

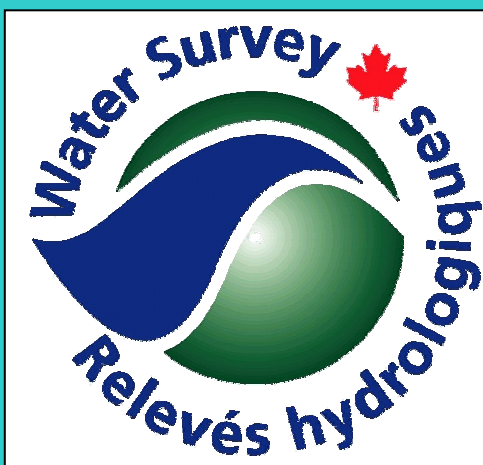


Environment  
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## OPERATOR ACCREDITATION – DETERMINING DISCHARGE WITH ADCP

qSOP-NA016-02-2005



Water Survey of Canada  
Meteorological Service of Canada  
Environment Canada  
Ottawa, Canada, 2005

Canada

## Revision History

Revision	Date	Source	Description/Rational for Change
0.0	August 2004	DCG/FOG	First Edition
1.0	June 2005	FOG/Accreditation Meeting	Second Edition

## Abstract

This publication describes procedures required for the accreditation of newly trained ADCP operators. This is one of several documents defining the standard procedures to be followed by ADCP Operators. As such, it is intended to be used by Water Survey of Canada personnel in conjunction with the documents called “*Policy on the Use of Hydro-Acoustic Technologies in Water Survey of Canada Operations*”, “*Procedures for Conducting ADCP Discharge Measurements*” and “*Procedures for Review and Approval of ADCP Discharge Measurements*”.

## Foreword

The *Procedures for ADCP Operator Accreditation* was prepared to assist Water Survey of Canada personnel within the Meteorological Service of Environment Canada. These procedures serve to guide the continued training of ADCP operators for the acquisition of valid hydrometric data. The scope of this document is unique to the practice of hydrometrics in Canada. Since hydro-acoustic technology in general and the techniques required for deploying an ADCP are still evolving rapidly, this document is expected to require frequent updates. In addition, it should be noted that at this stage ADCP hydro-acoustic sampling equipment is expected to evolve and since many elements within these procedures remain software and product specific, it is expected that the relevance of this document will be limited to current practice.

## Acknowledgement

It is not possible to acknowledge the specific contribution of each individual whose help was invaluable in completing this document. Nonetheless, we offer many thanks to members of the Field Operations Group and the Data Control Group within Water Survey of Canada Division of Environment Canada.

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## PROCEDURES FOR ADCP OPERATOR ACCREDITATION

### 1.0 Introduction

This document provides guidelines and references for operator accreditation within Water Survey of Canada. It outlines the requirements and steps to become an accredited Acoustic Doppler Current Profiler (ADCP) operator and as such, it is part of the organization's policy and procedures for the quality assurance of ADCP measurements.

### 2.0 Operator Accreditation Process

It is Water Survey of Canada policy that every ADCP operator must comply with the following process in order to become accredited:

- 1. Completion of an Introductory ADCP Operations Course**
- 2. Period of Apprenticeship and Knowledge Acquisition**
- 3. Successful Completion of 4 ADCP Accreditation Measurements with Check Measurements**

The completion of any ADCP measurement and their quality assurance must comply with the *Procedures for Conducting ADCP Discharge Measurements* and the *Procedures for Review and Approval of ADCP Measurements*.

The accreditation process involves the collection of check measurements along with the ADCP measurements, requiring extra attention to the documentation of site & measurement conditions and decisions, creation and submission of files, etc. This information may also be used in a data integrity study that compares conventional and ADCP measurements.

#### 2.1 Completion of Introductory ADCP Operations Course

The operator must successfully complete an Introductory ADCP Operations Course accredited by Environment Canada.

The successful completion of all courses is to be evaluated and determined by the accredited trainers and course organizers in conjunction with national and regional managers. No formal testing or examination is presently required. It is accepted that upon completion of this course, the operator has the ability to conduct a discharge measurement as outlined in the *Procedures for Conducting ADCP Discharge Measurements*.

#### 2.2 Period of Apprenticeship and Knowledge Acquisition

The minimum period during which experience is to be acquired is a full water year of hydroacoustic data collection. This is a period during which teams of new and experienced operators are encouraged to work together to reinforce skills obtained during more formal training. Apprenticeship covers both field situations and the review of data to share knowledge among groups and promote dialogue about deployments and problems.

Data quality is highly dependent on the operator's experience and knowledge. Accreditation must be understood as a way to ensure the acquisition of experience for diverse situations and not only completion of a prescribed number of measurements.

Timing to start acquiring the final accreditation measurements as well as the sites to be used by the operator is at the discretion of management.

### 2.3 Successful Completion of Four ADCP Measurements with Check Measurements

The operator must successfully complete four (4) independent and quality assured ADCP discharge measurements under different river conditions. The completion of the acceptable four accreditation measurements is an evaluation of competencies, and not part of the training. Having obtained the accreditation will mean that operators have received required training, understand the technology and methodology, and proven that they can use the equipment.

To avoid doubts about whether the technology is adequately deployed or not, it is good practice to team up a new operator with an experienced operator and thus promote the sharing of knowledge.

#### 2.3.1 Accreditation Measurements

During these measurements, the operator seeking accreditation must have acted as the team leader which means independently completing the trip preparation, site assessment, setup of computer and configuration files, completion of all field notes, operation of the computer during the measurement, and compilation of all relevant information required for submission. The operator must have completed the quality assessment of these discharge measurements while in the field. The operator must also have completed a quality assessment of the measurement upon returning to the office, according to the prescribed *Procedures for the Review and Approval of ADCP Measurements*.

Measurements submitted for accreditation are the final post-processed result of data collection. These measurements must be of a quality adequate for archiving in WSC databases. As such, accepted accreditation measurement results can be used in the verification of the stage discharge curve, computation of daily flows, or any other computational process used by Water Survey unless otherwise specified.

The evaluation and acceptance of both the ADCP measurement and the check measurement is the responsibility of the Hydroacoustic Accrerator. The Accrerator confirms whether a specific ADCP measurement can be used towards the operator accreditation requirements.

Once the process of accreditation has been completed, written recognition will be provided to the operator and will be recorded in the appropriate personnel files (national and regional) to recognize this level of proficiency. This is the responsibility of the Regional Hydroacoustic Accreditation Coordinator in conjunction with management.

#### 2.3.2 Measurement Documentation

ADCP accreditation measurement documentation must cover the following items using form FOR021-2005 ADCP Accreditation Measurement Documentation available from the [WSC intranet site](#):

1. Information requested on the standard survey notes specific to each technology used.
2. Measurement site information, including:
  - Reasons for selecting the deployment cross-section.
  - Information required during routine visits
  - Comments as to the hydraulic conditions observed at time of measurements
  - Conditions at edges, such as presence of weeds or reversed flow.
  - Potential problems for the collection of quality data at this site.
  - Recommendations for future deployments.
3. At least two water levels, one taken before and one after the measurement.
4. Difficulties encountered during the ADCP deployment, if any, and solutions adopted.
5. Description of configuration and post-processing choices, including:
  - Justification for the choice of ADCP modes used.
  - Description of lost data and anomalies with the potential causes.

- Justification for any post-processing change adopted.
- 6. Percentage of difference relative to the check measurement.
  - Explanation of possible reasons for difference between measurements if they exist.
- 7. The following must also be copied into the Excel workbook from CompuMod:
  - Station Visit Summary report (table R56)
  - Water Level and Discharge (both corrected and uncorrected) interpolated for every 10 minutes for the day of the accreditation and check measurement.
  - Table of Time Based and Stage Based Shift Corrections as well as the graph and Expanded Rating Table applicable for the period of the measurement.

### 2.3.3 Quality Assessment

Each ADCP accreditation measurement must be quality assessed by the Hydroacoustic Accreditor according to accepted procedures.

- Field work must have been done in accordance to the *Procedures for Conducting ADCP Discharge Measurements*. The process and requirements for the review of ADCP measurements are detailed in the *Procedures for Review and Approval of ADCP Measurements*.
- Any measurement that displays disparity from standard procedures for apparently valid reasons must be submitted to the Regional Hydroacoustic Accreditation Coordinator prior to final approval.
- If an accreditation measurement is rejected based on problems not requiring the recollection of data, it can be resubmitted once. If a resubmitted accreditation measurement is still not up to standards, the operator has to obtain a new measurement to replace it. An additional period of apprenticeship is then recommended prior to submitting the replacement measurement.

### 2.3.4 Check Measurement

The ADCP measurement validity must be confirmed with a current meter check measurement quality assessed by the Hydroacoustic Accreditor. The Hydroacoustic Accreditor can reject any ADCP measurement that falls outside of 5% from the check measurement. If the data appears to diverge for valid reasons, its acceptance can be determined in conjunction with the Regional Hydroacoustic Accreditation Coordinator. For example, site considerations such as rapid change in stage should be considered while assessing the validity of the accreditation ADCP measurement.

### 2.3.5 Site Selection

Exposure to different conditions is required to ensure that operators seeking accreditation obtain the knowledge appropriate to use a variety of profiling modes.

It is recommended that all accreditation measurements be taken at rivers with a well established stage-discharge curve and water level monitoring equipment.

To ensure accuracy of the ADCP measurement results under difficult site conditions, operators should have a strong knowledge of, and experience, with the instrument operating principles. The selection of sites for accreditation measurements must be done so that the conditions encountered are within typical operating thresholds of the ADCP so as to not impede on the acceptability of the data produced, and thus the accreditation of an operator. While some measurements can be valid according to current procedures, the acceptability of the measurement for the archives may be questionable if the ADCP was deployed near or outside its limits (e.g., rivers too shallow, flow too fast, etc.). Exceptions are made if the operator was explicitly mandated to explore the applicability of the technology under special and expected conditions, thus waiving the need for data to be of WSC archive quality.

3.0 Accreditation Roles and Responsibilities

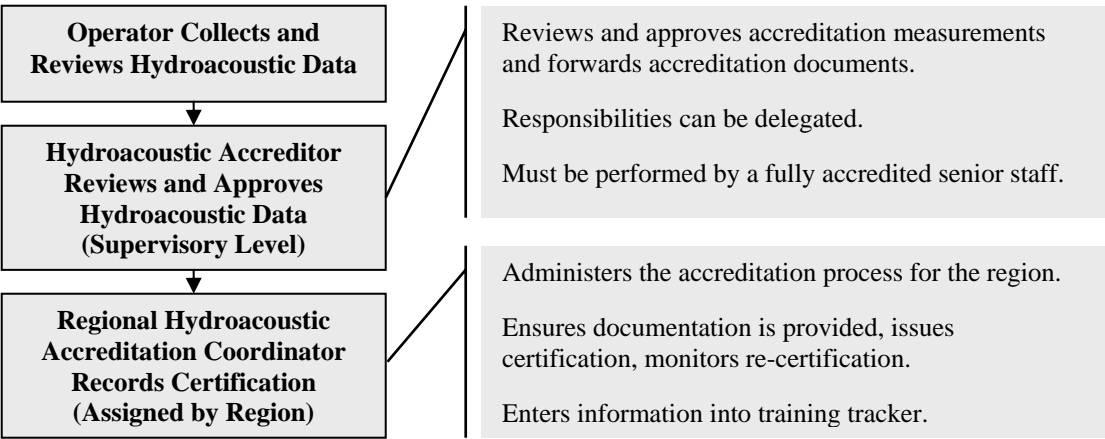
In implementing the accreditation requirements, all levels of management must be involved and assume ownership about staff performance.

The Hydroacoustic Accreditors are senior staff preferably with supervisory responsibilities. They review and approve accreditation measurements. Their responsibilities can be delegated but must be performed by a senior staff with documented knowledge and experience of ADCP measurement interpretation and quality assessment gained through the accreditation process.

The Regional Hydroacoustic Accreditation Coordinators are assigned by management. They administer the accreditation process for the region, ensure that documentation is provided, issue certification and monitor recertification. The coordinators enter the information in the training tracker.

Decisions on when, where, and how ADCP instruments are deployed and the data produced should be used remain within the responsibility of the District managers who may have distinct operational concerns.

Refer to the following diagram for details on the Accreditation Process roles and responsibilities:



4.0 Maintaining Operator Accreditation and Re-certification.

In order to maintain accreditation, the ADCP operator must conduct and submit four (4) quality reviewed ADCP discharge measurements to an Hydroacoustic Accreditor for review and re-certification once every two (2) years. If re-certification is not approved, the operator may be required to repeat all or portions of the certification process.

The need for a minimum number of discharge measurements is intended to assure that ADCP operators maintain a high level of proficiency in conducting ADCP measurements. It is also recommended that operators obtain refresher training and keep up to date with literature related to ADCP measurements as technology evolves.

It is the responsibility of the Hydroacoustic Accreditor to review submitted measurements and recommend re-certification of the operator to the Regional Hydroacoustic Accreditation Coordinator. The Coordinator will then issue the appropriate notification of accreditation to regional managers and Human Resources for appropriate tracking.

Some latitude is allowed in the requirement to take subsequent re-certification introductory training courses. Consideration should be given if an operator has maintained a high level of current knowledge in using ADCP's. In this case, the training requirement for re-certification may be waived

at the discretion of the Regional Hydroacoustic Accreditation Coordinator. However the requirement for the quality assurance review process should not be waived. This means that if there is a lapse in accreditation, the Regional Hydroacoustic Accreditation Coordinator can waive the requirement to attend the Introductory ADCP Operations Course a second time but should not waive the requirement to conduct four ADCP measurements that are submitted to the Hydroacoustic Accreditor for review.



## APPENDIX 1 - ADCP OPERATOR ACCREDITATION HISTORY FORM

FOR003-2004 ADCP Operator Accreditation History is a document that can be obtained in word format from the [WSC intranet site](#) for its use as an electronic document.

**Name:** \_\_\_\_\_

**Position/Location:** \_\_\_\_\_

**Accreditation Date:** \_\_\_\_\_ **Regional Coordinator:** \_\_\_\_\_

### TRAINING HISTORY

#### Introductory Training Course

**Date/Location:** \_\_\_\_\_

**Instructor:** \_\_\_\_\_

#### Advanced Training

**Date/Location:** \_\_\_\_\_

**Instructor:** \_\_\_\_\_

**Other Training:** \_\_\_\_\_

**Comments:** \_\_\_\_\_

### ACCREDITATION MEASUREMENTS

**File Name:** \_\_\_\_\_ **Accreditor:** \_\_\_\_\_  
**Station:** \_\_\_\_\_ **Regional Coordinator:** \_\_\_\_\_

**File Name:** \_\_\_\_\_ **Accreditor:** \_\_\_\_\_  
**Station:** \_\_\_\_\_ **Regional Coordinator:** \_\_\_\_\_

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**Station:** \_\_\_\_\_ **Regional Coordinator:** \_\_\_\_\_

**File Name:** \_\_\_\_\_ **Accreditor:** \_\_\_\_\_  
**Station:** \_\_\_\_\_ **Regional Coordinator:** \_\_\_\_\_

**RE-CERTIFICATION HISTORY**

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<b>Date of Re-</b> <b>certification:</b>	_____	<b>Regional Coordinator:</b>	_____
<b>Date of Re-</b> <b>certification:</b>	_____	<b>Regional Coordinator:</b>	_____
<b>Date of Re-</b> <b>certification:</b>	_____	<b>Regional Coordinator:</b>	_____
<b>Date of Re-</b> <b>certification:</b>	_____	<b>Regional Coordinator:</b>	_____

**RE-CERTIFICATION MEASUREMENTS**

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<b>File Name:</b>	_____	<b>Accreditor:</b>	_____
<b>Station:</b>	_____	<b>Regional Coordinator:</b>	_____
<b>File Name:</b>	_____	<b>Accreditor:</b>	_____
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## **APPENDIX 2 – ADCP ACCREDITATION MEASUREMENT DOCUMENTATION FORM – EXAMPLE**