



Procurement Hub – Fredericton
301 Bishop Drive
Fredericton, NB E3C 2M6

17 November 2022

30003283

TITLE: Experimental and numerical investigation of three-dimensional turbulent flows for downstream migrating fish

1. ADVANCED CONTRACT AWARD NOTICE (ACAN)

An ACAN is a public notice indicating to the supplier community that a department or agency intends to award a contract for goods, services or construction to a pre-identified supplier, thereby allowing other suppliers to signal their interest in bidding, by submitting a statement of capabilities. If no supplier submits a statement of capabilities that meets the requirements set out in the ACAN, on or before the closing date stated in the ACAN, the contracting officer may then proceed with the award to the pre-identified supplier.

2. Definition of the requirement

The purpose of this research contract is to perform experimental and numerical investigations to understand the role of hydrodynamics, including turbulence and turbulence eddies, on bypass designs for downstream migrating fish. Fish passage efficiency and effectiveness for ways to divert or guide fish downstream at obstructions have varied for many species. This research aims to improve conditions for safer passage of fish through bypasses to minimize injury or mortality risks.

The work comprises of the following: a) conduct literature review, design and fabricate modified spillways and bar rack models; b) conduct three-component velocity measurements using a sophisticated stereoscopic particle image velocimetry system; c) perform comprehensive and sophisticated analysis of the velocity data to understand the hydrodynamics, turbulence characteristics and turbulence eddies; d) assess how changes in hydraulic conditions, especially flow acceleration, turbulence and eddies, affect swimming behavior and movement of downstream migrating fish, e) create repository of comprehensive benchmark databases to validate three-dimensional computational fluid dynamics models for understanding the hydrodynamic conditions at bypass entrances which favour downstream fish migration, f) perform literature review to assess predictive performance of various computational fluid dynamics models, g) perform computational fluid dynamics analysis of turbulent flow over various spillway models.

Task 1: Conduct literature review on downstream bypasses. Design physical models for testing turbulent flows over modified spillways and bar rack system with and without a spillway. Fabricate the bypass models at University of Manitoba Machine Shop.

Task 2: Collect velocity data through laboratory testing of turbulent flow through various downstream bypasses including modified spillways and bar racks representing conditions downstream migrating fish may need to negotiate using high-speed Stereoscopic particle image velocimetry system.

Task 3: Create a repository of experimental databases that will facilitate assessment of predictive

performance of various three-dimensional computational fluid dynamics models for understanding the hydraulic conditions at standard and modified spillways as well as bar racks.

Task 4: Perform three-dimensional simulations using various computational fluid dynamics models for understanding the hydraulic conditions at spillways and validate the numerical results against the experimental databases.

Task 5: Regular phone, email and remote meetings will be scheduled by the contractor and the DFO scientific authority to ensure progress and address any questions.

Task 6: Prepare and submit draft publications and a draft final report to Fisheries and Oceans Canada.

Constraints

- Language of work must be English.

3. Criteria for assessment of the Statement of Capabilities (Minimum Essential Requirements)

Any interested supplier must demonstrate by way of a statement of capabilities that it meets the following requirements:

- a) Must be able to design a variety of spillway models for testing turbulent flow over different spillway models, representing conditions downstream migrating fish may need to negotiate, and work with machinists to fabricate the spillway models.
- b) Must have an open water Ecohydraulic channel facility and time-resolved particle image velocimetry system.
- c) Must be able to use time-resolved particle image velocimetry properly to collect two-dimensional velocity data through laboratory testing of turbulent flow over different spillway models representing conditions downstream migrating fish may need to negotiate.
- d) Must have experience (minimum 15 years) in applying particle image velocimetry to conduct experiments in turbulent flows over spillways, processing and analyzing the data.
- e) Must be able to design a variety of bar rack models for testing turbulent flow through different bar rack models, representing conditions migrating fish may need to negotiate, and work with machinists to fabricate the bar rack models.
- f) Must be able to develop post-processing codes to analyze particle image velocimetry data to understand the hydrodynamics and turbulent characteristics of turbulent flows over spillways and through bar racks.
- g) Must have a demonstrated experience of applying computational fluid dynamics models (minimum 15 years) to analyze complex turbulent flows, and be able to apply numerical models to simulate turbulent flows over spillways and through bar racks
- h) Must have demonstrated experience (minimum 15 years) with interpreting fish swimming performance tests and data extraction from publications.
- i) Must be able to conduct advanced database functions, specifically Microsoft Access Database.
- j) Must be able to conduct advanced data analyses and develop high quality graphs using dimensioned and dimensionless variables.

4. Applicability of the trade agreement(s) to the procurement and Justification for the Pre-Identified Supplier

This procurement is subject to the following trade agreement(s):

- Canada Free Trade Agreement (CTFA)
- Canada – Chile Free Trade Agreement (CCFTA)
- Canada – Columbia Free Trade Agreement
- Canada – Honduras Free Trade Agreement
- Canada – Korea Free Trade Agreement
- Canada – Panama Free Trade Agreement

5. Government Contracts Regulations Exception(s) or Limited Tendering Reasons

The following exception(s) to the *Government Contracts Regulations* is invoked for this procurement under subsection 6(d) - only one person is capable of performing the work.

6. Period of the proposed contract or delivery date

The proposed contract is for a period of two (2) years, from the contract award to March 31, 2024.

7. Cost estimate of the proposed contract

The estimated value of the contract, including option(s), is \$150,000.00 (GST/HST are extra).

8. Name and address of the pre-identified supplier

UNIVERSITY of MANITOBA
Department of Mechanical Engineering
Winnipeg, Manitoba R3T 5V6

9. Suppliers' right to submit a statement of capabilities

Suppliers who consider themselves fully qualified and available to provide the goods, services or construction services described in the ACAN may submit a statement of capabilities in writing to the contact person identified in this notice on or before the closing date of this notice. The statement of capabilities must clearly demonstrate how the supplier meets the advertised requirements.

10. Closing date for a submission of a statement of capabilities

The closing date and time for accepting statements of capabilities is November 30, 2022 at 2:00 p.m. ADT.

11. Inquiries and submission of statements of capabilities

Inquiries and statements of capabilities are to be directed to:

Terri Jones

Contracting Officer – Contracting Services

Procurement Hub – Fredericton

Telephone: (506) 461-3743

Email: DFOtenders-soumissionsMPO@dfo-mpo.gc.ca