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Forsmark site investigation

Sampling and analyses of surface waters

Results from sampling in the Forsmark area, July 2006–June 2007

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January 2008

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This report concerns a study which was conducted for SKB. The conclusions and viewpoints presented in the report are those of the authors and do not necessarily coincide with those of the client.

Data in SKB's database can be changed for different reasons. Minor changes in SKB's database will not necessarily result in a revised report. Data revisions may also be presented as supplements, available at www.skb.se.

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Abstract

A two years and four months long comprehensive chemical investigation campaign of surface waters in the Forsmark area commenced in March 2002 and was completed in June 2004. This was followed by a less extensive long-term monitoring programme which was initiated in July 2004. This report, the fifth in the present series, comprises documentation of the field-work as well as compilation and tabulation of surface water data obtained during the period July 2006–June 2007, i.e. the third year of the monitoring programme.

The sampling during the third year continued from the same eleven sampling objects and at unchanged frequency, once per month. The sampling continued also from the extra sampling object (Lake Biotestsjön) that was included in order to check possible tritium contamination from the nuclear power plant. The sampling focuses on streams, lakes, a shallow sea bay and a deep sea water location in Öregrundsgrepen in order to characterise the surface waters of the area. The results obtained included field measurements of ORP (Oxidising-Reducing Potential), pH, dissolved oxygen, electrical conductivity, salinity, barometric pressure, turbidity, chlorophyll, light penetration, PAR (Photosynthetic Active Radiation) and water temperature as well as chemical analyses of major constituents, nutrient salts, carbon species, trace metals and isotopes.

Three of the samples collected close to the cooling water outlet from the nuclear power plant (Lake Biotestsjön) showed somewhat elevated tritium contents. However, no unnaturally high values were observed from the regular sampling locations for sea water.

Fresh waters in the Forsmark area are well buffered with high alkalinity, high pH and high calcium concentrations. Furthermore, waters recently affected by brackish sea water show high sodium chloride concentrations and there is a clear relationship between the movement/alteration of the coastline and the salinity of the water samples collected at the sampling locations in the area. Generally, the new data confirm the knowledge and conclusions presented in previous reports from earlier investigation periods.

Sammanfattning

En omfattande kemisk undersökningskampanj på två år och fyra månader rörande ytvatten i Forsmarksområdet startade i mars 2002 och avslutades i juni 2004. Det åtföljdes av ett reducerat program för långtidsövervakning som påbörjades i juli 2004. Denna rapport, den femte i ordningen, innehåller dokumentation av fältarbetet samt presentation och sammanställning av erhållna data under perioden juli 2006 till och med juni 2007, det vill säga det tredje året av övervakningsprogrammet.

Provtagningen under tredje året fortsatte från samma elva provpunkter och med oförändrad provtagningsfrekvens, en gång per månad. Dock inkluderades en extra provpunkt (Biotestsjön) för att kontrollera eventuell kontaminering av tritium från kärnkraftverket. Provtagningen skedde i vattendrag, sjöar, en grund havsvik och en djuphavspunkt i Öregrundsgrepen för att karakterisera ytvatten i området. De erhållna resultaten omfattar fältmätningar av ORP (Oxidising-Reducing Potential), pH, löst syre, elektrisk konduktivitet, salinitet, barometertryck, turbiditet, klorofyll, siktdjup, PAR (Photosynthetic Active Radiation) och vattentemperatur samt kemiska analyser av huvudkomponenter, närsalter, kolföreningar, spårelement och isotoper.

Tre av proven som togs ut nära kylvattenutsläppet från kärnkraftverket (Biotestsjön) visade något förhöjda tritiumvärden. Inga onaturligt höga värden kunde dock observeras från den ordinarie provpunkten för havsvatten.

Sötvatten i Forsmarksområdet är väl buffrade med hög alkalinitet, högt pH och höga kalciumkoncentrationer. Vidare visar vatten som nyligen påverkats av bräckt havsvatten höga salthalter och det finns ett klart samband mellan kustlinjens förändring och saliniteten hos provtagna i olika provpunkter i området. De nya data som erhållits bekräftar i huvudsak de kunskaper och slutsatser som presenterats i föregående rapporter från tidigare undersökningsperioder.

Contents

1	Introduction	7
2	Objectives and scope	9
3	Sampling locations and sampling scheme	11
4	Equipment	13
4.1	Sampling equipment	13
4.2	Multiparameter sondes	13
4.3	General field equipment	15
5	Performance	17
5.1	Presampling preparations	17
5.2	Water sampling	17
5.3	Field measurements	17
5.4	Sample treatment and chemical analyses	20
5.5	Data handling/post processing	20
	5.5.1 Chemical analytical data	20
	5.5.2 Field measurement data	22
	5.5.3 Other relevant information and data	22
5.6	Nonconformities	22
6	Results	27
6.1	General	27
6.2	Water analyses	27
	6.2.1 Major components	27
	6.2.2 Surface water supplements	29
	6.2.3 Isotopes	29
	6.2.4 Trace metals	30
6.3	Field measurements	30
7	Summary and discussion	31
	References	33
	Appendix 1 Sampling and analytical methods	35
	Appendix 2 Field measurements	41
	Appendix 3 PAR-profile logs	47
	Appendix 4 Compilation of hydrochemical data from water analyses	59

1 Introduction

This document reports the performance and results from the activity *Long-term monitoring of surface waters* performed within the site investigation at Forsmark /1/. The work was conducted according to the activity plan and method documentations listed in Table 1-1 and is part of both the hydrochemistry and the surface ecosystem investigation programmes. Both activity plan and method descriptions are SKB's internal controlling documents. The report treats the third year of the long-term surface water monitoring programme (July 2006–June 2007). Four previous reports present results from earlier investigations periods, /2, 3, 4 and 5/.

Original data from the reported activity are stored in the primary database Sicada. Data are traceable in Sicada by the activity plan number (AP PF 400-06-064). Only data in databases are accepted for further interpretation and modelling. The data presented in this report are regarded as copies of the original data. Data in the database may be revised, if needed. However, such revision of the database will not necessarily result in a revision of this report.

The surface water activities include sampling, chemical analyses and field measurements. The sampling objects consist of lake waters, stream waters and sea waters from shallow bays in the Forsmark area. The sampling locations are presented in Figure 3-1.

Water sampling and measurement procedures are also described in SKB PIR-04-09 "Metodik för provtagning av ekologiska parametrar i hav", SKB PIR-04-06, "Metodik för provtagning av ekologiska parametrar i sjöar och vattendrag", and SKB PIR-04-12, "Översikt över provhanterings- och analysrutiner för vattenprov" (SKB internal documents).

Table 1-1 Controlling documents for performance of the activities.

Activity plan	Number	Version
Undersökningar i Forsmarksområdet: Långtidsövervakning av ytvatten juli 2006–juli 2007.	AP PF 400-06-064	1.0
Method description	Number	Version
Metodbeskrivning för ytvattenprovtagning vid platsundersökningar.	SKB MB 900.004	2.0
Measurement system description	Number	Version
Mätsystembeskrivning för YSI Multiparametersystem för vattenmätningar.	SKB MD 910.003	1.0

2 Objectives and scope

The ongoing surface water monitoring programme which started in July 2004, concentrates on sampling locations in the prioritised northwestern part of the Forsmark candidate area /6/ and aims at creating long-term series of data. The main objectives are to obtain further information on natural variations and also to allow identification of eventual perturbation effects from the ongoing investigations. The sampling locations are presented in Figure 3-1.

The monitoring programme includes water sampling and sonde measurements in the different lake systems; Lake Bolundsfjärden, Lake Eckarfjärden and Lake Labboträsket. Measurements are being performed also in Lake Norra Bassängen in order to monitor salinity changes. One regular sampling location represents a shallow sea bay (Forslingens grund). Besides the regular sampling locations, additional sampling was conducted for the second time by another contractor at a deep sea water location in Öregrundsgrepen. The first sampling occasion occurred in August 2004 /4/. Sampling of stream water is conducted at four localities (Kungsträsket, Bolundsskogen, Norr Eckarfjärden, Öster Gunnarsbo) and an electrical conductivity logger is installed in Lilleputtsundet, also to monitor salinity changes. Furthermore, due to observed enhanced tritium contents in the surface waters close to the nuclear power plant, samples for tritium analyses are collected close to the cooling water outlet in Lake Biotestsjön.

The monitoring programme included water sampling for chemical analysis as well as direct measurements of physical and chemical parameters such as ORP (Oxidising Reducing Potential), pH, dissolved oxygen, electrical conductivity, salinity, barometric pressure, turbidity, chlorophyll, light penetration, PAR (Photosynthetic Active Radiation) and water temperature. The extent of the sampling varied at different occasions. Analyses of major constituents and surface water supplements (nutrient salts, chlorophyll etc) were conducted frequently (12 times a year) while extended analyses including also isotopes and trace elements were performed once per season (four times a year). Some special isotopes ($\delta^{37}\text{Cl}$, $\delta^{13}\text{C}$, ^{14}C (pmC), $^{87}\text{Sr}/^{86}\text{Sr}$, $\delta^{34}\text{S}$, U- and Th-isotopes as well as Ra- and Rn-isotopes) were determined only once a year, in July.

3 Sampling locations and sampling scheme

The monitoring programme, which started in July 2004, includes four lakes, one shallow sea bay location and four streams as well as a sampling location close to the outlet of cooling water from the nuclear power plant to investigate eventual tritium contamination. Furthermore, a deep sea location was sampled at one occasion during the reported period by another contractor.

The sampling locations are presented in Figure 3-1. Table 3-1 lists the id-codes, coordinates and names together with clarifying comments. The sampling scheme for the period July 2006–June 2007 is given in Table 3-2.

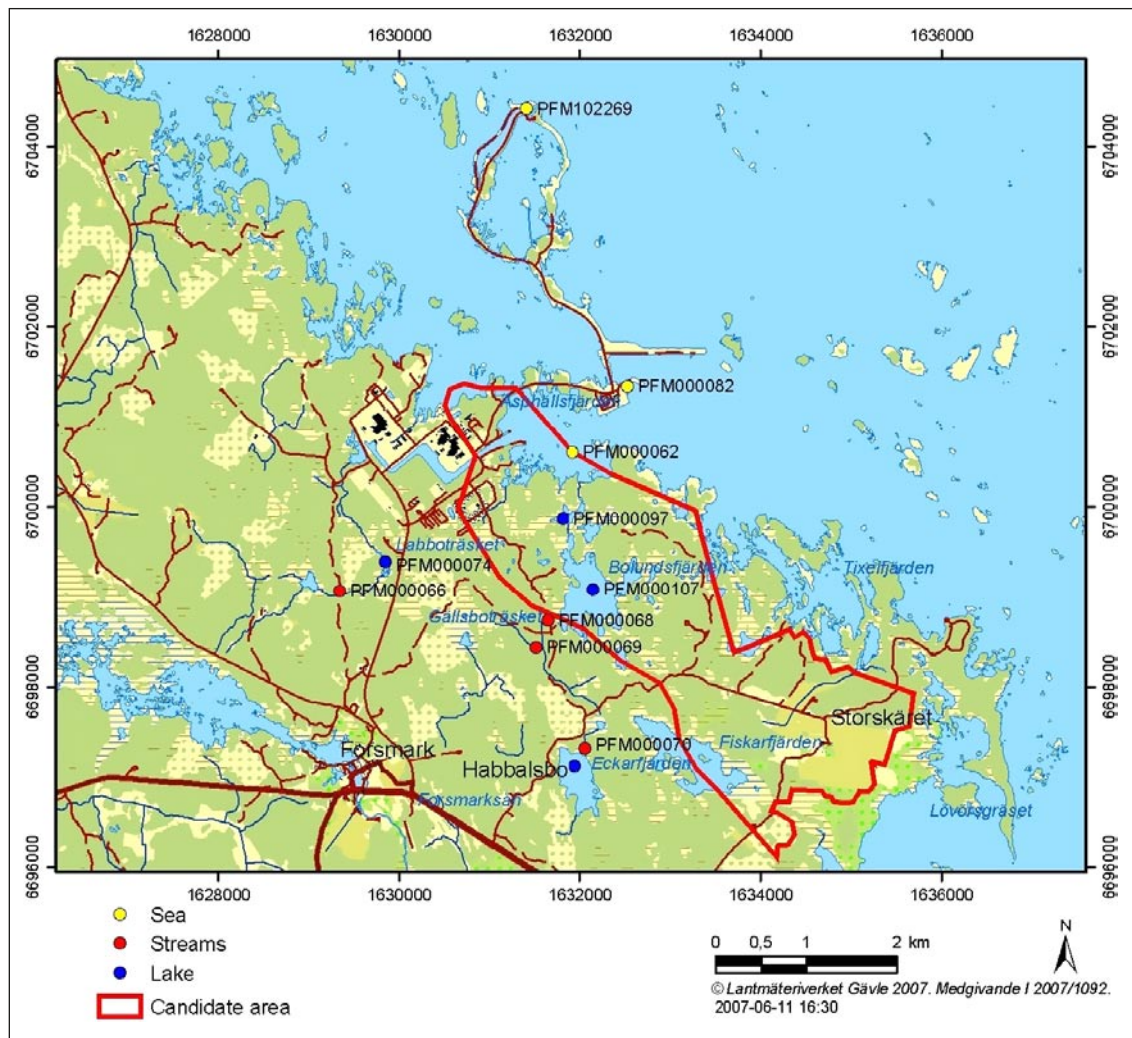


Figure 3-1. Sampling locations within the monitoring programme. One location constitutes an alternative for a regular sampling position (see Table 3-1). The deep sea water location in Öregrundsgrepen is not on the map, see /4/.

Table 3-1. Sampling locations (Id-code, coordinates, name and comments).

Sampling locations	Coordinates (RT90 RHB70)	Name	Comments
Lakes			
PFM000074	16 29 854, 66 99 393	Labboträsket	
PFM000097*	16 31 814, 66 99 868	Norra bassängen	
PFM000107	16 32 065, 66 99 031	Bolundsfjärden	
PFM000117	16 31 946, 66 97 118	Eckarfjärden	
Shallow sea bays and deep sea location			
PFM000062	16 31 921, 67 00 605	SV Forslingens grund	
PFM000082	16 32 528, 67 01 336		Alternative to PFM00062
PFM005865	16 38 071, 67 07 582	Öregrundsgrepen, close to Engelska grundet	Deep sea location
PFM102269	16 31 405, 67 04 412	Cooling water outlet, Lake Biotestsjön	Check of tritium contamination
Streams			
PFM000066	16 29 343, 66 99 064	Öster Gunnarsboträsket	
PFM000068	16 31 641, 66 98 735	Kungsträsket	
PFM000069	16 31 510, 66 98 440	Bolundsskogen	
PFM000070	16 32 061, 66 97 319	Norr Eckarfjärden	

* Only sonde measurements.

Table 3-2. Surface water sampling scheme from July 2006 to June 2007.

Year	Month	Week	Programme type*
2006	July	29	E+
2006	August	33	M
2006	September	37	M
2006	October	41	E
2006	November	46	M
2006	December	50	M
2007	January	3	E
2007	February	6	M
2007	March	10	M
2007	April	14	M
2007	May	19	E
2007	June	22	M
2007	June	26	M

*M = main programme (SKB class 3 including surface water supplements), E = extended programme (SKB class 5 including surface water supplements), E+ = extended programme and special isotopes ($\delta^{37}\text{Cl}$, $\delta^{13}\text{C}$, ^{14}C (pmC), $^{87}\text{Sr}/^{86}\text{Sr}$, $\delta^{34}\text{S}$, U- and Th-isotopes as well as Ra- and Rn-isotopes).

4 Equipment

4.1 Sampling equipment

Water samples were collected using an online pumping setup consisting of an electrical peristaltic pump system, PPS (ASF Thomas SR 10/100, powered by 12 VDC, 7 Ah cells), connected to 4–8 m long teflon-tubes (FEP 140) of 5 mm inner diameter. A manually operated regulator (ELFA, DCM 24–40 pwm) was used to adjust the water flow to a maximum of 1.3–2.9 litres/minute (depending on tube length, tube diameter and pumping level). The sampling equipment is presented in Figure 4-1.

4.2 Multiparameter sondes

Field measurements were performed using two multiparameter sondes (YSI 6600 EDS and YSI 600 QS). A terminal (YSI 650 MDS) is connected to each sonde through a cable for logging data (Figure 4-2). Calibration of the sondes was carried out according to the measurement system description SKB MD 910.003 (SKB internal controlling document, see Table 1-1).

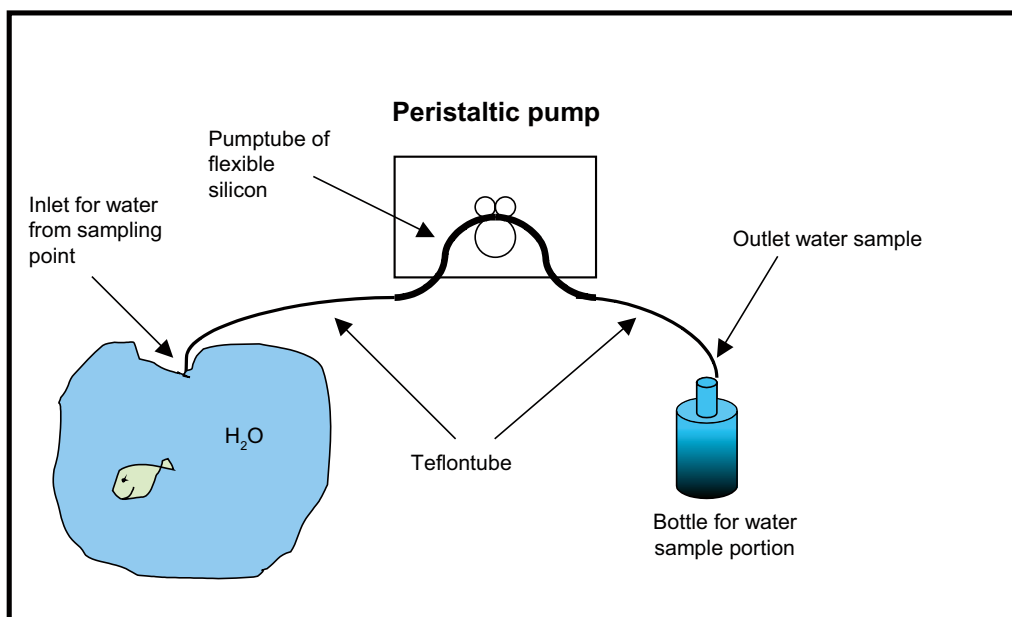


Figure 4-1. Schematic presentation of the peristaltic pump system (PPS).

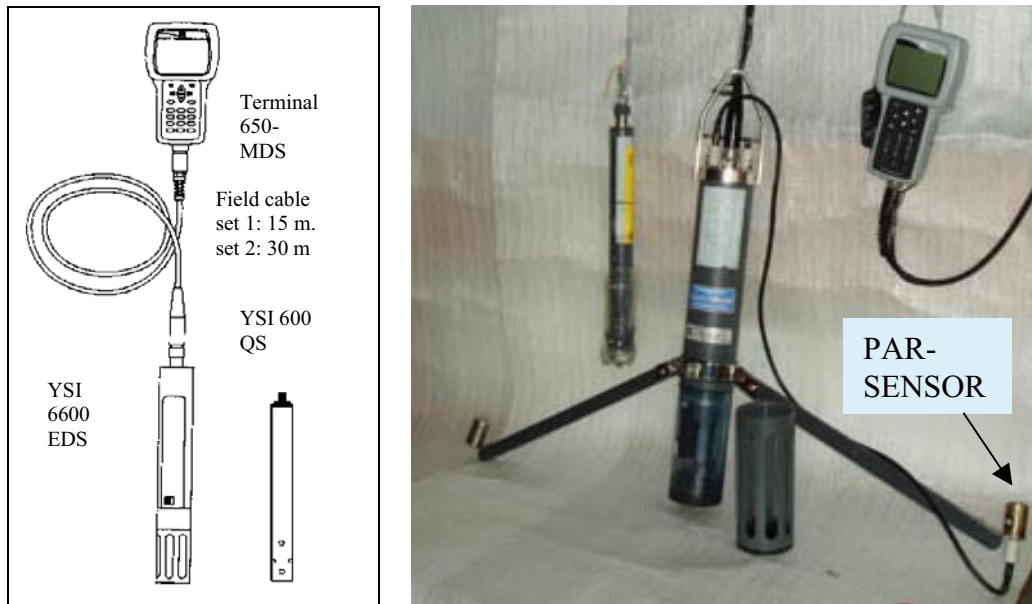


Figure 4-2. Measurement sondes used in the field investigations.

Table 4-1. Parameters measured by the two different YSI sondes.

Parameter	YSI 6600 EDS	YSI 600 QS
Date/time	Yes	Yes
Temperature (°C)	Yes	Yes
pH	Yes	Yes
Dissolved oxygen (mg/L)	Yes	Yes
ORP (Redox potential, mV)	Yes	Yes
Electrical conductivity (mS/cm)	Yes	Yes
Salinity (ppt)	Yes	Yes
Depth (m)	Yes	Yes
Barometric pressure (mm Hg)	Yes	Yes
Turbidity (NTU)	Yes	No
Chlorophyll (µg/l)	Yes	No
Light/PAR* (µmoles s ⁻¹ m ⁻²)	Yes	No

* Photosynthetic Active Radiation

4.3 General field equipment

- Ruttner samplers were used as back up if the portable pump system should fail.
- The exact locations of the sampling positions were found using a GPS (Garmin 172C) with an average accuracy of ± 0.5 – 1.0 m.
- Water depth was measured using an echo sounder (Plastimo, Echotest, LCD digital sounder) with an accuracy of ± 0.05 m.
- Water transparency was estimated using a Secchi disc and aqua scope.
- Disposable filters (Millipore, $0.40\ \mu\text{m}$, $\varnothing = 22$ mm) were used together with 60 mL syringes to filter specific sample portions of the sampled water in the field.
- Stopwatch (GUL), a water-filled plastic bottle (50 mL) and measuring-tape (Hultafors) were used for flow/runoff estimates in stream waters.
- Digital cameras (Nikon Coolpix 5000 and Olympus 400 mju) were used for documentation of stream waters.



Figure 4-3. Sampling from the ice at Lake Bolundsfjärden.

5 Performance

5.1 Presampling preparations

Prior to sampling, the sample bottles were cleaned (according to the routines for respective SKB class), labelled and packed in insulated boxes/bags. Acid additions were made in advance in bottles intended for trace metal analyses; these were placed in separate plastic bags to avoid contamination. The peristaltic pump system (PPS), including the Teflon tubes, was washed using acid (0.5 M HCl) and rinsed with deionised water before use. The equipment was kept well protected in plastic bags or in tight containers. The Disposable filters (Millipore) were rinsed with MilliQ-water (50 mL) and placed in plastic bags to prevent contamination. Calibration of the sondes was performed according to the measurement system description SKB MD 910.003.

5.2 Water sampling

Water samples were collected using a peristaltic pump system, PPS, and Ruttner samplers were used as backup if the PPS-system should fail. Lake and sea water samples were collected close to the surface (at 0.5 m depth) and in winter time also from approximately 0.5 m above the lake or sea bottom in case of ice coverage. Stream water samples were collected at approximately 0.1 m depth. The PPS-system and sample bottles were rinsed initially with water from the sampling locations prior to filling, except for bottles with acid additions. To avoid contamination, the field crew was obliged to wear rubber gloves and great care was taken not to contaminate bottles or equipment. Bottles and samples containing added acid were handled and stored separately to avoid contaminating other sample portions.

Each sample consists of several sample portions and is labelled with the same sample number. The preparation of the sample portions in the field differs depending on their eventual use. Details on collected sample portions, components to be analysed and sample preparations are summarised in Table 5-1.

5.3 Field measurements

The multiparameter sondes were used for measurements of pH, water temperature, barometric pressure, ORP, PAR, turbidity, electrical conductivity, salinity, dissolved oxygen and chlorophyll. Light penetration was measured in lakes and at the regular sea location (Forslingens grund) with a secchi disc according to the Swedish standard BIN SR 111. Photo documentation of stream waters was performed to facilitate evaluation of the investigation data. Photos were taken of each marked out (using a wooden stake) stream water sampling location.

In stream waters measurements were performed using a YSI 6600 EDS sonde if the water level was high enough, otherwise the smaller YSI 600 QS sonde was used. Chlorophyll, PAR and turbidity data were not reported for streams.

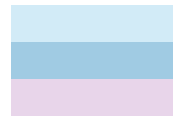
At lake and sea localities the multiple sonde (YSI 6600 EDS) was used to measure a profile at each sampling point. Measurements were conducted at every metre from the surface to the bottom, see Table 5-2. In addition, PAR was logged just below the surface and during the ice season above the ice, in the air. PAR measurements were performed at discrete depths and as continuous PAR-profile loggings. PAR-profiles were obtained by setting the sonde mode to 'continuous logging'. The sonde was then submerged from surface to bottom and hoisted up again. The produced PAR-data were used for regression analyses of PAR versus depth.

Table 5-1. Filled bottles, components to be analysed and preparation of samples in the field.

Class 3: frequent

Class 5: four times per year (each season)

Class 5+: once a year (July)



Bottle volume (mL)	Number of bottles	SKB-Label	Components	Preparation of sample in field	Filling instructions
125	1	Green	Na, K, Ca, Mg, Li, Sr, S, Si, Br, I	–	Fill up
5,000 (Collecting bottle)	1	Green	Chlorophyll a, c, Pheopigment, Alkalinity, pH, Conductivity, Tot-N, Tot-P, POP, PON, POC, Anions (Br, SO ₄ , Cl, F, I), TOC, DOC, DIC (only for control)	–	Fill up
25	2	Green	Ammonia, NO _x , Silicate	Filtering with syringe/0.40 µm filter	Fill to mark
50	1	Green	TOC	–	Leave 1cm
50	2	Green	DIC/DOC	Filtering with syringe/0.40 µm filter	Leave 1cm
Winkler bottles ¹⁾	2	Green	Oxygen	1 mL Mn(II) reagent + 2 mL alkaline iodine reagent and mix	Flow over 3 x
Winkler bottles ²⁾	2	Green	H ₂ S ²	1 mL ZnAc + 1 mL 1M NaOH	Flow over x 3 and mix
100	1	Red	Trace metals	–	Fill up
500 ²	1	Red	Fe(II)/Fetot ²	Filtering with syringe/0.40 µm filter	Fill up
500	1	Green	Tritium	–	Flow over x 1
100	1	Green	Deuterium, O-18	–	Fill up from bottom
1,000	1	Green	³⁴ S	–	Fill up
100	1	Green	³⁷ Cl	–	Fill up
100	1	Green	⁸⁷ Sr/ ⁸⁶ Sr	–	Fill up
100	1	Green	U- and Th- isotopes	–	Fill up
500	1	Green	Ra- and Rn- isotopes	–	Fill up

1) Winkler samples only when sonde measurements of oxygen show values below 4 mg/L.

2) Included in the comprehensive surface water campaign and only at reduced groundwater conditions.



Figure 5-1. Measuring a profile (PFM000064) in the ice covered Baltic Sea with the multiple sonde (YSI 6600 EDS).

Table 5-2. Logging depths at sampling locations in lakes and shallow sea bays.

Sampling locations	Name	Sonde logging depth (m)											
		0.5	1.0	1.5	2.0	2.5	3.0	4.0	4.5	5.0	6.0	6.5	7.0
Lakes													
PFM000074	Labbo-träsket	X											
PFM000097	Norra bassängen	X											
PFM000107	Bolunds-fjärden	X	X										
PFM000117	Eckar-fjärden	X	X	X									
Shallow sea bays													
PFM000062	SV Forslingens grund	X	X		X		X						
PFM000082	Alternative to PFM00062	X	X		X		X	X		X	X		X

A simple “floating bottle” method was used to measure water flow/runoff in the streams as a complement to the regular method using discharge weirs and gauges. The cross-section mean area of the stream was estimated, forming a rectangle, see Figure 5-2. The time for the bottle (close to neutral in weight in water) to float the distance (L) from point A to B was measured with a stopwatch. This procedure was repeated three times in each stream. The average water velocity (m/s) multiplied with the average area (m²) resulted in a rough water runoff estimate (m³/s).



Figure 5-2. Schematic presentation for estimating water runoff in natural stream waters (see text for explanation).

5.4 Sample treatment and chemical analyses

An overview of sample treatment and analytical methods is given in Appendix 1. The routines are applicable independently of sampling method or type of sampling object.

5.5 Data handling/post processing

Two field protocols (activity log and sampling protocol) contain meta data (id-code, date, time, sample no., field crew etc), a few measured data and weather observations as well as comments on field conditions which may influence the analytical results. The field protocols supply basic information for creating activities and activity comments in the SKB Sicada database. In addition, the few measured parameters and weather conditions, noted on the sampling protocol, are stored as data tables in Sicada.

Furthermore, eventual deviations from the sampling programme, if any, or from the normal routines are also documented in special reports/comment files. The comment files are stored in the Sicada file archive, see Table 5-3.

5.5.1 Chemical analytical data

The following routines for quality control and data management are generally applied for hydrochemical analysis data, independently of sampling method or type of sampling object.

Several components are determined by more than one method and/or laboratory. Moreover, duplicate analyses by an independent laboratory are performed as a standard procedure on each fifth or tenth collected sample. All analytical results are stored in the Sicada database. The applied hierarchy path “Hydrochemistry/Hydrochemical investigation/Analyses/Water in the database” contains two types of tables, raw data tables and primary data tables (final data tables).

Data on *basic water analyses* are inserted into the raw data tables for further evaluation. The evaluation results in a final reduced data set for each sample. These data sets are compiled in a primary data table named “water composition”. The evaluation is based on:

- Comparison of the results from different laboratories and/or methods. The analyses are repeated if a large disparity is noted (generally more than 10%).
- Calculation of charge balance errors according to the equation below. Relative errors within $\pm 10\%$ are considered acceptable in surface waters.

$$\text{Relative error (\%)} = 100 \times \frac{\sum \text{cations (equivalents)} - \sum \text{anions (equivalents)}}{\sum \text{cations (equivalents)} + \sum \text{anions (equivalents)}}$$

- General expert judgement of plausibility based on earlier results and experience.

All results from *special analyses of trace metals and isotopes* are inserted directly into primary data tables. In those cases where the analyses are repeated or performed by more than one laboratory, a “best choice” notation will indicate those results which are considered most reliable.

An overview of the data management is given in Figure 5-3.

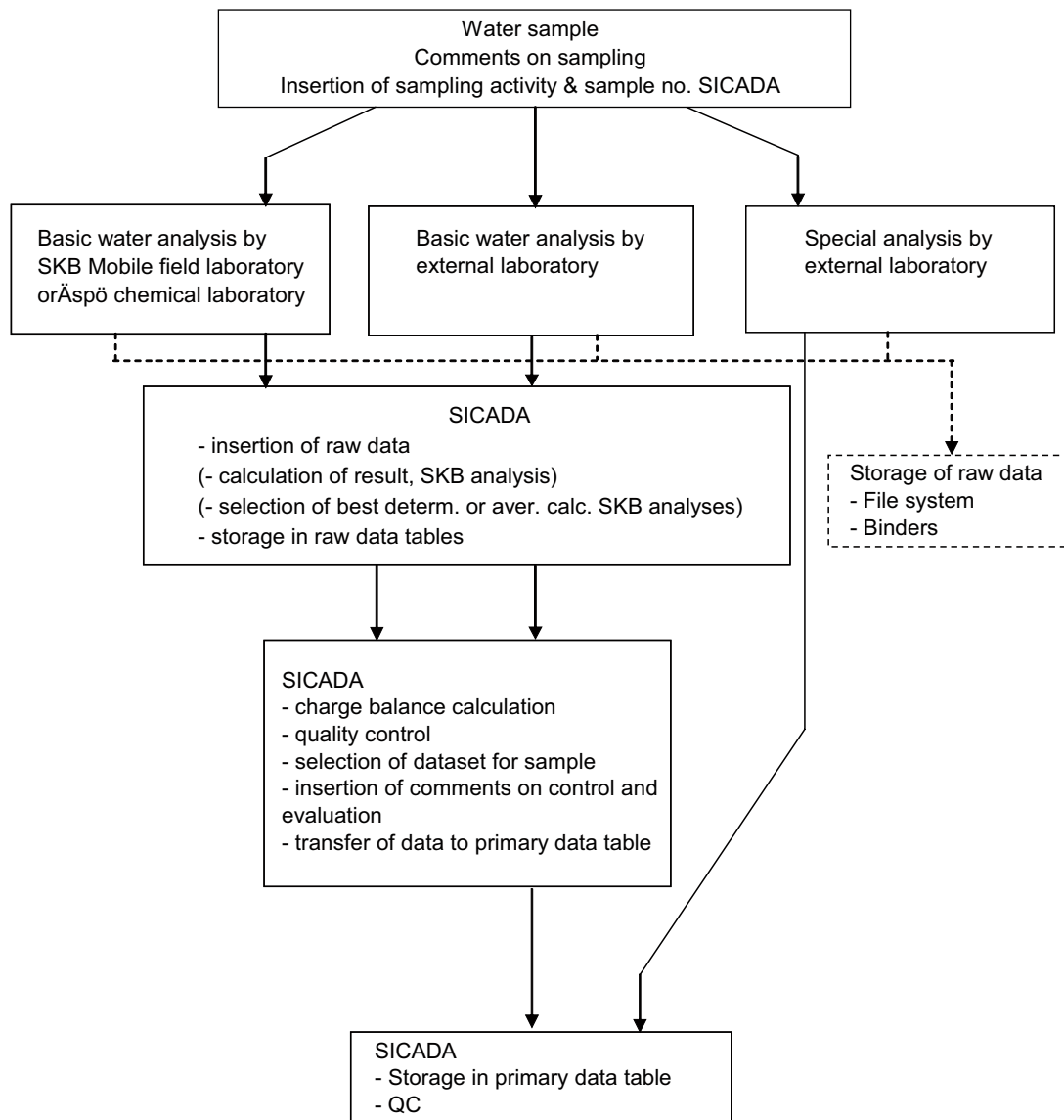


Figure 5-3. Overview of data management for analytical data.

5.5.2 Field measurement data

The logged data from sonde measurements are exported digitally from the YSI Terminal 650-MDS to the specified Sicada data table. The original raw data file, calibration file and calibration protocol from each sonde, as well as photographs and comments on sampling and measurements, are stored in the Sicada file archive, see Table 5-3.

5.5.3 Other relevant information and data

Information about weather conditions and related parameters during the sampling occasions are compiled in a separate table in Sicada called "Weather_data" which contains the following columns:

Air temperature	Wind velocity	Runoff/Water flow (streams)
Cloudiness	Wind direction	Water depth
Precipitation	Light penetration (lakes and sea)	Snow/ice depth

These data are not presented in this report.

5.6 Nonconformities

The only nonconformities that occurred during the reported sampling period involve omitted sampling locations due to, for example, problems with ice. The reasons for deviations from the programme are compiled in Tables 5-4 and 5-5.

Table 5-3. File types stored in the Sicada file archive.

Type of file	Example of file name	No. per sampling session
Raw data file	L580438.dat	1 or 2*
Comments	Kommentarer V38.xls	1
Calibration data file	000113CF.txt	1 or 2*
Calibration protocol	Stora sonden V38år04.xls	1 or 2*
Photography	PFM66.jpg	1–4
PAR data file	PAR-profiler V38_04.xls	1

* Depending on the number of measuring sondes used.

Table 5-4. Collected samples and conducted measurements.

week/year		29/06	33/06	37/06	41/06	46/06	50/06	03/07	06/07	10/07	14/07	19/07	22/07	26/07	Sum (x)
Sond															
YSI 6600		X	X	X	X	X	X	X	X	X	X	X	X		
YSI 600 QS														X	
Sea															
	Name														
PFM000062	SV-Forslingen	X	X	X	X	X	X	X	X	X	X	X	X	X	13
PFM000082	Alt PFM000062														0
PFM102269	Utloppet Biotesten	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	X*	13
Stream															
PFM000066	Ö-Gunnarsbo	E	E	E	E	X	X	X	X	X	X	X	X	X	9
PFM000068	Kungsträsket	E	E	X	E	X	X	X	X	X	X	X	X	X	10
PFM000069	Bolundsskogen	E	E	E	E	X	X	X	X	X	X	X	X	X	9
PFM000070	N-Eckarfjärden	E	E	X	E	X	X	X	X	X	X	X	X	X	10
Lakes															
PFM000074	Labboträsket	X	X	X	X	C	X	C	X	X	X	X	X	X	11
PFM000097	Norra bassängen	B	B	B	B	C	B	B	B	X**	B	B	B	B	1
PFM00107	Bolundsfjärden	X	X	X	X	C	X	X	X	X	X	X	X	X	12
PFM00117	Eckarfjärden	X	X	X	X	C	X	C	X	X	X	X	X	X	11
Sum (X)		5	5	7	5	6	9	7	9	10	9	9	9	9	99

Explanations and abbreviations:

X: Sample taken

B: No sample, only field measurements with sonde

C: No sample, due to weak ice

E: No sample, dry conditions, or too little water to collect a representative sample

* Only tritium, deuterium and ¹⁸O samples

** Only tritium and anions samples

*** Only oxygen sample due to measured low oxygen value

Table 5-5. Comments on measurements/water sampling.

week/year	29/06	33/06	37/06	41/06	46/06	50/06	03/07	06/07	10/07	14/07	19/07	22/07	26/07
Sond													
YSI 6600	X	X	X	X	X	X	X	X	X	X	X	X	
YSI 600 QS													X
Sea													
Name													
PFM000062 SV-Forslingen	J		J			J	J			J			V
PFM000082 Alt PFM62													
PFM102269 Utloppet Biotesten													V
Stream													
PFM000066 Ö-Gunnarsbo	F	F	F	F									H
PFM000068 Kungsträsket	F	F	F	F				F	F			H	H
PFM000069 Bolundsskogen	F	F	F	F				S					
PFM000070 N-Eckarfjärden	F	F	F	F							H	H	H
Lakes													
PFM000074 Labboträsket	G	G	G	G				S	Q				V
PFM000097 Norra bassängen									Q, Z				V
PFM00107 Bolundsfjärden		J	J,U	J			J						V
PFM00117 Eckarfjärden		J							Z		J		V

Explanations to codes/abbreviations:

F: No flow estimation.

G: Sample and sonde measurements at another depth, due to low water level or rich vegetation.

H: Stagnant water or nearly stagnant water – no flow estimation, flow approx 0 m³/s.

J: Incorrect PAR-values in one or several depths (mainly caused by waves, clouds, vegetation or darkness).

S: Peristaltic pump system was out of order, sample taken with Rutner-sampler.

U: Incorrect sond-data logged, noted in fieldprotocol.

V: No values for PAR, Turbidity and Chlorophyll, due to sonde malfunction.

Q: Risk for incorrect sonde values for PAR, Turbidity and Chlorophyll, due to plants and/or particles in the water.

Z: Winkler samples (2) collected, due to low oxygen level.



Figure 5-3. Stream sampling location PFM0069 with and without water.



Figure 5-4. Stream sampling location PFM0070 at springtime and during summer.

6 Results

6.1 General

The surface water investigation period from July 2006 to June 2007 includes records of 105 water analyses (i.e. number of analysed samples) and records of 300 field measurements. Furthermore, the accompanying field documentation is quite extensive. The data are compiled in the attached Appendices and stored in the Sicada database where they are traceable by the activity plan number.

Fresh waters in the Forsmark area are well buffered with high alkalinity, high pH and high calcium concentrations. In addition, waters recently affected by brackish sea water still show high sodium chloride concentrations. The relationship between the position of the coastline and the salinity of the water samples collected at the sampling locations in the area has been demonstrated in /3/. Furthermore, a detailed evaluation of surface water data from March 2002 to March 2004 was presented in /7/.

The results presented and compiled in this report are restricted to field work performed from July 2006. Besides results from the regular sampling objects, thirteen new tritium results have been obtained from the additional sampling object (outlet of cooling water into Lake Biotestsjön) and contamination problems from the nuclear power plant are further confirmed.

6.2 Water analyses

6.2.1 Major components

The basic water analyses include the major constituents Na, K, Ca, Mg, Sr, S, SO_4^{2-} , Cl^- , Si and HCO_3^- as well as the minor constituents Fe, Li, Mn, Br, F⁻, I and HS^- . Furthermore, batch measurements of pH and electrical conductivity are included. The basic water analysis data are compiled together with field measurements of pH and water temperature in Appendix 5, Table A5-1.

The charge balance errors give an indication of the quality and uncertainty of the analyses of major constituents. The errors exceed $\pm 5\%$ in 11 cases and no case exceeded $\pm 10\%$ out of 105 datasets. Furthermore, duplicate analyses by a second laboratory are conducted regularly. Comparison between results from different laboratories and methods shows acceptable agreement in most cases.

To provide a rough check of the data, the electrical conductivity values are plotted versus the corresponding chloride concentrations in Figure 6-1. As shown, the surface water data generally agree well with a thought regression line.

Sulphate by ion chromatography and sulphate calculated from total sulphur by ICP are compared in Figure 6-2. As shown, within the analytical error all the sulphur is present as sulphate.

As established earlier /4/, bromide determinations by ion chromatography may be difficult at high chloride concentrations. Selected bromide values (in most cases ICP results) for each sample are plotted versus the corresponding chloride concentrations in Figure 6-3 as a consistency check. The points do not differ too much from the linear trend and the data are therefore considered acceptable.



Figure 6-1. Electrical conductivity versus chloride concentrations.

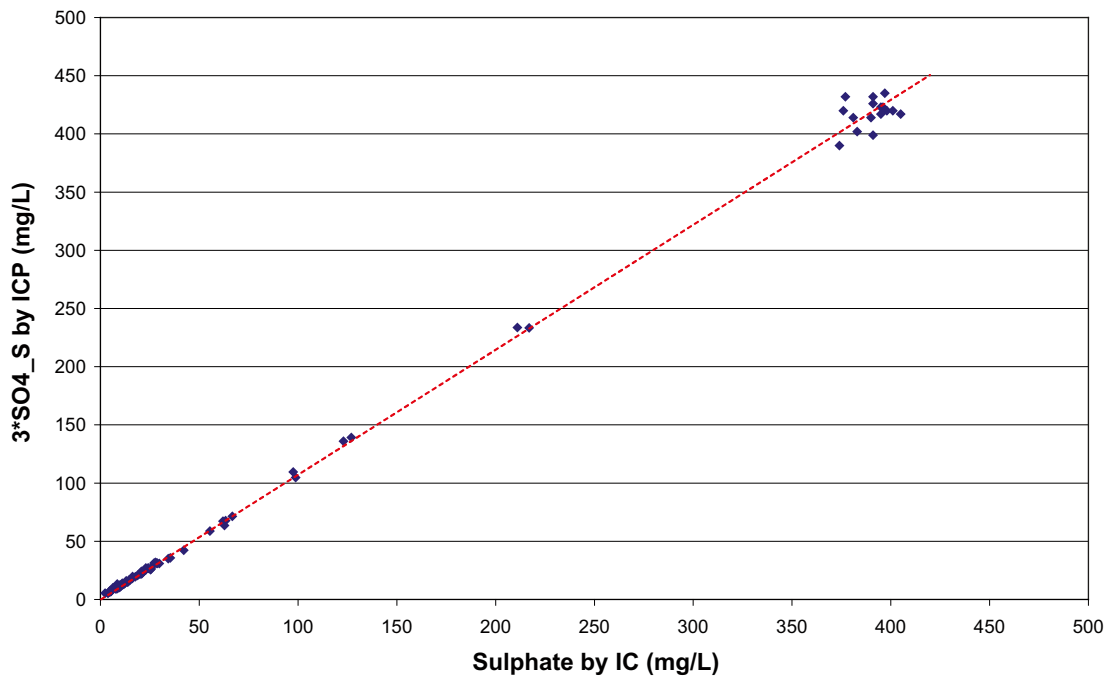


Figure 6-2. Sulphate by IC versus sulphate calculated from total sulphur ($3 \times SO_4-S$) by ICP.

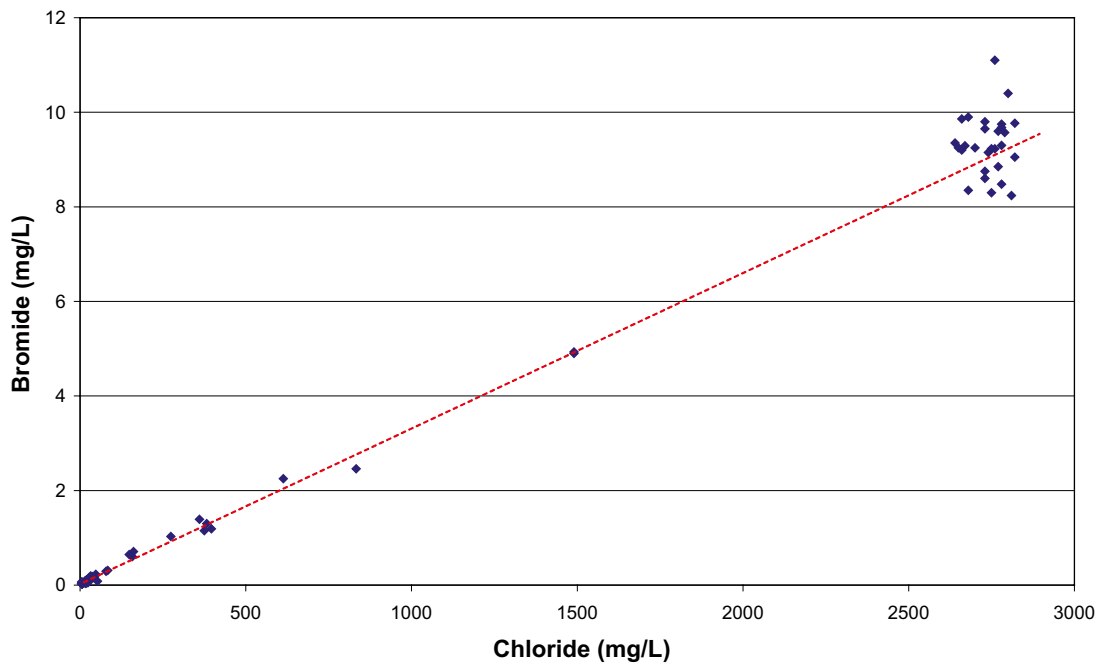


Figure 6-3. Bromide versus chloride.

6.2.2 Surface water supplements

The surface water supplements include $\text{NH}_4\text{-N}$, $\text{NO}_2\text{-N}$, $\text{NO}_3\text{-N} + \text{NO}_2\text{-N}$, $\text{NO}_3\text{-N}$, tot-N, tot-P, $\text{PO}_4\text{-P}$, TOC, DOC, DIC and sometimes at a few sampling occasions also dissolved oxygen. The analytical data are compiled in Appendix 5, Table A5-2. The DIC values should be used with care and bicarbonate values (by alkalinity titration) are considered more reliable.

6.2.3 Isotopes

The isotope determinations include the stable isotopes δD , $\delta^{18}\text{O}$, $^{10}\text{B}/^{11}\text{B}$, $\delta^{34}\text{S}$, $\delta^{13}\text{C}$, $\delta^{37}\text{Cl}$ and $^{87}\text{Sr}/^{86}\text{Sr}$ as well as the radioactive isotopes Tr (TU), ^{14}C (pmC), ^{238}U , ^{235}U , ^{234}U , ^{232}Th , ^{230}Th , ^{226}Ra and ^{222}Rn . The isotope data are compiled in Appendix 5, Table A5-3.

Tritium

It has been suggested that the adjacent nuclear power plant may have influenced the natural conditions for the tritium and ^{14}C isotopes /4/. Some relation between the presence of these isotopes and distance from the nuclear power reactors was observed during a previous sampling period March 2004–June 2005. In order to better understand the tritium data, repeated tritium determinations from close to the outlet of reactor cooling water commenced in July 2005. One very high tritium value was observed in July 2005 /5/ and three of the samples collected during this reported period July 2006–June 2007 revealed enhanced tritium concentration (16.5, 40.12 and 17.5 TU). These circumstances indicate that contamination from the nuclear power plant does occur at times. Samples from the regular sampling locations did not measure any exceptionally high tritium contents during this last year.

6.2.4 Trace metals

The analyses of trace elements include Al, As, Cd, Cr, Cu, Co, Hg, Ni, Zn, Pb, V, Mo, B and Ba. The trace element data are compiled in Appendix 5, Table A5-4.

These elements are generally present at low concentrations in the groundwater and the risk for contamination is high. Especially data on common metals like Al, Cr, Cu, Co, Ni and Zn must be used with caution. Generally, the distribution of data is location specific but outliers do exist; significantly large deviating concentrations for a sampling location are rejected in the Sicada database.

6.3 Field measurements

The field measurement data including redox potential, pH, dissolved oxygen, electrical conductivity, salinity, barometric pressure, turbidity, chlorophyll, light penetration, PAR (Photosynthetic Active Radiation) and water temperature are compiled in Appendix 2. The PAR-profile logs are presented as diagrams including regression constants in Appendix 3. Two sets of data are of lower quality; 1) sonde measurements (YSI 6600 EDS) of chlorophyll, and 2) turbidity measurements also by the sonde.

- The water flow rate estimations (not in the report) by the float method /8/ are of low accuracy compared to measurements using discharge weirs and gauges. They were performed in order to allow comparison between early data obtained when there was no other available method and new data from installed measurement stations.
- The chlorophyll measurements have been problematic, possibly due to the fact that humic substances and chlorophyll have similar fluorescence in the wavelength used by the sonde. Since the inland waters show high concentrations of humic substances and the sonde interprets humus as chlorophyll, the amount of chlorophyll tends to be overestimated.
- The turbidity measurements performed in the sea and in lakes often display negative values. This may be due to bad probe sensitivity in clear waters (turbidity weak waters) or calibration problems.

Comments on the low quality of chlorophyll and turbidity data as well as explanations to these circumstances are stored in the Sicada database.

7 Summary and discussion

The chemical investigation routines for surface waters are well established after more than five years of field work, reporting and data administration and the third year of the long-term surface water monitoring programme has passed without any major nonconformities or surprises.

The main experiences and conclusions from surface water sampling and analyses since July 2006 are summarised below:

- The statements/findings regarding the character of the surface waters after the fifth year of sampling and analyses remain unchanged.
- The additional data records from the deep seawater location verify the stable chemical conditions that are expected in seawater.
- Sampling performed close to the outlet of cooling water from the power plant for tritium analyses revealed three enhanced values during the reported time period. Therefore it seems clear that contamination from the nuclear power plant may occur at times.



Figure 7-1. Transport to sampling location on the ice covered Lake Bolundsfjärden.

References

- /1/ **SKB, 2001.** Site investigations. Investigation methods and general execution programme. SKB TR-01-29, Svensk Kärnbränslehantering AB.
- /2/ **Nilsson A-C, Karlsson S, Borgiel M, 2003.** Forsmark site investigation. Sampling and analyses of surface waters. Results from sampling in the Forsmark area, March 2002 to March 2003. SKB P-03-27, Svensk Kärnbränslehantering AB.
- /3/ **Nilsson A-C, Borgiel M, 2004.** Forsmark site investigation. Sampling and analyses of surface waters. Results from sampling in the Forsmark area, March 2003 to March 2004. SKB P-04-146, Svensk Kärnbränslehantering AB.
- /4/ **Nilsson A-C, Borgiel M, 2005.** Forsmark site investigation. Sampling and analyses of surface waters. Results from sampling in the Forsmark area, March 2004 to June 2005. SKB P-05-274, Svensk Kärnbränslehantering AB.
- /5/ **Nilsson A-C, Borgiel M, 2007.** Forsmark site investigation. Sampling and analyses of surface waters. Results from sampling in the Forsmark area, July 2005 to June 2006. SKB P-07-095, Svensk Kärnbränslehantering AB.
- /6/ **SKB, 2005.** Forsmark site investigation. Programme for further investigations of geosphere and biosphere. SKB R-05-14, Svensk Kärnbränslehantering AB.
- /7/ **Sonesten L, 2004.** Evaluation of surface water chemistry data from the Forsmark area. March 2002–March 2004. SKB R-05-41, Svensk Kärnbränslehantering AB.
- /8/ **Johansson P-O, 2005.** Forsmark site investigation. Manual discharge measurements in brooks, April 2002–April 2005. SKB P-05-153, Svensk Kärnbränslehantering AB.

Sampling and analytical methods

Table A1-1. Sample handling routines and analytical methods.

Component group	Component/element	Sample container (material)	Volume (mL)	Filtration	Preparation/ Conservation*	Analysis method	Analysis within – or delivery time to lab.
Anions 1	HCO ₃ pH(lab) cond (lab)	Plastic	250	No	No	Titration Pot. meas, Cond. meas	The same day – maximum 24 hours
Anions 2	Cl, SO ₄ , Br ⁻ , F ⁻ , I ⁻	Plastic	100	Yes (not in the field)	No	Titration (Cl ⁻) IC (Cl ⁻ , SO ₄ , Br ⁻ , F ⁻) ISE (F ⁻)	Not critical (month)
	Br, I	Plastic	100	Yes (not in the field)	No	ICP MS	Not critical (month)
Cations, Si and S according to SKB class 3	Na, K, Ca, Mg, S(tot), Si(tot), Li, Sr	Plastic (at low conc. acid washed bottles)	100	Yes (not in the field)	Yes (not in the field, 1 mL HNO ₃)	ICP-AES ICP-MS	Not critical (month)
Cations, Si and S according to SKB class 4 and 5	Na, K, Ca, Mg, S(tot), Si(tot), Fe, Mn, Li, Sr	Plastic (Acid washed)	100	Yes (immediately in the field)	Yes (1mL HNO ₃)	ICP-AES ICP-MS	Not critical (month)
Fe(II), Fe(tot)	Fe(II), Fe(tot)	Plastic (Acid washed)	500	Yes	Yes (5 mL HCl))	Spectrophotometry Ferrozine method	As soon as possible the same day
Hydrogen sulphide	HS-	Glass (Winkler)	About 120x2	Yes	Ev 1 mL 1 M NaOH+ 1 mL 1M ZnAc	Spectrophotometry	Immediately or if conserved, a few days
Environmental metals	Al, As, Ba, B, Cd, Co, Cr, Cu, Hg, Mo, Ni, P, Pb, V, Zn	Plastic (Acid washed)	100	Yes	Yes (1 mL HNO ₃)	ICP-AES ICP-MS	Not critical (month)
Lantanoids, U, Th and so on	Sc, Rb, Y, Zr, I, Sb, Cs, La, Hf, Tl, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, U, Th	Plastic (Acid washed)	100	Yes	Yes (1 mL HNO ₃)	ICP-AES ICP-MS	Not critical (month)
Dissolved organic Carbon, dissolved inorganic Carbon	DOC, DIC	Plastic	250 25	Yes	Frozen, transported in isolated bag	UV oxidation, IR Carbon analysator Shimadzu TOC5000	Short transportation time

Component group	Component/element	Sample container (material)	Volume (mL)	Filtering	Preparation/ Conservation*	Analysis method	Analysis within – or delivery time to lab.
Total organic Carbon	TOC	Plastic	250 25	No	Frozen, transported in isolated bag	UV oxidation, IR Carbon analysator Shimadzu TOC5000	Short transportation time
Environmental isotopes	$\delta^2\text{H}$, $\delta^{18}\text{O}$	Plastic	100	No	–	MS	Not critical (month)
Tritium	^3H (enhanced.)	Plastic (dry bottle)	500	No	–	LSC	
Chlorine-37	^{37}Cl	Plastic	100	No	–	ICP MS	Not critical (month)
Carbon isotopes	^{13}C , pmC	Plastic (HDPE)	100×2	No	–	(A)MS	A few days
Sulphur isotopes	^{34}S	Plastic	500–1000	No	–	Combustion, MS	No limit
Strontium-isotopes	$^{87}\text{Sr}/^{86}\text{Sr}$	Plastic	100	No	–	TIMS	Days or Week
Uranium and Thorium isotopes	^{234}U , ^{235}U , ^{238}U , ^{232}Th , ^{230}Th ,	Plastic	50 1000	No	–	Chemical separat. Alfa spectroscopy	No limit
Boron isotopes	$^{10}\text{B}/^{11}\text{B}$	Plastic	100	Yes	Yes (1 mL HNO_3)	ICP – MS	No limit
Radon and Radium isotopes	^{222}Rn , ^{226}Ra	Plastic	500–1000	No	No	LSS	Immediate transport
Dissolved gas (content and composition)	Ar , N_2 , CO_2 , O_2 , CH_4 , H_2 , CO , C_2H_2 , C_2H_4 , C_2H_6 , C_3H_8	Cylinder of stainless steel	200	No	No	GC	Immediate transport
Colloids	Filter series	Polycarbonate filter	0.4, 0.2 and 0.05 μm	–	Ar atmosphere	ICP-AES ICP-MS	Immediate transport
Fractionation; Humic and fulvic acids, inorganic constituents	< 1000 D > 1000 D but < 5000 D > 5000 D	Fractions are collected in plastic bottles	250	–	N_2 atmosphere	UV oxidation, IR (DOC)	Immediate transport
Archive samples with acid	-	Plast (washed in acid)	100×2 **	Yes	Yes (1 mL HNO_3)	–	Storage in freeze container
Archive samples without acid	-	Plastic	250×2 **	Yes	No	–	Storage in freeze container
Carbon isotopes in humic and fulvic acids	^{13}C , ^{14}C (pmc)	DEAE cellulose (anion exchanger)	–	–	–	(A)MS	A few days
Nutrient salt + silicate	NO_2 , NO_3 , NO_2+NO_3 , NH_4 , PO_4 , SiO_4	Sample tubes, plastic	25×2 250	No	No, frozen immediately***	Spectrophotometry	Short transportation time

Component group	Component/element	Sample container (material)	Volume (mL)	Filtering	Preparation/Conservation*	Analysis method	Analysis within – or delivery time to lab.
Total concentrations of Nitrogen and Phosphorous	N-tot, P-tot	Plastic	100	No	No, frozen immediately***	Spectrophotometry	Short transportation time
Particulate Carbon, Nitrogen and Phosphorous	POC, PON, POP	Plastic	1000	Yes (within 4 h) prepared filters. Blank filters	Filtering, the filters are frozen immediately 2 filters/sample	Elementar-analysator (N, C) own method 990121 (P)	Short transportation time
Chlorophyll	Chlorophyll a, c and pheopigment	Plastic	1000–2000	Yes (within 4 h)	Filtering, the filters are frozen immediately	Spectrophotometry Fluorometry	Short transportation time
Oxygen	Dissolved O ₂	Winkler, glass	2×ca 120	No	Mn (II) reagent Iodide reagent	Spectrophotometry SIS SS-EN 25813	Within 3 days
Archive samples for supplementary radio nuclides		Plastic	5000	No	50 mL HNO ₃	–	Storage in freeze container

* Suprapur acid is used for conservation of samples.

** Minimum number. The number of archive samples can vary depending on the number of similar samples collected at the same occasion.

*** The sample is transported in frozen condition to the laboratory. It is possible that the silicate concentration can change due to polymerisation for this reason.

Abbreviations and definitions:

IC	Ion chromatograph
ISE	Ion selective electrode
ICP-AES	Inductively Coupled Plasma Atomic Emission Spectrometry
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
INAA	Instrumental Neutron Activation Analysis
MS	Mass Spectrometry
TIMS	Thermal Ionization Mass Spectrometer
LSC	Liquid Scintillation Counting
LSS	Liquid Scintillation Spectrometry
(A)MS	(Accelerator) Mass Spectrometry
GC	Gas Chromatography

Table A1-2. Methods, reporting limits and measurement uncertainties (updated 2008).

Component	Method	Reporting limits (RL), detection limits (DL) or range ¹	Unit	Measurement uncertainty ²
pH	Potentiometric	3–10	pH unit	±0.1
EC	Electrical Conductivity meas.	1–150 150–10,000	mS/m	5% 3%
HCO ₃	Alkalinity titration	1	mg/L	4%
Cl ⁻	Mohr-titration	≥ 70	mg/L	5%
Cl ⁻	IC	0.5–70		8%
SO ₄	IC	0.5	mg/L	12%
Br ⁻	IC	DL 0.2, RL 0.5	mg/L	15%
Br	ICP SFMS	0.001, 0.004, 0.010 ³	mg/L	25% ⁴
F ⁻	IC	DL 0.2, RL 0.5	mg/L	13%
F ⁻	Potentiometric	DL 0.1, RL 0.2		12%
I ⁻	ICP SFMS	0.001, 0.004, 0.010 ³	mg/L	25% ⁴
Na	ICP AES	0.1	mg/L	13%
K	ICP AES	0.4	mg/L	12%
Ca	ICP AES	0.1	mg/L	12%
Mg	ICP AES	0.09	mg/L	12%
S(tot)	ICP AES	0.16	mg/L	12%
Si(tot)	ICP AES	0.03	mg/L	14%
Sr	ICP AES	0.002	mg/L	12%
Li	ICP AES	0.004	mg/L	12.2%
Fe	ICP AES	0.02	mg/L	13.3% ⁵
Fe	ICP SFMS	0.0004, 0.002, 0.004 ³	mg/L	20% ⁵
Mn	ICP AES	0.003	mg/L	12.1% ⁴
Mn	ICP SFMS	0.00003, 0.00004, 0.0001 ³	mg/L	53% ⁵
Fe(II), Fe(tot)	Spectrophotometry	DL 0.006, RL 0.02	mg/L	9% (0.05–1 mg/L)
HS ⁻	Spectrophotometry, SKB	SKB DL 0.006, RL 0.02	mg/L	25%
HS ⁻	Spectrophotometry, external laboratory	0.01	mg/L	0.02 (0.01–0.2 mg/L) 12% (> 0.2 mg/L)
NO ₂ as N	Spectrophotometry	0.1	µg/L	2%
NO ₃ as N	Spectrophotometry	0.2	µg/L	5%
NO ₂ +NO ₃ as N	Spectrophotometry	0.2	µg/L	0.2 (0.2–20 µg/L) 2% (> 20 µg/L)
NH ₄ as N	Spectrophotometry, SKB	11	µg/L	30% (11–20 µg/L) 25% (20–50 µg/L) 12% (50–1200 µg/L)
NH ₄ as N	Spectrophotometry external laboratory	0.8	µg/L	0.8 (0.8–20 µg/L) 5% (> 20 µg/L)
PO ₄ as P	Spectrophotometry	0.7	µg/L	0.7 (0.7–20 µg/L) 3% (> 20 µg/L)
SiO ₄	Spectrophotometry	1	µg/L	2.5% (> 100 µg/L)
O ₂	Iodometric titration	0.2–20	mg/L	5%
Chlorophyll a, c pheopigment ⁶	/1/	0.5	µg/L	5%
PON ⁶	/1/	0.5	µg/L	5%
POP ⁶	/1/	0.1	µg/L	5%
POC ⁶	/1/	1	µg/L	4%
Tot-N ⁶	/1/	10	µg/L	4%
Tot-P ⁶	/1/	0.5	µg/L	6%
Al,	ICP SFMS	0.2, 0.3, 0.7 ³	µg/L	17.6% ⁵
Zn	ICP SFMS	0.2, 0.8, 2 ³	µg/L	15.5, 17.7, 25.5% ⁵
Ba, Cr, Mo,	ICP SFMS	0.01, 0.04, 0.1 ³	µg/L	Ba 15% ⁴ , Cr 22% ⁵ Mo 39% ⁵
Pb	ICP SFMS	0.01, 0.1, 0.3 ³	µg/L	15% ⁵
Cd	ICP SFMS	0.002, 0.02, 0.5 ³	µg/L	15.5% ⁵
Hg	ICP AFS	0.002	µg/L	10.7% ⁵
Co	ICP SFMS	0.005, 0.02, 0.05 ³	µg/L	25.9% ⁵

Component	Method	Reporting limits (RL), detection limits (DL) or range ¹	Unit	Measurement uncertainty ²
V	ICP SFMS	0.005, 0.03, 0.05 ³	µg/L	18.1% ⁵
Cu	ICP SFMS	0.1, 0.2, 0.5 ³	µg/L	14.4% ⁵
Ni	ICP SFMS	0.05, 0.2, 0.5 ³	µg/L	15.8% ⁵
P	ICP SFMS	1, 5, 40 ³	µg/L	16.3% ⁵
As	ICP SFMS	0.01 (520 mS/m)	µg/L	59.2% ⁵
La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu	ICP SFMS	0.005, 0.02, 0.05 ³	µg/L	20%, 20%, 25% ⁵
Sc, In, Th	ICP SFMS	0.05, 0.2, 0.5 ³	µg/L	25% ⁵
Rb, Zr, Sb, Cs	ICP SFMS	0.025, 0.1, 0.25 ³	µg/L	15%, 20%, 20% ⁴ 25% ⁵
Tl	ICP SFMS	0.025, 0.1, 0.25 ³	µg/L	14.3% ^{4 and 5}
Y, Hf	ICP SFMS	0.005, 0.02, 0.05 ³	µg/L	15%, 20%, 20% ⁴ 25% ⁵
U	ICP SFMS	0.001, 0.005, 0.01 ³	µg/L	13.5%, 14.3%, 15.9% ⁴ 19.1%, 17.9%, 20.9% ⁵
DOC	UV oxidation, IR Carbon analysator	0.5	mg/L	8%
TOC	UV oxidation, IR Carbon analysator	0.5	mg/L	10%
δ ² H	MS	2	‰ SMOW ⁷	0.9 (one std)
δ ¹⁸ O	MS	0.1	‰ SMOW ⁷	0.1 (one std)
³ H	LSC	0.8	TU ⁸	0.8
³⁷ Cl	A (MS)	0.2	‰ SMOC ⁹	0.2 ¹⁶
δ ¹³ C	A (MS)	–	‰ PDB ¹⁰	0.3 ¹⁶
¹⁴ C pmc	A (MS)	–	PMC ¹¹	0.4 ¹⁶
δ ³⁴ S	MS	0.2	‰ CDT ¹²	0.4 (one std)
⁸⁷ Sr/ ⁸⁶ Sr	TIMS	–	No unit (ratio) ¹³	0.00002
¹⁰ B/ ¹¹ B	ICP SFMS	–	No unit (ratio) ¹³	–
²³⁴ U, ²³⁵ U, ²³⁸ U	Alfa spectr.	0.0005	Bq/L ¹⁴	≤ 5%
²³² Th, ²³⁰ Th	ICP SFMS			
²²² Rn, ²²⁶ Ra	LSS	0.01, resp. 0.005	Bq/L	≤ 5%

- Reporting limits (RL), generally 10×standard deviation, are presented if nothing else is stated.
- Measurement uncertainty reported by the laboratory, generally 95% confidence interval.
- Reporting limits at electrical cond. 520 mS/m, 1440 mS/m and 3810 mS/m respectively.
- Measurement uncertainty at concentrations 100×RL.
- Measurement uncertainty at concentrations 10×RL.
- Determined only in surface waters and near surface groundwater.
- Per mille deviation¹⁵ from SMOW (Standard Mean Oceanic Water).
- TU=Tritium Units, where one TU corresponds to a tritium/hydrogen ratio of 10⁻¹⁸ (1 Bq/L Tritium = 8.45 TU).
- Per mille deviation¹⁵ from SMOC (Standard Mean Oceanic Chloride).
- Per mille deviation¹⁵ from PDB (the standard PeeDee Belemnite).
- The following relation is valid between pmC (percent modern carbon) and Carbon-14 age: pmC = 100×e^{((1950–y–1.03t)/8274)} where y = the year of the C-14 measurement and t = C-14 age.
- Per mille deviation¹⁵ from CDT (the standard Canyon Diablo Troilite).
- Isotope ratio without unit.
- The following expressions are applicable to convert activity to concentration, for uranium-238 and thorium-232: 1 ppm U = 12.4 Bq/kg²³⁸U, 1 ppm Th = 3.93 Bq/kg²³²Th.
- Isotopes are often reported as per mill deviation from a standard. The deviation is calculated as: δ‰ = 1000×(K_{sample}–K_{standard})/K_{standard}, where K= the isotope ratio and ‰ = ²H, ¹⁸O, ³⁷Cl, ¹³C or ³⁴S etc.
- SKB estimation from doublet analyses by the contracted laboratory.

Field measurements

Table A2-1.

Idcode	Date	Sno	Sampling Depth (m)	Water temp. (degrees)	pH (pH unit)	EC (mS/m)	Salinity (per mill)	Turbidity	Light ($\mu\text{mol}/\text{m}^{**2}\cdot\text{s}$)	Oxygen (mg/l)	Oxygen (%)	Chlorophyll (ug/l)	Water Depth (m)	ORP (mV)	Atm.press. (hPa)
PFM000062	2006-07-17	12334	0.50	14.26	8.09	882.5	4.95	0.0	684.6	11.56	116.3	2.4	3.70	57.00	1020.2
PFM000062	2006-07-17		1.01	14.19	8.09	882.1	4.95	0.2	901.7	11.57	116.2	2.3	3.70	56.00	1019.3
PFM000062	2006-07-17		2.00	14.19	8.09	882.3	4.95	0.1	483.8	11.55	116.0	2.8	3.70	55.00	1020.5
PFM000062	2006-07-17		3.00	14.18	8.10	884.4	4.97	0.1	314.0	11.56	116.1	1.7	3.70	54.00	1021.7
PFM000062	2006-08-14	12337	0.50	19.11	8.08	895.1	5.02	-0.5	90.3	9.32	103.7	0.3	3.90	38.00	1009.6
PFM000062	2006-08-14		1.00	19.12	8.10	895.3	5.02	-0.6	70.7	9.33	103.8	0.2	3.90	33.00	1009.9
PFM000062	2006-08-14		2.00	19.11	8.11	894.6	5.02	-0.6	40.5	9.31	103.6	0.3	3.90	30.00	1010.0
PFM000062	2006-08-14		3.01	19.11	8.11	894.4	5.02	-0.4	28.6	9.31	103.6	0.4	3.90	27.00	1010.2
PFM000062	2006-09-11	12358	0.50	15.56	8.06	861.5	4.83	-0.3	193.4	10.21	105.5	3.1	3.80	63.00	1030.2
PFM000062	2006-09-11		1.00	15.53	8.06	861.8	4.83	-0.3	122.5	10.20	105.4	3.2	3.80	63.00	1029.4
PFM000062	2006-09-11		2.00	15.54	8.06	860.8	4.82	-0.3	227.0	10.20	105.3	3.3	3.80	61.00	1029.2
PFM000062	2006-09-11		3.00	15.47	8.06	861.5	4.83	-0.1	136.1	10.17	104.9	2.9	3.80	60.00	1030.3
PFM000062	2006-10-09	12381	0.51	13.00	7.72	874.7	4.91	-0.1	154.3	9.86	96.5	2.1	3.80	123.00	1014.8
PFM000062	2006-10-09		1.01	13.00	7.79	874.6	4.91	-0.1	92.3	9.84	96.2	2.3	3.80	113.00	1015.2
PFM000062	2006-10-09		2.00	13.00	7.83	876.7	4.92	-0.3	57.8	9.83	96.2	2.5	3.80	104.00	1016.1
PFM000062	2006-10-09		3.01	13.00	7.86	877.4	4.92	-0.2	37.4	9.74	95.3	2.6	3.80	97.00	1016.5
PFM000062	2006-11-13	12537	0.50	4.75	7.64	846.9	4.68	1.0	98.3	12.29	98.6	1.2	4.30	120.00	993.5
PFM000062	2006-11-13		1.01	4.77	7.73	847.3	4.68	1.4	70.6	12.25	98.4	2.0	4.30	114.00	994.4
PFM000062	2006-11-13		2.00	4.76	7.79	844.9	4.67	1.3	30.1	12.25	98.3	1.4	4.30	106.00	995.1
PFM000062	2006-11-13		3.02	4.77	7.82	845.3	4.67	1.2	15.1	12.24	98.3	0.8	4.30	103.00	995.3
PFM000062	2006-12-12	12555	0.50	4.63	7.60	884.5	4.90	-0.1	188.5	12.68	101.6	2.5	4.20	99.00	999.6
PFM000062	2006-12-12		1.01	4.64	7.64	904.7	5.02	0.1	54.0	12.59	101.0	2.2	4.20	97.00	999.9
PFM000062	2006-12-12		2.00	4.65	7.65	904.8	5.02	-0.1	27.3	12.57	100.9	2.2	4.20	96.00	1000.6
PFM000062	2006-12-12		3.00	4.66	7.68	904.9	5.02	-0.1	13.0	12.54	100.6	1.9	4.20	94.00	1000.6
PFM000062	2007-01-15	12564	0.50	2.60	7.36	860.9	4.72	4.1	10.9	13.83	105.0	2.2	4.20	134.00	994.8
PFM000062	2007-01-15		1.00	2.63	7.47	856.8	4.70	3.7	5.1	13.81	104.9	2.7	4.20	128.00	995.5
PFM000062	2007-01-15		2.00	2.62	7.52	856.6	4.70	3.7	0.8	13.81	104.8	2.5	4.20	126.00	995.7
PFM000062	2007-01-15		3.00	2.62	7.57	857.1	4.70	3.7	-0.5	13.81	104.9	2.8	4.20	123.00	996.6
PFM000062	2007-02-05	12593	0.50	0.43	7.55	907.2	4.94	0.5	140.3	14.76	105.8	0.5	4.40	148.00	996.9

Idcode	Date	Sno	Sampling Depth (m)	Water temp. (degrees)	pH (pH unit)	EC (mS/m)	Salinity (per mill)	Turbidity	Light ($\mu\text{mol/m}^2\text{s}$)	Oxygen (mg/l)	Oxygen (%)	Chlorophyll ($\mu\text{g/l}$)	Water Depth (m)	ORP (mV)	Atm.press. (hPa)
PFM000062	2007-02-05		1.00	0.46	7.61	906.8	4.94	0.5	103.2	14.70	105.4	0.4	4.40	141.00	998.1
PFM000062	2007-02-05		2.00	0.46	7.65	907.5	4.95	0.5	53.1	14.67	105.2	0.6	4.40	137.00	998.9
PFM000062	2007-02-05		3.00	0.46	7.68	907.5	4.94	0.5	27.9	14.65	105.0	1.5	4.40	132.00	999.4
PFM000062	2007-03-05	12592	0.50	1.23	7.43	918.5	5.03	-0.5	164.1	15.62	114.4	1.5	4.00	135.00	1019.5
PFM000062	2007-03-05		1.00	1.18	7.49	918.2	5.03	-0.5	119.2	15.66	114.6	-0.3	4.00	130.00	1020.4
PFM000062	2007-03-05		2.00	1.34	7.54	919.4	5.04	-0.7	61.7	15.64	115.0	-0.1	4.00	126.00	1021.0
PFM000062	2007-03-05		3.01	1.34	7.58	919.9	5.04	-0.5	38.5	15.62	114.9	0.9	4.00	123.00	1021.0
PFM000062	2007-04-02	12745	0.50	2.83	7.60	904.6	4.99	-0.8	1224.8	16.28	124.6	1.4	3.90	83.00	1019.1
PFM000062	2007-04-02		1.00	2.84	7.65	904.5	4.99	-0.8	342.5	16.28	124.5	1.4	3.90	81.00	1018.8
PFM000062	2007-04-02		2.00	2.73	7.77	907.3	5.00	-0.7	268.8	16.34	124.7	2.5	3.90	82.00	1019.0
PFM000062	2007-04-02		3.00	2.71	7.89	908.2	5.00	-0.8	114.0	16.38	124.9	4.6	3.90	82.00	1019.5
PFM000062	2007-05-07	12779	0.50	6.58	8.07	871.7	4.85	-0.8	349.5	12.94	108.9	1.1	3.70	177.00	997.8
PFM000062	2007-05-07		1.01	6.57	8.08	871.8	4.85	-0.8	255.6	12.89	108.5	0.6	3.70	175.00	998.0
PFM000062	2007-05-07		2.00	6.59	8.09	871.5	4.85	-0.8	133.1	12.85	108.2	1.2	3.70	172.00	998.3
PFM000062	2007-05-07		3.00	6.58	8.10	871.8	4.85	-0.7	73.3	12.82	107.9	1.2	3.70	171.00	998.4
PFM000062	2007-05-28	12797	0.51	10.25	8.03	906.1	5.08	0.0	88.5	12.19	112.2	1.5	3.90	132.00	
PFM000062	2007-05-28		1.00	10.25	8.04	905.9	5.08	0.1	63.9	12.18	112.1	1.9	3.90	134.00	
PFM000062	2007-05-28		2.00	10.25	8.04	906.5	5.09	-0.2	30.7	12.18	112.1	1.6	3.90	136.00	
PFM000062	2007-05-28		3.00	10.25	8.05	906.6	5.09	-0.1	14.8	12.16	111.9	2.3	3.90	138.00	
PFM000062	2007-06-25	12815	0.50	12.82	7.82	907.1	5.10			13.32	129.9		4.00	127.00	
PFM000062	2007-06-25		1.00	12.32	7.88	907.6	5.10			13.31	128.4		4.00	122.00	
PFM000062	2007-06-25		2.00	12.12	7.89	903.6	5.08			13.37	128.4		4.00	121.00	
PFM000062	2007-06-25		3.00	12.12	7.89	906.7	5.10			13.35	128.2		4.00	121.00	
PFM000066	2006-11-13	12382	0.22	1.18	7.45	33.5	0.16			7.50	53.1		0.40	98.00	992.2
PFM000066	2006-12-12	12385	0.32	3.17	7.49	37.4	0.18			7.71	57.6		0.35	85.00	999.3
PFM000066	2007-01-15	12565	0.29	0.72	7.24	35.8	0.17			6.88	48.1			102.00	993.0
PFM000066	2007-02-05	12591	0.27	0.27	7.77	41.2	0.20			5.65	39.0		30.00	106.00	990.9
PFM000066	2007-03-06	12722	0.15	0.47	7.24	42.9	0.20			5.54	38.5		0.25	51.00	1011.2
PFM000066	2007-04-02	12748	0.37	6.15	7.33	31.8	0.15			6.89	55.6		0.35	71.00	1014.3
PFM000066	2007-05-08	12781	0.19	11.86	7.68	37.8	0.18			8.45	78.3		0.20	103.00	991.3
PFM000066	2007-05-28	12799	0.17	9.32	7.43	32.9	0.16			7.82	68.2		0.15	194.00	
PFM000066	2007-06-25	12811	0.15	14.62	7.33	32.7	0.16			6.14	60.5		0.20	78.00	

Idcode	Date	Sno	Sampling Depth (m)	Water temp. (degrees)	pH (pH unit)	EC (mS/m)	Salinity (per mill)	Turbidity	Light ($\mu\text{mol/m}^2\text{s}$)	Oxygen (mg/l)	Oxygen (%)	Chlorophyll (ug/l)	Water Depth (m)	ORP (mV)	Atm.press. (hPa)
PFM000068	2006-09-11	12370	0.26	12.57	7.33	64.8	0.32			7.92	74.6		0.20	45.00	1022.2
PFM000068	2006-11-13	12538	0.67	1.55	7.21	34.3	0.16			7.26	51.9		0.70	104.00	993.6
PFM000068	2006-12-12	12558	0.36	3.53	7.29	35.0	0.17			7.33	55.3		0.75	79.00	1000.6
PFM000068	2007-01-15	12563	0.70	0.55	7.42	32.3	0.15			8.64	60.0			95.00	993.9
PFM000068	2007-02-06	12595	0.14	-0.22	7.42	35.1	0.17			10.90	74.2		0.55	95.00	1006.7
PFM000068	2007-03-06	12719	0.38	0.10	7.32	42.1	0.20			8.96	61.5		0.45	49.00	1012.6
PFM000068	2007-04-03	12746	0.45	3.95	7.23	33.0	0.16			7.78	59.3		0.50	70.00	1016.8
PFM000068	2007-05-08	12778	0.57	7.65	7.40	44.5	0.22			7.81	65.5		0.50	98.00	996.8
PFM000068	2007-05-28	12795	0.41	8.69	7.47	43.8	0.21			8.06	69.3		0.40	182.00	
PFM000068	2007-06-26	12814	0.47	12.29	7.48	49.2	0.24			8.54	79.9		0.50	29.00	
PFM000069	2006-11-13	12536	0.34	1.79	7.29	41.2	0.20			5.00	36.0		0.50	106.00	994.5
PFM000069	2006-12-12	12557	0.37	3.45	7.49	42.3	0.20			5.12	38.5		0.40	83.00	1000.8
PFM000069	2007-01-15	12569	0.27	0.70	7.48	44.5	0.21			4.58	32.0			76.00	995.1
PFM000069	2007-02-06	12594	0.10	-0.19	7.43	48.9	0.23			4.65	31.7		0.30	43.00	1006.3
PFM000069	2007-03-06	12721	0.16	0.08	7.36	53.2	0.25			5.27	36.2		0.15	-1.00	1011.9
PFM000069	2007-04-02	12749	0.11	4.81	7.14	37.2	0.18			5.73	44.7		0.30	59.00	1014.6
PFM000069	2007-05-08	12785	0.21	7.26	7.31	44.6	0.22			7.87	65.4		0.15	80.00	990.0
PFM000069	2007-05-28	12796	0.22	8.58	7.33	42.8	0.21			7.89	67.6		0.10	115.00	
PFM000069	2007-06-26	12813	0.13	12.66	7.56	3.8	0.02			10.75	101.3		0.10	77.00	
PFM000070	2006-09-11	12371	0.19	13.80	7.20	33.9	0.16			5.79	56.0		0.10	0.00	1021.6
PFM000070	2006-11-13	12383	0.31	0.98	7.99	22.2	0.10			13.12	92.3		0.30	97.00	993.4
PFM000070	2006-12-12	12539	0.39	2.98	7.78	25.9	0.12			12.00	89.2		0.40	87.00	1000.7
PFM000070	2007-01-16	12570	0.30	1.25	7.77	18.1	0.09			10.76	76.3			77.00	994.6
PFM000070	2007-02-06	12597	0.05	0.28	7.63	29.1	0.14			9.65	66.5		0.30	70.00	1005.5
PFM000070	2007-03-05	12714	0.21	0.42	7.59	31.0	0.15			10.26	71.1		0.20	19.00	1017.7
PFM000070	2007-04-02	12750	0.27	9.07	7.64	28.7	0.14			10.83	93.9		0.30	76.00	1017.2
PFM000070	2007-05-07	12780	0.16	11.23	7.20	27.2	0.13			5.48	50.0		0.15	166.00	992.9
PFM000070	2007-05-28	12802	0.22	9.64	7.29	27.3	0.13			7.13	62.7		0.20	140.00	
PFM000070	2007-06-25	12810	0.13	16.84	7.13	31.7	0.15			6.79	70.0		0.10	130.00	
PFM000074	2006-07-17	12336	0.30	21.31	8.13	35.4	0.17	0.0	75.8	12.93	146.0	9.1	0.50	-22.00	1013.0
PFM000074	2006-08-15	12355	0.28	19.17	7.84	37.0	0.18	-0.7	14.7	5.82	63.0	6.0	0.30	-8.00	1000.8

Idcode	Date	Sno	Sampling Depth (m)	Water temp. (degrees)	pH (pH unit)	EC (mS/m)	Salinity (per mill)	Turbidity	Light ($\mu\text{mol/m}^2\text{s}$)	Oxygen (mg/l)	Oxygen (%)	Chlorophyll ($\mu\text{g/l}$)	Water Depth (m)	ORP (mV)	Atm.press. (hPa)
PFM000074	2006-09-12	12369	0.33	13.86	7.94	38.4	0.19	-1.0	217.7	9.41	91.1	5.7	0.40	59.00	1022.6
PFM000074	2006-10-10	12338	0.35	9.02	8.04	38.8	0.19	-0.5	82.3	7.69	66.6	5.7	0.40	43.00	1022.0
PFM000074	2006-12-13	12556	0.50	3.20	7.83	38.3	0.18	-1.4	14.1	7.83	58.6	11.9	1.00	117.00	994.2
PFM000074	2007-02-06	12599	0.50	0.57	7.92	54.8	0.26	0.1	12.5	4.99	34.7	20.9	1.00	-205.00	1004.6
PFM000074	2007-03-06	12720	0.45	0.27	7.81	46.9	0.22	-0.5	26.4	4.17	28.8	24.6	0.70	-151.00	1012.8
PFM000074	2007-04-03	12747	0.51	4.55	7.65	38.7	0.19	-1.4	242.1	7.55	58.5	5.7	0.90	-83.00	1017.8
PFM000074	2007-05-08	12782	0.51	13.73	7.81	42.5	0.21	0.9	93.7	10.56	102.0	206.8	0.60	99.00	989.1
PFM000074	2007-05-29	12798	0.50	11.76	7.54	42.8	0.21	-0.3	24.7	4.47	41.3	11.4	0.60	53.00	
PFM000074	2007-06-26	12812	0.49	18.97	7.54	39.2	0.19			13.40	144.5		0.60	-25.00	
PFM000097	2006-07-18		0.50	18.04	8.03	66.8	0.33	2.4	544.8	7.44	78.8	8.4	0.60	-34.00	1020.1
PFM000097	2006-08-15		0.47	18.84	7.88	84.2	0.41	0.2	38.0	5.50	59.3	5.9	0.50	4.00	1000.7
PFM000097	2006-09-12		0.51	13.57	8.17	92.0	0.46	0.8	146.7	9.52	91.8	5.3	0.60	-13.00	1021.9
PFM000097	2006-10-10		0.50	8.85	8.03	145.4	0.73	-0.6	35.9	10.46	90.6	5.3	0.50	39.00	1020.5
PFM000097	2006-12-13		0.50	2.69	8.08	59.0	0.28	-1.0	2.4	12.70	93.7	7.9	1.00	81.00	993.9
PFM000097	2007-01-16		0.51	1.54	7.47	727.0	3.93	0.0	3.2	11.31	82.9	3.7	1.20	37.00	987.9
PFM000097	2007-02-06		0.50	1.36	7.39	698.3	3.76	-0.2	1.2	10.47	76.3	2.9	1.10	127.00	1002.4
PFM000097	2007-03-06	12718	0.50	2.09	7.24	568.0	3.03	8.1	1.6	0.80	5.9	13.0	0.70	-272.00	1011.6
PFM000097	2007-04-03		0.50	6.13	7.97	180.4	0.92	-0.8	62.7	12.34	100.1	5.3	0.70	67.00	1014.7
PFM000097	2007-05-08		0.47	11.11	8.45	174.5	0.89	0.4	400.6	11.52	105.4	3.4	0.50	104.00	991.3
PFM000097	2007-05-29		0.51	10.13	7.95	178.7	0.91	-0.1	19.2	9.40	84.0	4.5	0.60	27.00	
PFM000097	2007-06-26		0.50	19.58	8.52	196.8	1.01			14.35	157.5		0.60	152.00	
PFM000107	2006-07-17	12335	0.50	21.53	9.06	49.0	0.24	0.0	695.2	11.93	135.4	4.7	1.60	-22.00	1019.7
PFM000107	2006-07-17		1.00	21.50	9.07	49.1	0.24	0.2	294.0	11.90	135.0	4.4	1.60	-21.00	1020.1
PFM000107	2006-08-14	12357	0.50	20.86	9.07	70.3	0.34	0.5	501.5	9.76	109.4	2.6	1.50	-7.00	1010.6
PFM000107	2006-08-14		1.00	20.85	9.10	70.3	0.34	0.4	383.2	9.78	109.6	1.9	1.50	-11.00	1011.2
PFM000107	2006-09-11	12368	0.50	14.72	8.85	68.5	0.34	0.5	263.7	12.60	124.4	2.8	1.70	27.00	1025.7
PFM000107	2006-09-11		1.00	14.72	8.85	68.8	0.34	0.4	563.5	12.57	124.1	2.9	1.70	27.00	1025.5
PFM000107	2006-10-09	12333	0.51	11.60	8.26	75.3	0.37	-1.1	196.0	10.38	95.7	2.9	1.70	72.00	1017.9
PFM000107	2006-10-09		1.00	11.63	8.20	75.2	0.37	-1.0	294.6	10.30	95.0	2.6	1.70	69.00	1018.1
PFM000107	2006-12-12	12540	0.50	3.52	7.77	53.8	0.26	-1.2	5.4	13.28	100.2	7.1	2.00	104.00	1001.4
PFM000107	2006-12-12		1.00	3.52	7.82	53.7	0.26	-1.3	1.8	13.25	100.0	8.1	2.00	99.00	1001.7
PFM000107	2007-01-15	12566	0.50	-0.09	8.15	121.6	0.59	0.0	2.0	14.61	100.1	8.2	2.10	167.00	996.4

Idcode	Date	Sno	Sampling Depth (m)	Water temp. (degrees)	pH (pH unit)	EC (mS/m)	Salinity (per mill)	Turbidity	Light ($\mu\text{mol/m}^2\text{s}$)	Oxygen (mg/l)	Oxygen (%)	Chlorophyll ($\mu\text{g/l}$)	Water Depth (m)	ORP (mV)	Atm.press. (hPa)
PFM000107	2007-01-15		1.01	0.43	7.72	369.8	1.91	0.0	-0.8	13.49	94.7	6.4	2.10	163.00	997.2
PFM000107	2007-02-05	12590	0.50	0.91	7.80	228.5	1.15	-1.1	12.8	11.33	80.2	5.2	1.80	150.00	996.8
PFM000107	2007-02-05	12567	1.00	1.39	7.48	500.3	2.64	-1.2	7.6	9.41	68.2	3.8	1.80	155.00	997.4
PFM000107	2007-03-05	12715	0.50	0.98	7.63	217.9	1.10	-1.4	11.4	9.27	65.6	5.3	1.70	151.00	1021.2
PFM000107	2007-03-05	12717	1.00	2.45	7.37	466.2	2.46	-1.5	6.2	5.38	40.0	4.1	1.70	150.00	1022.0
PFM000107	2007-04-02	12744	0.50	7.75	7.51	161.6	0.82	-1.4	162.2	13.75	116.0	4.6	1.70	100.00	1021.8
PFM000107	2007-04-02		1.00	7.77	7.55	161.5	0.82	-1.4	77.6	13.75	116.1	4.6	1.70	99.00	1021.8
PFM000107	2007-05-07	12784	0.50	12.72	8.86	150.4	0.76	-1.0	141.8	12.48	118.3	2.5	1.70	116.00	996.2
PFM000107	2007-05-07		1.01	12.73	8.85	150.2	0.76	-0.9	78.9	12.25	116.1	2.9	1.70	115.00	996.1
PFM000107	2007-05-28	12800	0.51	15.61	8.87	153.3	0.78	-0.6	52.9	10.03	101.2	2.2	1.70	183.00	
PFM000107	2007-05-28		1.00	15.61	8.88	153.3	0.78	-0.5	28.8	10.02	101.1	2.6	1.70	179.00	
PFM000107	2007-06-25	12808	0.50	19.98	8.87	151.8	0.77			13.21	145.8		1.70	86.00	
PFM000107	2007-06-25		1.00	19.79	8.91	151.6	0.77			13.54	148.9		1.70	83.00	
PFM000117	2006-07-18	12339	0.50	20.41	8.96	19.8	0.09	-0.7	1086.5	10.56	117.1	3.0	2.00	-33.00	1020.7
PFM000117	2006-07-18		1.01	20.37	8.97	19.8	0.09	-0.2	473.6	10.56	117.0	3.0	2.00	-34.00	1020.7
PFM000117	2006-07-18		1.50	20.36	8.97	19.8	0.09	-0.6	343.3	10.54	116.8	3.4	2.00	-35.00	1020.9
PFM000117	2006-08-14	12332	0.50	20.99	8.90	18.3	0.09	0.0	448.9	9.50	106.6	1.8	2.10	-4.00	1012.1
PFM000117	2006-08-14		1.00	20.72	8.88	18.4	0.09	0.5	570.1	9.38	104.6	0.4	2.10	-4.00	1013.1
PFM000117	2006-08-14		1.50	20.57	8.88	18.4	0.09	0.2	227.1	9.36	104.1	1.3	2.10	-5.00	1013.9
PFM000117	2006-09-11	12356	0.51	15.17	8.71	19.2	0.09	-0.3	193.5	11.66	116.1	3.6	2.10	34.00	1022.5
PFM000117	2006-09-11		1.00	15.13	8.72	19.2	0.09	0.0	121.3	11.69	116.3	3.7	2.10	33.00	1022.6
PFM000117	2006-09-11		1.50	14.97	8.74	19.2	0.09	-0.6	82.5	11.89	117.9	3.1	2.10	32.00	1022.8
PFM000117	2006-10-09	12384	0.51	12.29	8.51	20.5	0.10	-0.9	234.3	10.53	98.4	2.4	2.10	56.00	1018.5
PFM000117	2006-10-09		1.00	12.28	8.51	20.5	0.10	-1.1	139.9	10.53	98.4	0.7	2.10	55.00	1018.8
PFM000117	2006-10-09		1.50	12.28	8.51	20.6	0.10	-1.1	95.7	10.51	98.2	2.6	2.10	54.00	1019.5
PFM000117	2006-12-13	12554	0.50	3.28	8.20	26.0	0.12	-1.2	14.1	12.87	96.4	6.8	2.10	114.00	993.7
PFM000117	2006-12-13		1.00	3.27	8.18	26.1	0.12	-1.3	7.8	12.86	96.3	7.2	2.10	109.00	994.0
PFM000117	2006-12-13		1.50	3.27	8.16	26.1	0.12	-1.3	4.1	12.85	96.2	7.3	2.10	105.00	994.0
PFM000117	2007-02-05	12568	0.50	2.27	7.80	29.7	0.14	-1.4	3.3	12.16	88.7	6.0	2.20	239.00	997.6
PFM000117	2007-02-05		1.00	3.68	7.71	31.0	0.15	-1.3	0.7	8.85	67.0	6.1	2.20	235.00	998.0
PFM000117	2007-02-05	12596	1.50	4.34	7.65	33.2	0.16	-1.3	0.4	4.38	33.7	6.8	2.20	184.00	998.6

Idcode	Date	Sno	Sampling Depth (m)	Water temp. (degrees)	pH (pH unit)	EC (mS/m)	Salinity (per mill)	Turbidity	Light ($\mu\text{mol}/\text{m}^2\cdot\text{s}$)	Oxygen (mg/l)	Oxygen (%)	Chlorophyll ($\mu\text{g}/\text{l}$)	Water Depth (m)	ORP (mV)	Atm.press. (hPa)
PFM000117	2007-03-05	12716	0.50	1.46	7.60	33.3	0.16	-1.2	7.3	9.43	67.2	6.7	1.90	143.00	1018.3
PFM000117	2007-03-05		1.00	2.83	7.55	33.9	0.16	-1.2	4.5	5.19	38.4	6.4	1.90	136.00	1018.4
PFM000117	2007-03-05	12713	1.50	4.11	7.98	35.4	0.17	-1.3	2.2	0.64	4.9	8.6	1.90	-206.00	1019.0
PFM000117	2007-04-02	12751	0.51	7.51	7.81	29.2	0.14	-1.4	139.3	13.74	114.7	8.2	2.20	90.00	1018.5
PFM000117	2007-04-02		1.00	7.45	7.75	29.2	0.14	-1.3	73.2	13.72	114.4	5.5	2.20	86.00	1018.8
PFM000117	2007-04-02		1.50	7.38	7.75	29.2	0.14	-1.3	37.3	13.75	114.5	6.4	2.20	82.00	1019.0
PFM000117	2007-05-07	12783	0.50	13.01	8.64	27.2	0.13	-0.8	283.7	12.80	121.6	3.7	2.00	165.00	995.5
PFM000117	2007-05-07		1.01	13.01	8.63	27.2	0.13	-0.8	291.2	12.22	116.1	4.8	2.00	166.00	996.2
PFM000117	2007-05-07		1.50	13.00	8.63	27.3	0.13	-0.9	277.2	12.12	115.1	4.1	2.00	166.00	996.9
PFM000117	2007-05-28	12801	0.50	16.03	8.71	25.7	0.12	0.2	49.5	10.82	109.8	6.4	2.10	192.00	
PFM000117	2007-05-28		1.00	16.03	8.72	25.7	0.12	0.4	31.8	10.82	109.7	8.4	2.10	191.00	
PFM000117	2007-05-28		1.51	16.03	8.71	25.7	0.12	0.2	20.0	10.80	109.6	7.1	2.10	189.00	
PFM000117	2007-06-25	12809	0.50	20.76	8.43	22.7	0.11			12.43	138.8		2.10	93.00	
PFM000117	2007-06-25		1.00	19.43	8.47	22.6	0.11			12.63	137.4		2.10	92.00	
PFM000117	2007-06-25		1.50	19.32	8.57	22.4	0.11			13.27	144.1		2.10	88.00	
PFM102269	2006-07-17	12348	0.50	25.91	8.05	883.4	4.92	22.7	241.2	10.40	131.5	2.0		-15.00	1016.6
PFM102269	2006-08-14	12365	0.50	29.78	8.08	901.2	5.00	-0.6	281.2	8.46	114.6	-0.9		-18.00	1009.5
PFM102269	2006-09-12	12372	0.50	25.60	8.01	863.7	4.80	-0.1	631.2	8.78	110.4	1.7		54.00	1022.7
PFM102269	2006-10-10	12359	0.50	23.65	7.94	876.9	4.89	-1.1	203.2	8.92	108.3	1.6		64.00	1023.9
PFM102269	2006-11-13	12542	0.50	14.93	7.57	835.5	4.67	0.9		11.24	114.5	1.3		112.00	994.7
PFM102269	2006-12-12	12559	0.50	14.82	7.65	892.4	5.01	-0.4		11.58	118.0	2.2		113.00	1001.3
PFM102269	2007-01-16	12571	0.50	13.21	7.70	841.3	4.71	1.5	21.6	11.93	117.1	1.7		105.00	996.1
PFM102269	2007-02-05	12598	0.50	10.76	7.55	882.0	4.94	0.5		13.23	123.1	0.3		136.00	991.0
PFM102269	2007-03-06	12712	0.50	11.57	7.49	898.7	5.05	-0.7	74.7	12.83	121.7	0.8		56.00	1012.3
PFM102269	2007-04-03	12743	0.50	14.14	8.06	886.4	4.98	-0.6	333.1	13.30	133.5	3.0		87.00	1017.3
PFM102269	2007-05-08	12777	0.50	17.11	8.06	857.7	4.80	-0.5	1513.5	12.47	133.1	1.1		151.00	992.3
PFM102269	2007-05-29	12794	0.51	18.51	7.87	899.3	5.05	0.1	122.3	9.96	109.6	1.5		149.00	
PFM102269	2007-06-25	12807	0.50	13.54	7.64	908.1	5.11			10.98	108.9			173.00	

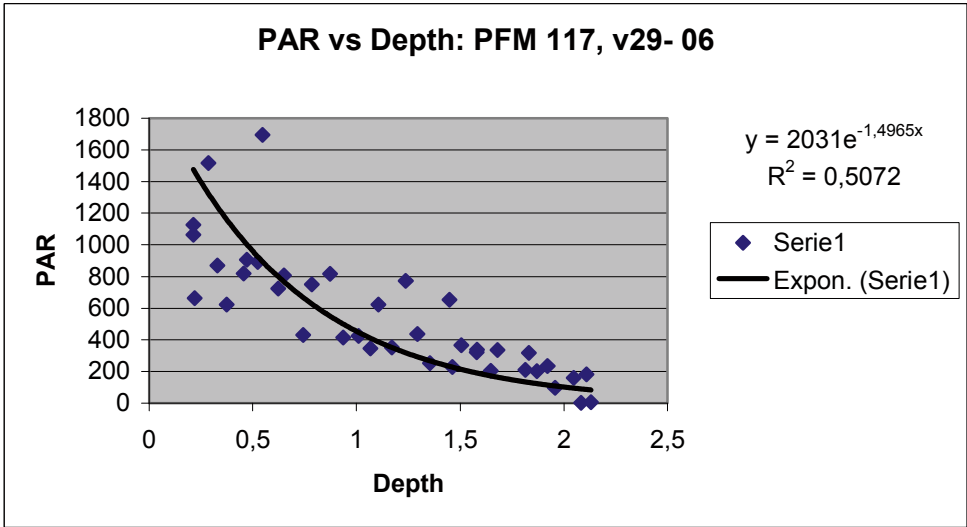
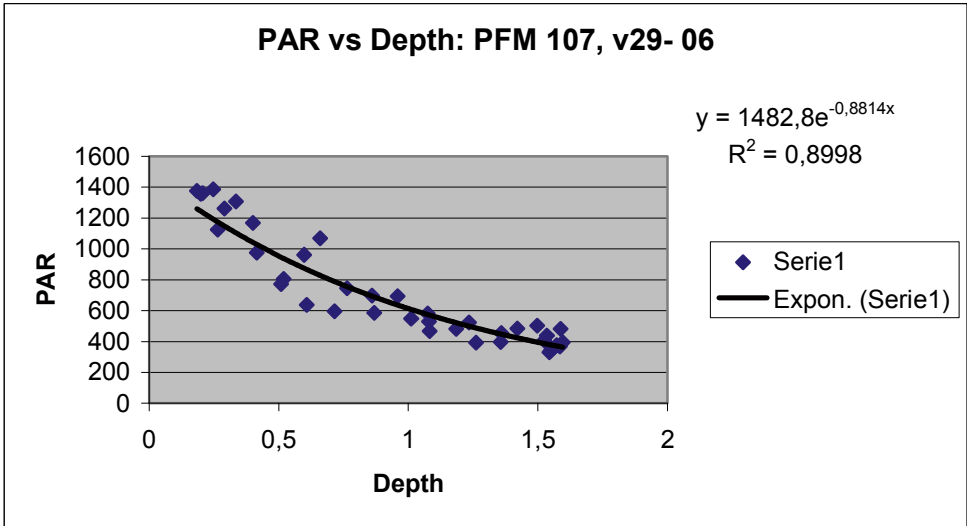
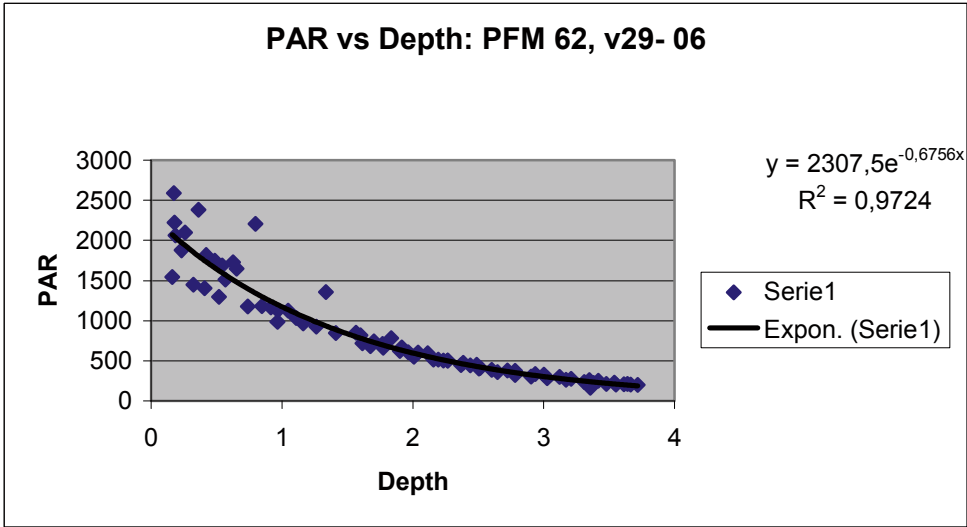
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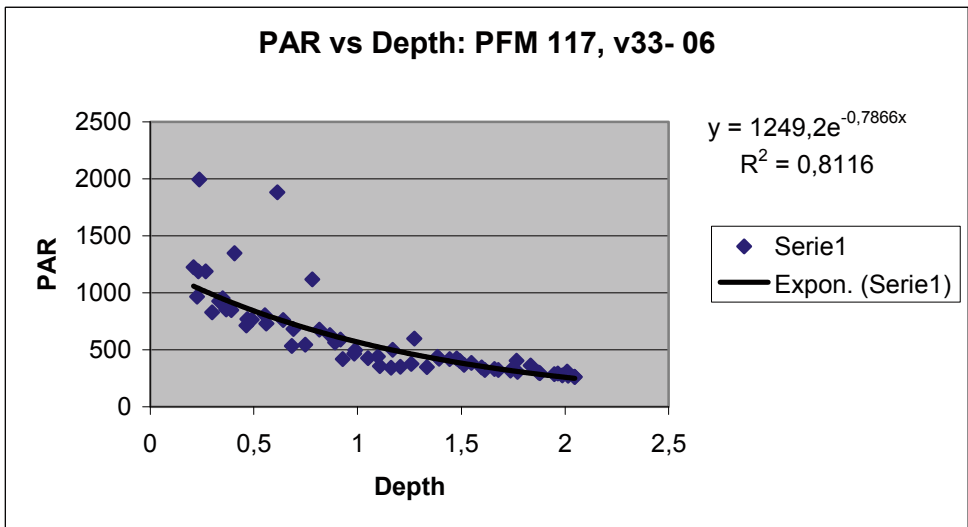
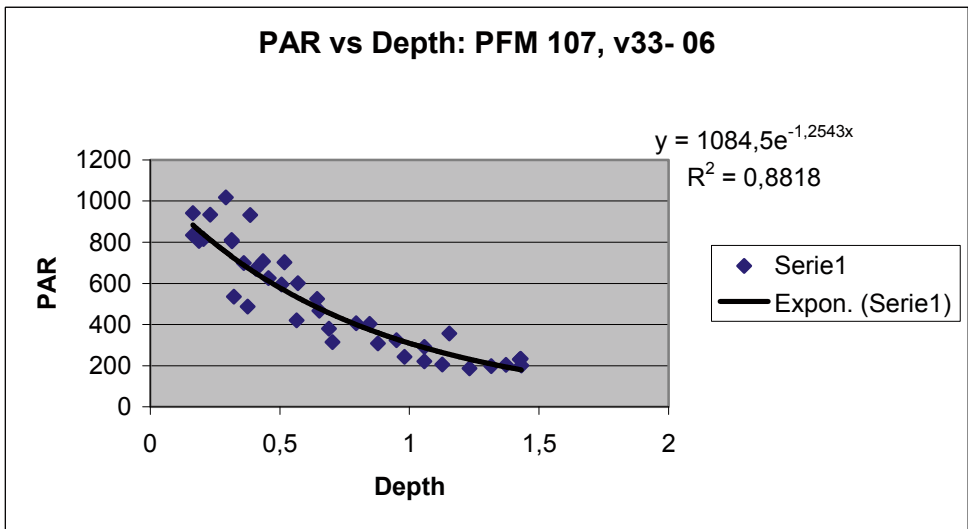
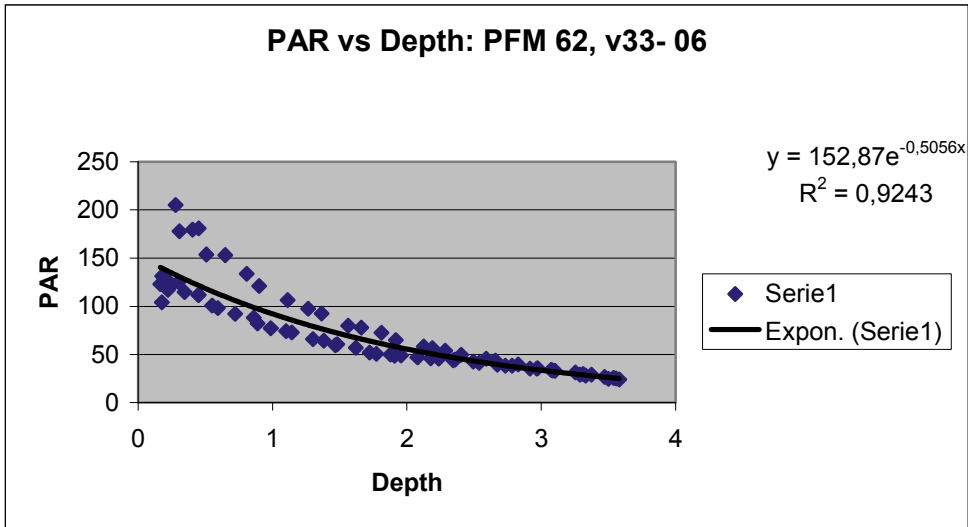
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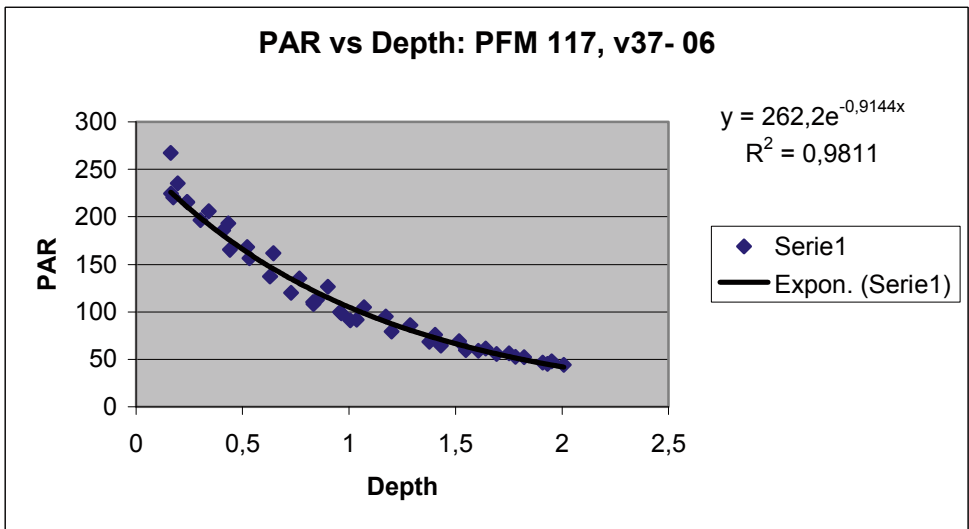
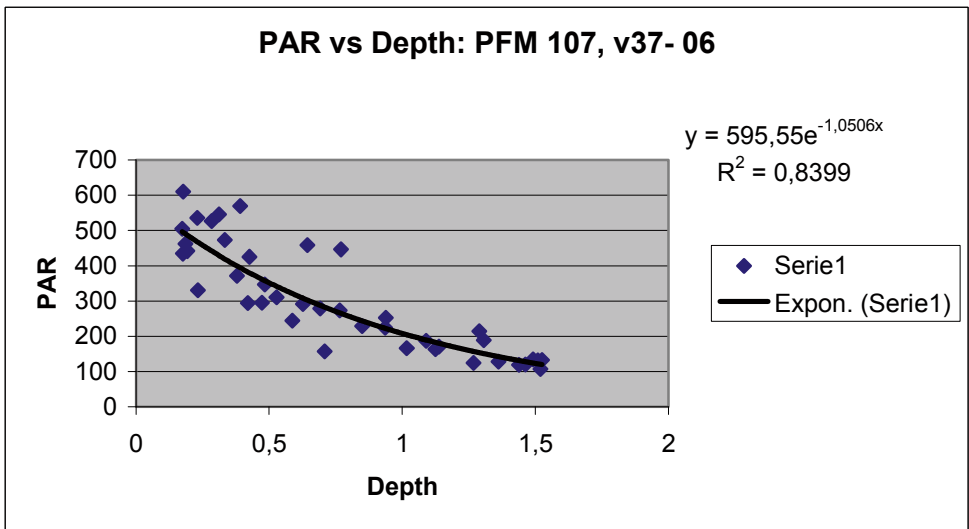
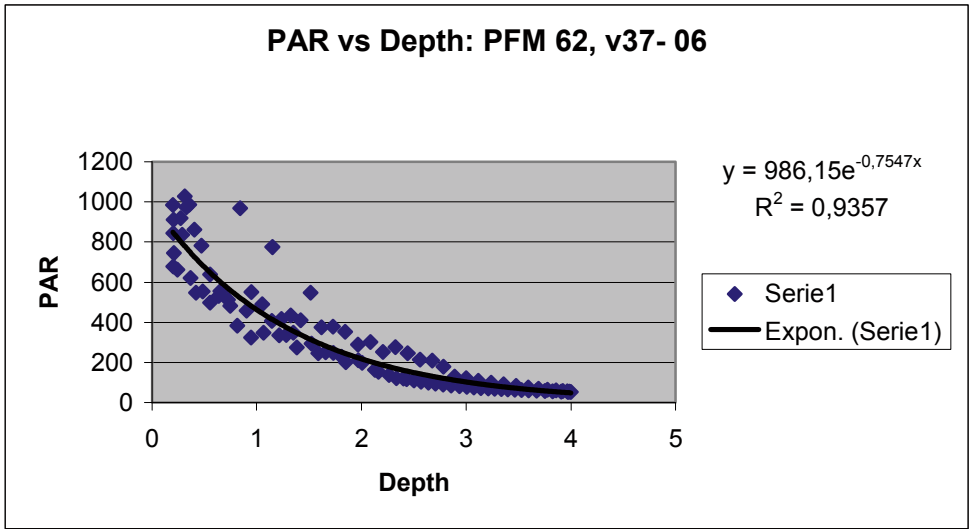
Atm.press. = Atmospheric pressure

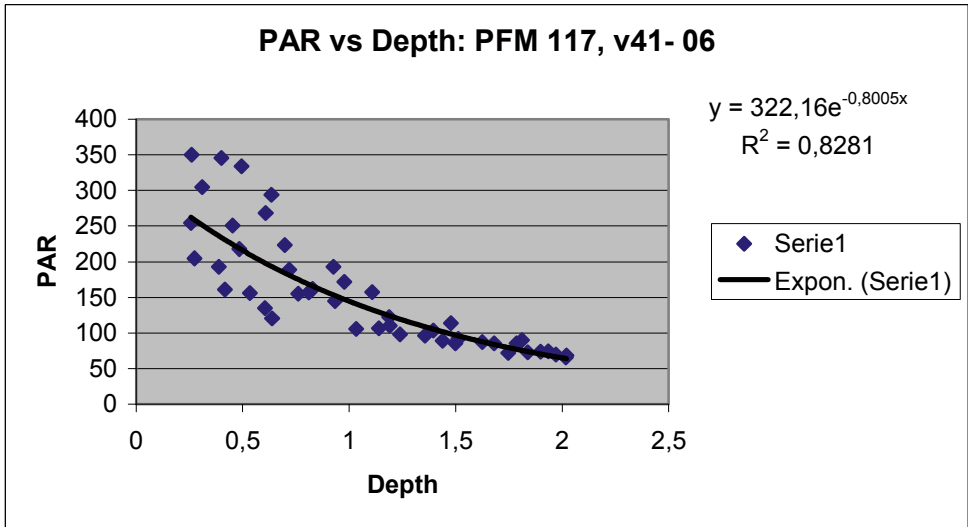
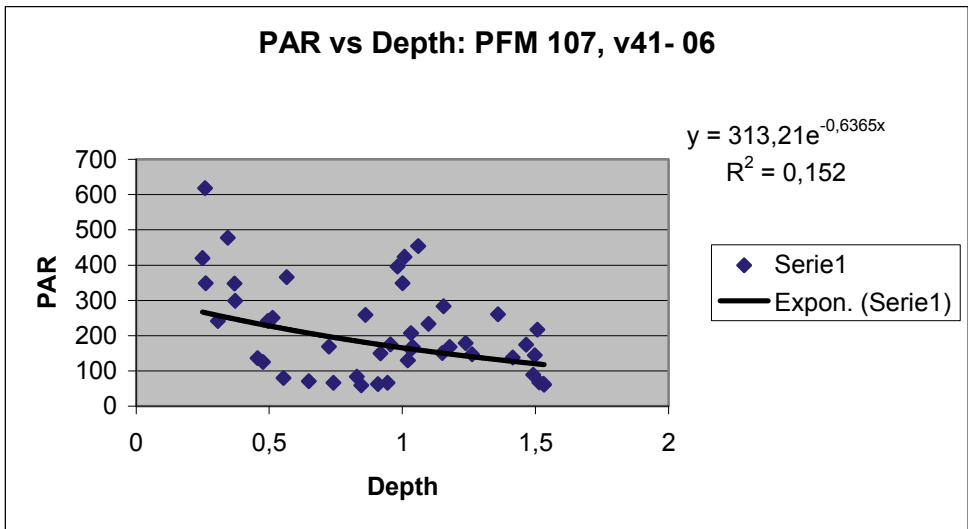
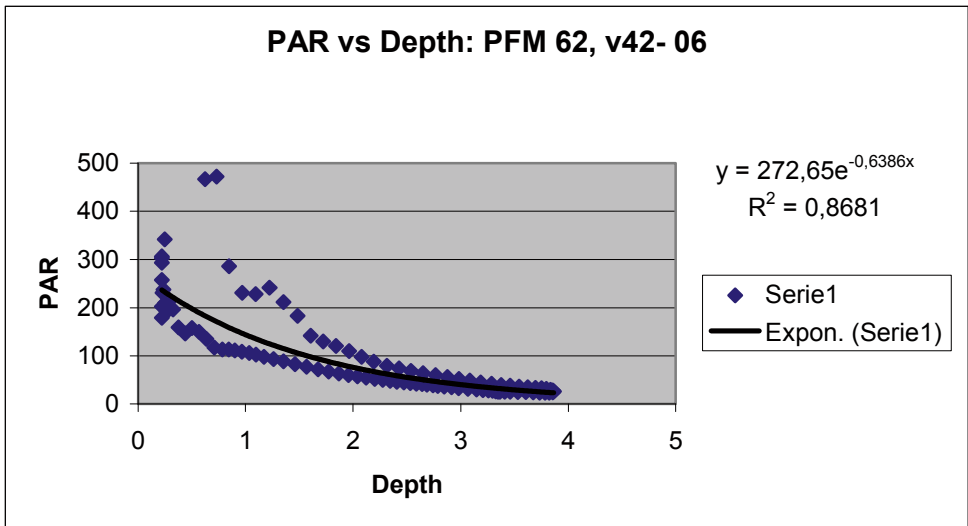
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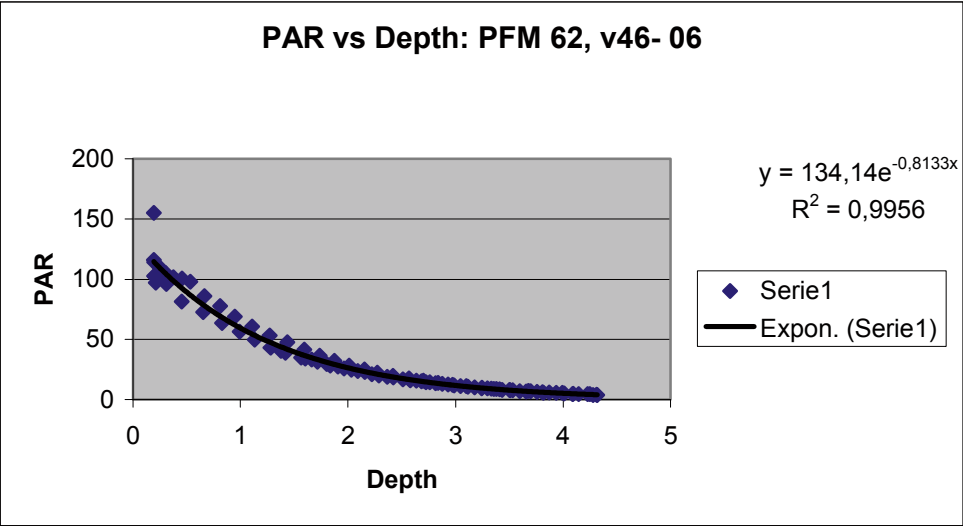
PAR-profile logs

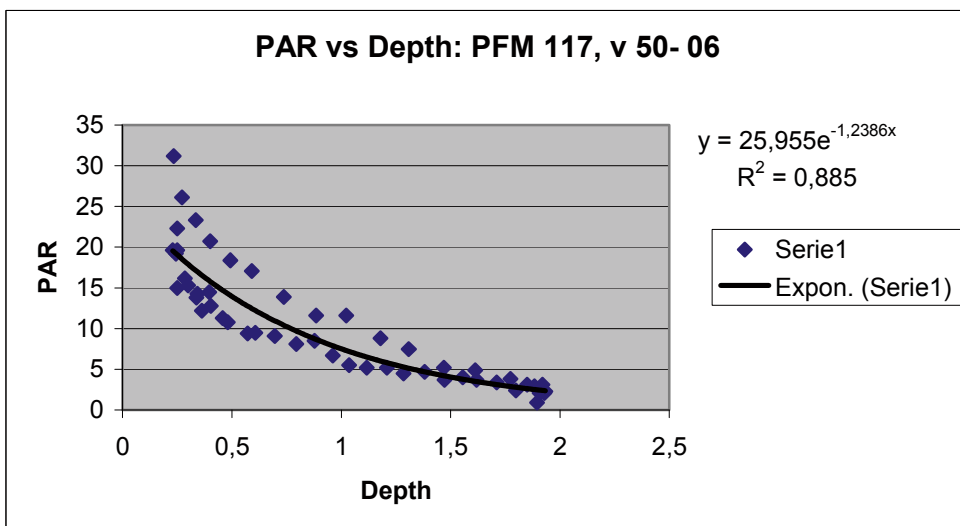
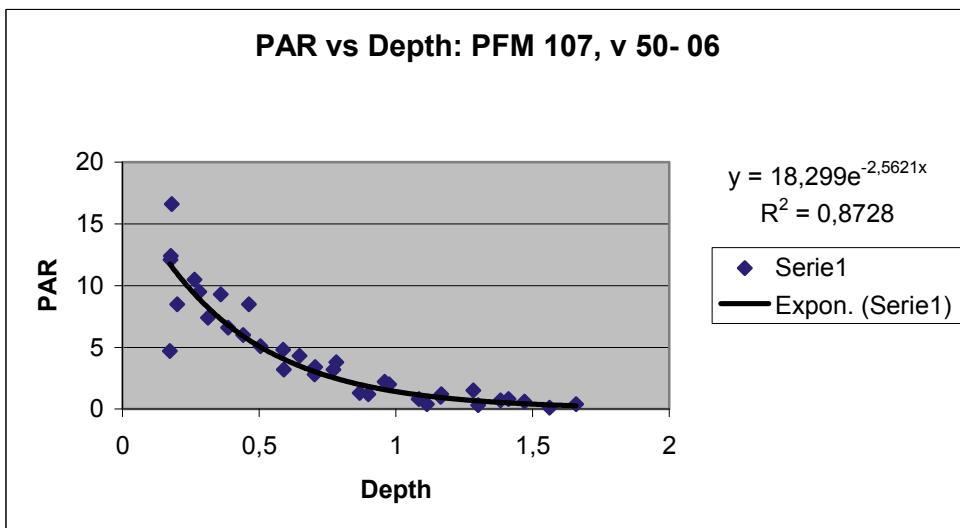
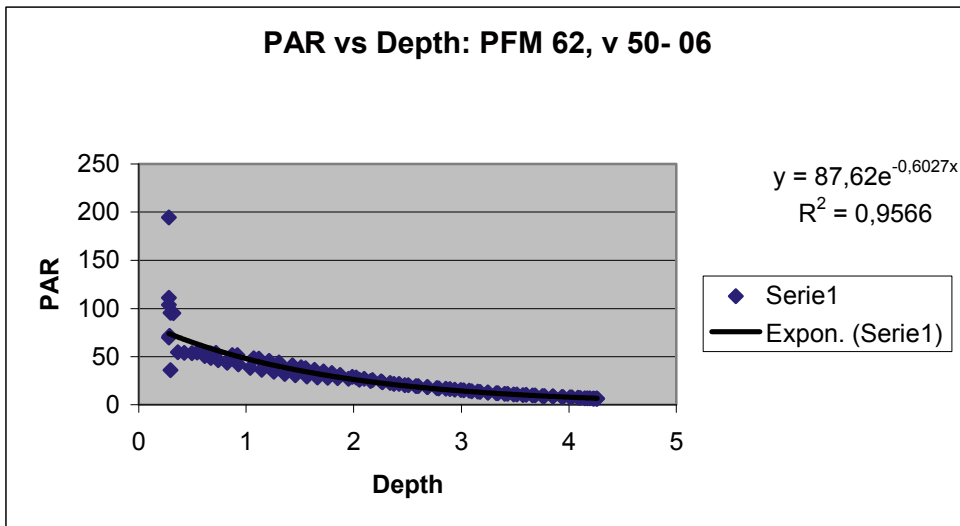


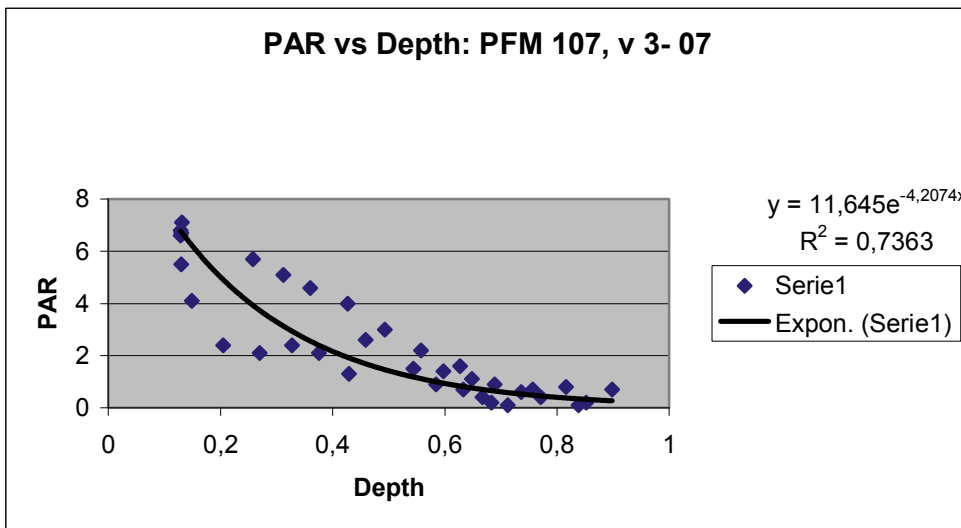
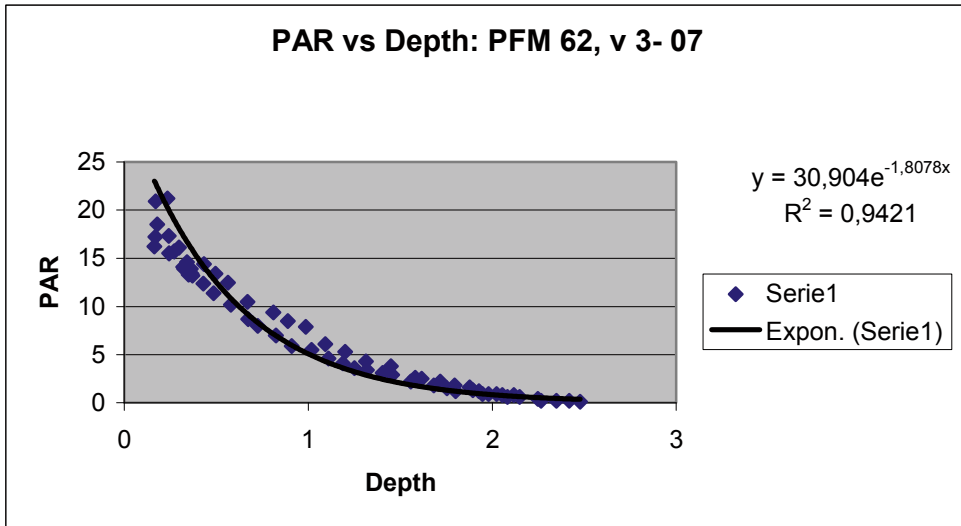


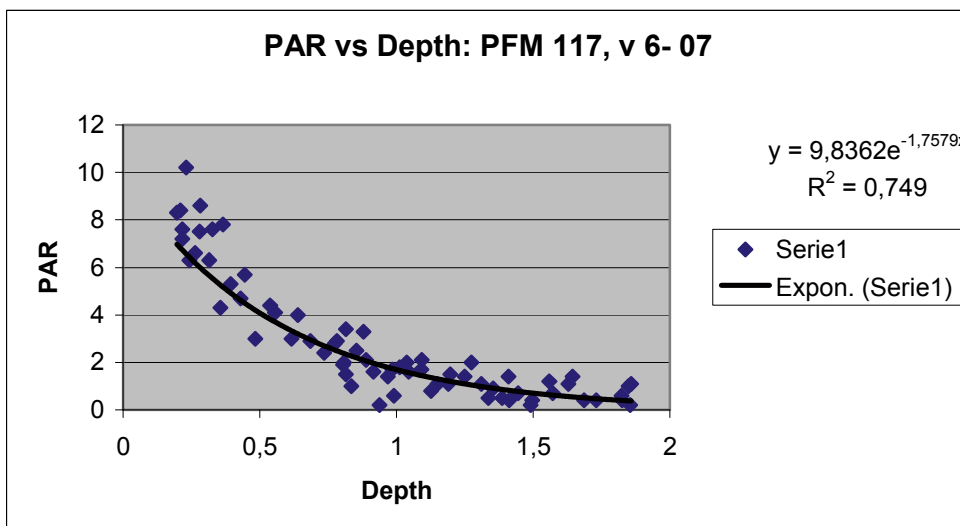
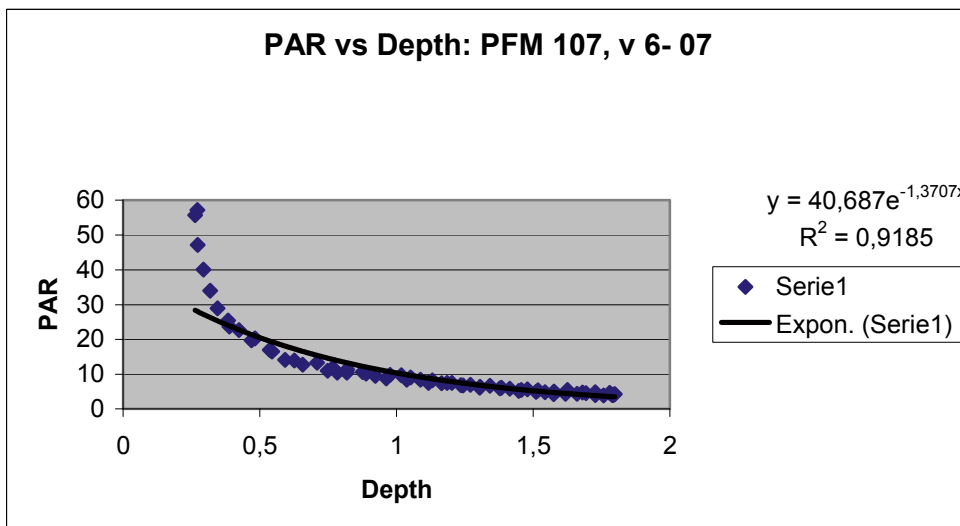
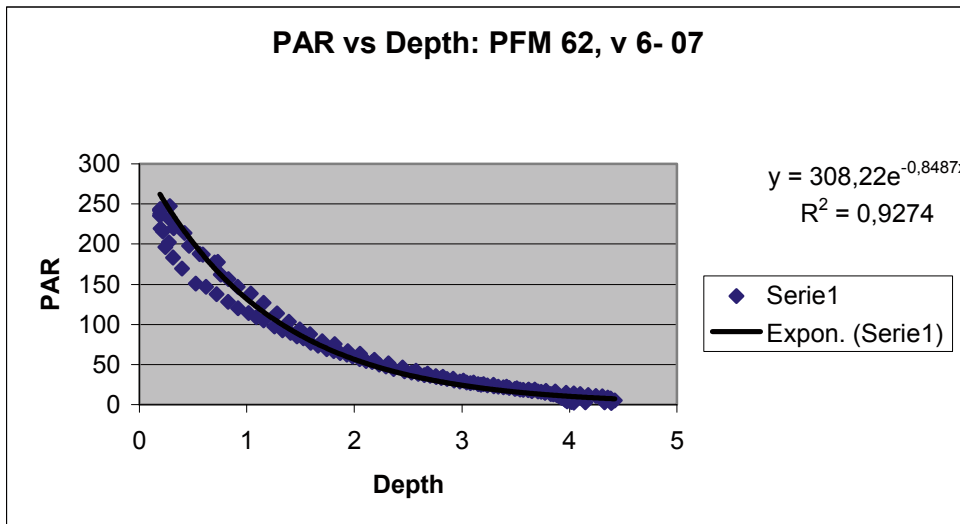


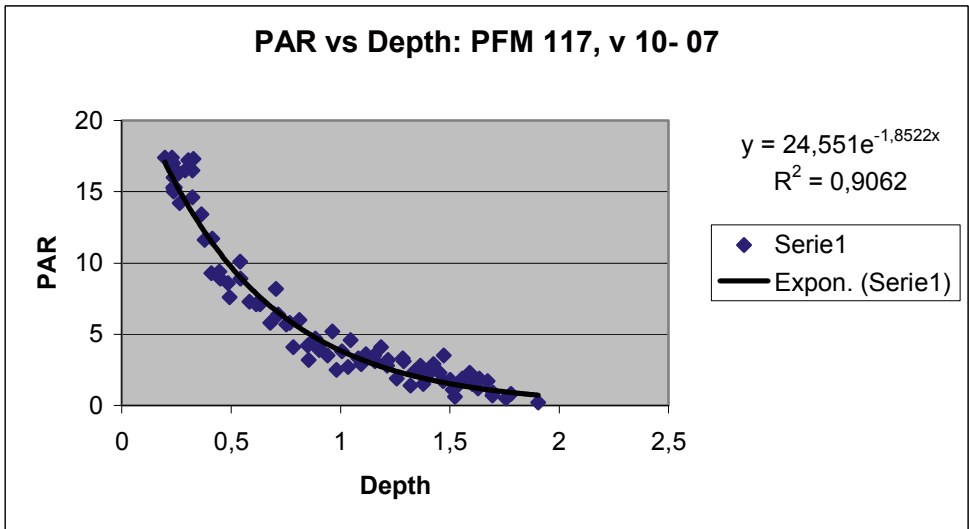
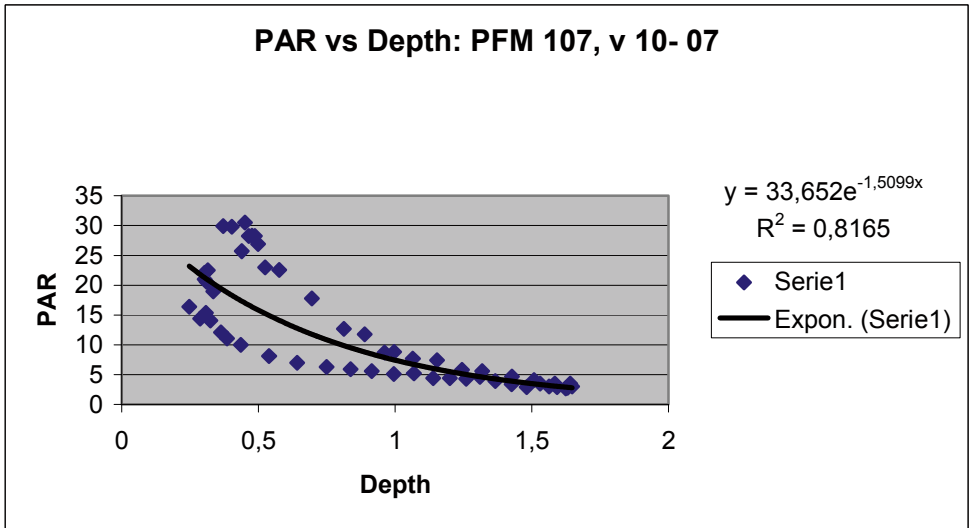
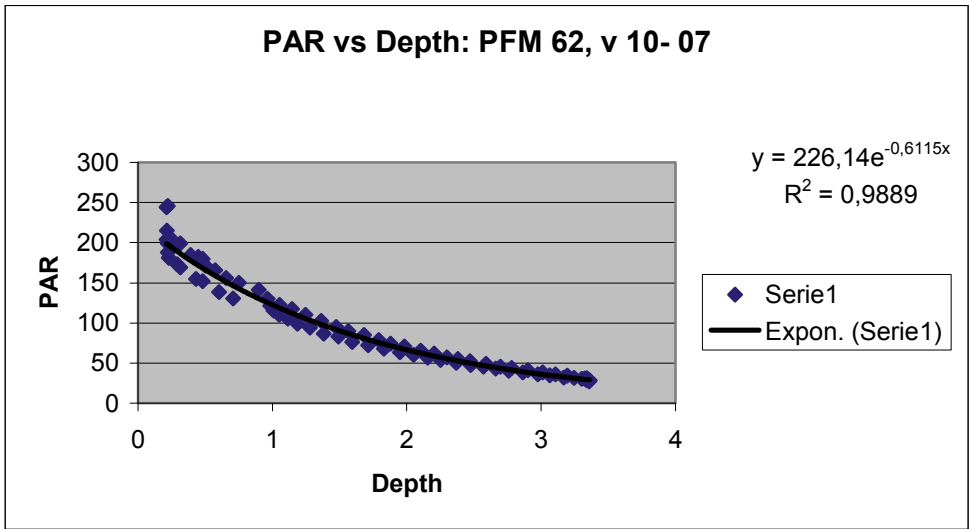


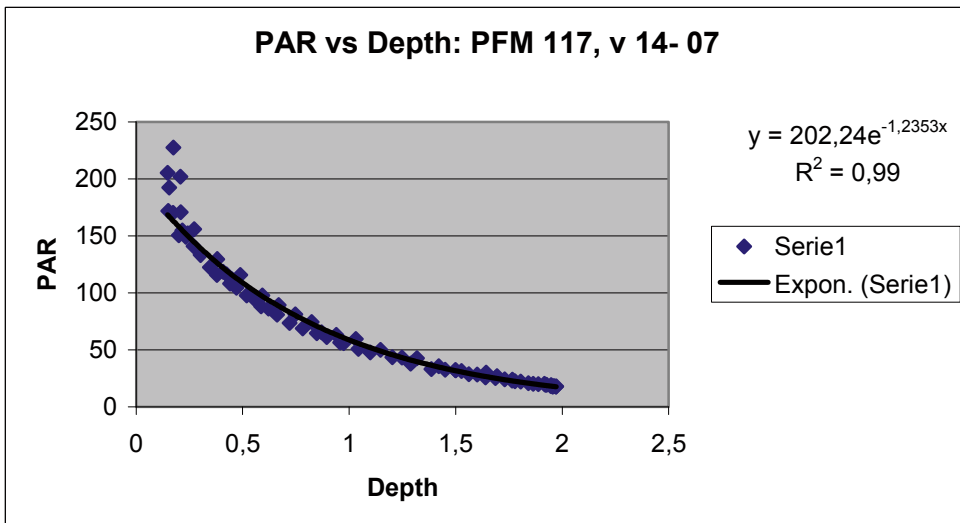
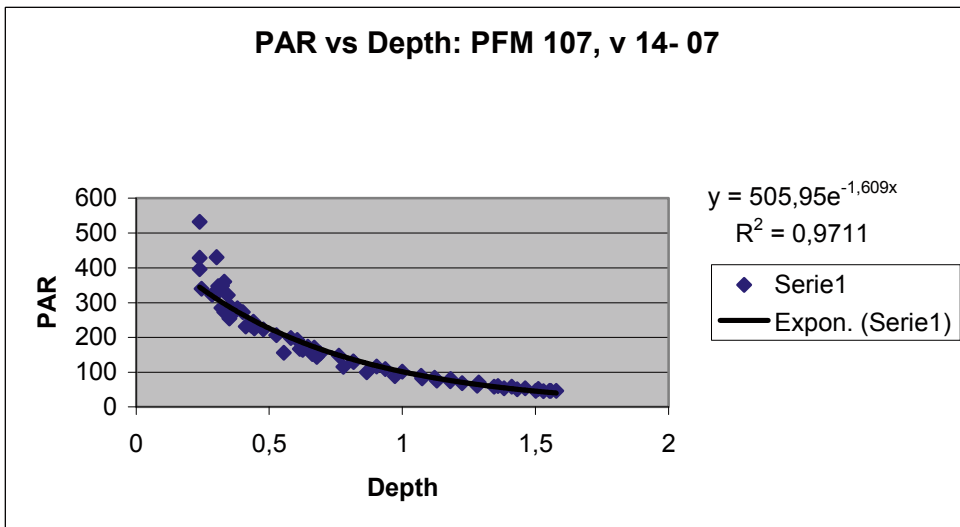
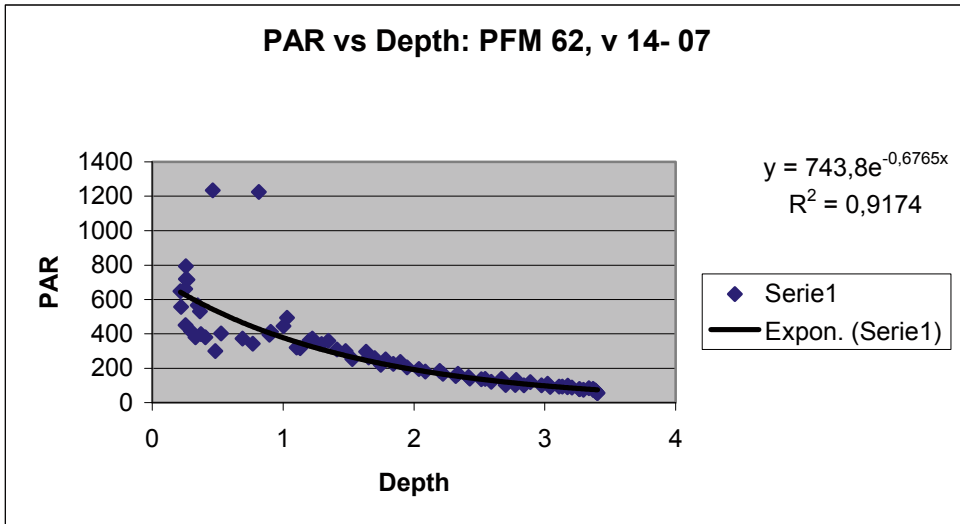


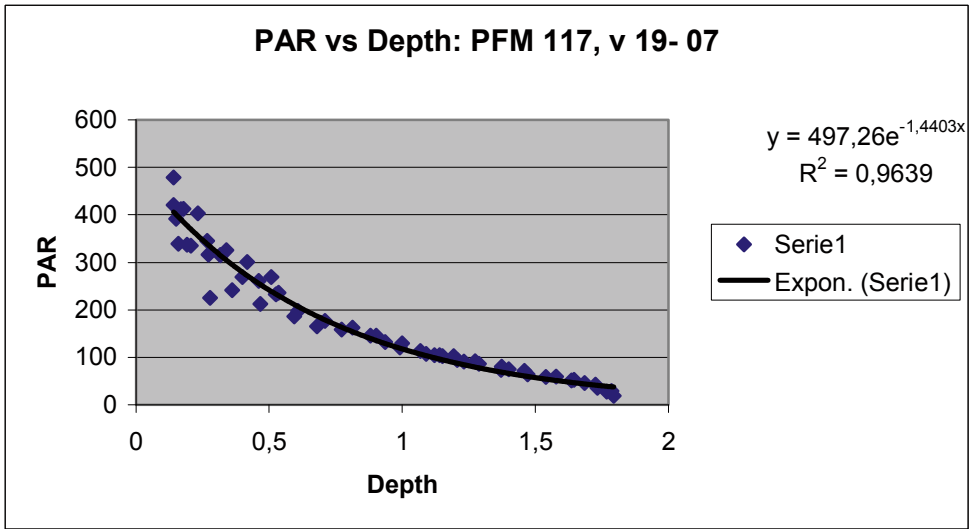
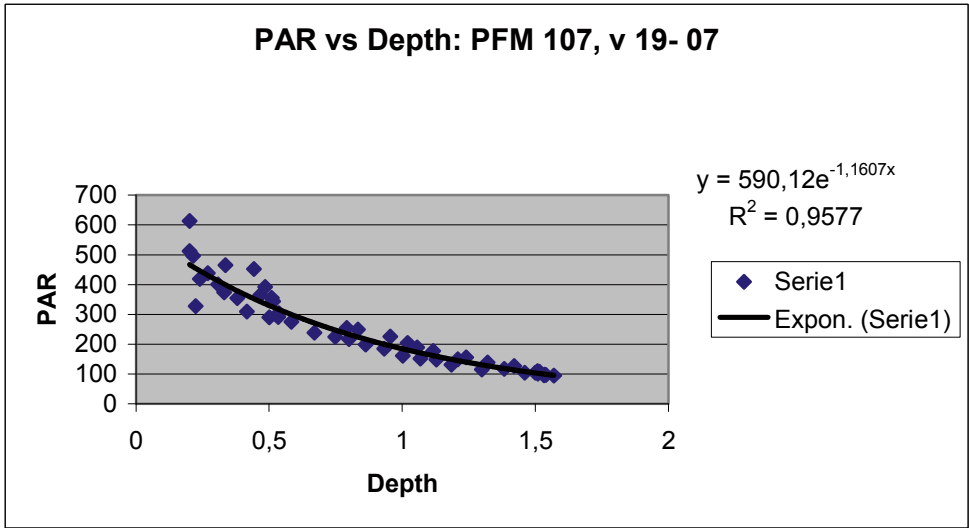
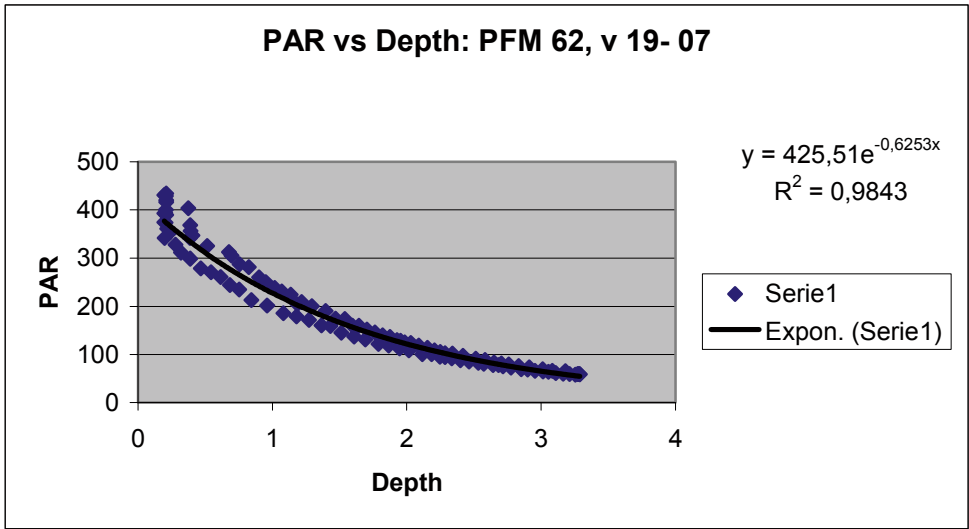


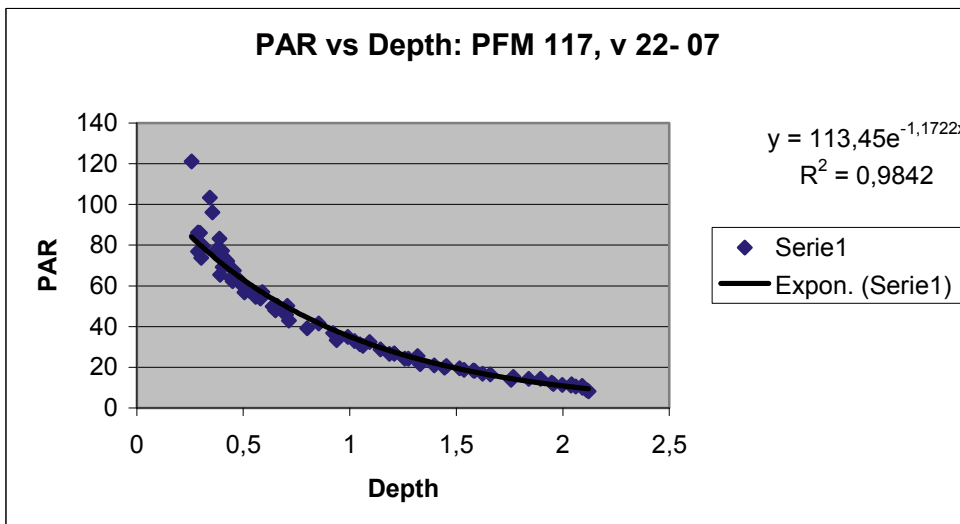
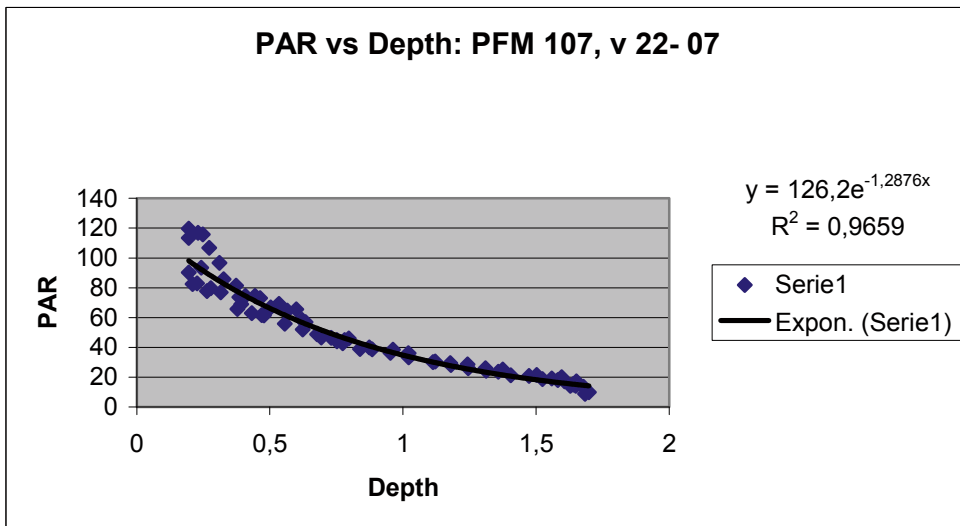
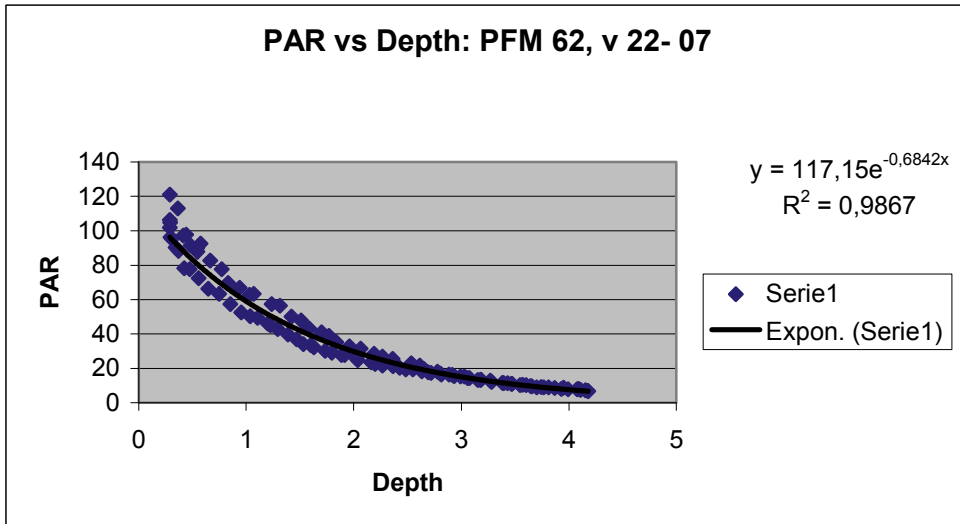












Compilation of hydrochemical data from water analyses

Table A4-1. Water composition.

Idcode	Sample no	Class no	Water_type	Sample_date	Sampling depth (m)	Na (mg/l)	K (mg/l)	Ca (mg/l)	Mg (mg/l)	HCO ₃ (mg/l)	Cl (mg/l)	SO ₄ (mg/l)	SO ₄ _S (mg/l)	Br (mg/l)	
PFM000062	12334	5	Sea Water	2006-07-17	0.50	Surface	1,510	60.2	75.9	177	81.4	2,760	390	138	9.23
PFM000062	12337	3	Sea Water	2006-08-14	0.50	Surface	1,530	62.0	75.3	176	76.2	2,780	391	144	9.30
PFM000062	12358	3	Sea Water	2006-09-11	0.50	Surface	1,410	56.3	76.0	181	73.6	2,660	377	144	9.86
PFM000062	12381	5	Sea Water	2006-10-09	0.50	Surface	1,530	58.8	77.0	178	76.4	2,760	391	142	11.10
PFM000062	12537	3	Sea Water	2006-11-13	0.50	Surface	1,370	55.9	72.2	170	76.2	2,670	374	130	9.29
PFM000062	12555	3	Sea Water	2006-12-12	0.50	Surface	1,450	58.2	77.3	171	78.9	2,750	391	133	8.30
PFM000062	12564	5	Sea Water	2007-01-15	0.50	Surface	1,360	58.0	79.7	184	76.9	2,640	376	140	9.35
PFM000062	12593	3	Sea Water	2007-02-05	0.50	Surface	1,280	55.9	75.7	176	77.8	2,730	381	138	8.75
PFM000062	12592	3	Sea Water	2007-03-05	0.50	Surface	1,450	55.6	78.0	176	80.8	2,780	395	141	8.48
PFM000062	12745	3	Sea Water	2007-04-02	0.50	Surface	1,480	57.5	76.6	174	78.0	2,730	401	140	8.60
PFM000062	12779	5	Sea Water	2007-05-07	0.50	Surface	1,390	58.2	74.2	165	75.7	2,680	383	134	9.90
PFM000062	12797	3	Sea Water	2007-05-28	0.50	Surface	1,460	60.3	77.4	179	78.0	2,810	398	140	8.24
PFM000062	12815	3	Sea Water	2007-06-25	0.50	Surface	1,470	57.5	78.6	177	78.7	2,790	397	145	9.57
PFM000066	12382	3	Stream Water	2006-11-13	0.10	Surface	5.4	2.79	59.4	3.3	158	6.7	25.30	8.53	0.046
PFM000066	12385	3	Stream Water	2006-12-12	0.10	Surface	5.4	3.04	70.8	3.5	184	6.8	25.70	9.04	0.037
PFM000066	12565	3	Stream Water	2007-01-15	0.10	Surface	5.4	2.38	68.1	3.5	184	7.0	21.40	7.73	0.047
PFM000066	12591	3	Stream Water	2007-02-05	0.10	Surface	6.0	2.68	76.5	3.9	216	9.1	20.90	7.37	0.046
PFM000066	12722	3	Stream Water	2007-03-06	0.10	Surface	6.6	2.82	82.1	4.4	230	8.5	22.90	8.46	0.053
PFM000066	12748	3	Stream Water	2007-04-02	0.10	Surface	4.5	2.32	62.0	3.1	172	5.2	13.70	4.98	0.031
PFM000066	12781	3	Stream Water	2007-05-08	0.10	Surface	5.6	2.74	66.8	3.6	200	6.5	14.90	5.57	0.048
PFM000066	12799	3	Stream Water	2007-05-28	0.10	Surface	5.9	3.23	62.3	3.4	178	6.5	14.10	5.19	0.048
PFM000066	12811	3	Stream Water	2007-06-25	0.10	Surface	6.0	2.48	57.7	3.4	166	6.3	9.87	4.12	0.047
PFM000068	12370	3	Stream Water	2006-09-11	0.50	Surface	16.6	5.20	107.0	8.1	162	31.6	123.00	45.30	0.193
PFM000068	12538	3	Stream Water	2006-11-13	0.10	Surface	9.8	3.17	56.1	4.2	133	15.9	34.30	11.70	0.086
PFM000068	12558	3	Stream Water	2006-12-12	0.10	Surface	9.3	2.80	51.0	3.9	149	14.1	23.00	9.00	< 0.2
PFM000068	12563	3	Stream Water	2007-01-15	0.10	Surface	9.2	2.34	53.7	4.1	143	15.8	17.70	6.49	0.096
PFM000068	12595	3	Stream Water	2007-02-06	0.10	Surface	10.4	2.56	65.7	4.8	183	17.2	20.00	7.27	0.096
PFM000068	12719	3	Stream Water	2007-03-06	0.10	Surface	13.0	3.12	68.4	5.3	194	21.0	20.10	7.53	0.107
PFM000068	12746	3	Stream Water	2007-04-03	0.10	Surface	9.1	2.46	57.5	4.0	153	14.1	16.20	6.01	0.063
PFM000068	12778	3	Stream Water	2007-05-08	0.10	Surface	19.7	2.67	64.8	6.2	183	35.1	21.00	8.03	0.177
PFM000068	12795	3	Stream Water	2007-05-28	0.10	Surface	22.3	2.72	58.6	6.1	168	40.4	18.80	6.87	0.166
PFM000068	12814	3	Stream Water	2007-06-26	0.50	Surface	26.0	2.26	68.2	7.0	194	46.7	13.00	5.35	0.207
PFM000069	12536	3	Stream Water	2006-11-13	0.10	Surface	11.9	3.45	66.0	4.9	157	20.3	42.20	14.10	0.103
PFM000069	12557	3	Stream Water	2006-12-12	0.10	Surface	12.2	3.32	69.9	5.0	172	20.9	35.40	11.90	0.088

Idcode	Sample no	Class no	Water_type	Sample_date	Sampling depth (m)	F (mg/l)	Si (mg/l)	Fe (mg/l)	Mn (mg/l)	Li (mg/l)	Sr (mg/l)	pH_L (pH unit)	EC_L (mS/m)	RCB (%)	
PFM000062	12334	5	Sea Water	2006-07-17	0.50	Surface	0.35	0.24	0.0047	0.00351	0.026	1.15	7.93	889	-1.35
PFM000062	12337	3	Sea Water	2006-08-14	0.50	Surface	0.33	0.30	< 0.02	< 0.003	0.026	1.18	8.04	896	-1.37
PFM000062	12358	3	Sea Water	2006-09-11	0.50	Surface	0.32	0.49	< 0.02	< 0.003	0.028	1.11	7.91	869	-2.33
PFM000062	12381	5	Sea Water	2006-10-09	0.50	Surface	0.33	0.63	0.0035	0.00297	0.027	1.14	7.76	884	-0.89
PFM000062	12537	3	Sea Water	2006-11-13	0.50	Surface	0.36	0.77	0.0279	< 0.003	0.026	1.08	7.81	848	-3.78
PFM000062	12555	3	Sea Water	2006-12-12	0.50	Surface	0.33	0.81	< 0.02	0.00324	0.028	1.10	7.74	874	-2.82
PFM000062	12564	5	Sea Water	2007-01-15	0.50	Surface	0.34	1.02	0.0126	0.00387	0.028	1.06	7.56	851	-2.94
PFM000062	12593	3	Sea Water	2007-02-05	0.50	Surface	0.32	1.01			0.025	1.11	7.65	891	-7.17
PFM000062	12592	3	Sea Water	2007-03-05	0.50	Surface	0.33	1.10			0.026	1.12	7.67	889	-3.37
PFM000062	12745	3	Sea Water	2007-04-02	0.50	Surface		0.53			0.027	1.13	8.10	885	-1.83
PFM000062	12779	5	Sea Water	2007-05-07	0.50	Surface	0.34	0.47	0.0071	0.00918	0.027	1.15	7.97	859	-3.70
PFM000062	12797	3	Sea Water	2007-05-28	0.50	Surface	0.38	0.40			0.027	1.23	7.91	905	-3.32
PFM000062	12815	3	Sea Water	2007-06-25	0.50	Surface	0.33	0.44			0.025	1.09	7.79	899	-3.04
PFM000066	12382	3	Stream Water	2006-11-13	0.10	Surface	0.21	4.83	0.0331	< 0.003	< 0.004	0.062	7.16	32.7	3.19
PFM000066	12385	3	Stream Water	2006-12-12	0.10	Surface	< 0.2	5.89	0.0750	0.00502	< 0.004	0.070	7.30	36.3	4.57
PFM000066	12565	3	Stream Water	2007-01-15	0.10	Surface	< 0.2	5.82	0.0529	0.00883	< 0.004	0.070	7.19	35.8	3.68
PFM000066	12591	3	Stream Water	2007-02-05	0.10	Surface	< 0.2	6.51			< 0.004	0.081	7.14	41.1	2.44
PFM000066	12722	3	Stream Water	2007-03-06	0.10	Surface	0.20	6.69			< 0.004	0.082	7.26	42.9	2.86
PFM000066	12748	3	Stream Water	2007-04-02	0.10	Surface	< 0.2	4.52			< 0.004	0.062	7.21	31.7	4.70
PFM000066	12781	3	Stream Water	2007-05-08	0.10	Surface	0.23	3.12			< 0.004	0.073	7.61	36.3	1.59
PFM000066	12799	3	Stream Water	2007-05-28	0.10	Surface	0.26	2.93			< 0.004	0.073	7.32	33.5	4.03
PFM000066	12811	3	Stream Water	2007-06-25	0.10	Surface	0.24	2.35			< 0.004	0.069	7.50	31.0	4.72
PFM000068	12370	3	Stream Water	2006-09-11	0.50	Surface	0.34	5.51	0.0510	0.00493	0.005	0.166	7.52	64.3	3.56
PFM000068	12538	3	Stream Water	2006-11-13	0.10	Surface	0.27	5.00	0.1270	0.00376	< 0.004	0.079	7.02	34.3	3.97
PFM000068	12558	3	Stream Water	2006-12-12	0.10	Surface	0.23	3.90	0.2000	0.00670	< 0.05	0.078	7.21	33.6	-1.05
PFM000068	12563	3	Stream Water	2007-01-15	0.10	Surface	0.21	5.42	0.2280	0.02470	< 0.004	0.076	7.04	32.2	4.07
PFM000068	12595	3	Stream Water	2007-02-06	0.10	Surface	0.23	6.45			< 0.004	0.093	7.11	39.3	2.92
PFM000068	12719	3	Stream Water	2007-03-06	0.10	Surface	0.24	6.75			< 0.004	0.094	7.23	41.4	2.72
PFM000068	12746	3	Stream Water	2007-04-03	0.10	Surface	0.24	4.48			< 0.004	0.075	7.21	32.9	5.29
PFM000068	12778	3	Stream Water	2007-05-08	0.10	Surface	0.40	6.00			< 0.004	0.107	7.34	44.8	1.70
PFM000068	12795	3	Stream Water	2007-05-28	0.10	Surface	0.31	5.48			< 0.004	0.103	7.39	44.6	1.44
PFM000068	12814	3	Stream Water	2007-06-26	0.50	Surface	0.35	5.57			< 0.004	0.117	7.50	49.2	3.15
PFM000069	12536	3	Stream Water	2006-11-13	0.10	Surface	0.31	5.53	0.1100	0.00539	< 0.004	0.092	6.97	40.5	3.07
PFM000069	12557	3	Stream Water	2006-12-12	0.10	Surface	0.24	6.39	0.1760	0.00551	< 0.004	0.093	7.19	41.4	4.01
PFM000069	12569	3	Stream Water	2007-01-15	0.10	Surface	0.24	6.92	0.2570	0.04620	< 0.004	0.105	6.96	44.2	3.71
PFM000069	12594	3	Stream Water	2007-02-06	0.10	Surface	0.29	7.40			< 0.004	0.113	7.07	48.6	2.29
PFM000069	12721	3	Stream Water	2007-03-06	0.10	Surface	0.29	8.36			0.004	0.117	7.06	52.4	2.04

Idcode	Sample no	Class no	Water_type	Sample_date	Sampling depth (m)	Na (mg/l)	K (mg/l)	Ca (mg/l)	Mg (mg/l)	HCO ₃ (mg/l)	Cl (mg/l)	SO ₄ (mg/l)	SO ₄ _S (mg/l)	Br (mg/l)	
PFM000069	12569	3	Stream Water	2007-01-15	0.10	Surface	15.1	2.97	72.9	5.7	190	25.5	28.70	10.40	0.140
PFM000069	12594	3	Stream Water	2007-02-06	0.10	Surface	14.5	3.11	79.9	6.0	217	26.5	28.60	10.30	0.146
PFM000069	12721	3	Stream Water	2007-03-06	0.10	Surface	19.2	3.37	83.6	7.0	237	34.6	24.10	9.01	0.166
PFM000069	12749	3	Stream Water	2007-04-02	0.10	Surface	11.5	2.47	58.7	4.5	161	20.4	22.10	8.31	0.078
PFM000069	12785	3	Stream Water	2007-05-08	0.10	Surface	20.4	2.64	64.0	6.2	180	36.1	20.70	7.74	0.181
PFM000069	12796	3	Stream Water	2007-05-28	0.10	Surface	23.2	30.10	55.9	6.0	150	42.2	24.30	8.91	0.155
PFM000069	12813	3	Stream Water	2007-06-26	0.10	Surface	26.1	2.16	68.2	7.1	189	47.4	16.30	6.59	0.227
PFM000070	12371	3	Stream Water	2006-09-11	0.50	Surface	5.7	4.50	59.0	3.3	53.9	5.3	97.60	36.50	0.071
PFM000070	12383	3	Stream Water	2006-11-13	0.10	Surface	5.9	1.73	33.2	2.4	95.6	6.1	10.00	3.63	0.031
PFM000070	12539	3	Stream Water	2006-12-12	0.10	Surface	6.2	2.31	44.7	2.9	132	6.5	9.55	3.48	0.036
PFM000070	12570	3	Stream Water	2007-01-16	0.10	Surface	4.3	1.29	30.7	1.9	78.8	5.0	7.65	3.02	0.026
PFM000070	12597	3	Stream Water	2007-02-06	0.10	Surface	5.8	2.04	51.8	3.2	142	7.0	12.40	4.63	0.034
PFM000070	12714	3	Stream Water	2007-03-05	0.10	Surface	6.6	2.23	54.7	3.4	160	7.6	12.00	4.51	0.049
PFM000070	12750	3	Stream Water	2007-04-02	0.10	Surface	5.7	1.99	52.1	2.9	156	6.4	8.79	3.49	0.031
PFM000070	12780	3	Stream Water	2007-05-07	0.10	Surface	7.3	2.03	52.2	3.2	155	6.9	6.27	3.30	0.038
PFM000070	12802	3	Stream Water	2007-05-28	0.10	Surface	6.2	1.90	46.8	2.8	145	6.2	3.75	1.78	0.039
PFM000070	12810	3	Stream Water	2007-06-25	0.10	Surface	6.7	0.74	57.5	3.3	173	4.6	2.40	1.83	0.031
PFM000074	12336	5	Lake Water	2006-07-17	0.50	Surface	15.7	2.09	53.7	4.6	164	22.3	5.82	2.68	0.072
PFM000074	12355	3	Lake Water	2006-08-15	0.30	Surface	18.1	2.37	54.7	5.1	166	25.9	5.30	2.62	0.090
PFM000074	12369	3	Lake Water	2006-09-12	0.35	Surface	15.8	2.43	61.6	4.7	189	24.0	5.13	2.47	0.091
PFM000074	12338	5	Lake Water	2006-10-10	0.50	Surface	16.9	2.61	61.2	4.8	190	25.1	4.76	2.36	0.083
PFM000074	12556	3	Lake Water	2006-12-13	0.50	Surface	7.7	3.06	70.5	3.7	181	11.7	25.50	8.63	0.043
PFM000074	12599	3	Lake Water	2007-02-06	0.50	Surface	11.2	2.82	82.4	4.5	219	17.4	20.70	7.42	0.048
PFM000074	12720	3	Lake Water	2007-03-06	0.50	Surface	28.4	4.17	120.0	6.4	375	52.6	8.52	4.42	0.083
PFM000074	12747	3	Lake Water	2007-04-03	0.50	Surface	10.2	2.53	64.7	3.5	181	17.7	14.10	5.19	0.036
PFM000074	12782	5	Lake Water	2007-05-08	0.50	Surface	11.9	3.29	73.4	4.2	213	19.0	14.60	5.59	0.056
PFM000074	12798	3	Lake Water	2007-05-29	0.50	Surface	12.8	3.17	71.7	4.2	215	22.0	11.60	4.31	0.057
PFM000074	12812	3	Lake Water	2007-06-26	0.50	Surface	14.9	2.41	64.5	4.5	185	24.4	11.10	4.66	0.057
PFM000107	12335	5	Lake Water	2006-07-17	0.50	Surface	45.9	3.72	41.6	8.2	103	83.3	20.70	8.02	0.313
PFM000107	12357	3	Lake Water	2006-08-14	0.50	Surface	74.1	4.68	45.6	10.9	77.0	158.0	28.10	10.50	0.603
PFM000107	12368	3	Lake Water	2006-09-11	0.50	Surface	70.8	4.44	44.5	11.2	81.3	148.0	27.10	10.40	0.648
PFM000107	12333	5	Lake Water	2006-10-09	0.50	Surface	78.0	4.82	50.8	11.6	98.0	161.0	27.80	10.60	0.708
PFM000107	12540	3	Lake Water	2006-12-12	0.50	Surface	38.3	4.08	54.4	7.6	128	78.4	29.80	10.30	0.290
PFM000107	12566	5	Lake Water	2007-01-15	0.50	Surface	148	8.02	58.2	20.9	137	274.0	55.40	19.60	1.030
PFM000107	12590	3	Lake Water	2007-02-05	0.50	Surface	304	13.80	60.9	39.0	129	613.0	98.80	34.90	2.250
PFM000107	12567	3	Lake Water	2007-02-05	1.00	Bottom	815	31.10	77.5	97.0	116	1490.0	217.00	77.80	4.900

Idcode	Sample no	Class no	Water_type	Sample_date	Sampling depth (m)	F (mg/l)	Si (mg/l)	Fe (mg/l)	Mn (mg/l)	Li (mg/l)	Sr (mg/l)	pH_L (pH unit)	EC_L (mS/m)	RCB (%)	
PFM000069	12749	3	Stream Water	2007-04-02	0.10	Surface	0.26	5.02		< 0.004	0.082	7.01	37.1	1.56	
PFM000069	12785	3	Stream Water	2007-05-08	0.10	Surface	0.30	6.13		< 0.004	0.105	7.23	45.0	2.09	
PFM000069	12796	3	Stream Water	2007-05-28	0.10	Surface	0.29	5.17		< 0.004	0.099	7.24	43.4	9.02	
PFM000069	12813	3	Stream Water	2007-06-26	0.10	Surface	0.35	5.72		0.004	0.117	7.54	49.0	3.11	
PFM000070	12371	3	Stream Water	2006-09-11	0.50	Surface	< 0.2	2.98	0.1690	0.01920	< 0.004	0.067	6.46	33.9	3.86
PFM000070	12383	3	Stream Water	2006-11-13	0.10	Surface	< 0.2		< 0.02	< 0.003		7.20	20.3		
PFM000070	12539	3	Stream Water	2006-12-12	0.10	Surface	< 0.2	3.63	0.0316	< 0.003	< 0.004	0.049	7.35	25.5	4.37
PFM000070	12570	3	Stream Water	2007-01-16	0.10	Surface	< 0.2	2.76	0.0314	0.00283	< 0.004	0.034	7.18	17.0	8.22
PFM000070	12597	3	Stream Water	2007-02-06	0.10	Surface	< 0.2	4.95			< 0.004	0.058	7.22	28.4	5.64
PFM000070	12714	3	Stream Water	2007-03-05	0.10	Surface	< 0.2	4.85			< 0.004	0.058	7.44	30.6	3.62
PFM000070	12750	3	Stream Water	2007-04-02	0.10	Surface	< 0.2	3.65			< 0.004	0.051	7.66	28.8	2.95
PFM000070	12780	3	Stream Water	2007-05-07	0.10	Surface	0.21	3.11			< 0.004	0.060	7.06	28.3	4.65
PFM000070	12802	3	Stream Water	2007-05-28	0.10	Surface	0.20	2.65			< 0.004	0.053	7.07	27.3	3.84
PFM000070	12810	3	Stream Water	2007-06-25	0.10	Surface	0.24	3.97			< 0.004	0.066	7.26	30.0	5.52
PFM000074	12336	5	Lake Water	2006-07-17	0.50	Surface	0.31	5.36	0.0187	0.00339	< 0.004	0.082	8.25	35.0	4.02
PFM000074	12355	3	Lake Water	2006-08-15	0.30	Surface	0.33	6.81	0.0248	0.00451	< 0.004	0.083	7.77	36.9	4.81
PFM000074	12369	3	Lake Water	2006-09-12	0.35	Surface	0.28	8.59	< 0.02	< 0.003	< 0.004	0.090	7.76	38.8	3.27
PFM000074	12338	5	Lake Water	2006-10-10	0.50	Surface	0.29	8.34	0.0179	0.00625	< 0.004	0.088	7.64	39.6	3.22
PFM000074	12556	3	Lake Water	2006-12-13	0.50	Surface	0.21	5.80	0.0408	0.00347	< 0.004	0.075	7.30	37.8	4.79
PFM000074	12599	3	Lake Water	2007-02-06	0.50	Surface	0.23	6.62			< 0.004	0.092	7.18	43.1	5.06
PFM000074	12720	3	Lake Water	2007-03-06	0.50	Surface	0.38	10.50			< 0.004	0.129	7.03	74.0	-0.45
PFM000074	12747	3	Lake Water	2007-04-03	0.50	Surface	0.22	4.52			< 0.004	0.069	7.23	37.4	2.88
PFM000074	12782	5	Lake Water	2007-05-08	0.50	Surface	0.26	4.07	0.0322	0.01270	< 0.004	0.086	7.73	42.5	2.49
PFM000074	12798	3	Lake Water	2007-05-29	0.50	Surface	0.29	5.00			< 0.004	0.088	7.38	43.2	1.49
PFM000074	12812	3	Lake Water	2007-06-26	0.50	Surface	0.29	4.66			< 0.004	0.087	7.65	39.6	3.27
PFM000107	12335	5	Lake Water	2006-07-17	0.50	Surface	0.29	0.49	0.0435	0.00285	< 0.004	0.121	9.05	49.1	3.08
PFM000107	12357	3	Lake Water	2006-08-14	0.50	Surface	0.35	0.62	0.0435	0.01060	0.004	0.169	9.00	71.3	0.92
PFM000107	12368	3	Lake Water	2006-09-11	0.50	Surface	0.30	0.36	0.0417	0.00519	< 0.004	0.170	8.62	69.0	1.26
PFM000107	12333	5	Lake Water	2006-10-09	0.50	Surface	0.30	0.20	0.0508	0.00638	< 0.004	0.182	7.96	75.8	1.26
PFM000107	12540	3	Lake Water	2006-12-12	0.50	Surface	0.22	2.76	0.0803	0.00306	< 0.004	0.119	7.93	51.8	1.47
PFM000107	12566	5	Lake Water	2007-01-15	0.50	Surface	0.30	3.64	0.1130	0.01920	0.006	0.191	7.65	119.0	0.20
PFM000107	12590	3	Lake Water	2007-02-05	0.50	Surface	0.23	3.53			0.008	0.308	7.45	233.0	-4.33
PFM000107	12567	3	Lake Water	2007-02-05	1.00	Bottom	0.22	2.80	0.1370	0.06510	0.015	0.664	7.14	519.0	-0.78
PFM000107	12715	3	Lake Water	2007-03-05	0.50	Surface	0.29	3.72			0.009	0.373	7.28	296.0	-2.89
PFM000107	12717	3	Lake Water	2007-03-05	1.00	Bottom	0.30	3.00			0.015	0.604	7.19	503.0	-2.46
PFM000107	12744	3	Lake Water	2007-04-02	0.50	Surface	0.27	3.12			0.007	0.216	7.86	160.0	-0.15
PFM000107	12784	5	Lake Water	2007-05-07	0.50	Surface	0.31	0.11	0.0471	0.01070	0.006	0.210	8.65	148.0	0.37

Idcode	Sample no	Class no	Water_type	Sample_date	Sampling depth (m)	Na (mg/l)	K (mg/l)	Ca (mg/l)	Mg (mg/l)	HCO ₃ (mg/l)	Cl (mg/l)	SO ₄ (mg/l)	SO ₄ _S (mg/l)	Br (mg/l)	
PFM000107	12715	3	Lake Water	2007-03-05	0.50	Surface	431	18.00	69.3	53.3	136	833.0	127.00	46.40	2.460
PFM000107	12717	3	Lake Water	2007-03-05	1.00	Bottom	786	29.80	85.1	92.3	134	1490.0	211.00	77.90	4.930
PFM000107	12744	3	Lake Water	2007-04-02	0.50	Surface	212	10.20	60.4	27.8	131	396.0	66.70	23.80	1.190
PFM000107	12784	5	Lake Water	2007-05-07	0.50	Surface	200	9.69	60.3	24.6	140	360.0	62.00	22.40	1.390
PFM000107	12800	3	Lake Water	2007-05-28	0.50	Surface	192	9.21	57.1	24.6	134	375.0	62.80	21.20	1.150
PFM000107	12808	3	Lake Water	2007-06-25	0.50	Surface	197	9.45	55.0	25.8	114	382.0	63.30	22.60	1.300
PFM000117	12339	5	Lake Water	2006-07-18	0.50	Surface	6.9	2.11	32.6	3.0	102	6.3	5.16	2.26	0.040
PFM000117	12332	3	Lake Water	2006-08-14	0.50	Surface	7.2	2.18	28.6	3.1	86.9	6.7	5.25	2.28	0.046
PFM000117	12356	3	Lake Water	2006-09-11	0.50	Surface	7.0	2.08	30.5	3.0	95.8	6.6	4.63	2.18	0.053
PFM000117	12384	5	Lake Water	2006-10-09	0.50	Surface	7.4	2.23	33.2	3.0	104	6.7	4.02	1.96	0.051
PFM000117	12554	3	Lake Water	2006-12-13	0.50	Surface	6.1	2.19	45.4	2.9	134	6.4	9.47	3.47	0.032
PFM000117	12568	3	Lake Water	2007-02-05	0.50	Surface	6.8	2.39	51.5	3.2	156	7.3	10.60	3.95	0.039
PFM000117	12596	3	Lake Water	2007-02-05	1.50	Bottom	6.6	2.29	62.0	3.3	180	7.7	10.30	3.98	0.050
PFM000117	12716	3	Lake Water	2007-03-05	0.50	Surface	7.0	2.39	58.8	3.4	179	7.8	10.50	4.12	0.048
PFM000117	12713	3	Lake Water	2007-03-05	1.50	Bottom	6.8	2.42	66.0	3.4	193	7.6	10.90	4.25	0.048
PFM000117	12751	3	Lake Water	2007-04-02	0.50	Surface	5.9	2.10	55.1	2.9	157	6.3	8.99	3.36	0.029
PFM000117	12783	5	Lake Water	2007-05-07	0.50	Surface	6.5	2.10	48.7	3.0	147	6.6	8.64	3.36	0.029
PFM000117	12801	3	Lake Water	2007-05-28	0.50	Surface	6.3	2.09	44.0	2.9	136	6.6	8.29	3.05	0.028
PFM000117	12809	3	Lake Water	2007-06-25	0.50	Surface	6.6	2.05	38.7	3.0	115	6.7	8.06	3.45	0.035
PFM005865	12340	5	Sea Water	2006-07-20	0.50	Surface	1480	61.4	76.4	180	76.1	2750	396	141.00	9.23
PFM005865	12341	5	Sea Water	2006-07-20	30.00	Intermediate	1540	61.2	76.5	181	78.6	2780	395	139.00	9.68
PFM005865	12342	5	Sea Water	2006-07-20	55.00	Bottom	1540	60.8	77.0	181	78.8	2820	405	139.00	9.77
PFM102269	12348	3	Sea Water	2006-07-17	0.50	Surface					76.3	2750	792		
PFM102269	12365	3	Sea Water	2006-08-14	0.50	Surface					75.2	2770	390		9.60
PFM102269	12372	3	Sea Water	2006-09-12	0.50	Surface					73.6	2680	380		8.35
PFM102269	12359	3	Sea Water	2006-10-10	0.50	Surface					76.4	2770	390		8.85
PFM102269	12542	3	Sea Water	2006-11-13	0.50	Surface					76.2	2660	374		9.20
PFM102269	12559	3	Sea Water	2006-12-12	0.50	Surface					79.4	2730	389		9.65
PFM102269	12571	3	Sea Water	2007-01-16	0.50	Surface					76.2	2650	377		9.25
PFM102269	12598	3	Sea Water	2007-02-05	0.50	Surface					77.9	2740	377		9.15
PFM102269	12712		Sea Water	2007-03-06	0.50	Surface					79.6	2820	394		9.05
PFM102269	12743	3	Sea Water	2007-04-03	0.50	Surface					77.6	2730	382		9.80
PFM102269	12777	3	Sea Water	2007-05-08	0.50	Surface					76.1	2700	382		9.25
PFM102269	12794	3	Sea Water	2007-05-29	0.50	Surface					78.2	2780	394		9.75
PFM102269	12807	3	Sea Water	2007-06-25	0.50	Surface					78.7	2800	393		10.40

Idcode	Sample no	Class no	Water_type	Sample_date	Sampling depth (m)	F (mg/l)	Si (mg/l)	Fe (mg/l)	Mn (mg/l)	Li (mg/l)	Sr (mg/l)	pH_L (pH unit)	EC_L (mS/m)	RCB (%)	
PFM000107	12800	3	Lake Water	2007-05-28	0.50	Surface	0.39	0.10		0.005	0.204	8.65	153.0	-2.42	
PFM000107	12808	3	Lake Water	2007-06-25	0.50	Surface	0.42	0.41		0.005	0.203	8.87	152.0	-1.48	
PFM000117	12339	5	Lake Water	2006-07-18	0.50	Surface	0.21	1.33	0.0067	0.00170	< 0.004	0.046	8.86	19.8	5.24
PFM000117	12332	3	Lake Water	2006-08-14	0.50	Surface	0.21	2.71	< 0.02	0.01800	< 0.004	0.043	8.82	18.3	7.41
PFM000117	12356	3	Lake Water	2006-09-11	0.50	Surface	0.21	3.41	< 0.02	0.01530	< 0.004	0.047	8.54	19.3	5.42
PFM000117	12384	5	Lake Water	2006-10-09	0.50	Surface	0.21	3.32	0.0031	0.00112	< 0.004	0.048	8.31	20.6	5.86
PFM000117	12554	3	Lake Water	2006-12-13	0.50	Surface	< 0.2	3.48	0.0245	0.00536	< 0.004	0.049	7.94	25.9	4.20
PFM000117	12568	3	Lake Water	2007-02-05	0.50	Surface	< 0.2	4.30	0.0308	0.01440	< 0.004	0.059	7.25	30.3	3.02
PFM000117	12596	3	Lake Water	2007-02-05	1.50	Bottom	0.20	4.82			< 0.004	0.066	7.44	33.6	3.98
PFM000117	12716	3	Lake Water	2007-03-05	0.50	Surface	< 0.2	4.85			< 0.004	0.060	7.49	33.2	2.43
PFM000117	12713	3	Lake Water	2007-03-05	1.50	Bottom	< 0.2	5.02			< 0.004	0.063	7.34	35.4	3.77
PFM000117	12751	3	Lake Water	2007-04-02	0.50	Surface	< 0.2	3.64			< 0.004	0.052	7.89	28.9	5.43
PFM000117	12783	5	Lake Water	2007-05-07	0.50	Surface	< 0.2	1.16	0.0189	0.00244	< 0.004	0.052	8.44	27.1	3.60
PFM000117	12801	3	Lake Water	2007-05-28	0.50	Surface	0.20	0.30			< 0.004	0.050	8.43	25.8	2.71
PFM000117	12809	3	Lake Water	2007-06-25	0.50	Surface	0.21	0.36			< 0.004	0.049	8.53	22.7	4.58
PFM005865	12340	5	Sea Water	2006-07-20	0.50	Surface	0.32	0.31	0.0022	0.00516	0.027	1.160	7.96	888.0	-1.84
PFM005865	12341	5	Sea Water	2006-07-20	30.00	Intermediate	0.32	0.45	0.0063	0.01550	0.027	1.160	7.56	911.0	-0.70
PFM005865	12342	5	Sea Water	2006-07-20	55.00	Bottom	0.34	0.47	0.0066	0.01990	0.027	1.150	7.52	921.0	-1.33
PFM102269	12348	3	Sea Water	2006-07-17	0.50	Surface	0.34					7.98	890		
PFM102269	12365	3	Sea Water	2006-08-14	0.50	Surface	0.33					8.03	894		
PFM102269	12372	3	Sea Water	2006-09-12	0.50	Surface	0.33					7.87	861		
PFM102269	12359	3	Sea Water	2006-10-10	0.50	Surface	0.34					7.80	887		
PFM102269	12542	3	Sea Water	2006-11-13	0.50	Surface	0.37					7.70	848		
PFM102269	12559	3	Sea Water	2006-12-12	0.50	Surface	0.32					7.80	873		
PFM102269	12571	3	Sea Water	2007-01-16	0.50	Surface	0.34					7.74	852		
PFM102269	12598	3	Sea Water	2007-02-05	0.50	Surface	0.33					7.35	888		
PFM102269	12712		Sea Water	2007-03-06	0.50	Surface	0.33					7.72	888		
PFM102269	12743	3	Sea Water	2007-04-03	0.50	Surface	0.33					8.18	881		
PFM102269	12777	3	Sea Water	2007-05-08	0.50	Surface	0.35					7.96	861		
PFM102269	12794	3	Sea Water	2007-05-29	0.50	Surface	0.36					7.77	900		
PFM102269	12807	3	Sea Water	2007-06-25	0.50	Surface	0.34					7.77	900		

pH_L = pH, laboratory measurement at 25 C

EC_L = Electrical Conductivity, laboratory measurement at 25 C

RCB = Relative Charge Balance error

< value = below reporting or detection limit

Sicada table: water_composition 2006-07-01 to 2007-06-30

Table A4-2. Biochemistry supplements.

Idcode	Sample no	Class no	Water_type	Sample date	Sampling depth (m)	NH ₄ -N (mg/l)	NO ₂ -N (mg/l)	NO ₃ -N+NO ₂ -N (mg/l)	NO ₃ -N (mg/l)	N_TOT (mg/l)	P_TOT (mg/l)	PO ₄ -P (mg/l)	POP (mg/l)	PON (mg/l)	SiO ₄ -Si (mg/l)	
PFM000062	12334	5	Sea Water	2006-07-17	0.50	Surface	0.0008	-0.0002	0.0003	-0.0003	0.255	0.0136	0.0011	0.0062	0.0527	0.230
PFM000062	12337	3	Sea Water	2006-08-14	0.50	Surface	0.0008		0.0006		0.249	0.0111	0.0007	0.0054		0.247
PFM000062	12358	3	Sea Water	2006-09-11	0.50	Surface	0.0010		0.0003		0.291	0.0172	0.0010	0.0101	0.0620	0.391
PFM000062	12381	5	Sea Water	2006-10-09	0.50	Surface	0.0071	0.0009	0.0077	0.0068	0.265	0.0156	0.0020	0.0073	0.0513	0.569
PFM000062	12537	3	Sea Water	2006-11-13	0.50	Surface	0.0059		0.0575	0.0575	0.306	0.0169	0.0044	0.0071	0.0326	0.668
PFM000062	12555	3	Sea Water	2006-12-12	0.50	Surface	0.0027		0.0745		0.576	0.0297	0.0078	0.0026	0.0186	0.726
PFM000062	12564	5	Sea Water	2007-01-15	0.50	Surface	0.0034	0.0019	0.0876	0.0857	0.354	0.0240	0.0069	0.0075	0.0513	0.843
PFM000062	12593	3	Sea Water	2007-02-05	0.50	Surface	0.0018		0.0754		0.285	0.0162	0.0075	0.0035	0.0107	0.841
PFM000062	12592	3	Sea Water	2007-03-05	0.50	Surface	0.0040		0.0873		0.336	0.0160	0.0078	0.0037	0.0133	0.852
PFM000062	12745	3	Sea Water	2007-04-02	0.50	Surface	0.0017		0.0014		0.250	0.0120	0.0009	0.0076	0.0461	0.521
PFM000062	12779	5	Sea Water	2007-05-07	0.50	Surface	0.0015	0.0005	0.0007	0.0001	0.243	0.0114	0.0006	0.0067	0.0489	0.423
PFM000062	12797	3	Sea Water	2007-05-28	0.50	Surface	0.0017		0.0005		0.245	0.0140	0.0005	0.0071	0.0444	0.321
PFM000062	12815	3	Sea Water	2007-06-25	0.50	Surface	0.0017		0.0004		0.245	0.0133	0.0009	0.0051	0.0360	0.371
PFM000066	12382	3	Stream Water	2006-11-13	0.10	Surface	0.0097		0.0624	0.0624	0.919	0.0092	0.0015	0.0023	0.0243	4.900
PFM000066	12385	3	Stream Water	2006-12-12	0.10	Surface	0.0160		0.0140		0.866	0.0076	0.0008	0.0012	0.0125	5.600
PFM000066	12565	3	Stream Water	2007-01-15	0.10	Surface	0.0110	0.0006	0.0298	0.0292	0.740	0.0072	0.0007	0.0021	0.0168	5.300
PFM000066	12591	3	Stream Water	2007-02-05	0.10	Surface	0.0140		0.0264		0.789	0.0065	0.0006	0.0019	0.0067	5.840
PFM000066	12722	3	Stream Water	2007-03-06	0.10	Surface	0.0261		0.0144		0.795	0.0075	0.0011		0.0154	5.930
PFM000066	12748	3	Stream Water	2007-04-02	0.10	Surface	0.0034		0.0139		0.627	0.0069	-0.0005	0.0023	0.0140	4.250
PFM000066	12781	3	Stream Water	2007-05-08	0.10	Surface	0.0422	0.0009	0.0090	0.0081	0.888	0.0177	0.0034	0.0088	0.0551	2.960
PFM000066	12799	3	Stream Water	2007-05-28	0.10	Surface	0.1200		0.0977		1.360	0.0476	0.0101	0.0193	0.0719	2.700
PFM000066	12811	3	Stream Water	2007-06-25	0.10	Surface	0.0275		0.0127		0.946	0.0187	0.0061	0.0072	0.0382	2.170
PFM000068	12370	3	Stream Water	2006-09-11	0.50	Surface	0.0355		5.4700		6.660	0.0368	0.0046	0.0154	0.0822	4.850
PFM000068	12538	3	Stream Water	2006-11-13	0.10	Surface	0.0083		0.0673	0.0673	1.110	0.0128	0.0017	0.0048	0.0408	4.880
PFM000068	12558	3	Stream Water	2006-12-12	0.10	Surface	0.0197		0.0759		1.070	0.0105	0.0009	0.0030	0.0283	5.340
PFM000068	12563	3	Stream Water	2007-01-15	0.10	Surface	0.0360	0.0013	0.1210	0.1200	1.020	0.0108	0.0016	0.0034	0.0231	4.950
PFM000068	12595	3	Stream Water	2007-02-06	0.10	Surface	0.0720		0.1140		1.180	0.0087	0.0012	0.0023	0.0131	5.770
PFM000068	12719	3	Stream Water	2007-03-06	0.10	Surface	0.1060		0.1450		1.250	0.0111	0.0015		0.0187	6.680
PFM000068	12746	3	Stream Water	2007-04-03	0.10	Surface	0.0199		0.0635		0.859	0.0099	-0.0005	0.0033	0.0240	4.200
PFM000068	12778	3	Stream Water	2007-05-08	0.10	Surface	0.0471	0.0014	0.0110	0.0096	0.901	0.0187	0.0035	0.0069	0.0459	5.510
PFM000068	12795	3	Stream Water	2007-05-28	0.10	Surface	0.0569		0.0637		1.090	0.0272	0.0056	0.0119	0.0820	5.100
PFM000068	12814	3	Stream Water	2007-06-26	0.50	Surface	0.0351		0.0058		0.948	0.0221	0.0074	0.0054	0.0301	5.050

Idcode	Sample no	Class no	Water_type	Sample date	Sampling depth (m)	C_PHYLL_A (ug/l)	C_PHYLL_C (ug/l)	PHEOP. (ug/l)	POC (mg/l)	TOC (mg/l)	DOC (mg/l)	DIC (mg/l)	O ₂ diss (mg/l)	A_436 (1/m)	ABS_436 (number)	SUSP (mg/l)
PFM000062	12334	5	Sea Water	2006-07-17	0.50	Surface	2.00	0.40	0.50	0.394	4.1	3.8	12.5	0.30	0.015	
PFM000062	12337	3	Sea Water	2006-08-14	0.50	Surface	1.70	0.20	0.20		4.2	4.0	14.1	0.16	0.008	
PFM000062	12358	3	Sea Water	2006-09-11	0.50	Surface	2.70	0.30	1.00	0.419	4.2	4.1	11.7	0.10	0.005	
PFM000062	12381	5	Sea Water	2006-10-09	0.50	Surface	2.60	0.30	0.90	0.360	3.7	3.3	13.8	0.22	0.011	
PFM000062	12537	3	Sea Water	2006-11-13	0.50	Surface	2.00	0.50	0.30	0.286	4.1	4.1	14.0	0.23	0.013	
PFM000062	12555	3	Sea Water	2006-12-12	0.50	Surface	0.90	0.20	0.40	0.182	4.0	4.1	13.7	0.24	0.012	
PFM000062	12564	5	Sea Water	2007-01-15	0.50	Surface	2.20	0.50	1.00	0.471	4.4	4.5	14.5	0.32	0.016	6.8
PFM000062	12593	3	Sea Water	2007-02-05	0.50	Surface	1.10	0.50	0.40	0.089	4.3	4.4	14.6	0.28	0.014	2.8
PFM000062	12592	3	Sea Water	2007-03-05	0.50	Surface	1.40	0.20	-0.20	0.094	4.5	4.3	14.3	0.34	0.017	-2.0
PFM000062	12745	3	Sea Water	2007-04-02	0.50	Surface	3.90	0.70	0.30	0.325	4.2	4.3	12.8	0.20	0.010	-2.0
PFM000062	12779	5	Sea Water	2007-05-07	0.50	Surface	1.90	0.40	0.30	0.364	4.3	4.3	12.5	0.32	0.016	-2.0
PFM000062	12797	3	Sea Water	2007-05-28	0.50	Surface	2.50	0.30	0.50	0.303	4.1	4.1	10.6	0.28	0.014	3.0
PFM000062	12815	3	Sea Water	2007-06-25	0.50	Surface	5.70	0.30	2.00	0.212	3.5	3.3	13.2	0.14	0.007	1.8
PFM000066	12382	3	Stream Water	2006-11-13	0.10	Surface				0.212	20.5	20.4	30.5	2.54	0.127	
PFM000066	12385	3	Stream Water	2006-12-12	0.10	Surface				0.078	21.7	21.6	35.4	3.12	0.156	
PFM000066	12565	3	Stream Water	2007-01-15	0.10	Surface				0.126	18.7	17.8	32.6	2.32	0.116	-2.0
PFM000066	12591	3	Stream Water	2007-02-05	0.10	Surface				0.075	20.7	20.7	41.3	2.44	0.122	-2.0
PFM000066	12722	3	Stream Water	2007-03-06	0.10	Surface				0.115	19.5	19.1	43.6	2.48	0.124	-2.0
PFM000066	12748	3	Stream Water	2007-04-02	0.10	Surface				0.112	15.7	15.6	31.1	2.02	0.101	-2.0
PFM000066	12781	3	Stream Water	2007-05-08	0.10	Surface				0.390	18.9	18.7	32.2	2.38	0.119	-2.0
PFM000066	12799	3	Stream Water	2007-05-28	0.10	Surface				0.649	23.1	23.8	28.4	3.76	0.188	3.0
PFM000066	12811	3	Stream Water	2007-06-25	0.10	Surface				0.265	20.0	20.1	24.9	2.66	0.133	-2.0
PFM000068	12370	3	Stream Water	2006-09-11	0.50	Surface				0.415	16.8	16.2	26.3	2.86	0.143	
PFM000068	12538	3	Stream Water	2006-11-13	0.10	Surface				0.388	26.0	25.5	25.0	3.88	0.194	
PFM000068	12558	3	Stream Water	2006-12-12	0.10	Surface				0.199	26.6	25.3	30.3	3.88	0.194	
PFM000068	12563	3	Stream Water	2007-01-15	0.10	Surface				0.227	23.9	22.5	26.0	3.70	0.185	-2.0
PFM000068	12595	3	Stream Water	2007-02-06	0.10	Surface				0.122	26.1	25.9	35.6	3.50	0.175	-2.0
PFM000068	12719	3	Stream Water	2007-03-06	0.10	Surface				0.165	23.9	23.7	34.9	3.32	0.166	-2.0
PFM000068	12746	3	Stream Water	2007-04-03	0.10	Surface				0.201	19.6	19.4	19.2	3.04	0.152	-2.0
PFM000068	12778	3	Stream Water	2007-05-08	0.10	Surface				0.378	20.7	20.5	31.9	3.52	0.176	-2.0
PFM000068	12795	3	Stream Water	2007-05-28	0.10	Surface				0.772	22.3	22.2	26.3	4.32	0.216	2.0
PFM000068	12814	3	Stream Water	2007-06-26	0.50	Surface				0.246	23.0	23.2	30.3	4.66	0.233	-2.0
PFM000069	12536	3	Stream Water	2006-11-13	0.10	Surface				0.159	26.5	26.1	30.2	3.94	0.197	

Idcode	Sample no	Class no	Water_type	Sample date	Sampling depth (m)	NH ₄ -N (mg/l)	NO ₂ -N (mg/l)	NO ₃ -N+NO ₂ -N (mg/l)	NO ₃ -N (mg/l)	N_TOT (mg/l)	P_TOT (mg/l)	PO ₄ -P (mg/l)	POP (mg/l)	PON (mg/l)	SiO ₄ -Si (mg/l)	
PFM000069	12536	3	Stream Water	2006-11-13	0.10	Surface	0.0060		0.0133	1.010	0.0130	0.0019	0.0032	0.0226	5.440	
PFM000069	12557	3	Stream Water	2006-12-12	0.10	Surface										
PFM000069	12569	3	Stream Water	2007-01-15	0.10	Surface	0.0112	0.0005	0.0222	0.0217	0.884	0.0120	0.0013	0.0025	0.0294	6.160
PFM000069	12594	3	Stream Water	2007-02-06	0.10	Surface	0.0115		0.0024	0.903	0.0098	0.0009	0.0028	0.0163	6.730	
PFM000069	12721	3	Stream Water	2007-03-06	0.10	Surface	0.0182		0.0036	0.938	0.0135	0.0013		0.0422	7.450	
PFM000069	12749	3	Stream Water	2007-04-02	0.10	Surface	0.0020		0.0041	0.688	0.0108	0.0005	0.0027	0.0240	4.650	
PFM000069	12785	3	Stream Water	2007-05-08	0.10	Surface	0.0309	0.0006	0.0024	0.0017	0.911	0.0222	0.0041	0.0088	0.0709	5.680
PFM000069	12796	3	Stream Water	2007-05-28	0.10	Surface	0.0398		0.0355	1.150	0.0300	0.0300	0.0133	0.0862	5.100	
PFM000069	12813	3	Stream Water	2007-06-26	0.10	Surface	0.0102		0.0017	0.922	0.0158	0.0036	0.0062	0.0353	5.130	
PFM000070	12371	3	Stream Water	2006-09-11	0.50	Surface	0.1560		0.0056	2.160	0.0594	0.0076	0.0250	0.2170	2.700	
PFM000070	12383	3	Stream Water	2006-11-13	0.10	Surface	0.1110		0.0600	0.0600	1.150	0.0095	0.0016	0.0038	0.0425	2.770
PFM000070	12539	3	Stream Water	2006-12-12	0.10	Surface										
PFM000070	12570	3	Stream Water	2007-01-16	0.10	Surface	0.1340	0.0020	0.1170	0.1150	0.912	0.0062	0.0008	0.0022	0.0216	2.440
PFM000070	12597	3	Stream Water	2007-02-06	0.10	Surface	0.2990		0.0718	1.550	0.0081	0.0007	0.0021	0.0155	4.540	
PFM000070	12714	3	Stream Water	2007-03-05	0.10	Surface	0.4440		0.0748	1.680	0.0094	0.0009	0.0024	0.0336	4.390	
PFM000070	12750	3	Stream Water	2007-04-02	0.10	Surface	0.2230		0.0427	1.210	0.0090	-0.0005	0.0037	0.0362	3.440	
PFM000070	12780	3	Stream Water	2007-05-07	0.10	Surface	0.1420	0.0022	0.0317	0.0295	1.120	0.0170	0.0025	0.0092	0.0726	2.740
PFM000070	12802	3	Stream Water	2007-05-28	0.10	Surface	0.0573		0.0849	1.190	0.2060	0.0016	0.0065	0.0814	2.550	
PFM000070	12810	3	Stream Water	2007-06-25	0.10	Surface	0.0167		0.0008	0.955	0.0111	0.0210	0.0030	0.0345	3.560	
PFM000074	12336	5	Lake Water	2006-07-17	0.50	Surface	0.0094	0.0002	0.0004	-0.0003	1.210	0.0117	0.0021	0.0043	0.0651	5.190
PFM000074	12355	3	Lake Water	2006-08-15	0.30	Surface	0.0134		0.0028	1.460	0.0199	0.0016	0.0079	0.2020	6.060	
PFM000074	12369	3	Lake Water	2006-09-12	0.35	Surface	0.0140		0.0004	1.130	0.0119	0.0019	0.0043	0.0680	7.560	
PFM000074	12338	5	Lake Water	2006-10-10	0.50	Surface	0.0612	-0.0002	0.0009	0.0007	1.110	0.0100	0.0014	0.0039	0.0430	7.640
PFM000074	12556	3	Lake Water	2006-12-13	0.50	Surface	0.0084		0.0450	0.848	0.0068	0.0045	0.0016	0.0122	5.620	
PFM000074	12599	3	Lake Water	2007-02-06	0.50	Surface	0.0179		0.1220	0.873	0.0064	0.0007		0.0081	5.840	
PFM000074	12720	3	Lake Water	2007-03-06	0.50	Surface	0.6080		0.0039	1.440	0.0108	0.0012		0.0590	8.000	
PFM000074	12747	3	Lake Water	2007-04-03	0.50	Surface	0.0078		0.0444	0.670	0.0075	-0.0005	0.0030	0.0161	4.280	
PFM000074	12782	5	Lake Water	2007-05-08	0.50	Surface	0.0158	0.0005	0.0009	0.0005	0.886	0.0132	0.0028	0.0054	0.0338	3.810
PFM000074	12798	3	Lake Water	2007-05-29	0.50	Surface	0.0224		0.0045	1.040	0.0204	0.0039	0.0133	0.1490	4.780	
PFM000074	12812	3	Lake Water	2007-06-26	0.50	Surface	0.0071		0.0003	1.050	0.0123	0.0018	0.0048	0.0350	4.280	
PFM000107	12335	5	Lake Water	2006-07-17	0.50	Surface	0.0067	0.0002	0.0003	-0.0003	1.200	0.0185	0.0018	0.0084	0.1750	0.479

Idcode	Sample no	Class no	Water_type	Sample date	Sampling depth (m)	C_PHYLL_A (ug/l)	C_PHYLL_C (ug/l)	PHEOP. (ug/l)	POC (mg/l)	TOC (mg/l)	DOC (mg/l)	DIC (mg/l)	O ₂ diss (mg/l)	A_436 (1/m)	ABS_436 (number)	SUSP (mg/l)
PFM000069	12557	3	Stream Water	2006-12-12	0.10											
PFM000069	12569	3	Stream Water	2007-01-15	0.10				0.309	23.9	23.6	36.9		3.64	0.182	-2.0
PFM000069	12594	3	Stream Water	2007-02-06	0.10				0.145	25.2	25.4	42.2		3.50	0.175	-2.0
PFM000069	12721	3	Stream Water	2007-03-06	0.10				0.307	23.7	23.8	45.3		3.94	0.197	-2.0
PFM000069	12749	3	Stream Water	2007-04-02	0.10				0.166	18.4	18.1	26.3		3.02	0.151	-2.0
PFM000069	12785	3	Stream Water	2007-05-08	0.10				0.699	20.8	20.7	29.3		3.48	0.174	3.7
PFM000069	12796	3	Stream Water	2007-05-28	0.10				0.763	27.5	26.6	24.9		4.68	0.234	2.9
PFM000069	12813	3	Stream Water	2007-06-26	0.10				0.314	22.1	22.3	26.6		4.30	0.215	-2.0
PFM000070	12371	3	Stream Water	2006-09-11	0.50				1.500	35.5	35.2	11.9		5.66	0.283	
PFM000070	12383	3	Stream Water	2006-11-13	0.10				0.363	17.8	17.6	18.2		1.48	0.074	
PFM000070	12539	3	Stream Water	2006-12-12	0.10											
PFM000070	12570	3	Stream Water	2007-01-16	0.10				0.186	16.1	16.1	15.3		2.02	0.101	-2.0
PFM000070	12597	3	Stream Water	2007-02-06	0.10				0.157	28.2	28.3	26.2		3.42	0.171	-2.0
PFM000070	12714	3	Stream Water	2007-03-05	0.10				0.303	25.0	24.1	26.1		2.72	0.136	-2.0
PFM000070	12750	3	Stream Water	2007-04-02	0.10				0.293	20.5	19.9	23.6		2.18	0.109	-2.0
PFM000070	12780	3	Stream Water	2007-05-07	0.10				0.608	21.0	20.9	27.5		2.64	0.132	2.2
PFM000070	12802	3	Stream Water	2007-05-28	0.10				0.694	24.8	24.8	26.8		3.44	0.172	3.0
PFM000070	12810	3	Stream Water	2007-06-25	0.10				0.237	23.5	23.5	30.0		3.38	0.169	1.8
PFM000074	12336	5	Lake Water	2006-07-17	0.50	3.00	0.20	0.60	0.537	22.4	22.4	29.0		2.38	0.119	
PFM000074	12355	3	Lake Water	2006-08-15	0.30	5.30	0.30	0.80	1.550	23.9	24.3	26.8		2.10	0.105	
PFM000074	12369	3	Lake Water	2006-09-12	0.35	2.00	-0.20	0.60	0.532	19.7	19.4	29.7		2.00	0.100	
PFM000074	12338	5	Lake Water	2006-10-10	0.50	2.60	-0.20	0.80	0.310	19.8	19.3	33.4		1.70	0.085	
PFM000074	12556	3	Lake Water	2006-12-13	0.50	0.30	-0.20	0.20	0.087	20.7	20.9	34.4		2.86	0.143	
PFM000074	12599	3	Lake Water	2007-02-06	0.50	1.00	-0.20	0.30	0.087	19.8	19.7	42.0		2.08	0.104	-2.0
PFM000074	12720	3	Lake Water	2007-03-06	0.50	2.90	-0.20	2.80	0.334	21.5	21.0	52.8		2.78	0.139	-2.0
PFM000074	12747	3	Lake Water	2007-04-03	0.50	0.60	-0.20	-0.20	0.125	15.9	16.0	32.2		2.21	0.106	-2.0
PFM000074	12782	5	Lake Water	2007-05-08	0.50	4.50	0.40	0.30	0.249	19.2	19.3	34.2		2.48	0.124	-2.0
PFM000074	12798	3	Lake Water	2007-05-29	0.50	7.30	0.40	2.20	1.100	19.9	19.9	30.7		2.34	0.117	-2.0
PFM000074	12812	3	Lake Water	2007-06-26	0.50	2.10	-0.20	0.40	0.264	21.0	21.0	26.8		2.40	0.120	-2.0
PFM000107	12335	5	Lake Water	2006-07-17	0.50	2.60	-0.20	-0.20	1.525	19.9	18.9	15.0		1.10	0.055	
PFM000107	12357	3	Lake Water	2006-08-14	0.50	5.30	0.30	-0.20	1.050	21.5	20.8	11.8		0.88	0.044	
PFM000107	12368	3	Lake Water	2006-09-11	0.50				0.933	19.0	18.8	12.4		0.72	0.036	
PFM000107	12333	5	Lake Water	2006-10-09	0.50	1.40	-0.20	-0.20	0.520	19.1	18.3	16.5		0.66	0.033	

Idcode	Sample no	Class no	Water_type	Sample date	Sampling depth (m)	C_PHYLL_A (ug/l)	C_PHYLL_C (ug/l)	PHEOP. (ug/l)	POC (mg/l)	TOC (mg/l)	DOC (mg/l)	DIC (mg/l)	O ₂ diss (mg/l)	A_436 (1/m)	ABS_436 (number)	SUSP (mg/l)
PFM000107	12540	3	Lake Water	2006-12-12	0.50	Surface	0.80	-0.20	0.20	0.242	20.2	19.8	20.3	2.36	0.118	
PFM000107	12566	5	Lake Water	2007-01-15	0.50	Surface	2.50	0.30	1.20	0.490	20.3	20.0	23.4	2.48	0.124	2.3
PFM000107	12590	3	Lake Water	2007-02-05	0.50	Surface	0.50	-0.20	0.50	0.250	18.2	17.9	24.0	2.28	0.114	-2.0
PFM000107	12567	3	Lake Water	2007-02-05	1.00	Bottom	0.60	-0.20	0.20	0.289	13.1	13.0	20.3	1.52	0.076	-2.0
PFM000107	12715	3	Lake Water	2007-03-05	0.50	Surface	0.40	0.20	0.30	0.278	17.0	16.7	25.2	2.34	0.117	-2.0
PFM000107	12717	3	Lake Water	2007-03-05	1.00	Bottom	0.50	0.20	0.30	0.261	12.1	12.6	26.5	1.80	0.090	-2.0
PFM000107	12744	3	Lake Water	2007-04-02	0.50	Surface	1.10	0.20	-0.20	0.240	14.9	16.5	17.4	2.50	0.125	-2.0
PFM000107	12784	5	Lake Water	2007-05-07	0.50	Surface										
PFM000107	12800	3	Lake Water	2007-05-28	0.50	Surface	2.90	0.20	0.50	0.369	17.7	17.4	18.5	1.48	0.074	2.5
PFM000107	12808	3	Lake Water	2007-06-25	0.50	Surface	1.90	0.20	0.30	0.447	18.0	18.3	14.7	1.18	0.059	-2.0
PFM000117	12339	5	Lake Water	2006-07-18	0.50	Surface	2.20	0.20	0.20	0.656	20.0	19.7	15.9	1.04	0.052	
PFM000117	12332	3	Lake Water	2006-08-14	0.50	Surface	3.40	0.30	-0.20	0.952	22.2	21.9	14.1	0.60	0.030	
PFM000117	12356	3	Lake Water	2006-09-11	0.50	Surface	2.70	0.30	0.40	1.030	19.9	19.3	15.5	0.40	0.020	
PFM000117	12384	5	Lake Water	2006-10-09	0.50	Surface	1.50	-0.20	0.30	0.585	18.1	19.1	18.8	0.62	0.031	
PFM000117	12554	3	Lake Water	2006-12-13	0.50	Surface	1.30	-0.20	0.20	0.305	19.9	19.8	20.8	1.72	0.086	
PFM000117	12568	3	Lake Water	2007-02-05	0.50	Surface	2.10	0.30	-0.20	0.319	22.8	22.0	25.8	1.88	0.094	-2.0
PFM000117	12596	3	Lake Water	2007-02-05	1.50	Bottom	0.80	0.20	0.30	0.317	22.1	22.3	31.8	1.94	0.097	-2.0
PFM000117	12716	3	Lake Water	2007-03-05	0.50	Surface	2.30	0.40	0.30	0.363	22.3	22.0	31.2	2.10	0.105	-2.0
PFM000117	12713	3	Lake Water	2007-03-05	1.50	Bottom	0.90	0.20	0.40	0.470	22.6	21.8	29.2	1.10	0.135	-2.0
PFM000117	12751	3	Lake Water	2007-04-02	0.50	Surface	2.20	0.20	-0.20	0.161	20.5	20.0	27.5	2.26	0.113	-2.0
PFM000117	12783	5	Lake Water	2007-05-07	0.50	Surface	2.40	0.30	-0.20	0.558	20.6	19.9	23.8	1.70	0.085	-2.0
PFM000117	12801	3	Lake Water	2007-05-28	0.50	Surface	8.00	0.70	-0.20	0.809	20.5	20.3	20.6	1.40	0.070	-2.0
PFM000117	12809	3	Lake Water	2007-06-25	0.50	Surface	2.40	0.20	0.30	0.647	21.0	20.6	18.4	1.26	0.063	1.4
PFM005865	12340	5	Sea Water	2006-07-20	0.50	Surface	1.80	0.20	0.20	0.290	4.1	4.0	13.7	0.18	0.009	
PFM005865	12341	5	Sea Water	2006-07-20	30.00	Intermediate	2.40	0.40	0.40	0.310	3.9	3.5	14.5	0.14	0.007	
PFM005865	12342	5	Sea Water	2006-07-20	55.00	Bottom	5.10	0.70	0.60	0.633	4.0	3.6	13.0	0.14	0.007	
PFM000097	12718	3	Lake Water	2007-03-06	0.50	Surface							3.90			

C_PHYLL_A = Chlorophyll a

C_PHYLL_C = Chlorophyll c

ABS_436 = absorption 436 nm

SUSP = Suspended matter

Sicada table: biochemistry_supp 2006-07-01 to 2007-06-30

Table A4-3. Isotopes I and Isotopes II.

Idcode	Sample no	Class no	Water_type	Sampling date	Sampling depth (m)	¹⁴ C (pmC)	δ ¹³ C (‰ PDB)	δ ³⁴ S (‰ CDT)	δ ³⁷ C (‰ SMOC)	⁸⁷ Sr/ ⁸⁶ Sr (ratio)	δD (‰ SMOW)	Tr (TU)	δ ¹⁸ O (‰ SMOW)	
PFM000062	12334	5	Sea Water	2006-07-17	0.50	Surface	102.92	-1.28	19.8	-0.03	0.709472	-63.0	14.10	-8.10
PFM000062	12381	5	Sea Water	2006-10-09	0.50	Surface						-63.0	12.10	-8.00
PFM000062	12564	5	Sea Water	2007-01-15	0.50	Surface						-63.9	11.10	-8.20
PFM000062	12779	5	Sea Water	2007-05-07	0.50	Surface						-64.5	10.04	-8.20
PFM000066	12565	3	Stream Water	2007-01-15	0.10	Surface						-84.9	8.80	-11.70
PFM000066	12781	3	Stream Water	2007-05-08	0.10	Surface						-79.0	9.23	-10.40
PFM000068	12563	3	Stream Water	2007-01-15	0.10	Surface						-78.8	9.90	-10.70
PFM000068	12778	3	Stream Water	2007-05-08	0.10	Surface						-79.8	10.86	-10.80
PFM000069	12569	3	Stream Water	2007-01-15	0.10	Surface						-84.6	10.80	-11.70
PFM000069	12785	3	Stream Water	2007-05-08	0.10	Surface						-82.2	8.94	-10.90
PFM000070	12570	3	Stream Water	2007-01-16	0.10	Surface						-77.0	9.30	-10.00
PFM000070	12780	3	Stream Water	2007-05-07	0.10	Surface						-68.3	10.93	-8.20
PFM000074	12336	5	Lake Water	2006-07-17	0.50	Surface	114.23	-7.05	4.7	0.25	0.722504	-64.4	13.10	-7.40
PFM000074	12338	5	Lake Water	2006-10-10	0.50	Surface						-59.0	13.50	-6.80
PFM000074	12782	5	Lake Water	2007-05-08	0.50	Surface						-78.0	11.85	-10.30
PFM000107	12335	5	Lake Water	2006-07-17	0.50	Surface	107.98	-4.56	9.0	-0.12	0.721057	-53.3	11.40	-5.50
PFM000107	12333	5	Lake Water	2006-10-09	0.50	Surface						-48.5	12.80	-4.30
PFM000107	12566	5	Lake Water	2007-01-15	0.50	Surface						-71.5	9.30	-9.20
PFM000107	12784	5	Lake Water	2007-05-07	0.50	Surface						-67.9	11.23	-8.40
PFM000117	12339	5	Lake Water	2006-07-18	0.50	Surface	109.01	-2.58	3.2	0.21	0.724358	-58.8	10.80	-6.20
PFM000117	12384	5	Lake Water	2006-10-09	0.50	Surface						-53.2	13.50	-5.20
PFM000117	12783	5	Lake Water	2007-05-07	0.50	Surface						-68.2	10.52	-8.10
PFM005865	12340	5	Sea Water	2006-07-20	0.50	Surface						-63.4	10.80	-8.10
PFM005865	12341	5	Sea Water	2006-07-20	30.00	Intermediate						-61.7	11.30	-8.10
PFM005865	12342	5	Sea Water	2006-07-20	55.00	Bottom						-62.4	11.30	-8.10
PFM102269	12348	3	Sea Water	2006-07-17	0.50	Surface							12.00	
PFM102269	12365	3	Sea Water	2006-08-14	0.50	Surface							12.20	
PFM102269	12372	3	Sea Water	2006-09-12	0.50	Surface							11.90	
PFM102269	12359	3	Sea Water	2006-10-10	0.50	Surface							11.40	
PFM102269	12542	3	Sea Water	2006-11-13	0.50	Surface							10.40	
PFM102269	12559	3	Sea Water	2006-12-12	0.50	Surface							11.30	
PFM102269	12571	3	Sea Water	2007-01-16	0.50	Surface							8.80	
PFM102269	12598	3	Sea Water	2007-02-05	0.50	Surface							10.80	
PFM102269	12712		Sea Water	2007-03-06	0.50	Surface							16.50	
PFM102269	12743	3	Sea Water	2007-04-03	0.50	Surface							11.70	
PFM102269	12777	3	Sea Water	2007-05-08	0.50	Surface							10.36	
PFM102269	12794	3	Sea Water	2007-05-29	0.50	Surface							40.12	
PFM102269	12807	3	Sea Water	2007-06-25	0.50	Surface							17.50	

Idcode	Sample no	Class no	Water_type	Sampling date	Sampling depth (m)		Ra-226 (Bq/l)	Rn-222 (Bq/l)	Rn-222_CORR (Bq/l)	U-238 (mBq/kg)	U-235 (mBq/kg)	U-234 (mBq/kg)	Th-232 (mBq/kg)	Th-230 (mBq/kg)
PFM000062	12334	5	Sea Water	2006-07-17	0.50	Surface	-0.015	0.050	0.110	7.08	0.18	8.34	0.08	0.25
PFM000062	12381	5	Sea Water	2006-10-09	0.50	Surface								
PFM000062	12564	5	Sea Water	2007-01-15	0.50	Surface								
PFM000062	12779	5	Sea Water	2007-05-07	0.50	Surface								
PFM000066	12565	3	Stream Water	2007-01-15	0.10	Surface								
PFM000066	12781	3	Stream Water	2007-05-08	0.10	Surface								
PFM000068	12563	3	Stream Water	2007-01-15	0.10	Surface								
PFM000068	12778	3	Stream Water	2007-05-08	0.10	Surface								
PFM000069	12569	3	Stream Water	2007-01-15	0.10	Surface								
PFM000069	12785	3	Stream Water	2007-05-08	0.10	Surface								
PFM000070	12570	3	Stream Water	2007-01-16	0.10	Surface								
PFM000070	12780	3	Stream Water	2007-05-07	0.10	Surface								
PFM000074	12336	5	Lake Water	2006-07-17	0.50	Surface	-0.015	0.003	0.008	17	0.70	19.0	0.40	0.80
PFM000074	12338	5	Lake Water	2006-10-10	0.50	Surface								
PFM000074	12782	5	Lake Water	2007-05-08	0.50	Surface								
PFM000107	12335	5	Lake Water	2006-07-17	0.50	Surface	-0.015	0.080	0.190	32	1.3	37.0	0.20	0.70
PFM000107	12333	5	Lake Water	2006-10-09	0.50	Surface								
PFM000107	12566	5	Lake Water	2007-01-15	0.50	Surface								
PFM000107	12784	5	Lake Water	2007-05-07	0.50	Surface								
PFM000117	12339	5	Lake Water	2006-07-18	0.50	Surface	-0.015	-0.015	-0.015	13	0.60	20.0	0.20	0.30
PFM000117	12384	5	Lake Water	2006-10-09	0.50	Surface								
PFM000117	12783	5	Lake Water	2007-05-07	0.50	Surface								
PFM005865	12340	5	Sea Water	2006-07-20	0.50	Surface								
PFM005865	12341	5	Sea Water	2006-07-20	30.00	Intermediate								
PFM005865	12342	5	Sea Water	2006-07-20	55.00	Bottom								
PFM102269	12348	3	Sea Water	2006-07-17	0.50	Surface								
PFM102269	12365	3	Sea Water	2006-08-14	0.50	Surface								
PFM102269	12372	3	Sea Water	2006-09-12	0.50	Surface								
PFM102269	12359	3	Sea Water	2006-10-10	0.50	Surface								
PFM102269	12542	3	Sea Water	2006-11-13	0.50	Surface								
PFM102269	12559	3	Sea Water	2006-12-12	0.50	Surface								
PFM102269	12571	3	Sea Water	2007-01-16	0.50	Surface								
PFM102269	12598	3	Sea Water	2007-02-05	0.50	Surface								
PFM102269	12712		Sea Water	2007-03-06	0.50	Surface								
PFM102269	12743	3	Sea Water	2007-04-03	0.50	Surface								
PFM102269	12777	3	Sea Water	2007-05-08	0.50	Surface								
PFM102269	12794	3	Sea Water	2007-05-29	0.50	Surface								
PFM102269	12807	3	Sea Water	2007-06-25	0.50	Surface								

Rn-222 = Value at date of analysis

RN-222_CORR = Corrected value representing sampling date

Sicada tables: isotopes_1 and isotopes_2 2006-07-01 to 2007-06-30

Table A4-4. Trace metals I.

Idcode	Sample no	Class no	Water_type	Sample date	Sampling depth (m)	Al (µg/L)	As (µg/L)	B (µg/L)	Ba (µg/L)	Cd (µg/L)	Cr (µg/L)	Cu (µg/L)	
PFM000062	12334	5	Sea Water	2006-07-17	0.50	Surface	1.72		16.3	0.1140	0.1440	0.812	
PFM000062	12381	5	Sea Water	2006-10-09	0.50	Surface	2.76	680.0	16.0	0.0300	0.1730	0.992	
PFM000062	12564	5	Sea Water	2007-01-15	0.50	Surface	4.27	0.620	690.0	17.3	0.0278	2.2200	0.879
PFM000062	12779	5	Sea Water	2007-05-07	0.50	Surface	4.07		15.8	0.0140	0.0685	0.984	
PFM000074	12336	5	Lake Water	2006-07-17	0.50	Surface	2.59		25.2	0.0033	0.0549	0.304	
PFM000074	12338	5	Lake Water	2006-10-10	0.50	Surface	2.75	19.6	26.2	0.0057	0.0468	0.225	
PFM000074	12782	5	Lake Water	2007-05-08	0.50	Surface	2.46		29.8	< 0.002	0.1010	0.707	
PFM000107	12335	5	Lake Water	2006-07-17	0.50	Surface	21.30		18.4	< 0.002	0.0686	0.674	
PFM000107	12333	5	Lake Water	2006-10-09	0.50	Surface	19.00		48.2	0.0057	0.0858	0.355	
PFM000107	12566	5	Lake Water	2007-01-15	0.50	Surface	11.40	< 0.5	72.8	23.0	< 0.02	0.4380	0.946
PFM000107	12784	5	Lake Water	2007-05-07	0.50	Surface	9.12		25.2	< 0.002	0.1030	0.839	
PFM000117	12339	5	Lake Water	2006-07-18	0.50	Surface	4.20		9.6	< 0.002	0.0583	0.488	
PFM000117	12384	5	Lake Water	2006-10-09	0.50	Surface	2.29	13.1	10.7	0.0038	0.0361	0.209	
PFM000117	12783	5	Lake Water	2007-05-07	0.50	Surface	2.54		14.4	0.0046	0.1190	1.150	
PFM005865	12340	5	Sea Water	2006-07-20	0.50	Surface	12.20		16.7	0.0930	0.2560	1.730	
PFM005865	12341	5	Sea Water	2006-07-20	30.00	Intermediate	72.10		16.7	0.1220	0.3710	1.010	
PFM005865	12342	5	Sea Water	2006-07-20	55.00	Bottom	46.10		17.0	0.0576	0.1680	1.010	

Idcode	Sample no	Class no	Water_type	Sample date	Sampling depth (m)	Co (µg/L)	Hg (µg/L)	Ni (µg/L)	Mo (µg/L)	Pb (µg/L)	V (µg/L)	Zn (µg/L)	
PFM000062	12334	5	Sea Water	2006-07-17	0.50	Surface	0.0546	< 0.002	0.824	1.730	0.5210	0.151	1.200
PFM000062	12381	5	Sea Water	2006-10-09	0.50	Surface	0.0359	< 0.002	0.810	1.930	0.4540	0.191	1.220
PFM000062	12564	5	Sea Water	2007-01-15	0.50	Surface	< 0.02	< 0.002	0.864	2.320	0.1970	0.229	1.750
PFM000062	12779	5	Sea Water	2007-05-07	0.50	Surface	0.0198	< 0.002	0.932	1.430	0.1190	0.242	1.410
PFM000074	12336	5	Lake Water	2006-07-17	0.50	Surface	0.0450	< 0.002	0.258	0.512	0.0575	0.161	1.870
PFM000074	12338	5	Lake Water	2006-10-10	0.50	Surface	0.0483	< 0.002	0.139	0.319	0.0497	0.116	0.975
PFM000074	12782	5	Lake Water	2007-05-08	0.50	Surface	0.0384	< 0.002	0.476	0.738	0.0757	0.318	1.680
PFM000107	12335	5	Lake Water	2006-07-17	0.50	Surface	0.0792	< 0.002	0.371	1.050	0.3100	0.554	0.762
PFM000107	12333	5	Lake Water	2006-10-09	0.50	Surface	0.0745	< 0.002	0.329	0.898	0.1870	0.177	0.818
PFM000107	12566	5	Lake Water	2007-01-15	0.50	Surface	0.0541	< 0.002	0.524	1.140	0.1610	0.394	1.870
PFM000107	12784	5	Lake Water	2007-05-07	0.50	Surface	0.0688	< 0.002	0.391	0.823	0.1550	0.372	1.840
PFM000117	12339	5	Lake Water	2006-07-18	0.50	Surface	0.0432	< 0.002	0.235	0.237	0.0235	0.243	0.537
PFM000117	12384	5	Lake Water	2006-10-09	0.50	Surface	0.0451	< 0.002	0.133	0.196	0.0277	0.186	0.470
PFM000117	12783	5	Lake Water	2007-05-07	0.50	Surface	0.0280	< 0.002	0.348	0.326	0.0804	0.359	1.920
PFM005865	12340	5	Sea Water	2006-07-20	0.50	Surface	0.0316	< 0.002	4.230	1.480	0.6060	0.159	21.700
PFM005865	12341	5	Sea Water	2006-07-20	30.00	Intermediate	0.0462	< 0.002	1.090	1.630	0.4130	0.178	4.850
PFM005865	12342	5	Sea Water	2006-07-20	55.00	Bottom	0.0559	< 0.002	0.942	1.590	0.3470	0.158	4.240

< value = below reporting limit

Sicada table: trace_metals_1 2006-07-01 to 2007-06-30