long tailrace; a 0.5-mile-long transmission line; and appurtenant facilities.

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The dam creates an impoundment (Brassua Lake) that is about 7.75 miles long and has a surface area of about 9,700 acres at a normal full pond elevation of 1,074 feet (USGS datum). Brassua Lake was a natural water feature and construction of the dam raised the water level by about 30 feet.

The impoundment has a usable storage capacity of 207,000 acre-feet at drawdown of 40 feet from normal full pond level (the minimum pond level of 1,034 feet USGS corresponds to the sill elevation of the deep sluice gates).

Flows exiting the Brassua Dam and powerhouse form the Moose River, which flows easterly for about 3 miles to Moosehead Lake. The lower 2 miles of the Moose River are within the seasonal back-water effect of Moosehead Lake, which is licensed to Kennebec Water Power Company as FERC Project No. 2671.

Project Operation—Lake Levels

The Brassua Project is operated in conjunction with the downstream Moosehead Storage Project and Flagstaff Storage Project to store and release water on an annual cycle for downstream hydroelectric generation and flood control. Outflows that are within the hydraulic range of the project turbine (a single double-regulated horizontal Kaplan unit) are used to generate power at the project.

Brassua Lake generally reaches its highest level in late May following spring runoff and its lowest level in late March prior to spring runoff. Lake levels typically remain relatively stable during the summer months, with a gradual reduction between a maximum of 1,074 feet USGS (equal to full pond elevation) and a minimum of 1,068 feet USGS (6 feet below full pond) by late August. For the 1990-2006 period¹, June 1 lake levels ranged from full pond (elevation 1,074 feet USGS) to four feet below full pond (elevation 1,070 feet USGS), while September 1 lake levels ranged from 1 foot below full pond (elevation 1,073 feet USGS) to 7 feet below full pond (elevation 1,067 feet USGS). Average lake levels for this period were about 1 foot below full pond (elevation 1,073 feet USGS) on June 1 and 4 feet below full pond (elevation 1,071 feet USGS) on September 1.

Under Article 405 of FERC's April 22, 1994 Order Approving and Modifying Project Operation Schedules, during fish attraction flow releases beginning on September 16 annually, a minimum lake level of 1,070.6 feet USGS (3.4 feet below full pond) is targeted by October 15. From October 16, during spawning flow releases, the lake should refill to a target level of 1,073 feet (1 foot below full pond) by November 5 annually. These elevations are target conditions, attainable in normal years but not in a very dry or wet years.

¹ This covers the period since the generating station went on line.

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Lake levels normally continue to drop throughout the fall, reaching a minimum of 1,060 feet USGS (14 feet below full pond) by late November.

Under Article 30 of FERC's September 16, 1977 Order Issuing Major License for the project, the level of Brassua Lake shall be maintained above the fishway exit elevation of 1,059 feet (15 feet below full pond) during the period between spring runoff and October 31 to ensure the operability of the fishway on providing the for passage of migratory fish. It is noted here that, by agreement between the dam owners and the Department of Inland Fisheries and Wildlife, the fishway is currently not being operated in order to prevent the upstream migration of smallmouth bass, a non-native species, into Brassua Lake and the Moose River above the project dam.

Finally, lake levels are further reduced during the winter to meet downstream water demands and to increase storage capacity for the spring. For the 1990-2006 period², minimum annual lake levels on or about April 1 ranged from about 16 feet below full pond (elevation 1,058 feet USGS) to about 24 feet below full pond (elevation 1,050 feet USGS), with an average level about 20 feet below full pond (elevation 1,054 feet USGS).

There are no minimum impoundment level restrictions contained in any of FERC's orders for the Brassua Project. However, Ordering paragraph (B)(ii) of FERC's September 16, 1977 Order Issuing Major License for the project and July 28, 1987 Order Amending License for the project both cite the project works as including a reservoir with normal elevation of 1074 feet "and maximum drawdown of 31 feet..."

Project Operation—Flows Releases

Under Article 406 of FERC's July 28, 1987 Order Amending License for the project, from May 1 to September 15, a minimum daily flow of 358 cfs shall be maintained from the project whenever daily inflow is greater than 358 cfs or, when daily inflow is less than 358 cfs, a minimum daily flow of 250 cfs or inflow, whichever is greater, shall be maintained from the project.

Under Article 405 of FERC's April 22, 1994 Order Approving and Modifying Project Operation Schedules, from September 16 through October 15, minimum fish attraction flows of 800 to 1200 cfs, plus any inflows over 673 cfs, shall be maintained from the project. Additionally, from October 16 through November 5, minimum fish spawning flows of 425 cfs, plus any inflows over 988 cfs, shall be maintained from the project.

Under Article 406 of FERC's July 28, 1987 Order Amending License for the project, from November 6 to April 30, a daily minimum flow of 425 cfs shall be maintained from the project whenever daily inflow is greater than 425 or, when daily inflow is less than

² Ibid.

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425 cfs, a minimum daily flow of 250 cfs or inflow, whichever is greater, shall be maintained from the project.

Project Peaking Operation

Under Article 405 of FERC's April 22, 1994 Order Approving and Modifying Project Operation Schedules, the generating station is allowed to operate in a peaking mode from July 1 through August 31 and again from November 6 through the start of the spring freshet annually. The project is not allowed to operate in a peaking mode from the spring freshet through June 30 and again from September 1 through November 5 annually.

Project Generation

The generating station began operation in October 1989. For the 1990-2006 period, the project generated an average annual energy output of 18,863,000 kilowatt-hours of electricity. Project power is sold to the local electric utility for distribution through the interstate transmission grid.

Relicensing Proposal

The Owners of Brassua Dam are not currently proposing any new project facilities or changes in project operation.

Jurisdiction

The proposed relicensing is subject to the Water Quality Certification provisions of Section 401 of the Clean Water Act. By executive Order of the Governor of the State of Maine, the DEP is the State certifying agency for all activities in the state not subject to Land Use Regulation Commission permitting and review. Because no project construction, reconstruction, or structural alteration is proposed, no LURC permitting is required, even though the project is located in part in the unorganized territory of Forest City Township. Therefore, the DEP will be the certifying agency for the project.

Applicable Water Quality Standards

Water Quality Standards and the water quality classifications of all surface waters of the State have been established by the Maine Legislature (Title 38 MRSA Sections 464-469).

The following classifications apply to the waters affected by the Brassua Project:

- Brassua Lake—Class GPA.
- Moose River, main stem, from the outlet of Long Pond (in Long Pond Township) to its confluence with Moosehead Lake—Class A.

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Class GPA waters shall be of such quality that they are suitable for the designated uses of drinking water after disinfection; recreation in and on the water; fishing; industrial process and cooling water supply; hydroelectric power generation; navigation; and as habitat for fish and other aquatic life. The habitat of Class GPA waters shall be characterized as natural. Class GPA waters shall be described by their trophic state based on measures of the chlorophyll "a" content, Secchi disk transparency, total phosphorus content and other appropriate criteria. Class GPA waters shall have a stable or decreasing trophic state, subject only to natural fluctuations and shall be free of culturally induced algal blooms which impair their use and enjoyment. There may be no new direct discharge of pollutants into Class GPA waters. Discharges into these waters licensed prior to January 1, 1986 are allowed to continue only until practical alternatives exist. The habitat and aquatic life criteria of Class GPA are deemed to be met in an existing impoundment classified as GPA if the impounded waters, at a minimum, satisfy Class C aquatic life criteria (the receiving waters shall be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community), provided that, where the actual quality of the impounded waters attains any more stringent characteristic or criteria, that existing water quality must be maintained and protected.

Class A waters shall be of such quality that they are suitable for the designated uses of drinking water after disinfection; recreation in and on the water; fishing; industrial process and cooling water supply; hydroelectric power generation; navigation; and as habitat for fish and other aquatic life. The habitat of Class A waters shall be characterized as natural. The dissolved oxygen content of Class A waters shall be not less than 7 parts per million or 75% of saturation, whichever is higher, and the aquatic life and bacteria content of these waters shall be as naturally occurs. New direct discharges to Class A waters are permitted only if, in addition to satisfying all other requirements, the effluent is equal to or better than the existing water quality of the receiving water. Discharges into these waters licensed prior to January 1, 1986 are allowed to continue only until practical alternatives exist. The habitat characteristics and aquatic life criteria of Class A are deemed to be met in existing impoundments classified as A if the impounded waters satisfy Class C aquatic life criteria (the receiving waters shall be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community), provided that any reasonable changes are implemented that do not significantly affect existing energy generation capability and would result in improvement in the habitat and aquatic life of the impounded waters, and further provided that, when the actual quality of the impounded waters attains any more stringent habitat characteristic or aquatic life criteria than required under Class C standards, that water quality must be maintained and protected.

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Antidegradation

The Department may only approve water quality certification if the standards of classification of the waterbody and the requirements of the State's antidegradation policy will be met. The Department may approve water quality certification for a project affecting a waterbody in which the standards of classification are not met if the project does not cause or contribute to the failure of the waterbody to meet the standards of classification.

Criteria for Study Plan Requests

Pursuant to FERC's regulations on the integrated licensing process at 18 C.F.R. § 5.9, comments on the PAD must be accompanied by any information gathering and study requests, and any information or study request must satisfy the following criteria:

- (1) Describe the goals and objectives of each study proposal and the information to be obtained;
- (2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
- (3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
- (4) Describe existing information concerning the subject of the study proposal, and the need for additional information;
- (5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;
- (6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and
- (7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

These criteria are intended to provide clear and consistent guidelines for study requests and to ensure that the scope of any studies is related to project operations and effects and thus stays within FERC's purview in the relicensing process.

Requested Study—Lake Trophic State

As outlined above, under Maine's water quality standards, Class GPA waters shall have a stable or decreasing trophic state. Therefore, the DEP requests that the Owners of Brassua Dam collect sufficient impoundment data to determine the trophic state of

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Brassua Lake. Data should be collected in accordance with the DEP's Lake Trophic State Sampling Protocol (copy attached).

Requested Studies—Impoundment Aquatic Habitat

As outlined above, under Maine's water quality standards, Class GPA waters shall be suitable for the designated use of habitat for fish and other aquatic life and such habitat shall be characterized as natural. Further, these habitat and aquatic life criteria are deemed to be met in an existing Class GPA impoundment if the impounded waters are of sufficient quality to support all fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

In determining water levels at hydropower projects, the DEP operates under the rebuttal presumption that water levels providing wetted conditions for 3/4ths of the littoral zone of the impoundment, measured from full pond conditions, will be needed to meet aquatic life and habitat standards. On a case-by-case basis, the DEP may establish alternative water levels based on identified site-specific conditions, where those alternative water levels can be shown to meet all water quality standards. See attached DEP Bureau of Land and Water Quality Hydropower Project Flow and Water Level Policy.³

The littoral zone is defined as the zone around a Class GPA water body in which, under full pond conditions, at least 1% of incident light penetrates to the bottom. The littoral zone can also be approximated as extending from full pond to a depth equal to twice the average early summer season Secchi disk transparency.

Therefore, the DEP requests that the Owners of Brassua Dam provide sufficient information to determine the depth of the littoral zone of Brassua Lake, as defined above.

The DEP also requests that the Owners of Brassua Dam provide sufficient bathymetry data to determine the extent of the littoral zone, in acres, in one-foot increments from full pond to the bottom of the littoral zone.

The DEP further requests that the Owners of Brassua Dam collect sufficient macroinvertebrate data from Brassua Lake to characterize the existing resident biological community and to determine the impact of historic lake level fluctuations on community structure and function.

Finally, the DEP requests that the Owners of Brassua Dam provide sufficient data to assess the impact of historic lake level fluctuations on the ability of Brassua Lake to support all fish species indigenous to the lake, including brook trout and lake trout.

³ The issue of the proper interpretation and applicability of Class GPA aquatic life standards to water storage reservoirs such as Brassua Lake is currently being litigated with respect to Flagstaff Lake. A decision by the Maine Supreme Judicial Court in this case is expected shortly. The DEP reserves the right to amend these comments based on the Court's decision in the Flagstaff Lake case.

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Requested Study—Impoundment Mercury Levels

As outlined above, under Maine's water quality standards, Class GPA waters shall be suitable for the designated uses of fishing and as habitat for fish and other aquatic life.

A fish consumption advisory has been issued for all freshwaters in Maine due to the presence of elevated levels of mercury in fish tissue. As a result, all Maine lakes are classified as not supporting fish consumption. In addition, high mercury levels have been shown to affect reproduction in loons.

The largest source of mercury in Maine waters appears to be atmospheric deposition from out-of-state sources. However, some studies have suggested that there may be a correlation between lake drawdowns and the bioavailability of mercury (in the form of methylmercury), especially in lakes with drawdowns in excess of 20 feet.

Therefore, the DEP requests that the Owners of Brassua Dam collect sufficient data to analyze the levels of mercury in selected species of fish and wildlife from Brassua Lake and a suitable reference lake.

Requested Study—Riverine Dissolved Oxygen

As outlined above, under Maine's water quality standards, the dissolved oxygen content of Class A waters shall be not less than 7 parts per million or 75% of saturation, whichever is higher. Therefore, the DEP requests that the Owners of Brassua Dam collect sufficient data to determine whether the Moose River below Brassua Dam meets Class A dissolved oxygen standards under current flow conditions. Data should be collected in accordance with the DEP's River Sampling Protocol (copy attached).

Requested Studies—Riverine Aquatic Habitat

As outlined above, under Maine's water quality standards, Class A waters shall be suitable for the designated use of habitat for fish and other aquatic life and such habitat shall be characterized as natural.

The DEP uses the benthic macroinvertebrate community as an indicator of the general state of aquatic life in rivers and streams for the purpose of attainment of water quality standards.

In addition, in determining flows at hydropower projects, the DEP operates under the rebuttal presumption that flows providing wetted conditions in a weighted average of 3/4ths of the cross-sectional area of the affected river or stream, measured from bank full conditions, will be needed to meet aquatic life and habitat standards. On a case-by-case basis, the DEP may establish alternative flows based on identified site-specific

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conditions, where those alternative flows can be shown to meet all water quality standards. See attached DEP Bureau of Land and Water Quality Hydropower Project Flow and Water Level Policy.

Therefore, the DEP requests that the Owners of Brassua Dam collect sufficient data to determine whether the existing macroinvertebrate community in the Moose River below Brassua Dam meets Class A standards under current flow conditions. Macroinvertebrate sampling should be conducted in accordance with the protocols outlined in DEP's Methods for Biological Sampling and Analysis of Maine's Rivers and Streams (Davies/Tsomides, August 2002).

The DEP also requests that the Owners of Brassua Dam collect sufficient transect data to determine the wetted area at representative habitat locations in the Moose River below the Brassua Project under a range of flow conditions, including bank full flow conditions, Aquatic Base Flow conditions (defined as 0.5 cfs per square mile of drainage area), and current minimum flow conditions (250 cfs).

Study Plans

The DEP requests the opportunity to review and provide comments on all draft study plans.

Thank you for this opportunity to comment on this important hydropower project relicensing. Please feel free to contact me by telephone at 207-287-7784 or by email at dana.p.murch@maine.gov if you have any questions.

Sincerely,



Dana Paul Murch
Dams & Hydropower Supervisor

Attachments

cc: FERC (via electronic filing)
Barry Mower, DEP
Steve Timpano, DIFW
Tim Obrey, DIFW-Region E Fisheries
Doug Kane, DIFW-Region E Wildlife
Kathy Eickenberg, DOC
Betsy Elder, SPO
Art Spiess, MHPC
Fred Seavey, USFWS
Kevin Mendik, NPS

DEP
10/1/86

LAKE TROPHIC STATE SAMPLING PROTOCOL

This lake trophic state sampling protocol shall apply to all dam impoundments classified as great ponds.

Each lake basin shall be sampled at the deepest location twice each month for at least five consecutive months during one open water season as follows:

<u>Parameter</u>	<u>Sampling Methodology</u>	<u>Detection Limits</u>
Secchi disk transparency	water scope	0.1 meter
Temperature	profile*	0.1 degrees Celcius
Dissolved oxygen	profile*	0.1 ppm
Total phosphorus	epilimnetic core	0.001 ppm (DEP method)
Chlorophyll a	epilimnetic core	0.001 ppm
Color	epilimnetic core	1.0 SPU
pH	epilimnetic core	0.1 SU
Total alkalinity	epilimnetic core	1.0 ppm

* Profiles shall consist of temperature and dissolved oxygen samples taken every meter in lakes less than 10 meters in depth and every two meters in lakes more than 10 meters in depth.

In addition, during late summer stratification (mid to late August depending on latitude and weather conditions), the following parameters shall be sampled at three depths (in the epilimnion and at the top and bottom of the hypolimnion) in stratified lakes or from the core in unstratified lakes:

<u>Parameter</u>	<u>Detection limit</u>
Color	1.0 SPU
pH	0.1 SU
Total alkalinity	1.0 ppm
Total phosphorus	0.001 ppm
Total sulfate	1.0 ppm
Total iron	0.1 ppm
Total manganese	0.01 ppm
Total calcium	1.0 ppm
Total magnesium	0.1 ppm
Total Dis. silica	1.0 ppm

Additional sampling may be required due to the hydraulic or physical characteristics of a given lake or to the presence of significant water quality problems.



ANGUS S. KING, JR.
GOVERNOR

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

MARTHA KIRKPATRICK
COMMISSIONER

BUREAU OF LAND AND WATER QUALITY

HYDROPOWER PROJECT FLOW AND WATER LEVEL POLICY

In determining flows and water levels at hydropower projects, the Bureau of Land and Water Quality will operate under the rebuttable presumption that a flow providing wetted conditions in a weighted average of 3/4ths of the cross-sectional area of the affected river or stream, as measured from bank full conditions, or a water level that provides wetted conditions for 3/4ths of the littoral zone of a lake or pond, as measured from full pond conditions, will be needed to meet aquatic life and habitat standards.

Bank full conditions for rivers and streams will be determined based on the available cross sectional information or, where appropriate, average summer flow conditions.

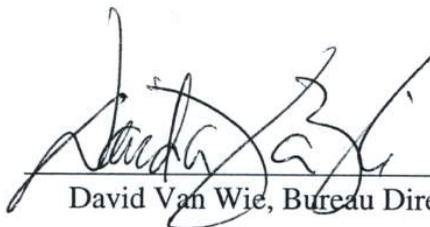
Full pond conditions for lakes and ponds will be determined based on the maximum impounding capacity of a dam or, where appropriate, historic dam operations.

On a case-by-case basis, the Bureau may establish alternative flows or water levels under the following circumstances, where the alternative flows or water levels can be shown to meet all water quality standards:

- Where site-specific study data (e.g., the results of an IFIM or other in-stream flow study) are provided to support an alternative flow or water level;
- Where site-specific conditions (e.g., ledge substrates or winter ice cover) limit the impact of flows or water levels on the quality or quantity of aquatic habitat;
- Where site-specific flow or water level data (e.g., unregulated stream flow calculations or information on unregulated water level fluctuations) are provided to support a preferred alternative flow or water level; or
- Where the available data indicate that flows or water levels based on the policy above are insufficient to protect all existing and designated uses.

Where alternative flows or water levels are recommended, the following factors may be considered:

- Avoiding an impact altogether by not taking a certain action or parts of an action;
- Minimizing an impact by limiting the magnitude or duration of an activity, or by controlling the timing of an activity;
- Rectifying an impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating an impact over time through preservation and maintenance operations during the life of the project; and
- Compensating for an impact by replacing affected resources or environments. Compensation may occur in the form of restoration, enhancement, preservation, or creation of aquatic habitat. Preference will be given to in-kind and on-site compensation.



David Van Wie, Bureau Director



Date

River Sampling Protocol

Applicability

This river sampling protocol shall apply to dam impoundments and tailwater areas not classified as great ponds where existing data are insufficient to determine existing and future water quality.

Sampling Stations

Sampling should occur at a minimum of two stations located as follows: (1) in the impoundment deephole upstream from the turbine/gate intake; and (2) in the tailwater downstream from the turbine/gate outlet.

Sampling should also occur in any bypassed segment of the river created by the project.

Additional sampling stations may be required in the upstream or downstream areas where significant point or nonpoint sources exist or where slow moving or deep water occurs. The number and spacing of any additional stations will be determined on a case-by-case basis.

Parameters

Dissolved oxygen and temperature shall be sampled in 1 meter profiles. In water bodies less than 1 meter in depth, mid depth sampling rather than profile sampling will be sufficient. In general, each sampling location shall include first, second and third quarter points across the width. In narrow streams or other site specific circumstances, sampling at mid channel rather than quarter points may be sufficient.

Chlorophyll a shall be sampled in an integrated profile at a minimum of one impoundment sampling station. Secchi disk transparency sampling and additional chlorophyll a sampling may be required in slow moving or deep impoundments, especially where significant upstream point or nonpoint discharges exist or where significant algae occurs.

In rivers where it is already known that attainment of required statutory dissolved oxygen criteria is questionable, sampling for additional parameters (e.g. BOD, nitrogen, phosphorus) may be necessary.

Frequency and Timing

For all hydropower projects, each sampling event for dissolved oxygen and temperature shall consist of a minimum of two daily runs, the first of which should occur before 7 AM and the second of which should occur after 2 PM. For cycling hydropower projects, in addition to twice daily monitoring, continuous monitoring will be required at some locations for a duration equivalent to the period of one cycle of the storage and the release of flow.

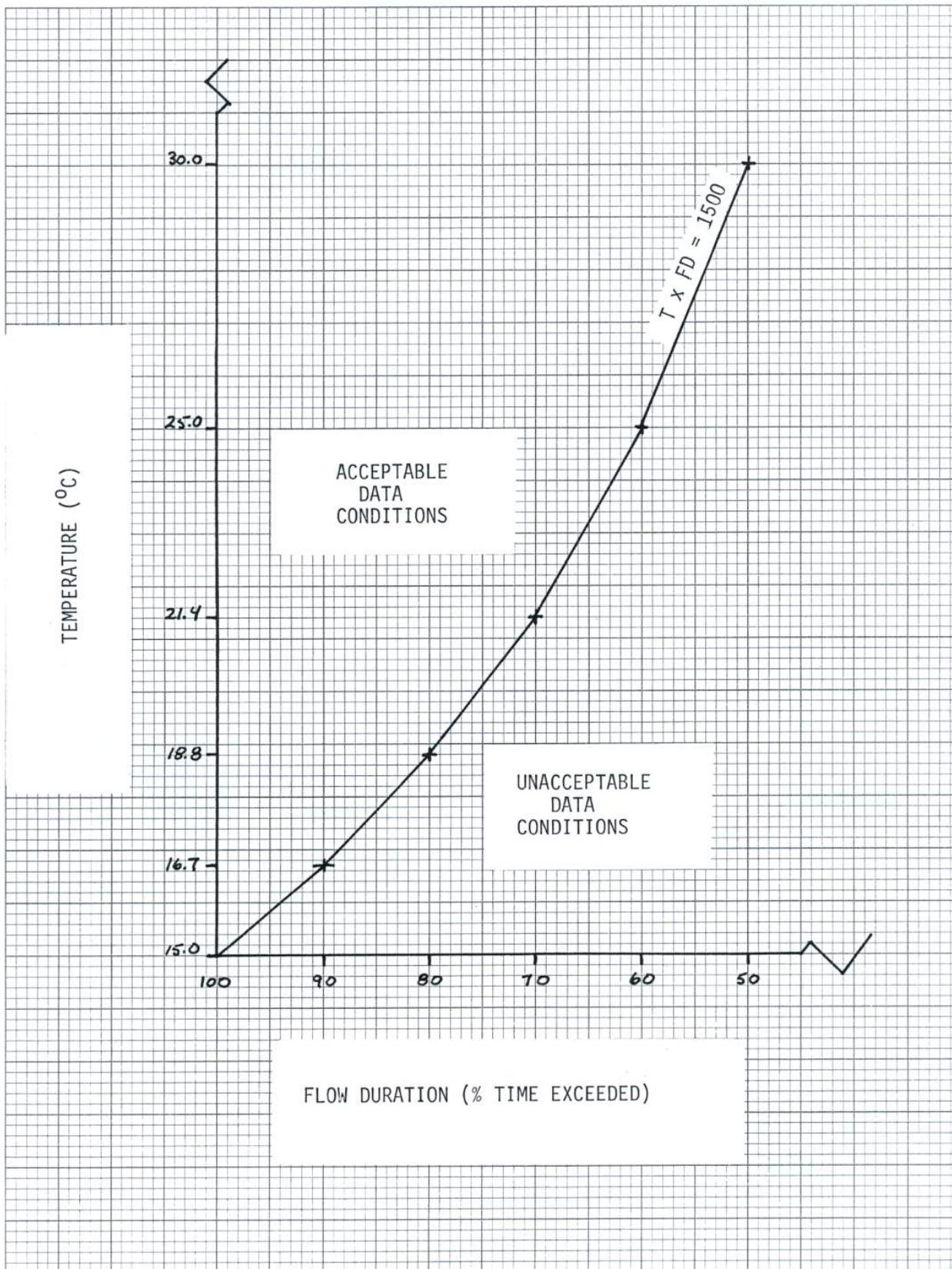
Sampling should be undertaken one day per week for a minimum of ten weeks throughout the summer low flow, high temperature period. Sampling should occur so as to achieve the best combination of low flow-high temperature conditions, with the ideal conditions being the 7Q10 flow (the 7 day average low flow with a 1 in 10 year recurrence interval) combined with daily average water temperatures exceeding 24 °C. Sampling results will not be considered complete unless a minimum of 5 sampling days meets the following conditions: The product of the water temperature (°C) and the flow duration (the percentage of the time a given flow is statistically exceeded) at the time of sampling exceeds 1500. A summer in which low flows are not experienced may result in additional sampling requirements for the next summer.

Low flow conditions may occur naturally, as an unregulated river or may be artificially induced, as in the case of upstream flow regulation or flows downstream from a cycling or peaking power project or in the case of a bypassed segment which receives flow only by spillage, leakage or specific releases.

Available Data

The use of data already available is encouraged provided that adequate QA/QC procedures have been followed. Old data may not be acceptable for considerations of meeting minimum sampling requirements, but could still provide useful information. Acceptance/rejection of data will be determined on a case by case basis, but generally data more than 10 years old may be rejected.

FLOW/TEMPERATURE SAMPLING MATRIX



46 1610

K+S
5 X 5 TO THE CENTIMETER 18 X 24 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.

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Submission Contents

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