**Task 4.1.2 Optical Sensors**

(\* Please provide a separate sheet for each parameter)

Part b: Calibration

Parameter/measurand\*: Chl-a fluorescence

Unit of measurement: µg/l

Range: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_0 - 50\_\_\_\_\_\_\_\_\_\_\_

Accuracy: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_0.1\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Precision: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Calibration uncertainty (if available): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*Algal culture calibration once per year, plus water sample calibration monthly or biweekly* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Add lines as necessary)

 2. Please provide a brief description of your calibration setup for the specified parameter/ measurand, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

*Skeletonema costatum algal culture in exponential growth. Phytoplankton from water samples taken during operation.*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Add lines as necessary)

 3. Do you employ reference material which are mutable or unstable

(e.g. biological cultures, optically-sensitive pigment extracts, etc.)

to calibrate the sensor/s or sensor system/s you are presently using for

the specified parameter/measurand. **Yes**

(if **Yes**, please list the types of this kind of reference material you are employing; kindly specify also the measures you take to guarantee the reliability of the reference material in terms of batch-to-batch uniformity of characteristics)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*The algal cultures are unstable.* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Add lines as necessary)

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *The factory calibration has no relevance for the real calibration of the variable Chl-a fluorecense reltive to Chl-a. Algal culture or water samples most be used.*

*\_\_\_*\_\_\_\_\_\_\_

(Add lines as necessary)

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

(If **Yes**, kindly attach a copy to the completed questionnaire, otherwise please provide a short, description below)

*Internal document. Contact NIVA.*

\_\_\_\_\_\_\_\_\_\_\_\_\_

(Add lines as necessary)

 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field? **No**

(If **Yes**, please provide details of the sensors/instrumentation, indicating also the intervals you recommend for factory calibration/servicing, below)

*See above about Chl-a\_Fl/Chla variability*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Add lines as necessary)

 8. Do you perform field calibrations for the specified parameter/measurand? **Yes**

(If **Yes**, please provide a brief description of the method and procedures)

*Algal cultures and water samples have been used up to now. From October 12 inntridtion of Solid standard for quality control of sensor will be used in addition.*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Add lines as necessary)

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **Yes**

 - independent quality audits to monitor and assess its

 calibration system for the specified parameter? **Yes**

(If **Yes** to any of the above, please provide a brief description of the procedure/s applied, including a list of the principal equipment and instrumentation involved).

*Yearly alga culture calibration giving an approximate Chla-Fl as proxy for Chl-a and offline use water samples to perform a yearly calibration of Chl-F. vs Chl-a. Introduction seasonal calibration are under consideration.*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Add lines as necessary)

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand? **Yes**

(If **Yes**, please specify the document retention time/s)

*Longer than the lifetime of the sensor within the organization*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)? **Yes**

(if **Yes**, please provide a brief description of your ideas and/or suggestions, including the details of the sensor/s or sensor system/s)

*Introduction of solid standards. Use of seasonal ratios between Chl-a\_Fl and Chl-a will probably increase the estimate of Chl-a from Chl-a\_fl.*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Add lines as necessary)

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)? **Yes**

(if **Yes**, please provide a brief description of your ideas and/or suggestions)

As above.

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(Add lines as necessary)

Submitted on: 01/10/2012

 (Date)

Compiled by: Kai Sørensen

 (Name of respondent)