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Forsmark site investigation

Sampling and analyses of surface waters

Results from sampling in the Forsmark area, July 2005–June 2006

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May 2007

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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 forth in the present series, comprises documentation of the fieldwork as well as compilation and tabulation of surface water data obtained during the period July 2005 to June 2006, i.e. the second year of the monitoring programme.

The sampling during the second year continued from the same eleven sampling objects and at unchanged frequency, once per month. However, one extra sampling object (Lake Biotestsjön) was included in order to check eventual tritium contamination from the nuclear power plant. The sampling focused on streams, lakes and shallow sea bays 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, measurement depth, 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.

The report presents ORP-values (Oxidising-Reducing Potential) in diagrams since the start in 2002 in order to illustrate the seasonal variation. Furthermore, the tritium contents and possible contamination of the sea water is discussed. It is concluded that the tritium contents in the sea water close to the nuclear power plant have decreased to normal values since last year. Only the first sample (July 2005) from close to the cooling water outlet in lake Biotestsjön displayed a conspicuously high tritium content of 120 TU. In the following samples the tritium content measured between 9.1 TU and 12.9 TU, which is the expected level.

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 fjärde i ordningen, innehåller dokumentation av fältarbetet samt presentation och sammanställning av erhållna data under perioden juli 2005 till och med juni 2006, det vill säga det andra året av övervakningsprogrammet.

Provtagningen under andra 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 och grunda havsvikar för att karakterisera ytvattnen i området. De erhållna resultaten omfattar fältmätningar av ORP (Oxidising-Reducing Potential), pH, löst syre, elektrisk konduktivitet, salinitet, mätdjup, barometertryck, turbiditet, klorofyll, siktdjup, PAR (Photosynthetic Active Radiation) och vattentemperatur samt kemiska analyser av huvudkomponenter, närsalter, kolföreningar, spårelement och isotoper.

Rapporten presenterar ORP-värden i diagram sedan starten 2002 för att illustrera säsongsvariationerna. Vidare diskuteras tritiumvärden och eventuell kontaminering av havsvattnet. Det konstateras att tritiumhalten i havsvikarna nära kärnkraftverket har minskat till normala värden sedan förra året. Endast det första av proven (juli 2005) tagna i närheten av kylvattenutloppet i Biotestsjön visade ett uppseendeväckande högt tritiumvärde på 120 TU. I de följande proven mättes tritiumhalten till mellan 9,1 TU och 12,9 TU, vilket kan anses vara en normal nivå.

Sötvattnen 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 prov tagna 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

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 second year of the long-term surface water monitoring programme (July 2005 to June 2006). Three previous reports present results from earlier investigations periods, /2/, /3/ and /4/. Furthermore, a detailed evaluation of surface water data from March 2002 to March 2004 is presented in /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 400-05-051). 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.

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

Activity plan	**Number**	**Version**
Undersökningar i Forsmarksområdet: Långtidsövervakning av ytvatten juli 2004–juli 2005.	AP PF 400-05-051	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

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).

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 sampling location remains in a shallow sea bay (Forslingens grund). Sampling of stream water continues at four localities (Kungsträsket, Bolundsskogen, Norr Eckarfjärden, Öster Gunnarsbo) and an electrical conductivity logger is installed in Lilleputt-sundet, 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, measurement depth, 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 ($\delta^{37}Cl$, $\delta^{13}C$, ^{14}C (pmC), $^{87}Sr/^{86}Sr$, $\delta^{34}S$, 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 five 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.

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 2005 to June 2006 is given in Table 3-2.

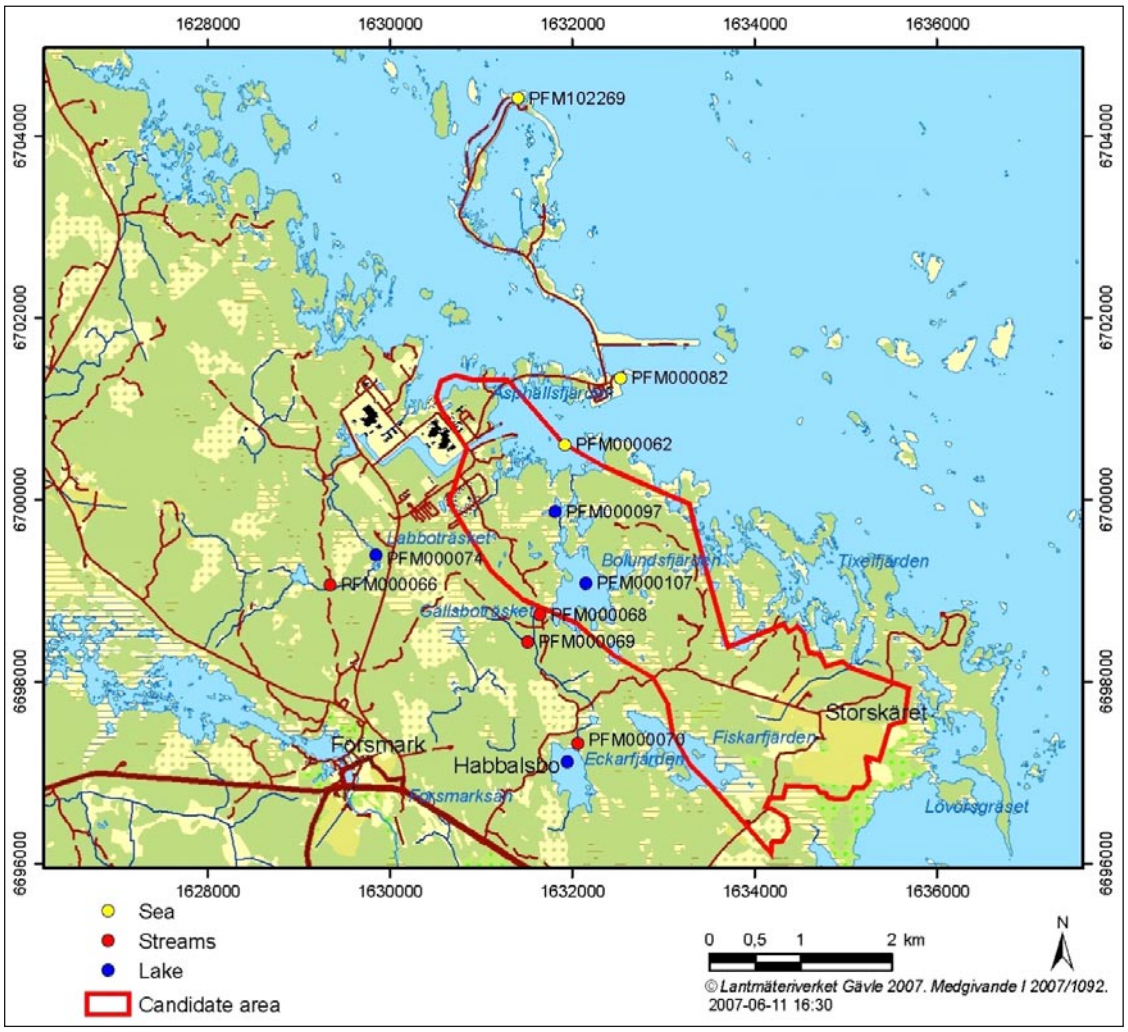


Figure 3-1. *Sampling locations within the monitoring programme. One location constitutes an alternative for a regular sampling position (see Table 3-1).*

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	
PFM102270		Bolundsfjärden, not on the map in Figure 3-1	Alternativ till PFM00107, använd vid ett tillfälle på grund av svag is
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
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 2005 to June 2006.

Year	Month	Week	Programme type*
2005	July	28	E+
2005	August	31	M
2005	September	36	M
2005	October	40	E
2005	November	44	M
2005	November	48	M
2005	December	51	M
2006	January	4	E
2006	February	8	M
2006	March	12	M
2006	April	16	E
2006	May	20	M
2006	June	24	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 ($\delta^{37}Cl$, $\delta^{13}C$, ^{14}C (pmC), $^{87}Sr/^{86}Sr$, $\delta^{34}S$, 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).

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

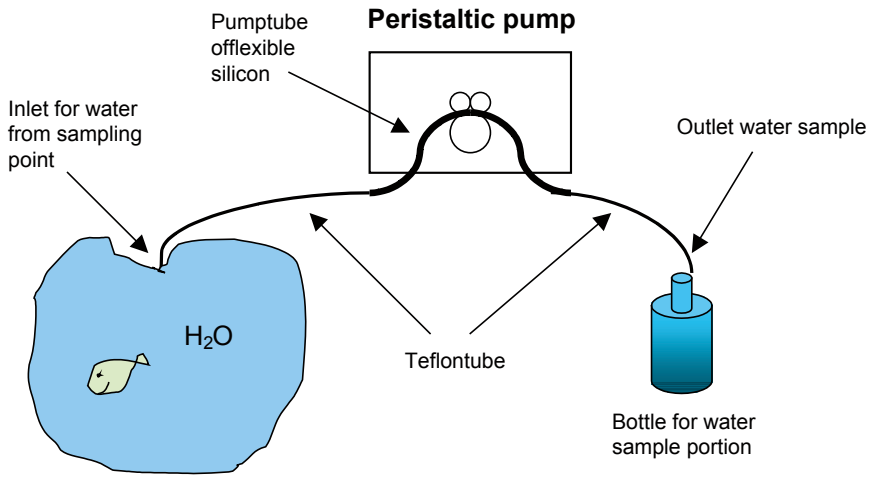


Figure 4-1. *Schematic presentation of the peristaltic pump system (PPS).*

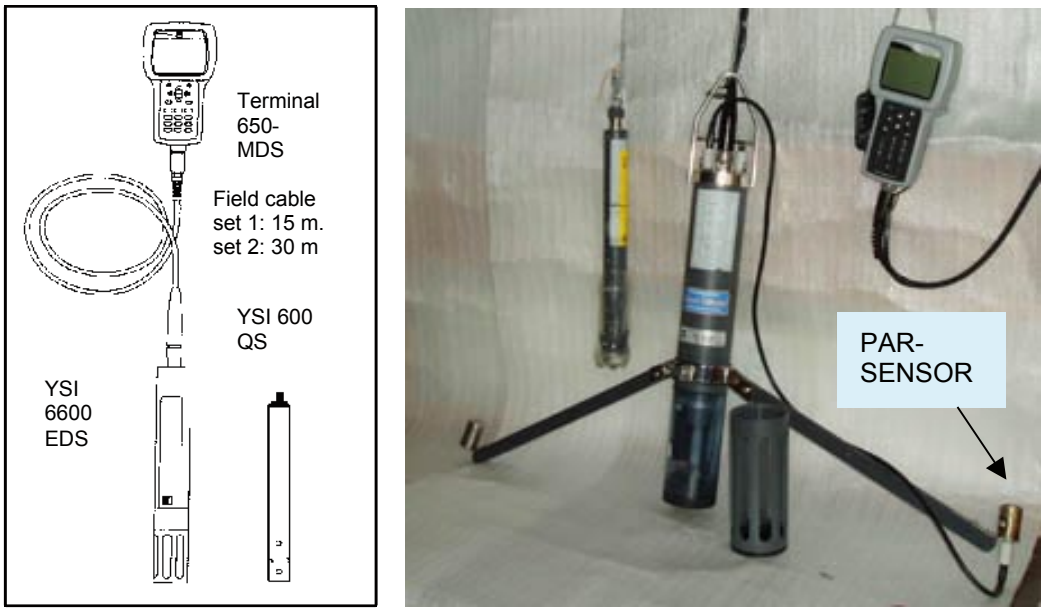


Figure 4-2. *Measurement sondes used in the field investigations.*

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 location 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 µm, Ø = 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 at Kungsträsket (PFM 000068) January 2006.*

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.

Figure 5-1. *Left: Sampling of surface water from below wet and soft ice (Lake Bolunds-fjärden, April 2006). Right: Filtration of water in the field using a disposable filter.*

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, NOx, Silicate	Filtering with syringe/0.40 µm filter	Fill to mark
50	1	Green	TOC	–	Leave 1 cm
50	2	Green	DIC/DOC	Filtering with syringe/0.40 µm filter	Leave 1 cm
Winkler bottles[1]	2	Green	Oxygen	1 mL Mn(II) reagent + 2 mL alkaline iodine reagent and mix	Flow over x 3
Winkler bottles[2]	2	Green	H_2S[2]	1 mL ZnAc + 1 mL 1M NaOH and mix	Flow over x 3
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.

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 sea locations 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.

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 5-3. 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 (m^2) resulted in a rough water runoff estimate (m^3/s).

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	

Figure 5-2. *Measuring a profile (PFM000064) in the ice covered Baltic Sea with the multiple sonde (YSI 6600 EDS).*

Figure 5-3. *Schematic presentation for estimating water runoff in natural stream waters (see text for explanation). Sampling location PFM000073 (Söder Bredviken).*

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 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 ± 10% are considered acceptable in surface waters.

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

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

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
Light data file	PAR-profiler V38_04.xls	1

* Depending on the number of measuring sondes used.

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 5-4.

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:

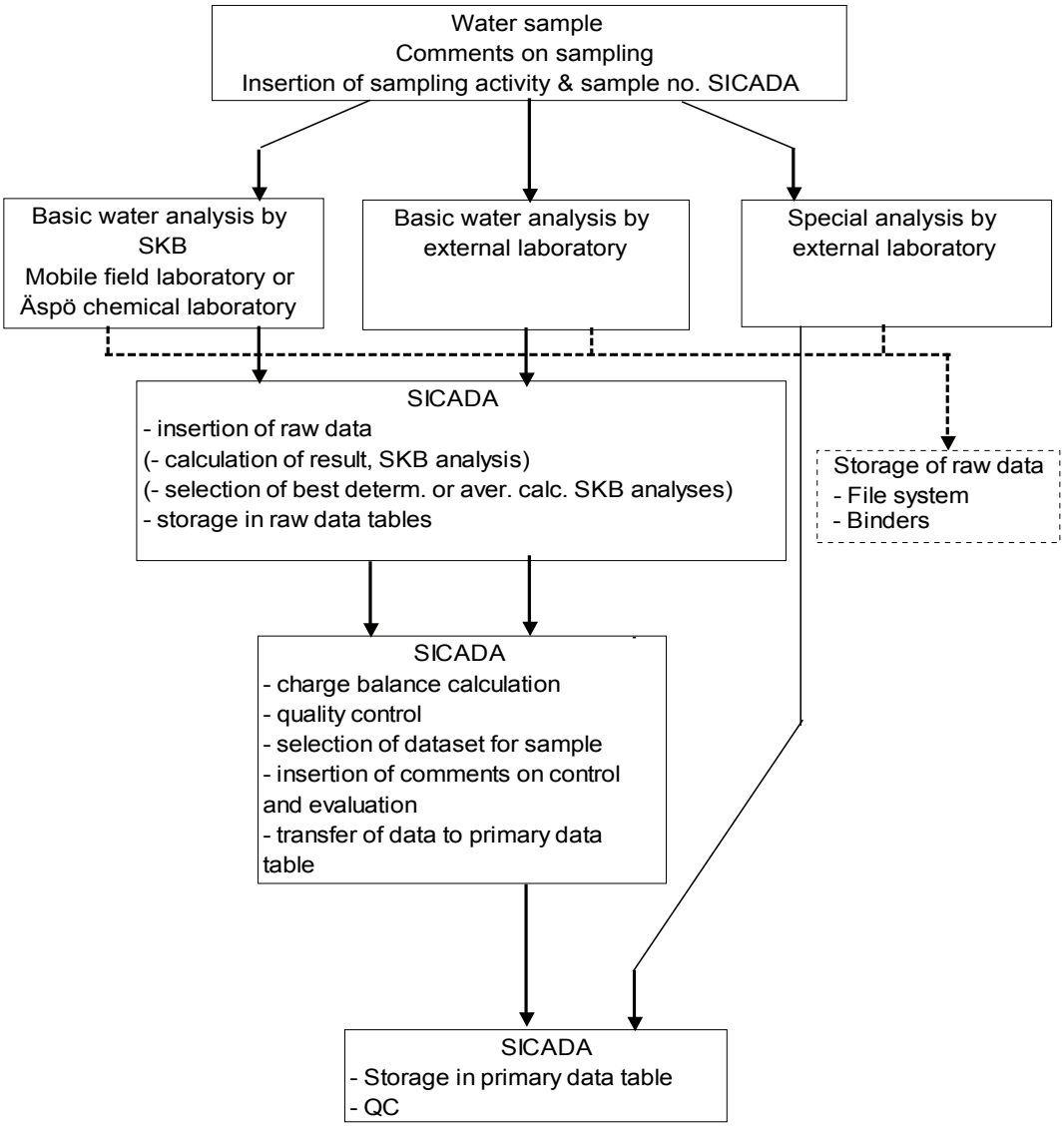


Figure 5-4. *Overview of data management for analytical data.*

Air temperature	Wind velocity	Runoff/Water flow
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 5-4. Collected samples and conducted measurements.

Week/year		28/05	31/05	36/05	40/05	44/05	48/05	51/05	04/06	08/06	12/06	16/06	20/06	24/06	Sum (x)
Sond															
YSI 6600		X	X	X	X	X	X	X	X	X	X	X	X		
Sea	**Name**														
PFM000062	SV-Forslingen	X	X	X	X	X	X	X				X	X	X	10
PFM000082	Alt PFM000062								X	X	X				3
PFM102269	Cooling water outlet Lake Biotesten	X*							X**	X**	X**	X**	X**	X**	7
Stream															
PFM000066	Ö-Gunnarsbo	X	X	X	E	X	X	X	X	X	X	X	X	X	12
PFM000068	Kungsträsket	X	X	X	X	X	X	X	X	X	X	X	X	X	13
PFM000069	Bolundsskogen	X	X	X	X	X	X	X	X	X	X	X	X	X	13
PFM000070	N-Eckarfjärden	X	X	X	X	X	X	X	X	X	X	X	X	X	13
Lakes															
PFM000074	Labboträsket	X	X	X	X	X	X	X	X	X	X	X	X	X	13
PFM000097	Norra bassängen	B	X***	B	B	B	B	B	B	X***	X***	B	B	B	3
PFM00107	Bolundsfjärden	X	X	X	X	X	X	X	X	X	X	X	X	X	13
PFM00117	Eckarfjärden	X	X	X	X	X	X	X	X	X	X	C	X	X	12
Sum (X)		9	9	8	7	8	8	8	9	10	10	8	9	9	112

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 an representative sample

* Only tritium, deuterium and ^{18}O

** Only tritium and anions

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

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

Week/year		28/05	31/05	36/05	40/05	44/05	48/05	51/05	04/06	08/06	12/06	16/06	20/06	24/06
Sond														
YSI 6600		X	X	X	X	X	X	X	X	X	X	X	X	X
Sea	**Name**													
PFM000062	SV-Forslingen	J	J									J	J	
PFM000082	Alt PFM62								J	J		U		
PFM102269	Cooling water outlet Lake Biotesten													
Stream														
PFM000066	Ö-Gunnarsbo	H	H, Z	H, Z		H		F, S	F, Z	F	F, Z			H
PFM000068	Kungsträsket	H, Z	H	H	H, Z	H		F, S	F, Z	F	F			H
PFM000069	Bolundsskogen				H			F, Z	F, Z	F, Z	F, Z			
PFM000070	N-Eckarfjärden	H	H	H	H	H		F	F, Z	F	F, Z			H
Lakes														
PFM000074	Labbotträsket						Z	Z	Q, Z	Z	Z		J	
PFM000097	Norra bassängen		Z				Q	J	J, Q, Z	Q, Z	Q, Z			
PFM00107	Bolundsfjärden	J			J				Z	Z	Z	K	J	
PFM00117	Eckarfjärden								U, Z	Q, Z	Z			

Explanations to codes/abbreviations:

F: No flow estimation.

H: Stagnant water or nearly stagnant water - no flow estimation, flow approx 0 m^3/s.

J: Incorrect PAR-values at one or several depths (mainly caused by waves or clouds).

K: Sample taken at another position, “close by”, due to weak ice (applies only to surface samples).

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

S: Peristaltic pump system out of order, sample collected with Ruthner-sampler.

U: Incorrect sonde-data logging, noted in field protocol.

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

6 Results

6.1 General

The surface water investigation period from July 2005 to June 2006 includes records of 120 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 /5/.

The results presented and compiled in this report are restricted to field work performed after July 2005 except for the ORP-measurements which are plotted in diagrams versus date since the start 2002 to show the seasonal variation. Some of the more thoroughly discussed issues are:

- Check of consistency by comparison between TDS (Total Dissolved Solids) calculated from water composition and from EC (Electrical Conductivity).
- Improved quality of bromide analyses.
- Tritium result from the additional sampling object (outlet of cooling water into Lake Biotestsjön).
- Seasonal variation of ORP-measurements.

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 ± 5% in 23 cases and no case exceeded ± 10% out of 120 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. Generally, the difference in concentrations between laboratories/methods for each analysed constituent is less than ± 10%. A constituent showing larger deviation is bromide; see Figure 6-6.

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 near surface groundwater data generally agree well with a thought regression line. Another way to check the consistency of the data is to calculate TDS (Total Dissolved Solids) from water composition and from EC (Electrical Conductivity), respectively. A diagram comparing the TDS values is given in Figure 6-2. The conversion factor between EC and TDS varies (from 5 to 9 according to literature) depending on water type but should coincide for similar water samples.

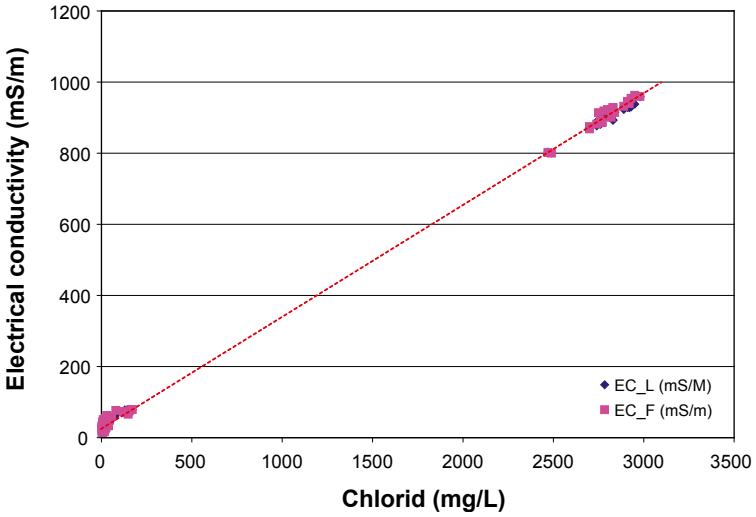


Figure 6-1. *Electrical conductivity versus chloride concentrations. EC_L = Laboratory value, EC_F = Field value.*

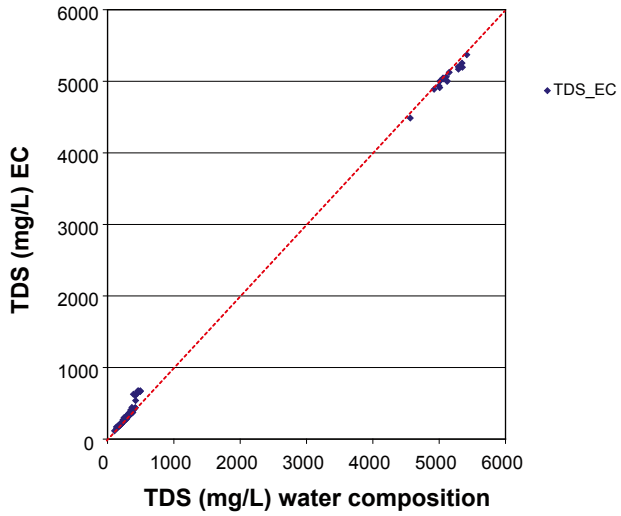


Figure 6-2. *TDS (Total Dissolved Solids) calculated from EC versus TDS from water composition. TDS (mg/L) = a×EC(mS/m) where a = 5.6 in sea water and a = 8.5 in fresh water.*

Sulphate by ion chromatography and sulphate calculated from total sulphur by ICP are compared in Figure 6-3. As shown, within the analytical error nearly all the sulphur is present as sulphate.

Total silicon concentrations by ICP, and SiO_4 as silicon concentrations (SiO_4-Si) by spectrophotometry, are compared in Figure 6-4. The diagram shows very good agreement although somewhat higher total silicon concentrations may be expected/explained.

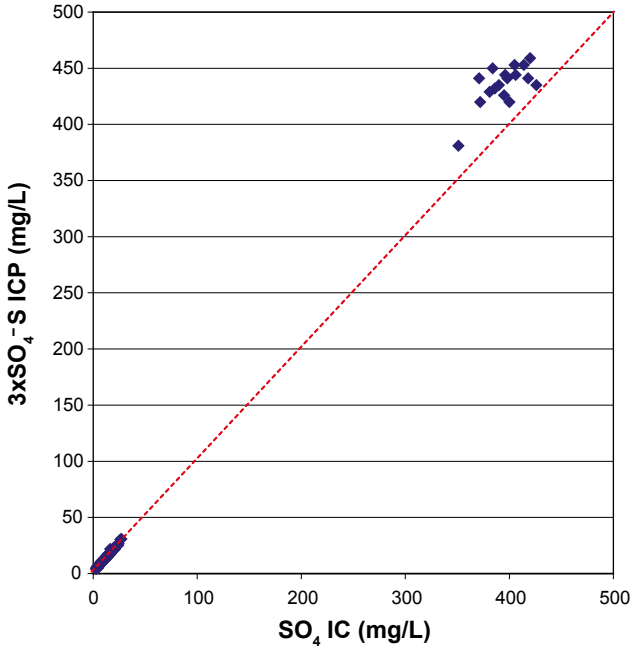


Figure 6-3. *Sulphate (SO_4^{-} by IC) versus sulphate calculated from total sulphur ($3 \times SO_4^{-}S$) by ICP.*

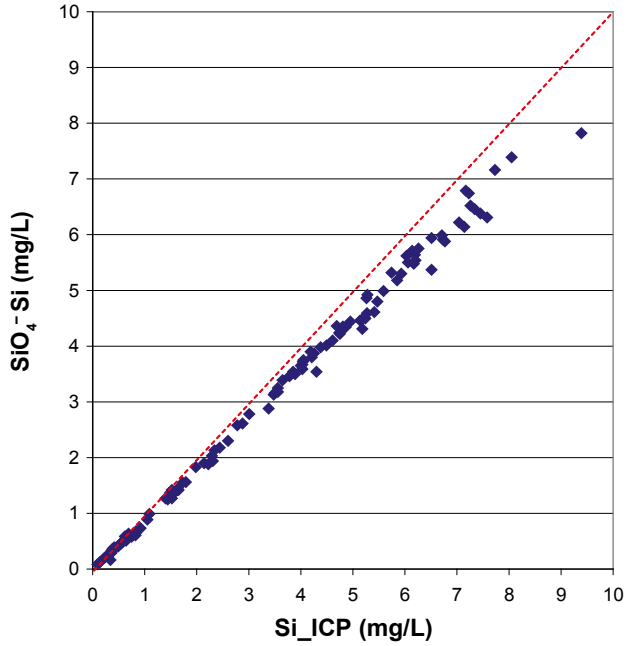


Figure 6-4. *SiO_4-Si determined by spectrophotometry versus total Si analysed by ICP.*

Bromide

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 6-5 as a consistency check. The points do not differ too much from the linear trend and the data are therefore considered acceptable. A comparison of the analytical results by ion chromatography (IC) and by ICP is presented in Figure 6-6. As demonstrated, some high bromide concentrations (sea water) by ion chromatography show deviations. However, these data points derive from early analyses before October 2005. The quality of the bromide analyses by IC have been improved since then after change of IC-column.

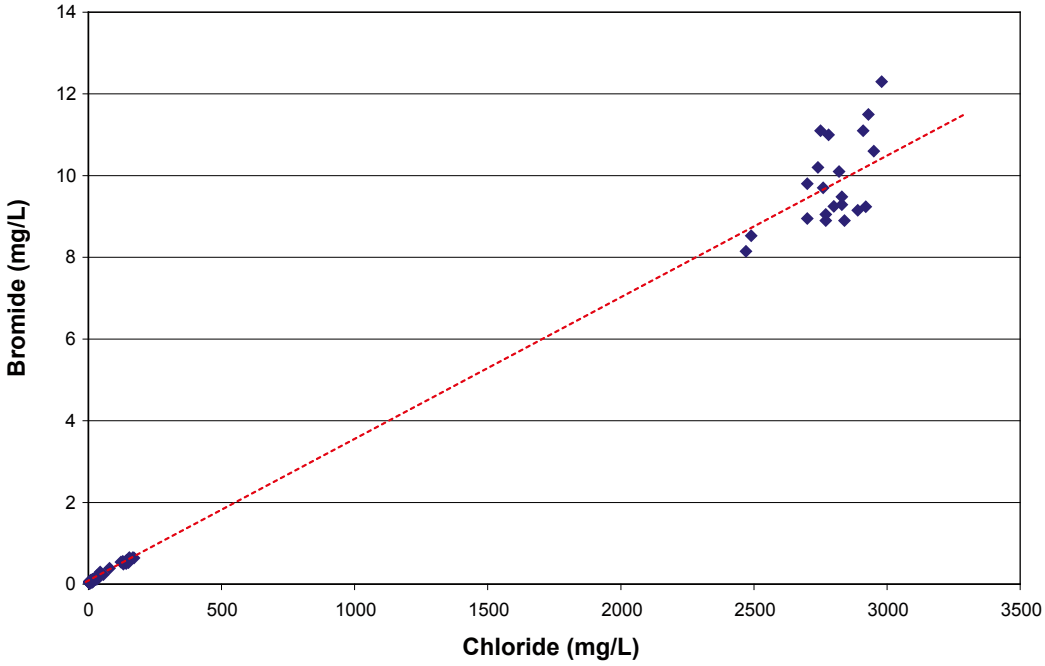


Figure 6-5. *Bromide versus chloride.*

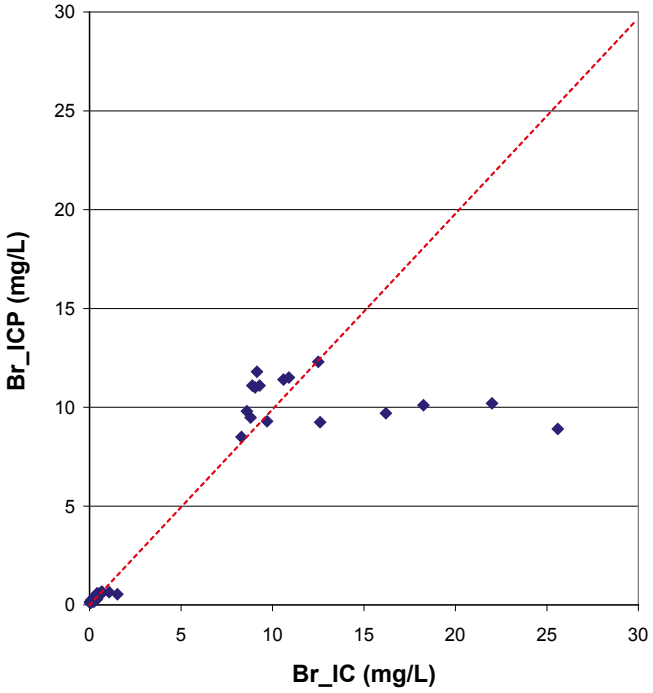


Figure 6-6. *Comparison of bromine by ICP technique and bromide by ion chromatography.*

6.2.2 Trace metals

The analyses of trace and rare-earth elements include Al, As, Sc, Cd, Cr, Cu, Co, Hg, Ni, Zn, Pb, V, U, Th , Rb, Y, Zr, Mo, In, Sb, Cs, Ba, La, Hf, Tl, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu. 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.

6.2.3 Surface water supplements

The surface water supplements include NH_4-N, NO_2-N, NO_3-N+NO_2-N, NO_3-N, tot-N, tot-P, PO_4-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.

6.2.4 Isotopes

The isotope determinations include the stable isotopes δD, $\delta^{18}O$, $^{10}B/^{11}B$, $\delta^{34}S$, $\delta^{13}C$, $\delta^{37}Cl$ and $^{87}Sr/^{86}Sr$ as well as the radioactive isotopes Tr (TU), 14C (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 the previous sampling period March 2004 to 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. Of the seven samples analysed so far, only the first sample collected in July 2005 revealed enhanced tritium concentration (120.7 TU). The latter samples showed normal concentrations between 8.5 and 12.9 TU. Samples from the regular sampling locations did not measure any exceptionally high tritium contents during this last year. These circumstances indicate that contamination from the nuclear power plant does occur at times.

Uranium isotopes

The ICP analyses of uranium and the converted ^{238}U-determinations are compared in Table 6-3 and the agreement is quite good.

Table 6-3. Comparison of uranium (µg/L) calculated from ^{238}U-determinations and Uranium (µg/L) by ICP-MS.

Id code	Date	Sample no.	^{238}U (mBq/L)	U (µg/L) calc. from ^{238}U*	U (µg/L) ICP
PFM000107	2005-07-11	8938	25.3	2.04	2.17
PFM000062	2005-07-11	8936	7.4	0.60	0.70
PFM000074	2005-07-11	8937	14.9	1.20	1.41
PFM000117	2005-07-11	8935	15.3	1.23	1.23

* 1 ppm U = 12.4 Bq/kg^{238}U

6.3 Field measurements

The field measurement data including redox potential, pH, dissolved oxygen, electrical conductivity, salinity, measurement depth, 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. Three sets of data are of lower quality; 1) water flow data, 2) sonde measurements (YSI 6600 EDS) of chlorophyll, and 3) turbidity measurements also by the sonde.

- The water flow rate estimations (Appendix 4) by the float method /6/ 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).

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

6.3.1 Electrical conductivity, pH and dissolved oxygen

pH-measurement

Field measurements of pH are plotted against the corresponding laboratory values in Figure 6-7. The observed disagreement is reasonable considering the change of water temperature and the time delay prior to the laboratory measurement. However, in some cases, the disagreement seems to be greater than expected.

Electrical conductivity

Electrical conductivities measured in the field are plotted against the corresponding laboratory values in Figure 6-8. The agreement is good.

Dissolved oxygen

The field measurements of dissolved oxygen were expected to be less reliable, especially at low concentration (< 4 mg/L), see evaluation of the equipment (Jämförelse mellan sondmätningar och laboratorieresultat i Forsmark och Simpevarp 2002 to 2003, Ulf Ericsson, Medins Sjö- och Åbiologi AB, 2003-06-03). In Figure 6-9 measured oxygen concentrations below 4 mg/L are plotted versus corresponding analytical results. A few laboratory analyses show much higher concentrations than the ones measured in the field. A possible reason might be contamination by oxygen from the air at the sampling occasion.

6.3.2 ORP-measurements and redox conditions

ORP-measurements (Oxidising-Reducing Potential) have been conducted using the multipurpose measurement sonde in surface waters from lakes, streams and shallow sea bays. The recorded ORP-values (versus Ag/AgCl reference electrode and not Standard Hydrogen Electrode (SHE)) should be used with great caution and merely considered as an indication of the redox conditions in the waters. Factors that may affect certainty/reliability of the ORP-values are short measurement time (10–15 minutes) and complicated redox conditions (mixed potentials etc.).

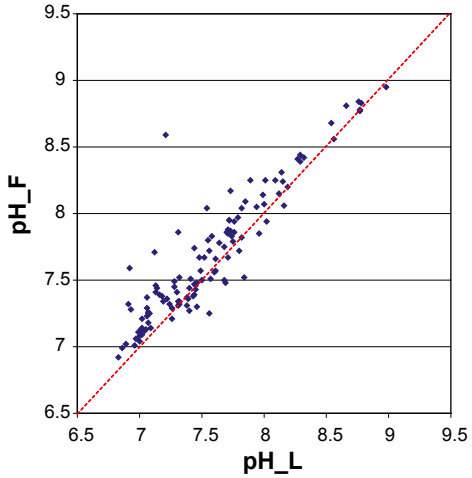


Figure 6-7. *Field-pH values versus laboratory-pH values. Field-pH and laboratory-pH values are measured at prevailing water temperature and at 25°C respectively.*

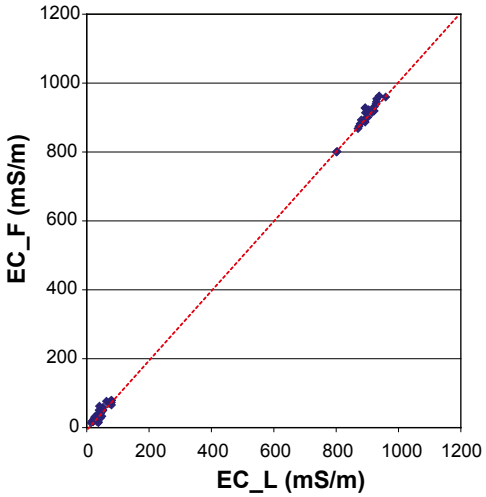


Figure 6-8. *Electrical conductivity (25°C). Field measurements versus laboratory values.*

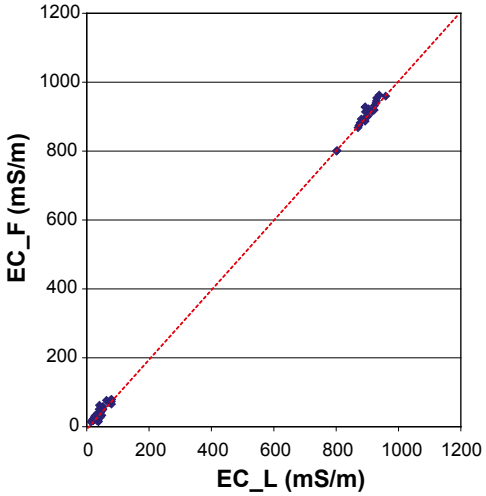


Figure 6-9. *Dissolved oxygen. Field measurement versus laboratory analytical results. Values below detection limit are plotted as zero. Analyses are performed when the measured values record less than 4 mg/L.*

Figures 6-10 to 6-12 present the seasonal variation of the ORP-values in lakes, streams and shallow sea bays respectively. As expected, the ORP decreases in the lakes and streams during winter time due to ice coverage and low biological production. This phenomenon is less pronounced in the sea bays. As reported previously /4/, the concentrations of dissolved oxygen and ORP-values were proved to be consistent for the time period December 2002 until October 2005 and this is the case also for the eight additional measurement occasions after that period.

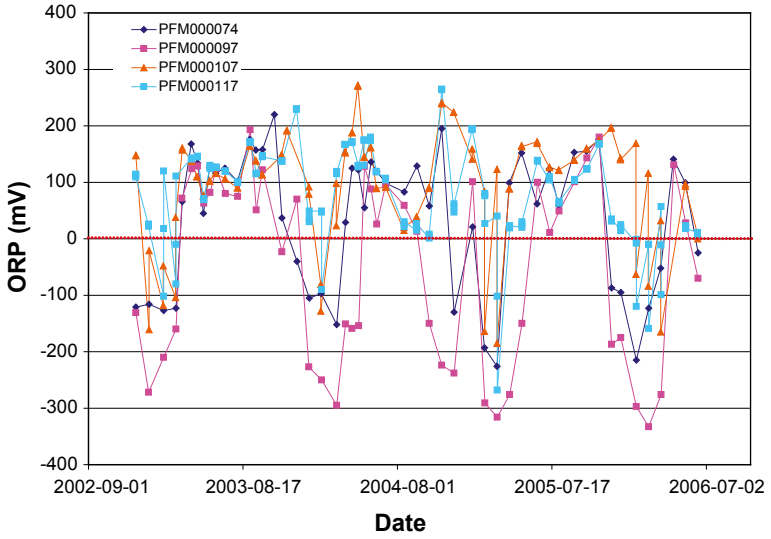


Figure 6-10. *Seasonal variation of ORP-values in lake waters from start of measurements (December 2002 to June 2006).*

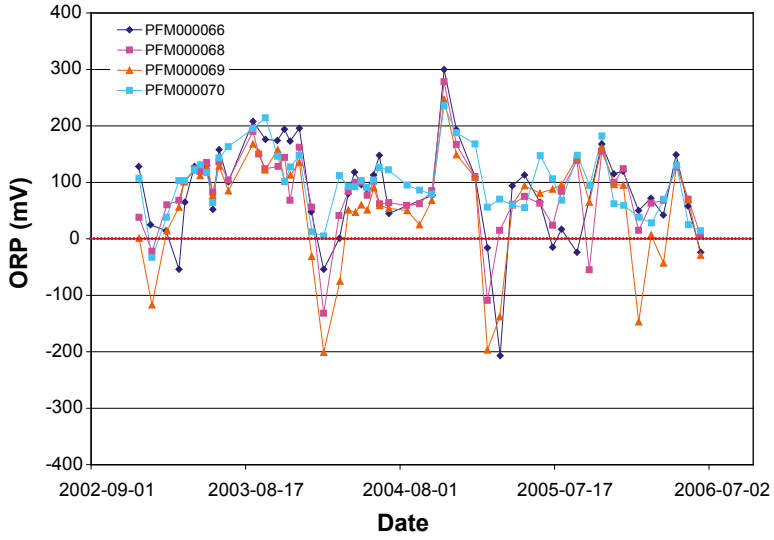


Figure 6-11. *Seasonal variation of ORP-values in stream waters from start of measurements (December 2002 to June 2006).*

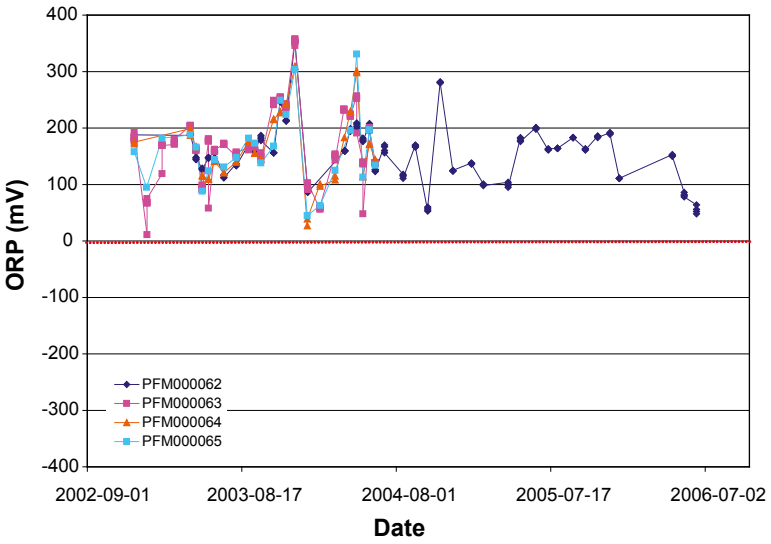


Figure 6-12. *Seasonal variation of ORP-values at sea bay locations from start of measurements (December 2002 to June 2006).*

7 Summary and discussion

The chemical investigation routines for surface waters are well established after more than four years of field work, reporting and data administration and the second 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 2005 are summarised below:

- The statements/findings regarding the character of the surface waters after the fourth 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.
- The bromide analyses by ion chromatography have improved after October 2005.
- The sampling for tritium analyses performed close to the outlet of cooling water from the power plant revealed an enhanced value in July 2005 (120.7 TU) but the following samples showed normal concentrations. These circumstances indicate that contamination from the nuclear power plant may occur at times.
- The ORP measurements continued to display similar seasonal variation as reported previously /4/.

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/ **Sonesten L, 2004.** Evaluation of surface water chemistry data from the Forsmark area. March 2002 to March 2004. SKB R-05-41, 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/ **Johansson, P-O, 2005.** Forsmark site investigation. Manual discharge measurements in brooks, April 2002 to April 2005. SKB P-05-153, Svensk Kärnbränslehantering AB.

Appendix 1

Methods for sampling and analyses

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

Component group	Component/element	Sample container (material)	Volume (mL)	Filtering	Preparation/ Conservation*	Analysis method	Analysis within – or delivery time to lab.
Anions 1	HCO^3 pH(lab) cond (lab)	Plastic	250	Yes (not in the field)	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 120×2	No	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	^{2}H, ^{18}O	Plastic	100	No	– –	MS	Not critical (month)
Tritium, Chlorine-37	^{3}H (enhanced.) Chlorine-37	Plastic (dry bottle) Plastic	500 100	No No	– –	LSC MS	Not critical (month)
Carbon isotopes	^{13}C, ^{14}C	Glass (brown)	100×2	No	–	(A)MS	A few days
Sulphur isotopes	^{34}S	Plastic	500–1,000	Yes	–	Combustion, MS	No limit
Strontium-isotopes	$^{87}Sr/^{86}Sr$	Plastic	100	Yes	–	TIMS	Days or Week
Uranium and Thorium isotopes	^{234}U, ^{235}U, ^{238}U, ^{232}Th, ^{230}Th,	Plastic	50	Nej	–	Chemical separat. Alfa/gamma spectrometry	No limit
Boron isotopes	^{10}B	Plastic	100	Yes	Yes (1 mL HNO^{3})	ICP-MS	No limit
Radon and Radium isotopes	^{222}Rn, ^{226}Ra	Plastic	500	No	No	EDA, RD-200	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 and fractionation (see below)	Polycarbonate filter	0.45, 0.2 and 0.05 µm	–	N_2 atmosphere	ICP-AES ICP-MS	Immediate transport
Humic and fulvic acids	Fractionation	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	Yes (in the field)	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	1,000	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	1,000–2,000	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	5,000	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
(A)MS	(Accelerator) Mass Spectrometry
GC	Gas Chromatography

Table A1-2. Reporting limits and measurement uncertainties.

Component	Method	Reporting limits or range		Unit	Measurement uncertainty [2]	"Total" uncertainty [3]
HCO_3	Alkalinity titration	1		mg/L	4%	< 10%
Cl^-	Mohr-titration	> 70		mg/L	5%	< 10%
Cl^-	IC	1–100			6%	10%
SO_4	IC	1		mg/L	10%	15%
Br^-	IC	0.2		mg/L	9%	20%
Br^-	ICP	0.001			15%	
F^-	IC	0.1		mg/L	10%	20%
F^-	Potentiometric	–			–	
I^-	ICP	0.001		mg/L	15%	20%
Na	ICP	0.1		mg/L	4%	10%
K	ICP	0.4		mg/L	6%	15%
Ca	ICP	0.1		mg/L	4%	10%
Mg	ICP	0.09		mg/L	4%	10%
S(tot)	ICP	0.160		mg/L	21%	15%
Si(tot)	ICP	0.03		mg/L	4%	15%
Sr	ICP	0.002		mg/L	4%	15%
Li	ICP	0.2[1]	2	mg/L	10%	20%
Fe	ICP	0.4[1]	4	mg/L	6%	10%
Mn	ICP	0.03[1]	0.1	µg/L	8%	10%
Fe(II), Fe(tot)	Spectrophotometry	0.02 (DL = 0.005 mg/L)		mg/L	15% (> 30 µg/L)	20%
HS-	Spectrophotometry	SKB 0.03 (DL = 0.002)		mg/L	10%	30% (low conc.)
NO_2 as N	Spectrophotometry	0.1		µg/L	2%	20%
NO_3 as N	Spectrophotometry	0.2		µg/L	5%	20%
NO_2+NO_3 as N	Spectrophotometry	0.2		µg/L	0.2 (0.2–20 µg/L) 2% (> 20 µg/L)	20%
NH_4 as N	Spectrophotometry	0.8		µg/L	0.8 (0.8–20 µg/L) 5% (> 20 µg/L)	20%
		50 (SKB)			20%	
PO_4 as P	Spectrophotometry	0.7		µg/L	0.7 (0.7–20 µg/L) 3% (> 20 µg/L)	20%
SiO_4	Spectrophotometry	1		µg/L	3% (> 200 µg/L)	–
O_2	Jodometrisc titration	0.2–20		mg/L	5%	–
Chlorophyll a, c pheopigment[4]	See table A1-2	0.5		µg/L	5%	–
PON[4]	See table A1-2	0.5		µg/L	5%	–
POP[4]	See table A1-2	0.1		µg/L	5%	–
POC[4]	See table A1-2	1		µg/L	4%	–
Tot-N[4]	See table A1-2	10		µg/L	4%	–
Tot-P[4]	See table A1-2	0.5		µg/L	6%	–
Al, Zn	ICP	0.2		µg/L	12%	20%[5]
Ba, Cr, Mo, Pb	ICP	0.01		µg/L	7–10%	20%[5]
Cd, Hg	ICP	0.002		µg/L	9 resp 5%	20%[5]
Co, V	ICP	0.005		µg/L	8 resp 5%	20%[5]
Cu	ICP	0.1		µg/L	8%	20%[5]
Ni	ICP	0.05		µg/L	8%	20%[s]

Component	Method	Reporting limits or range		Unit	Measurement uncertainty [2]	"Total" uncertainty [3]
P	ICP	1		µg/L	6%	10%
As	1CP	0.01		µg/L	20%	Correct order of size(low conc.)
La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb	ICP	0.005[1]	0.05	µg/L	10%	Correct order of size (low conc.)
Sc, In, Th	ICP	0.05[1]	0.5	µg/L	10%	Correct order of size (low conc.)
Rb, Zr, Sb, Cs, Tl	ICP	0.025[1]	0.25	µg/L	10%	Correct order of size (low conc.)
Y, Hf	ICP	0.005[1]	0.05	µg/L	10%	Correct order of size (low conc.)
U	ICP	0.001[1]	–	µg/L	12%	Correct order of size (low conc.)
DOC	See table A1-1	0.5		mg/L	8%	30%
TOC	See table A1-1	0.1		mg/L	10%	30%
$\delta^{2}H$	MS	2		‰ SMOW[5]	1‰	–
$\delta^{18}O$	MS	0.1		‰ SMOW[5]	0.2‰	–
^{3}H	LSC	0.8 eller 0.1		TU[6]	0.8 eller 0.1	–
^{37}Cl	MS	0.2‰° (20 mg/L)		‰ SMOC[7]	–	–
$\delta^{13}C$	A (MS)	–		‰ PDB[8]	–	–
^{14}C pmc	A (MS)	–		PMC[9]	–	–
δ^{34} S	MS	0.2‰		‰ CDT[10]	0.3‰	–
$^{87}Sr/^{86}Sr$	TIMS	–		No unit (ratio)[11]	–	–
$^{10}B/^{11}B$	ICP MS	–		No unit (ratio)[11]	–	–
^{234}U, ^{235}U, ^{238}U, ^{232}Th, ^{230}Th	Alfa spectr.	0.0005		Bq/L[13]	5%	–
^{222}Rn, ^{226}Rn	LSC	0.03		Bq/L	5%	–

1. Reporting limits at salinity ≤ 0.4% (520 mS/m) and ≤ 3.5% (3,810 mS/m) respectively.
2. Measurement uncertainty reported by consulted laboratory, generally 95% confidence interval.
3. Estimated total uncertainty by experience (includes effects of sampling and sample handling).
4. Determined only in surface waters and near surface groundwater.
5. Per mille deviation[13] from SMOW (Standard Mean Oceanic Water).
6. TU = Tritium Units, where one TU corresponds to a Tritium/hydrogen ratio of 10^{-18} (1 Bq/L Tritium = 8.45 TU).
7. Per mille deviation[13] from SMOC (Standard Mean Oceanic Chloride).
8. Per mille deviation[13] from PDB (the standard PeeDee Belemnite).
9. The following relation is valid between pmC (percent modern carbon) and Carbon-14 age: $pmC = 100 \times e^{((1,950-y-1.03t)/8,274)}$ where y = the year of the C-14 measurement and t = C-14 age.
10. Per mille deviation[13] from CDT (the standard Canyon Diablo Troilite).
11. Isotope ratio without unit.
12. The following expressions are applicable to convert activity to concentration, for uranium-238 and thorium-232:
    1 ppm U = 12.4 Bq/kg^{238}U
    1 ppm Th = 3.93 Bq/kg^{232}Th
13. Isotopes are often reported as per mill deviation from a standard. The deviation is calculated as: $\delta^{y}I = 1,000 \times (K^{sample} - K^{standard})/K^{standard}$, where K = the isotope ratio and $^{y}I = {}^{2}H$, ^{18}O, ^{37}Cl, ^{13}C or ^{34}S etc.

Appendix 2

Field measurements

Idcode	Start date	Stop date	Meas depth (m)	Water depth (m)	Sno	temp. (°C)	pH	EC (mS/m)	Salinity (%)	Turb* (NTU)	Light (µmol/m²s)	O_2 diss. (mg/L)	Chlorophyll (µg/L)	ORP (mV)	Atm. Pressure (hPa)
PFM000062	2005-07-11 08:00	2005-07-11 19:00	0.5	3.5	8936	16.8	7.94	882	4.95	0.0	1498	10.3	0.8	161	1036.9
PFM000062	2005-07-11 08:00	2005-07-11 19:00	1	3.5		16.0	7.92	883	4.95	0.1	818	10.2	2.2	162	1038.9
PFM000062	2005-07-11 08:00	2005-07-11 19:00	2	3.5		15.8	7.92	884	4.96	0.2	730	10.2	1.4	163	1039.1
PFM000062	2005-07-11 08:00	2005-07-11 19:00	3	3.5		15.6	7.91	884	4.97	0.4	313	10.2	1.8	163	1039.1
PFM000062	2005-08-01 08:00	2005-08-01 19:00	0.5	3.8	8953	18.4	8.20	901	5.06	0.5	2080	10.3	1.0	164	1013.8
PFM000062	2005-08-01 08:00	2005-08-01 19:00	1	3.8		18.2	8.20	901	5.06	0.4	935	10.3	0.7	164	1014.4
PFM000062	2005-08-01 08:00	2005-08-01 19:00	2	3.8		18.1	8.20	901	5.06	0.6	506	10.2	2.1	164	1014.7
PFM000062	2005-08-01 08:00	2005-08-01 19:00	3	3.8		18.1	8.20	901	5.06	0.5	310	10.2	2.2	164	1015.0
PFM000062	2005-09-05 08:00	2005-09-05 18:30	0.5	3.9	8959	14.4	7.82	915	5.15	–1.6	303	9.65	0.9	183	1016.5
PFM000062	2005-09-05 08:00	2005-09-05 18:30	1	3.9		14.4	7.84	915	5.15	–1.7	272	9.64	1.1	183	1016.6
PFM000062	2005-09-05 08:00	2005-09-05 18:30	2	3.9		14.4	7.86	914	5.15	–1.7	180	9.63	1.5	183	1018.4
PFM000062	2005-09-05 08:00	2005-09-05 18:30	3	3.9		14.4	7.88	914	5.15	–1.6	125	9.63	0.9	183	1019.7
PFM000062	2005-10-03 08:00	2005-10-03 20:00	0.5	4.1	8971	8.2	7.50	960	5.39	0.2	212	10.7	1.1	163	1013.4
PFM000062	2005-10-03 08:00	2005-10-03 20:00	1	4.1		8.2	7.53	960	5.39	0.2	159	10.7	1.9	163	1013.9
PFM000062	2005-10-03 08:00	2005-10-03 20:00	2	4.1		8.3	7.56	960	5.39	0.1	80.2	10.7	2.2	162	1014.2
PFM000062	2005-10-03 08:00	2005-10-03 20:00	3	4.1		8.3	7.57	961	5.40	0.1	61.1	10.7	1.5	161	1014.5
PFM000062	2005-10-31 08:00	2005-10-31 19:00	0.5	3.7	8996	7.1	7.52	940	5.26	0.4	128	12.4	2.2	186	1009.2
PFM000062	2005-10-31 08:00	2005-10-31 19:00	1	3.7		7.1	7.57	940	5.26	0.4	94.4	12.4	4.1	185	1009.2
PFM000062	2005-10-31 08:00	2005-10-31 19:00	2	3.7		7.1	7.61	940	5.26	0.3	50.3	12.4	3.2	185	1009.2
PFM000062	2005-10-31 08:00	2005-10-31 19:00	3	3.7		7.1	7.69	940	5.26	0.3	35.6	12.4	2.8	183	1009.6
PFM000062	2005-11-28 08:00	2005-11-28 19:00	0.5	3.7	12019	4.5	7.72	932	5.18	–0.8	19.2	12.2	1.8	192	980.5
PFM000062	2005-11-28 08:00	2005-11-28 19:00	1	3.7		4.5	7.76	935	5.20	–1.0	12.7	12.1	1.8	191	981.0
PFM000062	2005-11-28 08:00	2005-11-28 19:00	2	3.7		4.5	7.81	935	5.20	–1.0	5.3	12.1	1.1	190	981.2

Idcode	Start date	Stop date	Meas depth (m)	Water depth (m)	Sno	temp. (°C)	pH	EC (mS/m)	Salinity (%)	Turb* (NTU)	Light (µmol/m²s)	O_2 diss. (mg/L)	Chlorophyll (µg/L)	ORP (mV)	Atm. Pressure (hPa)
PFM000062	2005-11-28 08:00	2005-11-28 19:00	3	3.7		4.5	7.82	935	5.20	–1.0	2.6	12.1	1.1	189	981.4
PFM000062	2005-12-19 08:00	2005-12-19 19:00	0.5	4	12021	2.2	7.79	946	5.21	0.0	43.1	14.2	0.0	111	1000.7
PFM000062	2005-12-19 08:00	2005-12-19 19:00	1	4		2.2	7.79	946	5.21	0.0	32.7	14.2	0.5	111	1000.8
PFM000062	2005-12-19 08:00	2005-12-19 19:00	2	4		2.2	7.80	946	5.21	0.2	15.3	14.1	0.6	111	1000.9
PFM000062	2005-12-19 08:00	2005-12-19 19:00	3	4		2.2	7.79	946	5.21	0.1	9.6	14.1	0.5	111	1000.9
PFM000062	2006-04-18 08:00	2006-04-18 18:30	0.5	3.9	12234	1.2	8.04	923	5.05	–1.0	432	17.3	1.5	153	994.0
PFM000062	2006-04-18 08:00	2006-04-18 18:30	1	3.9		1.2	8.05	923	5.05	–1.0	856	17.2	2.4	151	994.3
PFM000062	2006-04-18 08:00	2006-04-18 18:30	2	3.9		1.2	8.06	923	5.05	–1.0	183	17.2	2.5	151	995.1
PFM000062	2006-04-18 08:00	2006-04-18 18:30	3	3.9		1.2	8.06	923	5.05	–1.0	100	17.2	2.8	150	995.1
PFM000062	2006-05-15 08:00	2006-05-15 19:00	0.5	3.8	12249	9.5	8.44	875	4.89	0.0	542	14.1	2.6	86	1015.1
PFM000062	2006-05-15 08:00	2006-05-15 19:00	1	3.8		9.5	8.44	875	4.89	0.0	571	14.1	2.8	82	1015.9
PFM000062	2006-05-15 08:00	2006-05-15 19:00	2	3.8		9.5	8.45	874	4.89	–0.3	340	14.1	1.0	80	1016.2
PFM000062	2006-05-15 08:00	2006-05-15 19:00	3	3.8		9.5	8.46	875	4.89	–0.2	190	14.1	5.4	78	1016.7
PFM000062	2006-06-12 08:00	2006-06-12 18:30	0.5	3.6	12297	14.2	8.14	800	4.46	0.7	977	11.8	0.2	64	1029.7
PFM000062	2006-06-12 08:00	2006-06-12 18:30	1	3.6		14.1	8.15	801	4.46	–0.4	716	11.7	0.5	56	1028.9
PFM000062	2006-06-12 08:00	2006-06-12 18:30	2	3.6		13.2	8.15	803	4.48	–0.5	410	11.9	0.5	52	1028.8
PFM000062	2006-06-12 08:00	2006-06-12 18:30	3	3.6		13.0	8.15	802	4.47	–0.5	222	11.9	1.1	48	1028.6
PFM000066	2005-07-12 07:00	2005-07-12 18:00	0.1	0.1	8934	18.6	7.30	32.6	0.16			4.62		–15	1025.6
PFM000066	2005-08-01 08:00	2005-08-01 19:00	0.1	0.1	8952	16.3	7.56	31.8	0.15			2.53		17	1003.7
PFM000066	2005-09-05 08:00	2005-09-05 18:30	0.1	0.2	8955	12.8	7.72	32.0	0.15			3.21		–24	1012.2
PFM000066	2005-10-31 08:00	2005-10-31 19:00	0.1	0.2	8993	7.2	7.39	31.7	0.15			6.37		168	1008.1
PFM000066	2005-11-28 08:00	2005-11-28 19:00	0.1	0.2	12016	0.6	7.47	32.2	0.15			9.83		115	975.6
PFM000066	2005-12-19 08:00	2005-12-19 19:00	0.1	0.4	12022	–0.1	7.26	14.5	0.07			4.85		120	996.0
PFM000066	2006-01-23 08:00	2006-01-23 19:00	0.1	0.3	12042	–0.1	7.09	43.6	0.21			0.70		50	1016.8
PFM000066	2006-02-20 08:00	2006-02-20 18:30	0.1	0.3	12081	–0.1	7.18	41.1	0.19			4.41		72	1017.9
PFM000066	2006-03-20 08:00	2006-03-20 19:30	0.1	0.2	12098	–0.1	7.08	42.5	0.20			1.79		42	1002.5
PFM000066	2006-04-18 08:00	2006-04-18 18:30	0.1	0.6	12235	3.8	7.12	22.9	0.11	0.2		7.75		149	994.9
PFM000066	2006-05-15 08:00	2006-05-15 19:00	0.1	0.25	12253	11.5	7.48	35.0	0.17			7.18		58	1013.9

Idcode	Start date	Stop date	Meas depth (m)	Water depth (m)	Sno	temp. (°C)	pH	EC (mS/m)	Salinity (%)	Turb* (NTU)	Light (µmol/m²s)	O_2 diss. (mg/L)	Chlorophyll (µg/L)	ORP (mV)	Atm. Pressure (hPa)
PFM000066	2006-06-13 07:00	2006-06-13 16:00	0.1	0.3	12298	17.8	7.46	17.8	0.08			4.68		–24	1020.4
PFM000068	2005-07-12 07:00	2005-07-12 18:00	0.1	0.5	8932	16.7	7.38	42.4	0.20			3.61		24	1039.1
PFM000068	2005-08-01 08:00	2005-08-01 19:00	0.1	0.4	8951	15.5	7.57	45.7	0.22			4.89		84	1005.0
PFM000068	2005-09-05 08:00	2005-09-05 18:30	0.1	0.4	8960	12.5	7.67	41.2	0.20			6.92		139	1013.2
PFM000068	2005-10-03 08:00	2005-10-03 20:00	0.1	0.3	8977	10.2	7.34	49.2	0.24			0.48		–55	1012.4
PFM000068	2005-10-31 08:00	2005-10-31 19:00	0.1	0.6	9000	7.3	7.34	38.6	0.19			7.07		155	1007.7
PFM000068	2005-11-28 08:00	2005-11-28 19:00	0.1	0.6	8999	1.1	7.52	33.7	0.16			9.78		100	976.2
PFM000068	2005-12-19 08:00	2005-12-19 19:00	0.1	0.4	12027	–0.1	7.28	16.4	0.08			4.28		124	997.4
PFM000068	2006-01-23 08:00	2006-01-23 19:00	0.1	0.5	12045	–0.1	7.01	39.8	0.19			3.12		15	1016.6
PFM000068	2006-02-20 08:00	2006-02-20 18:30	0.1	0.5	12082	–0.1	7.11	37.4	0.18			4.93		63	1017.0
PFM000068	2006-03-20 08:00	2006-03-20 19:30	0.1	0.5	12091	–0.1	7.14	35.6	0.17			4.26		68	1003.1
PFM000068	2006-04-19 07:00	2006-04-19 18:30	0.1	0.9	12237	2.2	7.13	20.7	0.10	0.7		7.72		127	1010.5
PFM000068	2006-05-15 08:00	2006-05-15 19:00	0.1	0.6	12250	9.3	7.32	33.2	0.16			8.03		70	1015.6
PFM000068	2006-06-12 08:00	2006-06-12 18:30	0.1	0.4	12302	16.8	7.43	41.8	0.20			6.44		6	1024.4
PFM000069	2005-07-12 07:00	2005-07-12 18:00	0.1	0.1	8931	16.6	7.57	42.6	0.21			7.20		88	1027.3
PFM000069	2005-08-01 08:00	2005-08-01 19:00	0.1	0.1	8947	15.7	7.67	32.9	0.16			7.92		96	1004.5
PFM000069	2005-09-05 08:00	2005-09-05 18:30	0.1	0.1	8956	12.6	7.80	42.1	0.20			8.49		144	1013.3
PFM000069	2005-10-03 08:00	2005-10-03 20:00	0.1	0.05	8974	10.1	7.66	48.7	0.24			7.04		65	1013.9
PFM000069	2005-10-31 08:00	2005-10-31 19:00	0.1	0.15	8995	7.3	7.37	44.0	0.21			7.83		161	1009.1
PFM000069	2005-11-28 08:00	2005-11-28 19:00	0.1	0.2	12017	1.3	7.49	43.5	0.21			8.32		96	977.3
PFM000069	2005-12-19 08:00	2005-12-19 19:00	0.1	0.3	12020	–0.1	7.32	28.2	0.13			1.97		95	997.5
PFM000069	2006-01-23 08:00	2006-01-23 19:00	0.1	0.2	12043	–0.1	6.92	51.3	0.24			0.17		–147	1017.3
PFM000069	2006-02-20 08:00	2006-02-20 18:30	0.1	0.3	12079	–0.1	7.02	47.8	0.23			1.48		7	1016.6
PFM000069	2006-03-20 08:00	2006-03-20 19:30	0.1	0.3	12099	–0.1	6.99	50.4	0.24			0.85		–43	1003.6
PFM000069	2006-04-19 07:00	2006-04-19 18:30	0.1	0.65	12230	1.9	7.06	26.0	0.12	–0.4		6.02		132	1003.7
PFM000069	2006-05-15 08:00	2006-05-15 19:00	0.1	0.25	12236	9.0	7.21	36.5	0.18			6.58		69	1014.1
PFM000069	2006-06-12 08:00	2006-06-12 18:30	0.1	0.1	12301	16.3	7.36	42.1	0.20			7.18		–29	1024.7
PFM000070	2005-07-12 07:00	2005-07-12 18:00	0.1	0.1	8933	18.0	7.29	26.9	0.13			4.34		106	1025.8

Idcode	Start date	Stop date	Meas depth (m)	Water depth (m)	Sno	temp. (°C)	pH	EC (mS/m)	Salinity (%)	Turb* (NTU)	Light (µmol/m²s)	O_2 diss. (mg/L)	Chlorophyll (µg/L)	ORP (mV)	Atm. Pressure (hPa)
PFM000070	2005-08-02 07:00	2005-08-02 17:00	0.1	0.1	8954	15.9	7.36	24.3	0.12			6.01		68	1009.8
PFM000070	2005-09-06 07:00	2005-09-06 16:00	0.1	0.1	8957	14.0	7.44	20.3	0.10			5.90		148	1009.0
PFM000070	2005-10-04 07:00	2005-10-04 17:00	0.1	0.1	8975	9.2	7.46	24.2	0.12			4.95		94	1027.5
PFM000070	2005-11-01 07:00	2005-11-01 16:00	0.1	0.15	8992	6.4	7.38	19.9	0.09			8.61		182	1006.6
PFM000070	2005-11-28 08:00	2005-11-28 19:00	0.1	0.3	12014	1.0	7.86	21.4	0.10			11.9		62	977.3
PFM000070	2005-12-20 07:00	2005-12-20 17:00	0.1	0.3	12025	0.2	7.78	24.1	0.11			13.0		59	1006.9
PFM000070	2006-01-24 07:00	2006-01-24 20:00	0.1	0.3	12069	–0.1	7.75	26.9	0.13			10.8		38	1018.3
PFM000070	2006-02-21 07:00	2006-02-21 19:00	0.1	0.3	12083	0.3	7.45	27.2	0.13			7.95		28	1028.6
PFM000070	2006-03-21 07:00	2006-03-21 17:30	0.1	0.3	12092	0.2	7.32	29.4	0.14			2.33		70	1004.3
PFM000070	2006-04-19 07:00	2006-04-19 18:30	0.1	0.45	12240	4.7	7.37	14.1	0.07	–1.0		7.80		130	1002.3
PFM000070	2006-05-16 07:00	2006-05-16 16:00	0.1	0.2	12252	11.5	7.50	25.4	0.12			7.97		25	1025.4
PFM000070	2006-06-12 08:00	2006-06-12 18:30	0.1	0.15	12304	19.6	7.14	30.1	0.14			4.15		14	1025.4
PFM000074	2005-07-11 08:00	2005-07-11 19:00	0.5	0.8	8937	20.6	7.25	41.5	0.20	0.8	261	9.35	11.7	124	1037.4
PFM000074	2005-08-01 08:00	2005-08-01 19:00	0.5	0.7	8948	19.4	7.51	40.1	0.19	3.8	114	6.60	5.2	59	1004.0
PFM000074	2005-09-05 08:00	2005-09-05 18:30	0.5	0.7	8962	15.4	8.17	42.0	0.20	–2.0	246	12.3	6.4	153	1016.6
PFM000074	2005-10-03 08:00	2005-10-03 20:00	0.5	0.7	8976	12.1	8.15	39.1	0.19	–0.5	24.9	12.3	23.2	155	1014.6
PFM000074	2005-10-31 08:00	2005-10-31 19:00	0.5	0.7	8998	7.3	8.07	36.2	0.17	0.2	57.8	13.0	7.7	176	1009.3
PFM000074	2005-11-29 07:00	2005-11-29 17:00	0.5	0.7	12018	3.7	7.59	50.9	0.24	–1.5	5.6	1.50	8.9	–87	981.5
PFM000074	2005-12-20 07:00	2005-12-20 17:00	0.5	0.7	12023	0.9	7.25	39.8	0.19	–1.6	4.8	2.45	9.9	–95	1006.5
PFM000074	2006-01-24 07:00	2006-01-24 20:00	0.5	0.8	12032	0.7	7.04	54.5	0.26	7.4	2.5	0.51	157	–215	1017.8
PFM000074	2006-02-21 07:00	2006-02-21 19:00	0.5	0.9	12080	0.2	7.23	43.1	0.20	–1.5	28.4	3.51	8.5	–123	1030.3
PFM000074	2006-03-20 08:00	2006-03-20 19:30	0.5	0.8	12200	0.1	7.13	45.0	0.21	–1.5	20.8	2.64	8.3	–52	1005.4
PFM000074	2006-04-18 08:00	2006-04-18 18:30	0.5	1.1	12232	1.2	7.34	24.4	0.12	–0.3	198	9.02	7.6	141	998.6
PFM000074	2006-05-15 08:00	2006-05-15 19:00	0.5	1.1	12248	12.0	7.44	36.8	0.18	–1.3	218	9.36	7.3	99	1021.2
PFM000074	2006-06-13 07:00	2006-06-13 16:00	0.5	0.7	12303	18.6	7.27	40.2	0.19	0.0	443	6.84	8.2	–25	1024.6
PFM000082	2006-01-23 08:00	2006-01-23 19:00	0.5	6.4	12046	–0.3	7.85	954	5.19	–1.2	32.4	14.1	1.2	130	1017.9
PFM000082	2006-01-23 08:00	2006-01-23 19:00	1	6.4		–0.3	7.86	954	5.19	–1.2	19.2	14.1	1.5	126	1018.7
PFM000082	2006-01-23 08:00	2006-01-23 19:00	2	6.4		–0.3	7.87	956	5.20	–1.2	6.3	14.1	1.6	123	1019.3

Idcode	Start date	Stop date	Meas depth (m)	Water depth (m)	Sno	temp. (°C)	pH	EC (mS/m)	Salinity (%)	Turb* (NTU)	Light (µmol/m²s)	O_2 diss. (mg/L)	Chlorophyll (µg/L)	ORP (mV)	Atm. Pressure (hPa)
PFM000082	2006-01-23 08:00	2006-01-23 19:00	3	6.4		–0.3	7.87	958	5.21	–1.2	2.1	14.1	2.2	122	1019.9
PFM000082	2006-01-23 08:00	2006-01-23 19:00	4	6.4		–0.3	7.88	960	5.23	–1.3	1.4	14.0	1.4	120	1020.4
PFM000082	2006-01-23 08:00	2006-01-23 19:00	5	6.4		–0.4	7.88	962	5.23	–1.2	0.5	14.0	1.5	119	1021.0
PFM000082	2006-01-23 08:00	2006-01-23 19:00	6	6.4	12030	–0.3	7.88	963	5.24	–1.2	–0.4	13.9	1.7	117	1021.5
PFM000082	2006-02-20 08:00	2006-02-20 18:30	0.5	6.6	12084	–0.3	7.87	929	5.04	–0.8	29.6	16.0	1.9	221	1013.6
PFM000082	2006-02-20 08:00	2006-02-20 18:30	1	6.6		–0.3	7.91	930	5.05	–0.9	17.2	16.1	2.3	216	1014.4
PFM000082	2006-02-20 08:00	2006-02-20 18:30	2	6.6		–0.3	7.93	930	5.05	–0.9	7.1	16.1	2.0	211	1014.8
PFM000082	2006-02-20 08:00	2006-02-20 18:30	3	6.6		–0.3	7.95	929	5.05	–0.7	3.3	15.9	2.7	208	1015.1
PFM000082	2006-02-20 08:00	2006-02-20 18:30	4	6.6		–0.3	7.96	929	5.05	–0.9	1.5	16.1	2.4	204	1014.6
PFM000082	2006-02-20 08:00	2006-02-20 18:30	5	6.6		–0.2	7.96	928	5.04	–0.9	0.4	16.0	2.3	203	1014.8
PFM000082	2006-02-20 08:00	2006-02-20 18:30	6	6.6	12085	–0.1	7.95	927	5.04	–0.9	–0.3	15.8	2.7	202	1015.1
PFM000082	2006-03-20 08:00	2006-03-20 19:30	0.5	6.3	12097	1.1	7.83	914	5.00	–1.2	111	14.5	0.9	354	1003.4
PFM000082	2006-03-20 08:00	2006-03-20 19:30	1	6.3		1.1	7.88	915	5.01	–1.2	91.2	14.5	1.7	345	1004.4

Sno = Corresponding water sample no

EC = Electrical conductivity

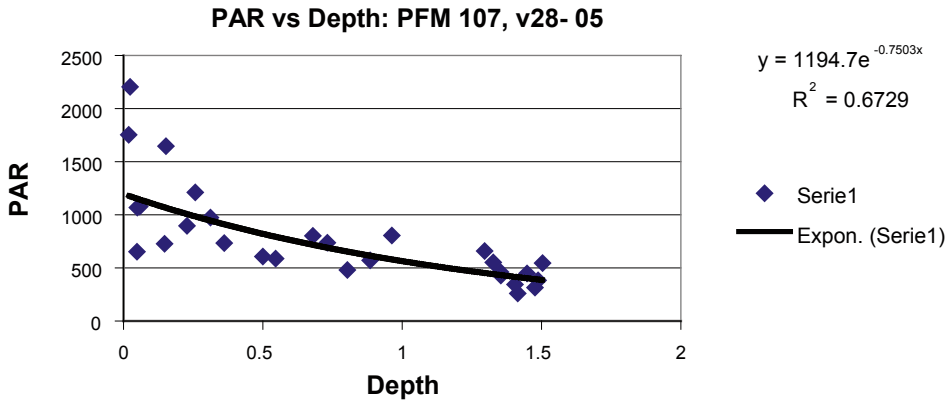
NTU = Nephelometric Turbidiy Unit

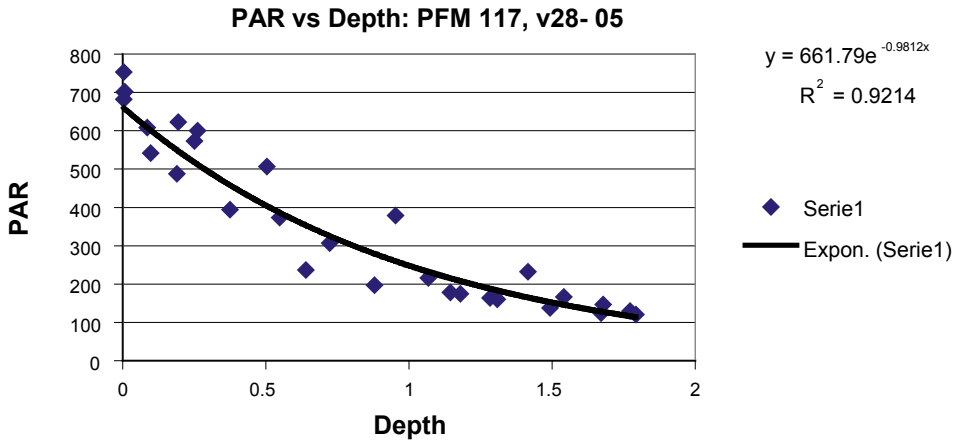
ORP = Oxidising Reducing Potential

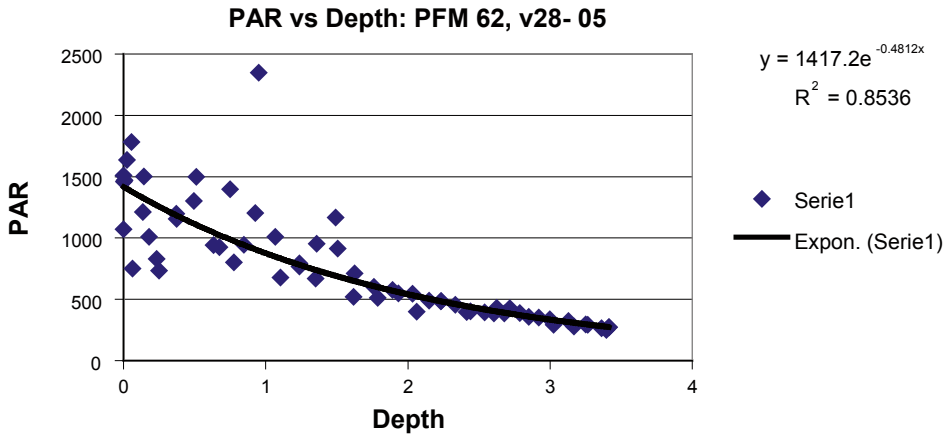
* Measurements with low reliability

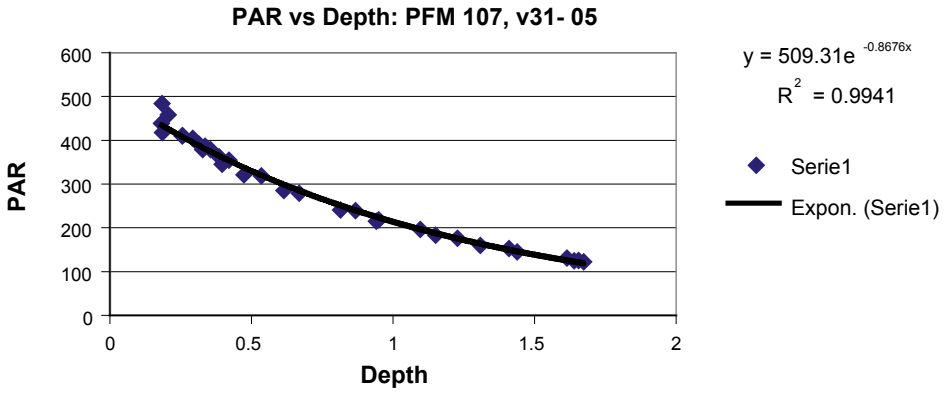
Appendix 3

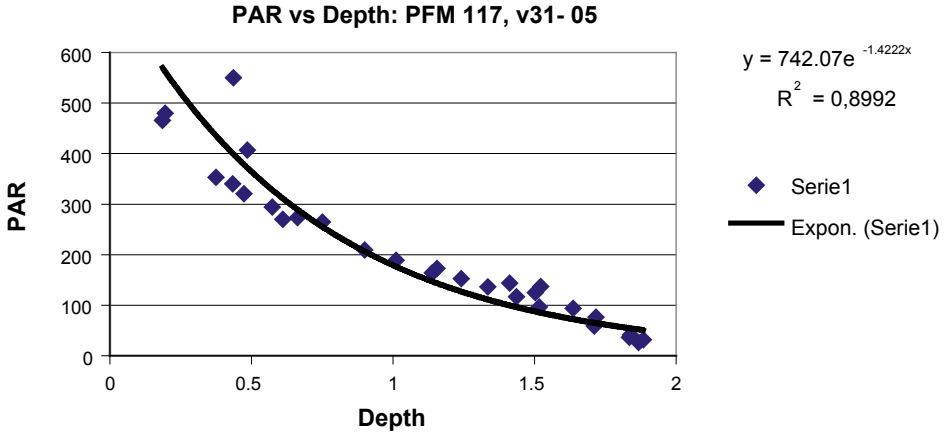
PAR-profile logs

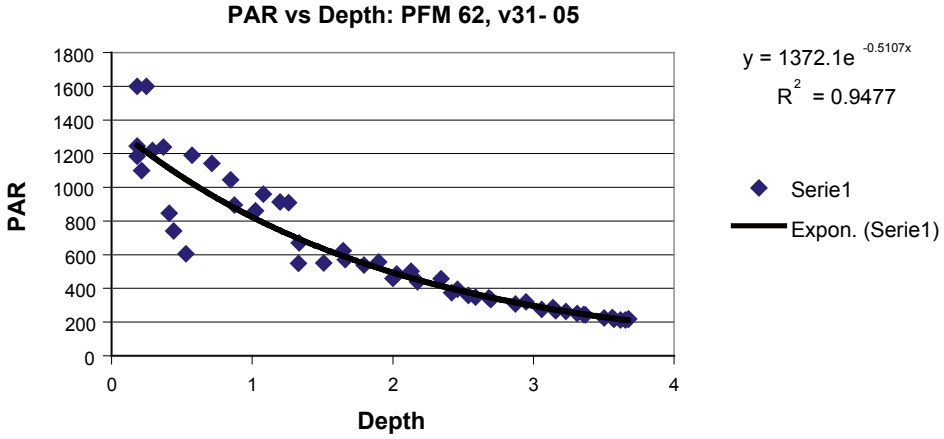


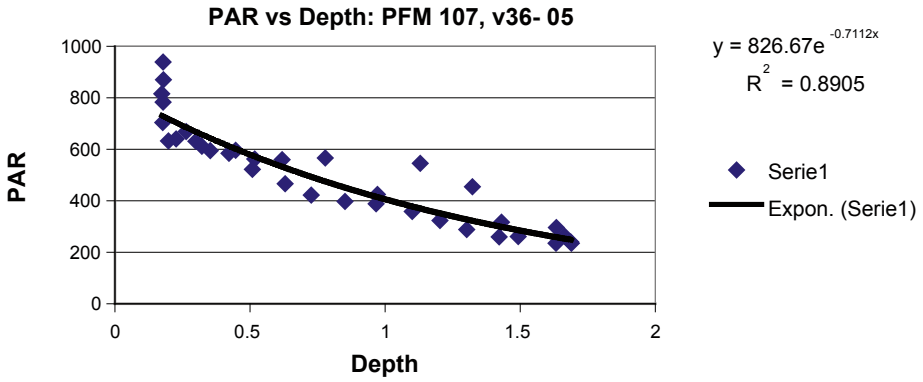


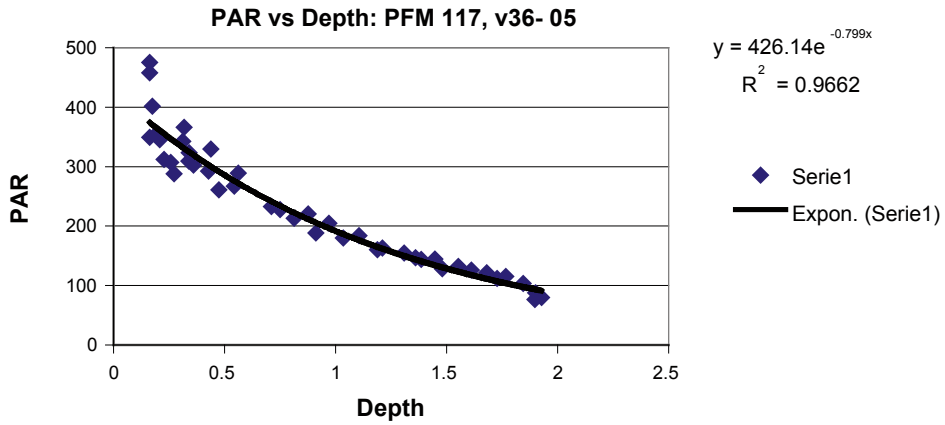


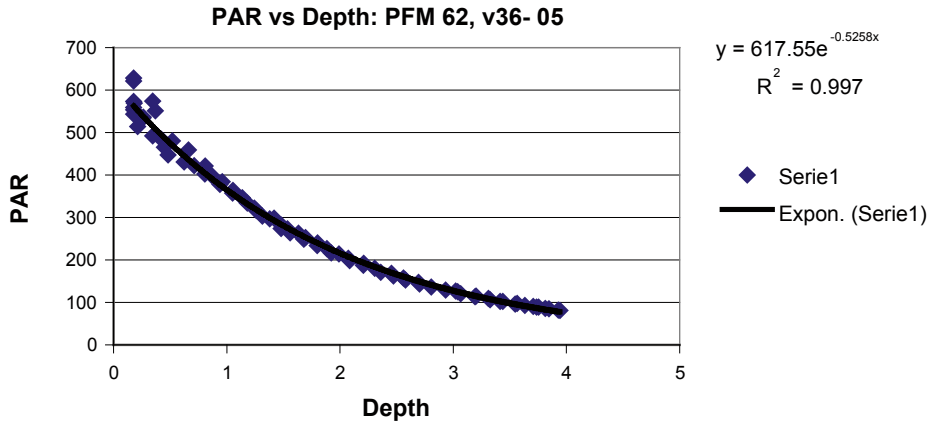

PAR vs Depth: PFM 107, v31- 05
PAR
Depth
y = 509.31e -0.8676x
R2 = 0.9941
Serie1
Expon. (Serie1)

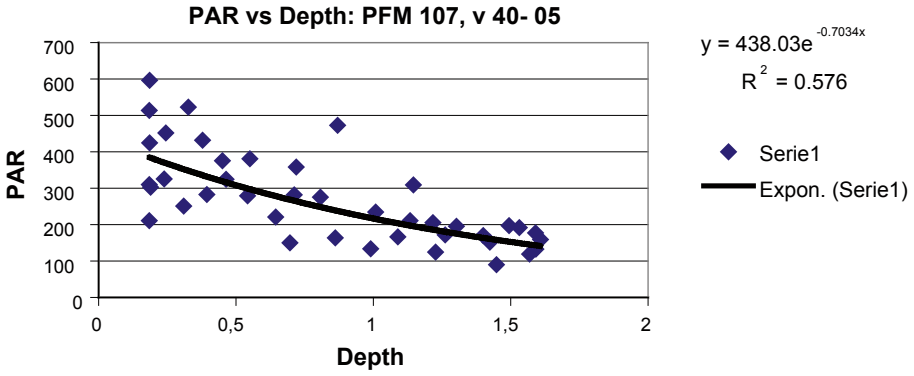

PAR vs Depth: PFM 117, v31- 05
PAR
Depth
y = 742.07e -1.4222x
R2 = 0,8992
Serie1
Expon. (Serie1)

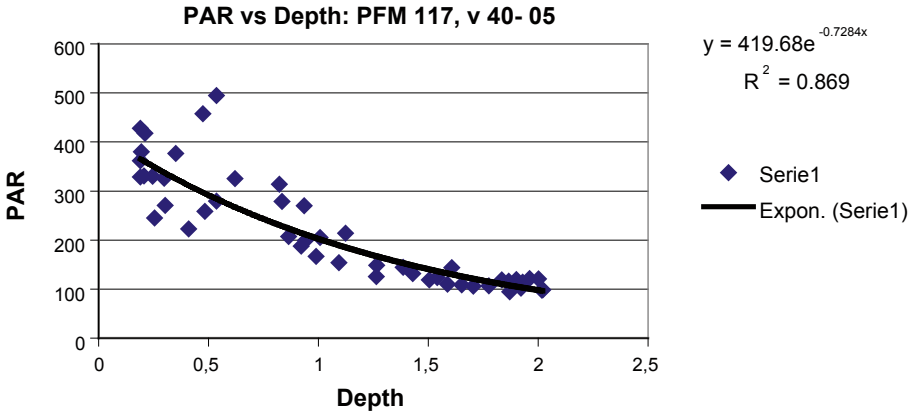

PAR vs Depth: PFM 62, v31- 05
PAR
Depth
y = 1372.1e -0.5107x
R2 = 0.9477
Serie1
Expon. (Serie1)

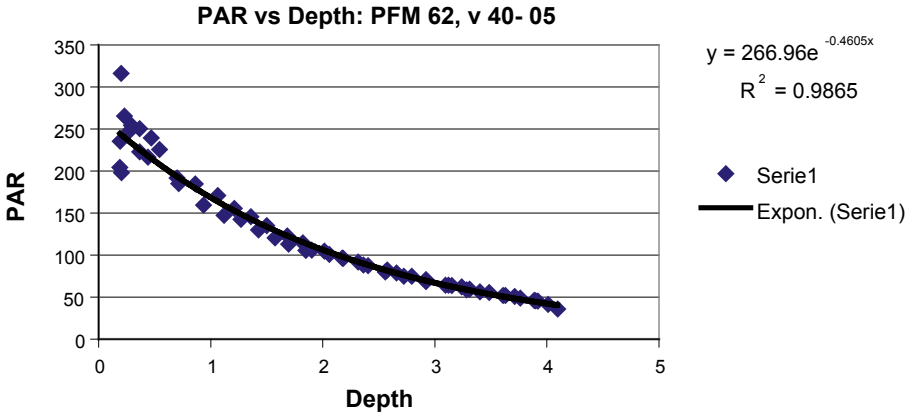

PAR vs Depth: PFM 107, v36- 05
PAR
Depth
y = 826.67e^-0.7112x
R^2 = 0.8905
Serie1
Expon. (Serie1)

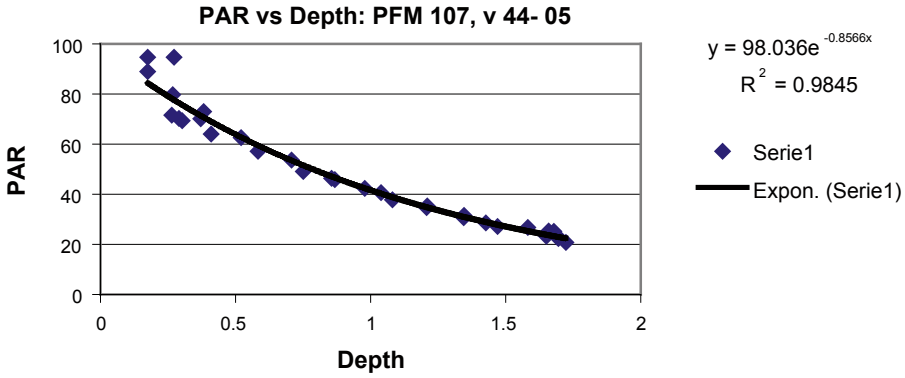

PAR vs Depth: PFM 117, v36- 05
PAR
Depth
y = 426.14e^-0.799x
R^2 = 0.9662
Serie1
Expon. (Serie1)

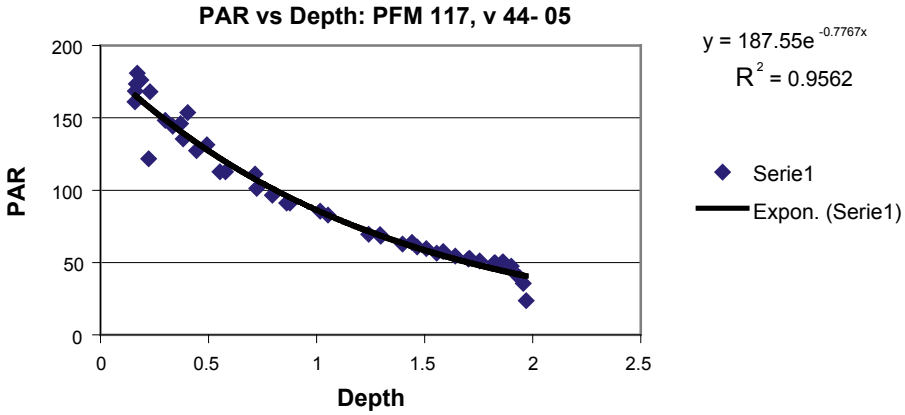

PAR vs Depth: PFM 62, v36- 05
PAR
Depth
y = 617.55e^-0.5258x
R^2 = 0.997
Serie1
Expon. (Serie1)

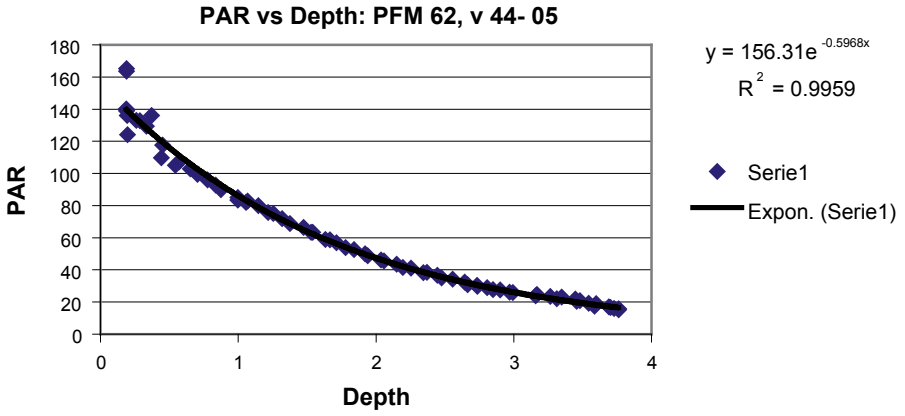

PAR vs Depth: PFM 107, v 40- 05
PAR
Depth
y = 438.03e -0.7034x
R 2 = 0.576
Serie1
Expon. (Serie1)

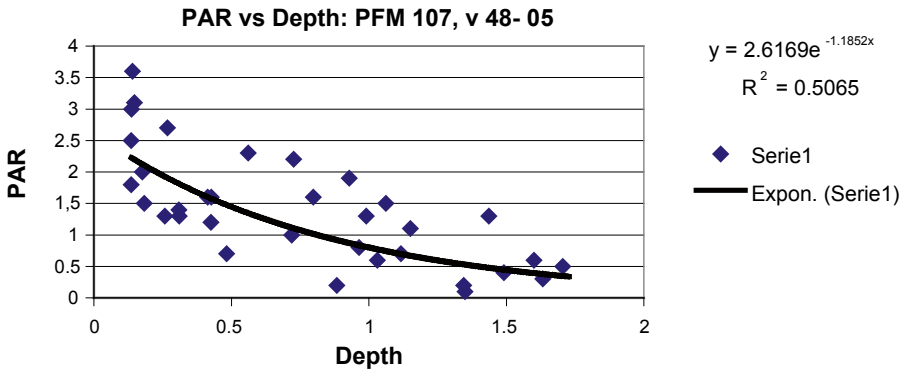

PAR vs Depth: PFM 117, v 40- 05
PAR
Depth
y = 419.68e -0.7284x
R 2 = 0.869
Serie1
Expon. (Serie1)

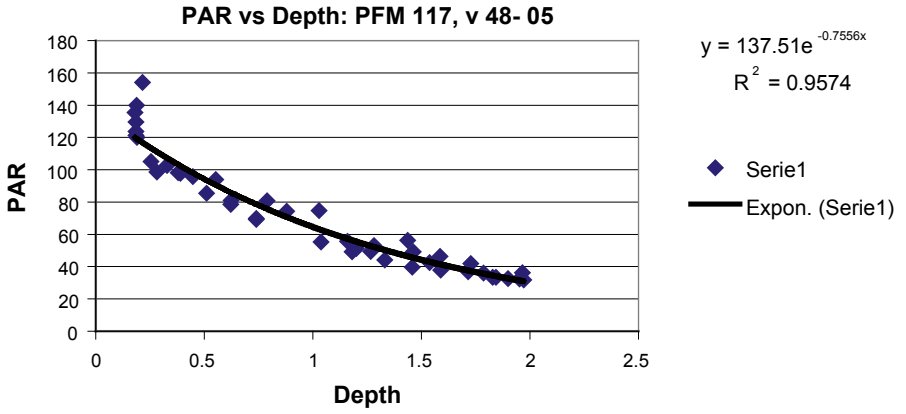

PAR vs Depth: PFM 62, v 40- 05
PAR
Depth
y = 266.96e -0.4605x
R 2 = 0.9865
Serie1
Expon. (Serie1)

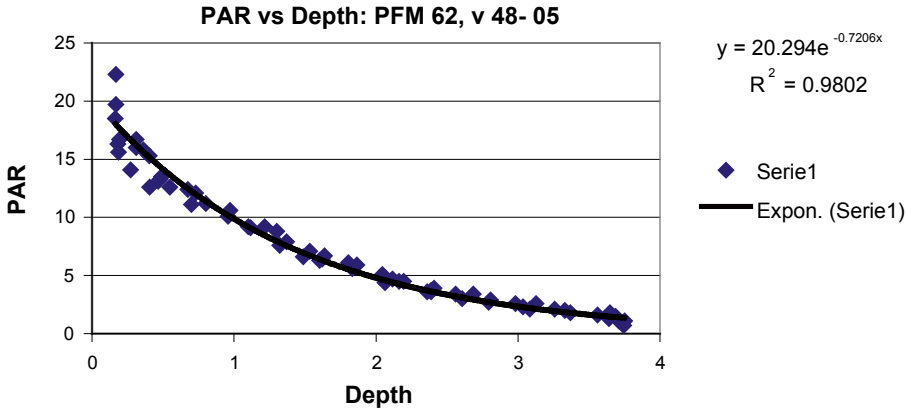

PAR vs Depth: PFM 107, v 44- 05
PAR
Depth
y = 98.036e -0.8566x
R 2 = 0.9845
Serie1
Expon. (Serie1)

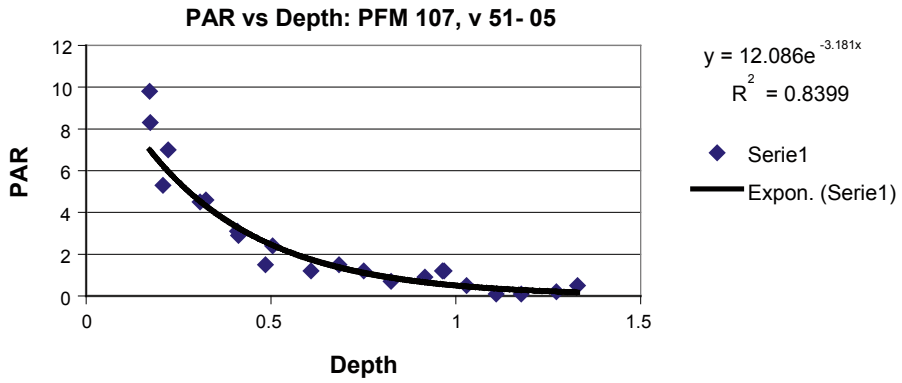

PAR vs Depth: PFM 117, v 44- 05
PAR
Depth
y = 187.55e -0.7767x
R 2 = 0.9562
Serie1
Expon. (Serie1)

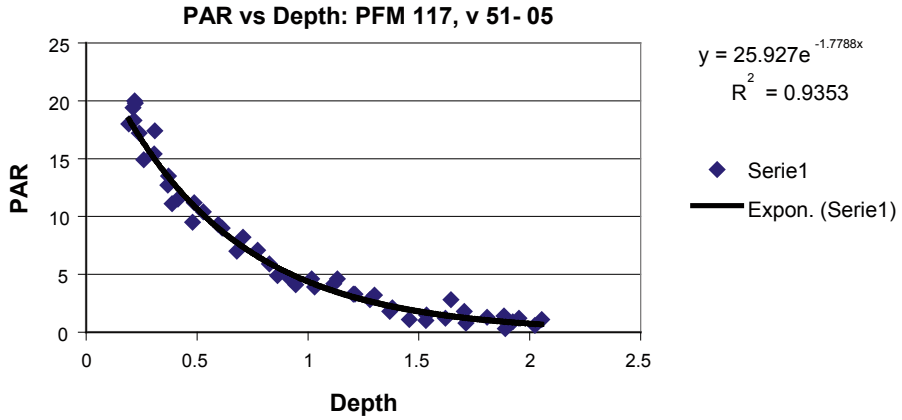

PAR vs Depth: PFM 62, v 44- 05
PAR
Depth
y = 156.31e -0.5968x
R 2 = 0.9959
Serie1
Expon. (Serie1)

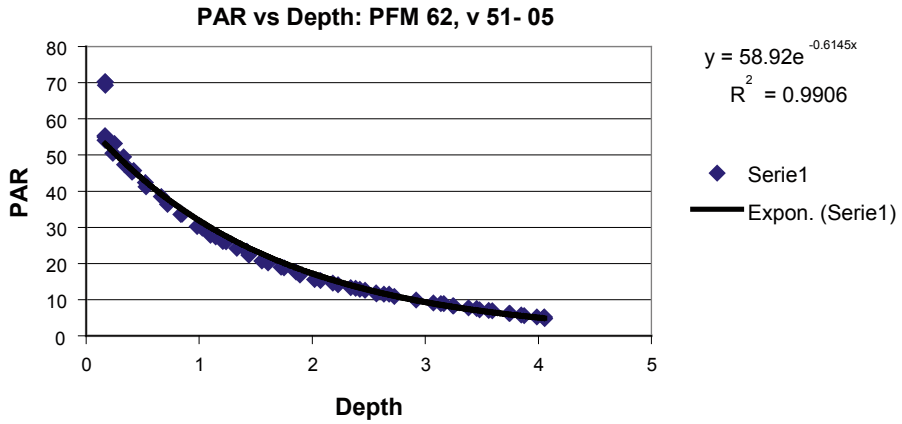

PAR vs Depth: PFM 107, v 48- 05
PAR
Depth
y = 2.6169e -1.1852x
R 2 = 0.5065
Serie1
Expon. (Serie1)

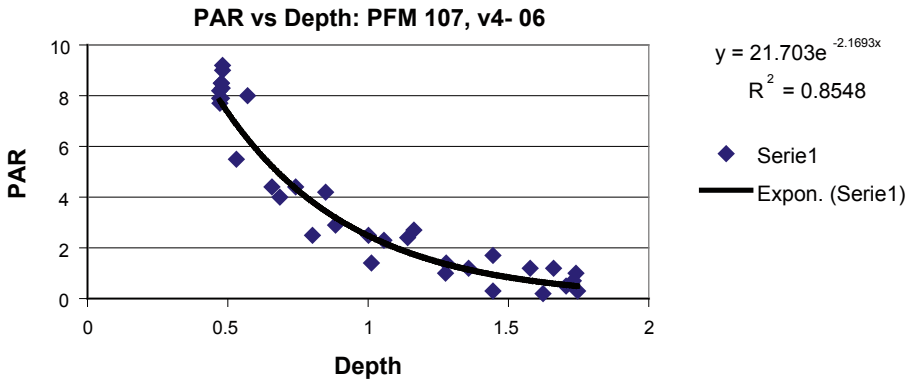

PAR vs Depth: PFM 117, v 48- 05
PAR
Depth
y = 137.51e -0.7556x
R 2 = 0.9574
Serie1
Expon. (Serie1)

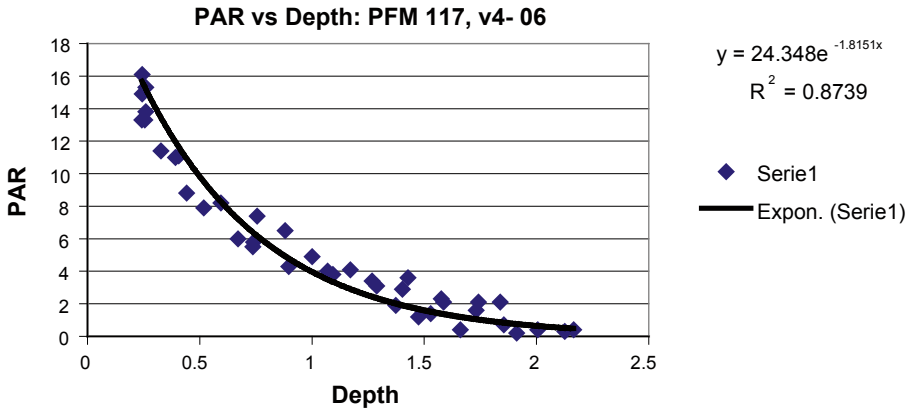

PAR vs Depth: PFM 62, v 48- 05
PAR
Depth
y = 20.294e -0.7206x
R 2 = 0.9802
Serie1
Expon. (Serie1)

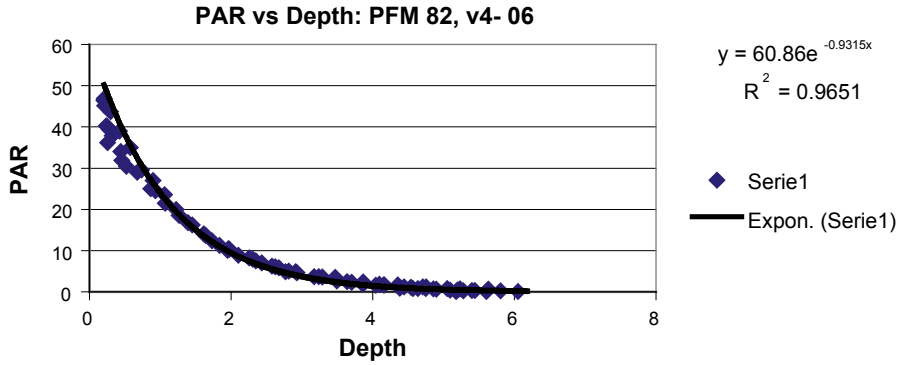

PAR vs Depth: PFM 107, v 51- 05
PAR
Depth
y = 12.086e -3.181x
R2 = 0.8399
Serie1
Expon. (Serie1)

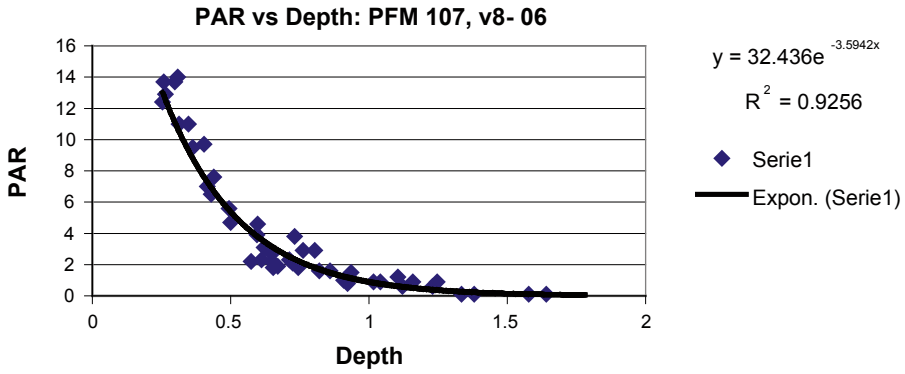

PAR vs Depth: PFM 117, v 51- 05
PAR
Depth
y = 25.927e -1.7788x
R2 = 0.9353
Serie1
Expon. (Serie1)

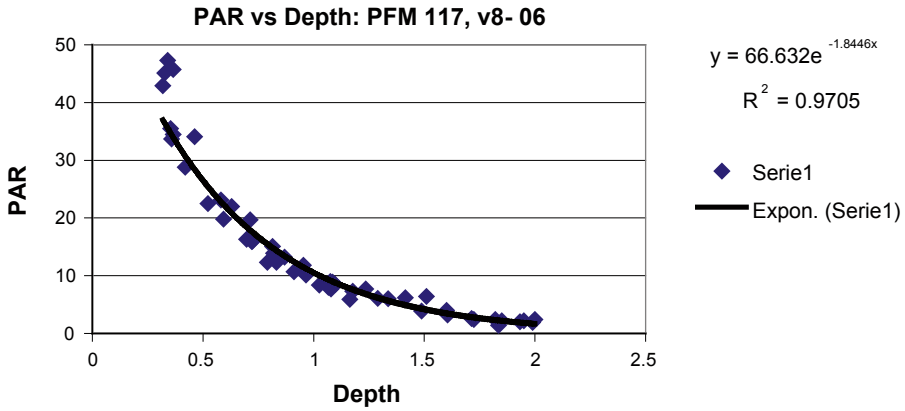

PAR vs Depth: PFM 62, v 51- 05
PAR
Depth
y = 58.92e -0.6145x
R2 = 0.9906
Serie1
Expon. (Serie1)

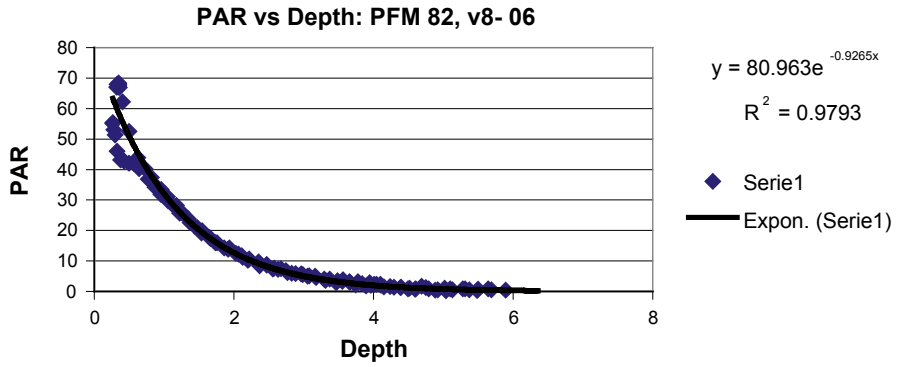

PAR vs Depth: PFM 107, v4- 06
PAR
Depth
y = 21.703e -2.1693x
R 2 = 0.8548
Serie1
Expon. (Serie1)

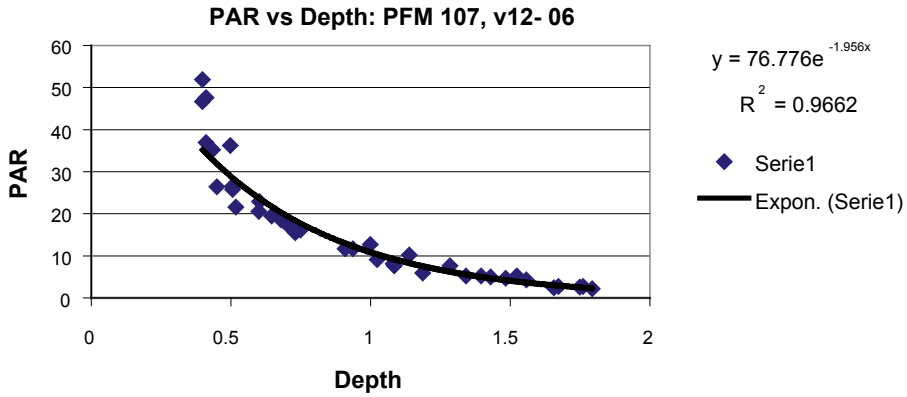

PAR vs Depth: PFM 117, v4- 06
PAR
Depth
y = 24.348e -1.8151x
R 2 = 0.8739
Serie1
Expon. (Serie1)

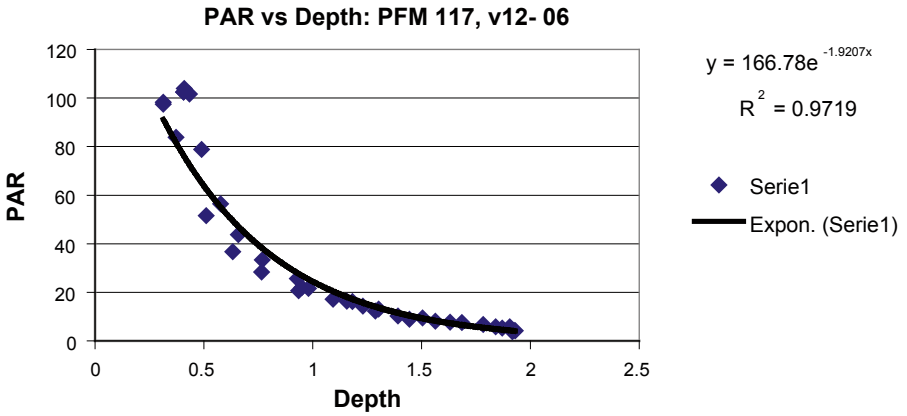

PAR vs Depth: PFM 82, v4- 06
PAR
Depth
y = 60.86e -0.9315x
R 2 = 0.9651
Serie1
Expon. (Serie1)

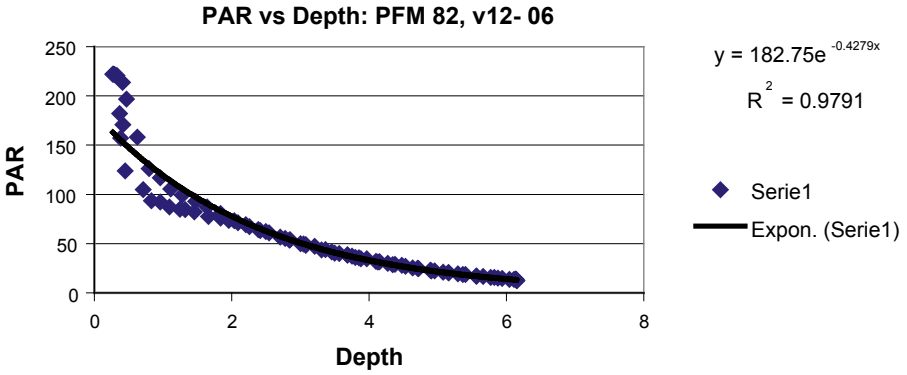

PAR vs Depth: PFM 107, v8- 06
PAR
Depth
y = 32.436e -3.5942x
R 2 = 0.9256
Serie1
Expon. (Serie1)

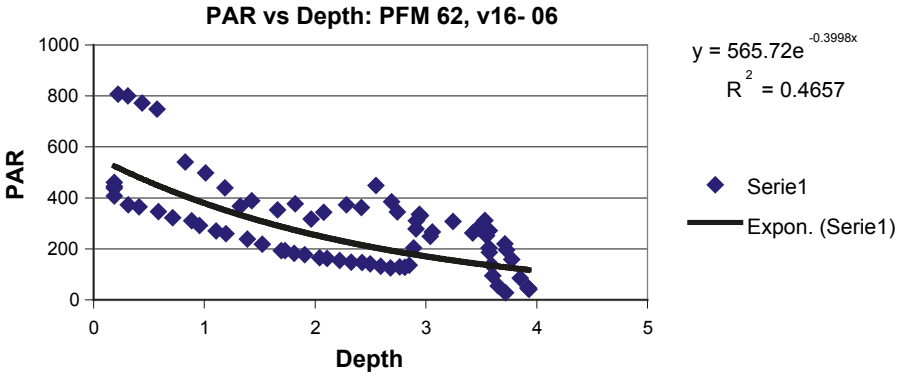

PAR vs Depth: PFM 117, v8- 06
PAR
Depth
y = 66.632e -1.8446x
R 2 = 0.9705
Serie1
Expon. (Serie1)

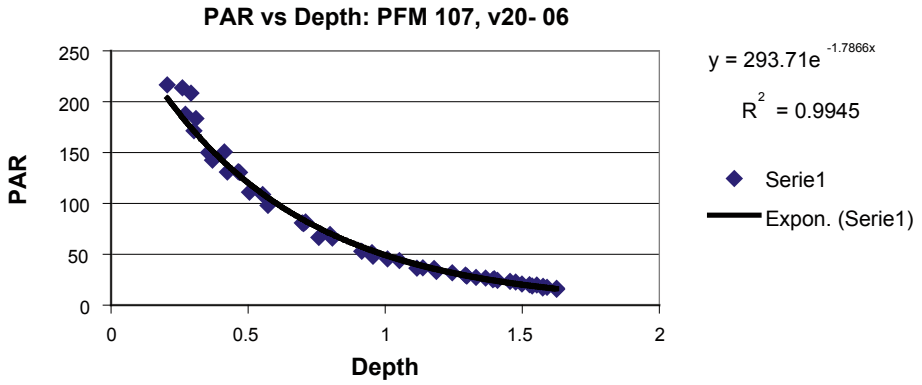

PAR vs Depth: PFM 82, v8- 06
PAR
Depth
y = 80.963e -0.9265x
R 2 = 0.9793
Serie1
Expon. (Serie1)

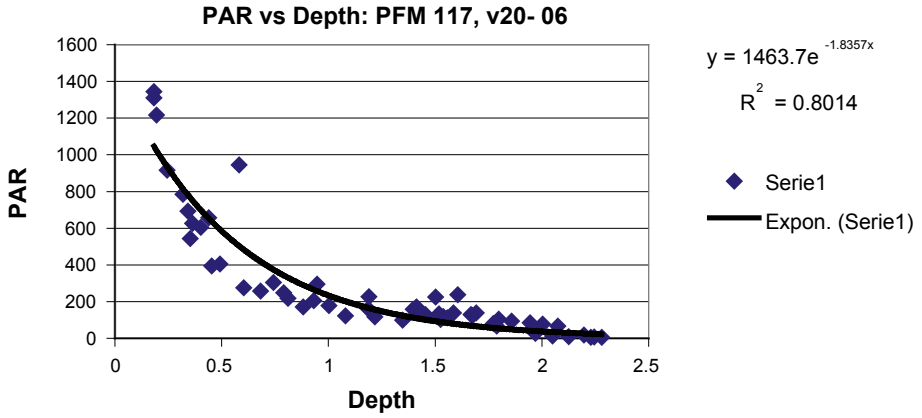

PAR vs Depth: PFM 107, v12- 06
PAR
Depth
y = 76.776e -1.956x
R 2 = 0.9662
Serie1
Expon. (Serie1)

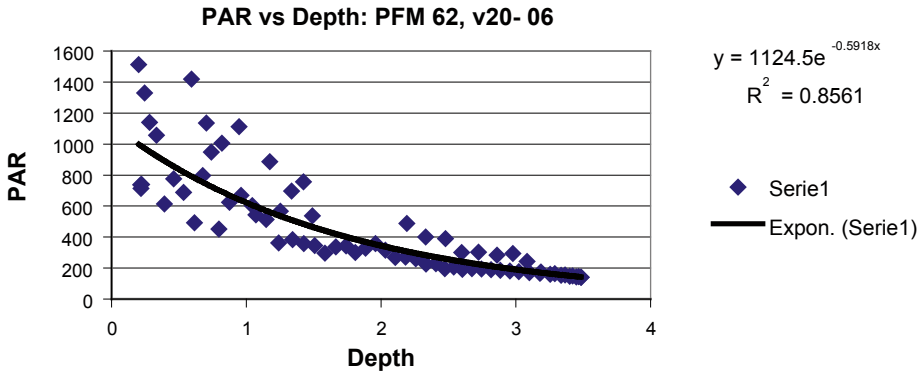

PAR vs Depth: PFM 117, v12- 06
PAR
Depth
y = 166.78e -1.9207x
R 2 = 0.9719
Serie1
Expon. (Serie1)

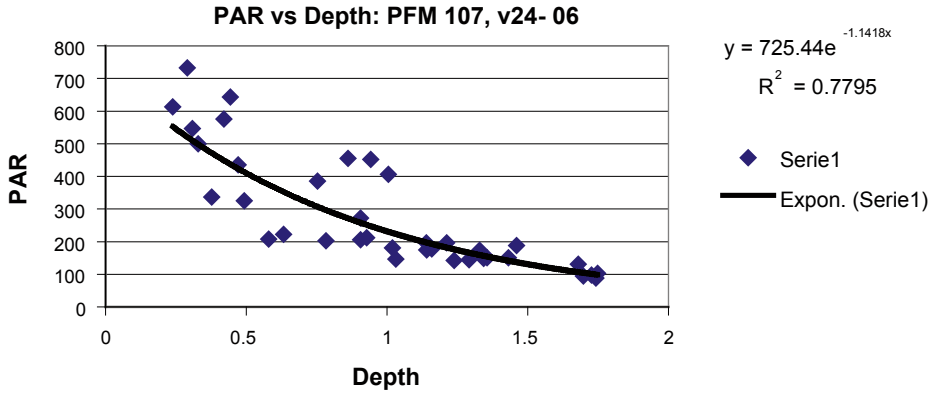

PAR vs Depth: PFM 82, v12- 06
PAR
Depth
y = 182.75e -0.4279x
R 2 = 0.9791
Serie1
Expon. (Serie1)

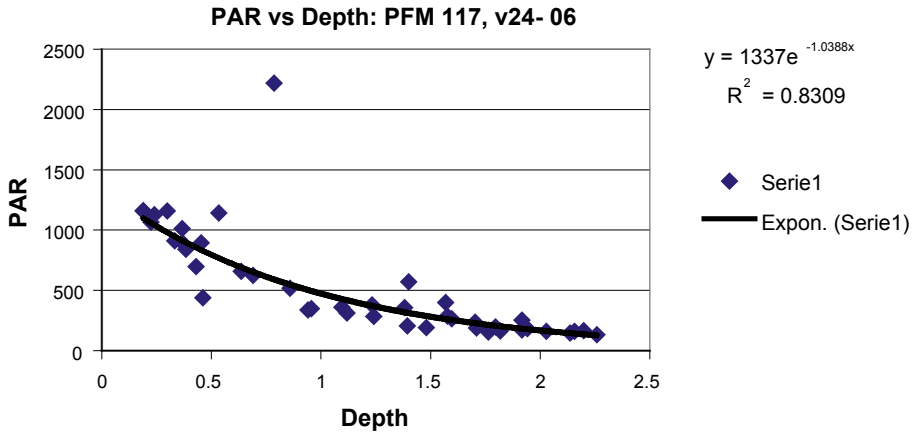

PAR vs Depth: PFM 62, v16- 06
PAR
Depth
1000
800
600
400
200
0
0
1
2
3
4
5
y = 565.72e -0.3998x
R 2 = 0.4657
Serie1
Expon. (Serie1)

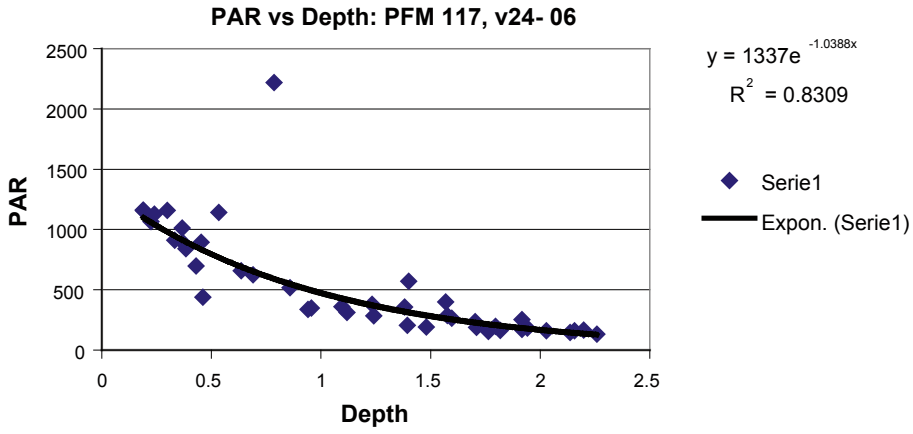

PAR vs Depth: PFM 107, v20- 06
PAR
Depth
y = 293.71e -1.7866x
R2 = 0.9945
Serie1
Expon. (Serie1)


PAR vs Depth: PFM 117, v20- 06
PAR
Depth
y = 1463.7e -1.8357x
R2 = 0.8014
Serie1
Expon. (Serie1)


PAR vs Depth: PFM 62, v20- 06
PAR
Depth
y = 1124.5e -0.5918x
R2 = 0.8561
Serie1
Expon. (Serie1)


PAR vs Depth: PFM 107, v24- 06
PAR
Depth
800
700
600
500
400
300
200
100
0
0
0.5
1
1.5
2
y = 725.44e -1.1418x
R2 = 0.7795
Serie1
Expon. (Serie1)


PAR vs Depth: PFM 117, v24- 06
PAR
Depth
2500
2000
1500
1000
500
0
0
0.5
1
1.5
2
2.5
y = 1337e -1.0388x
R2 = 0.8309
Serie1
Expon. (Serie1)


PAR vs Depth: PFM 117, v24- 06
PAR
Depth
2500
2000
1500
1000
500
0
0
0.5
1
1.5
2
2.5
y = 1337e -1.0388x
R2 = 0.8309
Serie1
Expon. (Serie1)

Appendix 4

Water flow measurements

IDcode	Start date	Stop date	Simple flow rate (m^3/s)	Code
PFM000062	2005-07-11 08:00	2005-07-11 19:00		**N**
PFM000062	2005-08-01 08:00	2005-08-01 19:00		N
PFM000062	2005-09-05 08:00	2005-09-05 18:30		N
PFM000062	2005-10-03 08:00	2005-10-03 20:00		N
PFM000062	2005-10-31 08:00	2005-10-31 19:00		N
PFM000062	2005-11-28 08:00	2005-11-28 19:00		N
PFM000062	2005-12-19 08:00	2005-12-19 19:00		N
PFM000062	2006-04-18 08:00	2006-04-18 18:30		N
PFM000062	2006-05-15 08:00	2006-05-15 19:00		N
PFM000062	2006-06-12 08:00	2006-06-12 18:30		N
PFM000066	2005-07-12 07:00	2005-07-12 18:00		F
PFM000066	2005-08-01 08:00	2005-08-01 19:00		F
PFM000066	2005-09-05 08:00	2005-09-05 18:30		F
PFM000066	2005-10-04 07:00	2005-10-04 17:00		G
PFM000066	2005-10-31 08:00	2005-10-31 19:00		F
PFM000066	2005-11-28 08:00	2005-11-28 19:00	2.30E–02	L
PFM000066	2005-12-19 08:00	2005-12-19 19:00		C
PFM000066	2006-01-23 08:00	2006-01-23 19:00		C
PFM000066	2006-02-20 08:00	2006-02-20 18:30		C
PFM000066	2006-03-20 08:00	2006-03-20 19:30		C
PFM000066	2006-04-18 08:00	2006-04-18 18:30		L
PFM000066	2006-05-15 08:00	2006-05-15 19:00	3.60E–02	L
PFM000066	2006-06-13 07:00	2006-06-13 16:00		F
PFM000068	2005-07-12 07:00	2005-07-12 18:00		F
PFM000068	2005-08-01 08:00	2005-08-01 19:00		B
PFM000068	2005-09-05 08:00	2005-09-05 18:30		F
PFM000068	2005-10-03 08:00	2005-10-03 20:00		F
PFM000068	2005-10-31 08:00	2005-10-31 19:00		F
PFM000068	2005-11-28 08:00	2005-11-28 19:00	5.30E–02	L
PFM000068	2005-12-19 08:00	2005-12-19 19:00		C
PFM000068	2006-01-23 08:00	2006-01-23 19:00		C
PFM000068	2006-02-20 08:00	2006-02-20 18:30		C
PFM000068	2006-03-20 08:00	2006-03-20 19:30		C
PFM000068	2006-04-19 07:00	2006-04-19 18:30		L
PFM000068	2006-05-15 08:00	2006-05-15 19:00	1.90E–01	L
PFM000068	2006-06-12 08:00	2006-06-12 18:30		F
PFM000069	2005-07-12 07:00	2005-07-12 18:00	8.00E–03	L
PFM000069	2005-08-01 08:00	2005-08-01 19:00	3.00E–03	L
PFM000069	2005-09-05 08:00	2005-09-05 18:30	5.00E–03	L
PFM000069	2005-10-03 08:00	2005-10-03 20:00		F
PFM000069	2005-10-31 08:00	2005-10-31 19:00	1.50E–02	L
PFM000069	2005-11-28 08:00	2005-11-28 19:00	2.90E–02	L
PFM000069	2005-12-19 08:00	2005-12-19 19:00		C
PFM000069	2006-01-23 08:00	2006-01-23 19:00		C

IDcode	Start date	Stop date	Simple flow rate (m^3/s)	Code
PFM000062	2005-07-11 08:00	2005-07-11 19:00		**N**
PFM000069	2006-02-20 08:00	2006-02-20 18:30		C
PFM000069	2006-03-20 08:00	2006-03-20 19:30		C
PFM000069	2006-04-19 07:00	2006-04-19 18:30		L
PFM000069	2006-05-15 08:00	2006-05-15 19:00	7.00E–02	L
PFM000069	2006-06-12 08:00	2006-06-12 18:30	1.60E–02	L
PFM000070	2005-07-12 07:00	2005-07-12 18:00		B
PFM000070	2005-08-02 07:00	2005-08-02 17:00		B
PFM000070	2005-09-06 07:00	2005-09-06 16:00		F
PFM000070	2005-10-04 07:00	2005-10-04 17:00		F
PFM000070	2005-11-01 07:00	2005-11-01 16:00		F
PFM000070	2005-11-28 08:00	2005-11-28 19:00	1.60E–02	L
PFM000070	2005-12-20 07:00	2005-12-20 17:00		C
PFM000070	2006-01-24 07:00	2006-01-24 20:00		C
PFM000070	2006-02-21 07:00	2006-02-21 19:00	3.90E–02	L
PFM000070	2006-03-21 07:00	2006-03-21 17:30		C
PFM000070	2006-04-19 07:00	2006-04-19 18:30		L
PFM000070	2006-05-16 07:00	2006-05-16 16:00	1.80E–02	L
PFM000070	2006-06-12 08:00	2006-06-12 18:30		F
PFM000074	2005-07-11 08:00	2005-07-11 19:00		N
PFM000074	2005-08-01 08:00	2005-08-01 19:00		N
PFM000074	2005-09-05 08:00	2005-09-05 18:30		N
PFM000074	2005-10-03 08:00	2005-10-03 20:00		N
PFM000074	2005-10-31 08:00	2005-10-31 19:00		N
PFM000074	2005-11-29 07:00	2005-11-29 17:00		N
PFM000074	2005-12-20 07:00	2005-12-20 17:00		N
PFM000074	2006-01-24 07:00	2006-01-24 20:00		N
PFM000074	2006-02-21 07:00	2006-02-21 19:00		N
PFM000074	2006-03-20 08:00	2006-03-20 19:30		N
PFM000074	2006-04-18 08:00	2006-04-18 18:30		N
PFM000074	2006-05-15 08:00	2006-05-15 19:00		N
PFM000074	2006-06-13 07:00	2006-06-13 16:00		N
PFM000082	2006-01-23 08:00	2006-01-23 19:00		N
PFM000082	2006-02-20 08:00	2006-02-20 18:30		N
PFM000082	2006-03-20 08:00	2006-03-20 19:30		N
PFM000097	2005-07-12 07:00	2005-07-12 18:00		N
PFM000097	2005-08-02 07:00	2005-08-02 17:00		N
PFM000097	2005-09-06 07:00	2005-09-06 16:00		N
PFM000097	2005-10-04 07:00	2005-10-04 17:00		N
PFM000097	2005-11-01 07:00	2005-11-01 16:00		N
PFM000097	2005-11-29 07:00	2005-11-29 17:00		N
PFM000097	2005-12-20 07:00	2005-12-20 17:00		N
PFM000097	2006-01-24 07:00	2006-01-24 20:00		N
PFM000097	2006-02-21 07:00	2006-02-21 19:00		N
PFM000097	2006-03-21 07:00	2006-03-21 17:30		N
PFM000097	2006-04-19 07:00	2006-04-19 18:30		N
PFM000097	2006-05-16 07:00	2006-05-16 16:00		N
PFM000097	2006-06-13 07:00	2006-06-13 16:00		N

IDcode	Start date	Stop date	Simple flow rate (m^3/s)	Code
PFM000062	2005-07-11 08:00	2005-07-11 19:00		**N**
PFM000107	2005-07-11 08:00	2005-07-11 19:00		N
PFM000107	2005-08-01 08:00	2005-08-01 19:00		N
PFM000107	2005-09-05 08:00	2005-09-05 18:30		N
PFM000107	2005-10-03 08:00	2005-10-03 20:00		N
PFM000107	2005-10-31 08:00	2005-10-31 19:00		N
PFM000107	2005-11-28 08:00	2005-11-28 19:00		N
PFM000107	2005-12-19 08:00	2005-12-19 19:00		N
PFM000107	2006-01-23 08:00	2006-01-23 19:00		N
PFM000107	2006-02-20 08:00	2006-02-20 18:30		N
PFM000107	2006-03-20 08:00	2006-03-20 19:30		N
PFM000107	2006-05-15 08:00	2006-05-15 19:00		N
PFM000107	2006-06-12 08:00	2006-06-12 18:30		N
PFM000117	2005-07-11 08:00	2005-07-11 19:00		N
PFM000117	2005-08-02 07:00	2005-08-02 17:00		N
PFM000117	2005-09-06 07:00	2005-09-06 16:00		N
PFM000117	2005-10-04 07:00	2005-10-04 17:00		N
PFM000117	2005-11-01 07:00	2005-11-01 16:00		N
PFM000117	2005-11-29 07:00	2005-11-29 17:00		N
PFM000117	2005-12-20 07:00	2005-12-20 17:00		N
PFM000117	2006-01-24 07:00	2006-01-24 20:00		N
PFM000117	2006-02-21 07:00	2006-02-21 19:00		N
PFM000117	2006-03-21 07:00	2006-03-21 17:30		N
PFM000117	2006-04-19 07:00	2006-04-19 18:30		N
PFM000117	2006-05-16 07:00	2006-05-16 16:00		N
PFM000117	2006-06-12 08:00	2006-06-12 18:30		N
PFM102269	2005-07-12 07:00	2005-07-12 18:00		N
PFM102269	2006-01-24 07:00	2006-01-24 20:00		N
PFM102269	2006-02-21 07:00	2006-02-21 19:00		N
PFM102269	2006-03-21 07:00	2006-03-21 17:30		N
PFM102269	2006-04-19 07:00	2006-04-19 18:30		N
PFM102269	2006-05-15 08:00	2006-05-15 19:00		N
PFM102269	2006-06-12 08:00	2006-06-12 18:30		N
PFM102270	2006-04-18 08:00	2006-04-18 18:30		N

Simple flow rate = based on simple “floating bottle” method.

Code	Code description
A	Blocked flow; no measurement
B	Too much water vegetation, no measurement
C	Water compleately frosen, no measurement
D	Too much ice, no measurement
E	Flow rate too high, no measurement
F	Flow rate too low, no measurement
G	Dry conditions, no measurements
H	Measurement not possible, estimated value
I	Measurement not possible, see protocol
K	Comment missing
L	Flow rate value available
M	Low water level
N	Lake, Sea, no measurement
O	Too much wind, no measurement
P	Stationary water

Appendix 5

Compilation of hydrochemical data from water analyses

Table A5-1. Water composition.

Idcode	Sample no.	Depth m	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3^- mg/L	Cl^- mg/L	SO_4^{2-} mg/L	SO_4-S mg/L	Br mg/L	F^- mg/L	Si mg/l	Fe mg/l	Mn mg/L	Li mg/L
PFM000062	8936	0.5	2005-07-11	–2.17	1480	61.8	75.7	177	77.0	2740	384	150	10.2	0.35	0.30	0.009	0.0035	0.034
PFM000062	8953	0.5	2005-08-01	–4.32	1430	63.7	77.7	182	77.2	2820	396	148	10.1	–	0.36	–	–	0.025
PFM000062	8959	0.5	2005-09-05	–2.51	1510	59.8	75.3	182	78.7	2840	395	142	8.90	0.32	0.54	–	–	0.031
PFM000062	8971	0.5	2005-10-03	–2.42	1580	61.3	82.7	191	81.9	2980	426	145	12.3	0.34	0.58	0.003	0.0067	0.027
PFM000062	8996	0.5	2005-10-31	–1.41	1590	59.1	81.8	190	80.3	2920	418	147	9.24	0.32	0.49	< 0.02	< 0.003	0.024
PFM000062	12019	0.5	2005-11-28	–1.21	1580	61.5	83.3	183	81.0	2890	400	140	9.15	0.36	0.64	–	–	0.028
PFM000062	12021	0.5	2005-12-19	–2.16	1540	56.3	86.4	196	80.5	2910	406	148	11.1	0.35	0.82	–	–	0.026
PFM000062	12234	0.5	2006-04-18	–2.12	1510	63.1	78.9	176	78.4	2800	390	145	9.25	0.32	0.58	0.006	0.0043	0.029
PFM000062	12249	0.5	2006-05-15	–2.12	1460	52.6	75.9	176	77.1	2700	371	147	9.80	0.32	0.34	0.027	< 0.003	0.022
PFM000062	12297	0.5	2006-06-12	–1.39	1350	54.7	71.7	165	72.4	2490	351	127	8.53	0.35	0.23	< 0.02	< 0.003	0.027
PFM000066	8934	0.1	2005-07-12	4.56	6.1	2.09	61.5	3.5	190	4.2	3.63	1.92	0.068	< 0.2	3.56	–	–	< 0.004

Idcode	Sample no.	Depth m	Sampling date	Sr mg/L	I^- mg/L	pH_L mg/L	pH_F mg/L	Temp_F °Cl	EC_L mS/m
PFM000062	8936	0.5	2005-07-11	1.21	0.017	8.02	7.94	16.8	877
PFM000062	8953	0.5	2005-08-01	1.23	0.017	8.19	8.20	18.4	901
PFM000062	8959	0.5	2005-09-05	1.29	0.015	7.82	7.82	14.4	915
PFM000062	8971	0.5	2005-10-03	1.23	0.030	7.68	7.50	8.2	959
PFM000062	8996	0.5	2005-10-31	1.17	0.011	7.84	7.52	7.1	928
PFM000062	12019	0.5	2005-11-28	1.27	0.014	7.80	7.72	4.5	923
PFM000062	12021	0.5	2005-12-19	1.13	< 0.05	7.75	7.79	2.2	929
PFM000062	12234	0.5	2006-04-18	1.15	0.010	7.82	8.04	1.2	904
PFM000062	12249	0.5	2006-05-15	1.08	0.010	8.29	8.44	9.5	873
PFM000062	12297	0.5	2006-06-12	0.956	< 0.01	7.99	8.14	14.2	801
PFM000066	8934	0.1	2005-07-12	0.072	0.008	7.46	7.30	18.6	32.4

Idcode	Sample no.	Depth m	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3^- mg/L	Cl^- mg/L	SO_4^{2-} mg/L	SO_4-S mg/L	Br mg/L	F^- mg/L	Si mg/l	Fe mg/l	Mn mg/L	Li mg/L
PFM000066	8952	0.1	2005-08-01	4.12	5.8	1.81	61.0	3.5	188	4.4	3.90	1.98	0.063	0.26	3.89	–	–	< 0.004
PFM000066	8955	0.1	2005-09-05	2.45	5.3	1.44	56.5	3.2	180	3.7	4.23	2.02	0.038	0.26	4.81	–	–	< 0.004
PFM000066	8993	0.1	2005-10-31	4.67	5.7	2.35	61.8	3.6	178	5.7	11.1	4.33	0.044	0.24	5.47	0.053	< 0.003	< 0.004
PFM000066	12016	0.1	2005-11-28	4.35	5.5	2.65	61.8	3.2	179	5.7	11.0	3.91	0.077	0.23	5.14	–	–	< 0.004
PFM000066	12022	0.1	2005-12-19	2.94	6.1	3.00	69.6	3.8	202	7.2	16.4	5.80	0.079	0.22	6.17	–	–	< 0.004
PFM000066	12042	0.1	2006-01-23	4.99	7.2	2.81	88.2	4.3	247	8.3	14.9	5.80	0.079	0.21	7.58	0.109	0.1520	< 0.004
PFM000066	12081	0.1	2006-02-20	1.57	6.5	2.64	74.9	3.9	231	7.4	11.9	4.33	0.075	0.20	6.03	0.090	0.0262	< 0.04
PFM000066	12098	0.1	2006-03-20	4.33	6.3	2.72	84.2	4.2	246	7.2	9.61	3.84	0.06	0.23	6.26	0.160	0.0379	< 0.004
PFM000066	12235	0.1	2006-04-18	5.53	3.3	2.25	43.2	2.4	123	3.6	7.24	2.79	< 0.2	< 0.2	4.00	0.047	0.0128	< 0.004
PFM000066	12253	0.1	2006-05-15	4.06	4.8	2.37	68.6	3.3	202	4.9	7.41	3.13	0.032	0.24	4.49	0.095	0.0045	< 0.004
PFM000066	12298	0.1	2006-06-13	4.31	5.7	2.33	65.0	3.4	196	5.3	5.29	2.22	0.046	0.25	2.88	0.177	0.0134	< 0.004
PFM000068	8932	0.1	2005-07-12	3.17	20.9	1.45	61.9	6.1	187	33.1	8.52	3.88	0.205	0.27	4.95	–	–	< 0.004
PFM000068	8951	0.5	2005-08-01	2.97	22.6	1.26	67.3	6.7	203	37.4	8.35	3.80	0.21	0.32	4.86	–	–	< 0.004
PFM000068	8960	0.5	2005-09-05	2.57	18.0	0.84	61.9	6.0	192	28.1	7.20	3.40	0.12	0.34	5.27	–	–	< 0.004

Idcode	Sample no.	Depth m	Sampling date	Sr mg/L	I^- mg/L	pH_L mg/L	pH_F mg/L	Temp_F °Cl	EC_L mS/m
PFM000066	8952	0.1	2005-08-01	0.071	0.006	7.60	7.56	16.3	32.3
PFM000066	8955	0.1	2005-09-05	0.072	0.010	7.56	7.72	12.8	32.6
PFM000066	8993	0.1	2005-10-31	0.062	0.004	7.44	7.39	7.2	32.2
PFM000066	12016	0.1	2005-11-28	0.065	0.009	7.44	7.47	0.6	33.3
PFM000066	12022	0.1	2005-12-19	0.073	0.009	7.07	7.26	–0.1	37.5
PFM000066	12042	0.1	2006-01-23	0.084	0.008	7.02	7.09	–0.1	44.0
PFM000066	12081	0.1	2006-02-20	0.075	0.007	7.07	7.18	–0.1	40.7
PFM000066	12098	0.1	2006-03-20	0.083	0.005	7.00	7.08	–0.1	42.7
PFM000066	12235	0.1	2006-04-18	0.042	0.008	7.04	7.12	3.8	23.2
PFM000066	12253	0.1	2006-05-15	0.065	0.005	7.46	7.48	11.5	35.2
PFM000066	12298	0.1	2006-06-13	0.071	0.005	7.45	7.46	17.8	33.1
PFM000068	8932	0.1	2005-07-12	0.103	0.009	7.43	7.38	16.7	42.5
PFM000068	8951	0.5	2005-08-01	0.116	0.009	7.49	7.57	15.5	46.2
PFM000068	8960	0.5	2005-09-05	0.114	0.009	7.52	7.67	12.5	41.8

Idcode	Sample no.	Depth m	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3^- mg/L	Cl^- mg/L	SO_4^{2-} mg/L	SO_4-S mg/L	Br mg/L	F^- mg/L	Si mg/l	Fe mg/l	Mn mg/L	Li mg/L
PFM000068	8977	0.1	2005-10-03	1.36	25.5	2.05	67.9	7.4	220	43.1	6.28	2.74	0.265	0.44	7.23	–	–	< 0.004
PFM000068	9000	0.5	2005-10-31	3.61	16.0	2.27	59.4	5.5	165	27.1	16.9	6.28	0.118	0.29	5.85	0.152	0.0051	< 0.004
PFM000068	8999	0.5	2005-11-28	4.85	13.5	2.43	54.2	4.3	150	21.2	13.6	4.74	0.109	0.28	5.20	–	–	< 0.004
PFM000068	12027	0.1	2005-12-19	4.01	11.2	2.88	60.7	4.7	171	16.9	16.3	5.97	0.10	0.28	5.41	–	–	< 0.004
PFM000068	12045	0.1	2006-01-23	5.42	13.1	2.65	70.4	5.2	195	19.8	13.6	5.41	0.106	0.27	6.51	0.296	0.0670	< 0.004
PFM000068	12082	0.1	2006-02-20	2.82	11.5	2.44	60.6	4.6	183	16.3	11.5	4.36	0.10	0.26	5.26	0.179	0.0233	< 0.04
PFM000068	12091	0.1	2006-03-20	4.99	11.7	2.56	70.5	5.1	202	17.3	10.1	4.27	0.113	0.29	5.93	0.216	0.0152	< 0.004
PFM000068	12237	0.1	2006-04-19	6.01	5.2	1.91	35.4	2.6	94.6	7.6	9.64	3.63	< 0.2	0.21	3.65	0.085	0.0059	< 0.004
PFM000068	12250	0.1	2006-05-15	4.99	10.5	2.39	56.5	4.2	159	16.1	10.1	4.17	0.088	0.29	4.74	0.190	0.0133	< 0.004
PFM000068	12302	0.1	2006-06-12	5.52	20.3	2.37	65.6	5.8	185	31.8	9.50	4.09	0.145	0.35	6.06	0.408	0.0695	< 0.004
PFM000069	8931	0.1	2005-07-12	3.86	21.7	1.60	62.6	6.2	188	33.7	8.37	3.62	0.216	0.29	4.75	–	–	< 0.004
PFM000069	8947	0.1	2005-08-01	2.75	23.6	1.10	66.6	6.8	203	39.3	7.55	3.47	0.241	0.36	4.61	–	–	< 0.004
PFM000069	8956	0.1	2005-09-05	2.36	18.8	0.73	62.5	6.2	193	30.3	7.54	3.54	0.14	0.37	5.24	–	–	< 0.004
PFM000069	8974	0.1	2005-10-03	3.11	27.3	1.55	69.8	7.8	215	44.2	8.84	3.67	0.30	0.47	7.26	–	–	< 0.004

Idcode	Sample no.	Depth m	Sampling date	Sr mg/L	I^- mg/L	pH_L mg/L	pH_F mg/L	Temp_F °Cl	EC_L mS/m
PFM000068	8977	0.1	2005-10-03	0.114	0.011	7.32	7.34	10.2	49.3
PFM000068	9000	0.5	2005-10-31	0.086	0.006	7.32	7.34	7.3	39.5
PFM000068	8999	0.5	2005-11-28	0.081	0.007	7.31	7.52	1.1	34.4
PFM000068	12027	0.1	2005-12-19	0.086	0.003	6.93	7.28	–0.1	36.8
PFM000068	12045	0.1	2006-01-23	0.093	0.007	6.96	7.01	–0.1	41.3
PFM000068	12082	0.1	2006-02-20	0.083	0.007	6.99	7.11	–0.1	37.2
PFM000068	12091	0.1	2006-03-20	0.094	0.009	7.02	7.14	–0.1	39.8
PFM000068	12237	0.1	2006-04-19	0.045	0.007	7.05	7.13	2.2	21.8
PFM000068	12250	0.1	2006-05-15	0.074	0.006	7.32	7.32	9.3	33.2
PFM000068	12302	0.1	2006-06-12	0.102	0.006	7.45	7.43	16.8	42.1
PFM000069	8931	0.1	2005-07-12	0.104	0.009	7.61	7.57	16.6	42.7
PFM000069	8947	0.1	2005-08-01	0.113	0.010	7.71	7.67	15.7	48.3
PFM000069	8956	0.1	2005-09-05	0.116	0.009	7.55	7.80	12.6	42.2
PFM000069	8974	0.1	2005-10-03	0.119	0.013	7.61	7.66	10.1	49.8

Idcode	Sample no.	Depth m	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3^- mg/L	Cl^- mg/L	SO_4^{2-} mg/L	SO_4-S mg/L	Br mg/L	F^- mg/L	Si mg/l	Fe mg/l	Mn mg/L	Li mg/L
PFM000069	8995	0.1	2005-10-31	2.67	20.7	1.77	65.7	6.5	196	36.1	10.1	4.14	0.16	0.33	6.71	0.082	0.0070	< 0.004
PFM000069	12017	0.1	2005-11-28	4.41	19.3	2.46	67.8	5.7	190	32.8	12.9	4.74	0.173	0.31	7.14	–	–	< 0.004
PFM000069	12020	0.1	2005-12-19	3.48	14.4	3.26	72.0	5.5	199	24.7	20.8	7.36	0.139	0.32	7.04	–	–	< 0.004
PFM000069	12043	0.1	2006-01-23	3.75	18.5	3.12	87.5	6.6	243	32.6	16.2	7.30	0.16	0.36	9.39	0.590	0.1330	< 0.004
PFM000069	12079	0.1	2006-02-20	1.18	15.9	2.68	75.0	5.8	228	26.8	15.3	5.63	0.137	0.32	7.17	0.252	0.0468	< 0.04
PFM000069	12099	0.1	2006-03-20	3.19	17.2	2.99	86.2	6.4	252	30.2	12.5	4.93	0.154	0.33	8.05	0.409	0.0547	< 0.004
PFM000069	12230	0.1	2006-04-19	5.45	7.1	2.23	43.6	3.3	114	11.5	13.5	5.05	< 0.2	0.23	4.25	0.081	0.0087	< 0.004
PFM000069	12236	0.1	2006-05-15	3.1	12.9	2.49	57.9	4.7	164	21.6	14.1	5.69	0.109	0.32	5.74	0.127	0.0034	< 0.004
PFM000069	12301	0.1	2006-06-12	4.34	20.6	2.32	63.7	5.8	184	32.9	10.3	4.20	0.15	0.36	6.19	0.135	0.0053	< 0.004
PFM000070	8933	0.1	2005-07-12	4.75	6.7	0.73	48.7	3.0	153	4.1	2.70	1.51	0.059	<0.2	3.48	–	–	< 0.004
PFM000070	8954	0.1	2005-08-02	4.89	5.9	1.28	45.9	2.9	141	4.5	3.13	1.70	0.056	0.21	3.50	–	–	< 0.004
PFM000070	8957	0.1	2005-09-06	2.16	6.0	0.97	37.3	2.6	123	4.9	3.20	1.63	0.017	<0.2	3.01	–	–	< 0.004
PFM000070	8975	0.1	2005-10-04	3.34	6.5	1.11	43.6	2.8	139	5.7	2.79	1.39	0.071	0.24	4.19	–	–	< 0.004
PFM000070	8992	0.1	2005-11-01	4.72	6.3	1.87	34.2	2.7	105	6.4	5.12	2.12	0.042	0.22	2.44	0.038	0.0090	< 0.004

Idcode	Sample no.	Depth m	Sampling date	Sr mg/L	I^- mg/L	pH_L mg/L	pH_F mg/L	Temp_F °Cl	EC_L mS/m
PFM000069	8995	0.1	2005-10-31	0.096	0.008	7.38	7.37	7.3	45.0
PFM000069	12017	0.1	2005-11-28	0.105	0.007	7.28	7.49	1.3	44.0
PFM000069	12020	0.1	2005-12-19	0.104	0.010	6.91	7.32	–0.1	44.0
PFM000069	12043	0.1	2006-01-23	0.117	0.009	6.83	6.92	–0.1	51.6
PFM000069	12079	0.1	2006-02-20	0.103	0.009	6.89	7.02	–0.1	47.4
PFM000069	12099	0.1	2006-03-20	0.117	0.007	6.86	6.99	–0.1	51.5
PFM000069	12230	0.1	2006-04-19	0.055	0.012	6.97	7.06	1.9	26.4
PFM000069	12236	0.1	2006-05-15	0.078	0.006	7.26	7.21	9.0	36.7
PFM000069	12301	0.1	2006-06-12	0.100	0.008	7.39	7.36	16.3	42.4
PFM000070	8933	0.1	2005-07-12	0.056	0.013	7.06	7.29	18.0	26.5
PFM000070	8954	0.1	2005-08-02	0.051	0.010	7.22	7.36	15.9	25.5
PFM000070	8957	0.1	2005-09-06	0.047	< 0.001	7.14	7.44	14.0	22.6
PFM000070	8975	0.1	2005-10-04	0.045	0.011	7.13	7.46	9.2	24.9
PFM000070	8992	0.1	2005-11-01	0.036	0.005	7.18	7.38	6.4	20.7

Idcode	Sample no.	Depth m	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3^- mg/L	Cl^- mg/L	SO_4^{2-} mg/L	SO_4-S mg/L	Br mg/L	F^- mg/L	Si mg/l	Fe mg/l	Mn mg/L	Li mg/L
PFM000070	12014	0.1	2005-11-28	5.47	6.6	1.85	36.9	2.7	114	5.8	4.48	1.71	0.045	0.22	1.63	–	–	< 0.004
PFM000070	12025	0.1	2005-12-20	3.56	6.6	2.07	40.6	3.0	128	6.2	5.89	2.41	0.046	0.23	2.14	–	–	< 0.004
PFM000070	12069	0.1	2006-01-24	4.6	7.5	2.03	47.7	3.2	146	7.2	5.70	2.41	0.045	0.21	2.22	–	–	< 0.004
PFM000070	12083	0.5	2006-02-21	3.68	6.1	1.95	47.7	3.1	144	6.1	7.99	3.16	0.053	0.20	3.56	0.066	0.0173	< 0.04
PFM000070	12092	0.1	2006-03-21	4.08	5.8	1.96	55.7	3.1	165	6.0	7.56	3.12	0.045	0.21	3.85	0.074	0.0615	< 0.004
PFM000070	12240	0.1	2006-04-19	8.45	2.8	1.22	24.7	1.5	67.3	2.7	3.65	1.54	< 0.2	<0.2	2.29	0.068	0.0139	< 0.004
PFM000070	12252	0.1	2006-05-16	5.47	5.7	1.70	48.1	2.9	142	5.3	4.95	2.22	0.031	0.20	1.65	0.038	0.0067	< 0.004
PFM000070	12304	0.1	2006-06-12	6.06	6.3	1.16	48.1	2.9	144	4.9	3.32	1.58	0.039	0.21	1.52	0.098	0.0843	< 0.004
PFM000074	8937	0.5	2005-07-11	4.19	10.9	1.76	70.8	4.3	218	12.5	3.57	2.08	0.08	<0.2	4.21	0.044	0.0080	0.003
PFM000074	8948	0.5	2005-08-01	3.52	12.1	1.68	66.8	4.4	206	15.7	4.31	2.24	0.086	0.26	5.59	–	–	< 0.004
PFM000074	8962	0.5	2005-09-05	2.44	11.5	1.52	75.9	4.6	239	14.6	4.02	2.16	0.065	0.28	6.77	–	–	< 0.004
PFM000074	8976	0.5	2005-10-03	2.87	12.4	1.61	67.8	4.5	211	17.1	4.97	2.16	0.119	0.31	7.73	0.014	0.0018	< 0.004
PFM000074	8998	0.5	2005-10-31	4.19	11.3	2.29	64.7	4.1	193	16.3	5.20	2.34	0.053	0.27	7.34	< 0.02	<0.003	< 0.004
PFM000074	12018	0.5	2005-11-29	2.98	7.5	2.70	74.3	3.7	215	10.2	14.5	5.27	0.105	0.24	6.73	–	–	< 0.004

Idcode	Sample no.	Depth m	Sampling date	Sr mg/L	I^- mg/L	pH_L mg/L	pH_F mg/L	Temp_F °Cl	EC_L mS/m
PFM000070	12014	0.1	2005-11-28	0.046	0.006	7.76	7.86	1.0	22.0
PFM000070	12025	0.1	2005-12-20	0.052	0.002	7.64	7.78	0.2	24.1
PFM000070	12069	0.1	2006-01-24	0.055	0.005	7.68	7.75	–0.1	27.5
PFM000070	12083	0.5	2006-02-21	0.052	0.007	7.28	7.45	0.3	27.1
PFM000070	12092	0.1	2006-03-21	0.057	0.006	7.24	7.32	0.2	29.7
PFM000070	12240	0.1	2006-04-19	0.025	0.006	7.06	7.37	4.7	13.5
PFM000070	12252	0.1	2006-05-16	0.048	0.005	7.50	7.50	11.5	25.8
PFM000070	12304	0.1	2006-06-12	0.053	0.007	7.09	7.14	19.6	25.3
PFM000074	8937	0.5	2005-07-11	0.090	0.011	7.56	7.25	20.6	39.4
PFM000074	8948	0.5	2005-08-01	0.088	0.009	7.57	7.51	19.4	38.8
PFM000074	8962	0.5	2005-09-05	0.103	0.010	7.73	8.17	15.4	42.4
PFM000074	8976	0.5	2005-10-03	0.084	0.013	8.12	8.15	12.1	39.4
PFM000074	8998	0.5	2005-10-31	0.070	0.004	8.00	8.07	7.3	36.8
PFM000074	12018	0.5	2005-11-29	0.080	0.013	6.92	7.59	3.7	40.1

Idcode	Sample no.	Depth m	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3^- mg/L	Cl^- mg/L	SO_4^{2-} mg/L	SO_4-S mg/L	Br mg/L	F^- mg/L	Si mg/l	Fe mg/l	Mn mg/L	Li mg/L
PFM000074	12023	0.5	2005-12-20	2.85	8.4	2.93	71.0	3.9	206	11.8	15.7	5.56	0.077	0.24	6.20	–	–	< 0.004
PFM000074	12032	0.5	2006-01-24	3.46	12.7	2.85	87.9	4.6	247	21.7	13.9	5.75	0.122	0.24	7.45	0.091	0.0350	< 0.004
PFM000074	12080	0.5	2006-02-21	1.23	7.4	2.64	76.1	4.0	234	10.0	12.2	4.45	0.087	0.21	6.14	0.056	0.0144	< 0.04
PFM000074	12200	1.5	2006-03-20	5.17	7.2	2.80	86.3	4.4	244	10.0	10.7	4.23	0.056	0.23	6.51	0.061	0.0106	< 0.004
PFM000074	12232	0.5	2006-04-18	4.84	3.7	2.16	45.1	2.5	129	4.9	7.58	2.84	< 0.2	<0.2	4.03	0.039	0.0087	< 0.004
PFM000074	12248	0.5	2006-05-15	7	8.6	2.76	71.9	3.8	197	12.2	6.79	3.10	0.046	0.28	5.18	0.048	0.0045	< 0.004
PFM000074	12303	0.5	2006-06-13	5.93	11.1	2.43	74.1	4.2	215	14.4	4.66	2.14	0.052	0.29	4.03	0.040	0.0073	< 0.004
PFM000082	12046	0.5	2006-01-23	–2.77	1550	54.8	82.5	189	81.5	2930	414	151	11.5	–	0.89	0.015	0.0030	0.024
PFM000082	12030	6	2006-01-23	–3.07	1550	55.6	83.3	190	82.2	2950	420	153	10.6	0.48	0.92	0.015	0.0030	0.024
PFM000082	12084	0.5	2006-02-20	–3.18	1470	57.5	78.8	191	78.5	2830	405	151	9.29	0.35	0.83	< 0.02	< 0.003	0.026
PFM000082	12085	6	2006-02-20	–2.99	1480	56.4	78.5	187	77.8	2830	398	147	9.48	–	0.83	< 0.02	< 0.003	0.026
PFM000082	12097	0.5	2006-03-20	–2.14	1480	56.9	77.1	177	78.7	2750	381	143	11.1	0.30	0.68	< 0.02	< 0.003	0.025
PFM000082	12090	6	2006-03-20	–2.25	1490	57.5	78.8	179	79.8	2780	386	144	11.0	0.30	0.75	< 0.02	0.0075	0.027
PFM000107	8938	0.5	2005-07-11	0.14	89.1	5.59	43.7	13.4	118	167	26.0	10.1	0.653	<0.2	0.43	0.051	0.0030	0.004

Idcode	Sample no.	Depth m	Sampling date	Sr mg/L	I^- mg/L	pH_L mg/L	pH_F mg/L	Temp_F °Cl	EC_L mS/m
PFM000074	12023	0.5	2005-12-20	0.077	0.006	7.07	7.25	0.9	39.4
PFM000074	12032	0.5	2006-01-24	0.090	0.011	7.00	7.04	0.7	48.6
PFM000074	12080	0.5	2006-02-21	0.078	0.007	7.06	7.23	0.2	41.9
PFM000074	12200	1.5	2006-03-20	0.087	0.006	7.01	7.13	0.1	43.9
PFM000074	12232	0.5	2006-04-18	0.045	0.010	7.19	7.34	1.2	24.5
PFM000074	12248	0.5	2006-05-15	0.074	0.005	7.40	7.44	12.0	37.2
PFM000074	12303	0.5	2006-06-13	0.087	0.007	7.40	7.27	18.6	39.2
PFM000082	12046	0.5	2006-01-23	1.14	0.012	7.71	7.85	–0.3	930
PFM000082	12030	6	2006-01-23	1.16	0.013	7.71	7.88	–0.3	938
PFM000082	12084	0.5	2006-02-20	1.15	0.007	7.73	7.87	–0.3	893
PFM000082	12085	6	2006-02-20	1.13	0.007	7.72	7.95	–0.1	893
PFM000082	12097	0.5	2006-03-20	1.11	< 0.01	7.74	7.83	1.1	894
PFM000082	12090	6	2006-03-20	1.14	< 0.01	7.76	7.94	1.2	899
PFM000107	8938	0.5	2005-07-11	0.119	0.009	8.56	8.56	25.3	79.5

Idcode	Sample no.	Depth m	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3^- mg/L	Cl^- mg/L	SO_4^{2-} mg/L	SO_4-S mg/L	Br mg/L	F^- mg/L	Si mg/l	Fe mg/l	Mn mg/L	Li mg/L
PFM000107	8950	0.5	2005-08-01	–0.45	89.8	5.47	40.1	13.5	106	171	27.1	10.3	0.641	0.24	0.36	–	–	< 0.004
PFM000107	8961	0.5	2005-09-05	8.75	84.6	4.57	38.3	13.0	102	122	24.4	8.89	0.54	0.26	0.36	–	–	0.004
PFM000107	8970	0.5	2005-10-03	1.28	87.6	4.63	39.8	12.0	112	154	24.0	8.41	0.651	0.32	0.14	0.037	0.0041	< 0.004
PFM000107	8997	0.5	2005-10-31	1.26	83.4	4.44	42.4	12.3	117	150	22.7	8.44	0.528	0.33	0.09	0.026	< 0.003	< 0.004
PFM000107	12015	0.5	2005-11-28	2.07	75.6	4.39	45.2	10.9	130	131	20.2	7.08	0.491	0.28	0.53	–	–	< 0.004
PFM000107	12024	0.5	2005-12-19	1.78	16.0	3.17	60.2	5.2	172	29.5	17.7	6.27	0.135	0.29	5.28	–	–	< 0.004
PFM000107	12028	1	2005-12-19	–0.28	77.5	4.70	47.3	11.9	144	143	20.5	7.28	0.58	0.29	0.62	–	–	< 0.004
PFM000107	12047	0.5	2006-01-23	4.4	49.2	4.16	67.0	9.3	188	79.3	20.2	7.83	0.389	0.29	4.30	0.161	0.0600	< 0.004
PFM000107	12044	1	2006-01-23	0.93	81.1	4.64	57.6	12.5	167	148	20.4	7.73	0.558	0.26	1.05	0.112	0.0670	0.004
PFM000107	12078	0.5	2006-02-20	1.27	32.2	3.49	61.5	7.2	186	56.5	16.0	5.82	0.233	0.29	4.38	0.185	0.0410	< 0.04
PFM000107	12086	1	2006-02-20	–0.68	76.8	4.86	57.0	11.9	178	142	19.8	7.17	0.506	0.26	1.49	0.125	0.0175	< 0.04
PFM000107	12096	0.5	2006-03-20	3.57	25.4	3.11	66.3	6.6	192	42.2	13.5	5.39	0.189	0.28	4.69	0.189	0.0550	< 0.004
PFM000107	12094	1	2006-03-20	0.44	70.3	5.08	62.8	11.8	191	129	18.3	7.03	0.557	0.29	1.98	0.145	0.0065	< 0.004
PFM000107	12231	0.5	2006-05-15	4.24	20.2	2.43	45.9	5.2	128	32.6	12.9	5.31	0.124	0.26	1.79	0.065	< 0.003	< 0.004

Idcode	Sample no.	Depth m	Sampling date	Sr mg/L	I^- mg/L	pH_L mg/L	pH_F mg/L	Temp_F °Cl	EC_L mS/m
PFM000107	8950	0.5	2005-08-01	0.115	0.008	8.77	8.78	21.8	78.9
PFM000107	8961	0.5	2005-09-05	0.123	0.008	8.78	8.83	16.4	73.8
PFM000107	8970	0.5	2005-10-03	0.110	0.011	8.27	8.41	11.7	75.7
PFM000107	8997	0.5	2005-10-31	0.101	0.006	8.09	8.25	6.2	73.9
PFM000107	12015	0.5	2005-11-28	0.112	0.005	7.89	8.25	1.2	71.8
PFM000107	12024	0.5	2005-12-19	0.091	0.003	7.31	7.86	1.8	40.9
PFM000107	12028	1	2005-12-19	0.121	< 0.002	7.58	7.83	2.4	75.3
PFM000107	12047	0.5	2006-01-23	0.120	0.008	7.13	7.31	1.7	63.4
PFM000107	12044	1	2006-01-23	0.130	0.007	7.38	7.41	3.2	79.4
PFM000107	12078	0.5	2006-02-20	0.101	0.008	7.08	7.25	1.1	52.1
PFM000107	12086	1	2006-02-20	0.128	0.007	7.31	7.31	2.7	78.6
PFM000107	12096	0.5	2006-03-20	0.101	0.005	7.02	7.21	1.2	47.8
PFM000107	12094	1	2006-03-20	0.136	0.007	7.26	7.29	3.5	78.2
PFM000107	12231	0.5	2006-05-15	0.072	0.005	8.14	8.31	13.7	35.1

Idcode	Sample no.	Depth m	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3^- mg/L	Cl^- mg/L	SO_4^{2-} mg/L	SO_4-S mg/L	Br mg/L	F^- mg/L	Si mg/l	Fe mg/l	Mn mg/L	Li mg/L
PFM000107	12300	0.5	2006-06-12	4.49	24.3	2.72	43.2	5.7	125	37.2	13.1	5.11	0.154	0.27	0.38	0.031	0.0032	< 0.004
PFM000117	8935	0.5	2005-07-11	6.07	6.3	1.92	32.5	2.9	101	4.8	4.84	2.29	0.042	<0.2	0.69	0.006	0.0015	0.002
PFM000117	8949	0.5	2005-08-02	6.44	6.4	1.92	27.4	2.9	86.3	5.0	4.90	2.27	0.047	<0.2	1.09	–	–	< 0.004
PFM000117	8958	0.5	2005-09-06	5.43	6.2	1.69	27.3	3.0	87.9	5.0	4.57	2.20	0.02	<0.2	1.44	–	–	< 0.004
PFM000117	8973	0.5	2005-10-04	4.87	6.6	1.77	29.8	2.9	95.7	5.9	4.84	1.90	0.06	0.23	1.40	0.004	0.0003	< 0.004
PFM000117	8994	0.5	2005-11-01	5.45	6.5	1.71	34.1	2.9	106	5.8	4.55	1.91	0.041	0.22	1.51	< 0.02	0.0063	< 0.004
PFM000117	12013	0.5	2005-11-29	5.04	6.6	1.87	37.9	2.7	118	5.8	4.46	1.71	0.04	0.21	1.62	–	–	< 0.004
PFM000117	12031	0.5	2005-12-20	3.43	6.8	2.02	39.9	3.0	128	6.2	4.80	2.06	0.055	0.21	1.73	–	–	< 0.004
PFM000117	12026	1.5	2005-12-20	3.78	6.2	2.02	47.1	3.0	145	6.0	5.73	2.36	0.045	0.22	2.60	–	–	< 0.004
PFM000117	12048	0.5	2006-01-24	5.77	7.7	2.12	48.3	3.3	144	7.2	5.91	2.55	0.047	0.23	2.31	0.015	0.004	< 0.004
PFM000117	12033	1.5	2006-01-24	6.53	6.6	2.07	58.5	3.2	166	6.6	6.56	2.77	0.057	0.21	3.38	0.047	0.060	< 0.004
PFM000117	12087	0.5	2006-02-21	2.54	7.2	2.24	48.2	3.2	155	6.9	5.67	2.32	0.044	0.21	2.34	0.021	0.0143	< 0.04
PFM000117	12088	1.5	2006-02-21	2.04	7.0	2.40	52.6	3.1	169	6.6	5.91	2.45	0.051	0.21	2.78	0.030	0.0309	< 0.04
PFM000117	12093	0.5	2006-03-21	6.23	5.7	1.93	55.6	3.2	156	6.0	8.18	3.35	0.043	0.23	4.05	0.074	0.0541	< 0.004

Idcode	Sample no.	Depth m	Sampling date	Sr mg/L	I^- mg/L	pH_L mg/L	pH_F mg/L	Temp_F °Cl	EC_L mS/m
PFM000107	12300	0.5	2006-06-12	0.080	0.005	8.66	8.81	23.2	35.2
PFM000117	8935	0.5	2005-07-11	0.046	0.007	8.77	8.77	26.2	19.3
PFM000117	8949	0.5	2005-08-02	0.043	0.007	8.98	8.95	21.2	20.2
PFM000117	8958	0.5	2005-09-06	0.047	0.004	8.76	8.84	16.2	17.8
PFM000117	8973	0.5	2005-10-04	0.043	0.010	7.21	8.59	11.6	19.1
PFM000117	8994	0.5	2005-11-01	0.041	0.006	8.15	8.24	5.5	20.3
PFM000117	12013	0.5	2005-11-29	0.047	0.005	8.01	8.25	0.9	22.3
PFM000117	12031	0.5	2005-12-20	0.052	< 0.002	7.96	8.04	1.3	23.9
PFM000117	12026	1.5	2005-12-20	0.054	< 0.002	7.54	7.85	3.4	26.8
PFM000117	12048	0.5	2006-01-24	0.060	0.005	7.69	7.74	1.5	27.0
PFM000117	12033	1.5	2006-01-24	0.060	0.008	7.44	7.48	4.0	30.7
PFM000117	12087	0.5	2006-02-21	0.056	0.005	7.48	7.67	1.1	28.6
PFM000117	12088	1.5	2006-02-21	0.057	0.007	7.41	7.51	3.7	30.6
PFM000117	12093	0.5	2006-03-21	0.059	0.005	7.16	7.39	1.0	29.3

Idcode	Sample no.	Depth m	Sampling date	RCB %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3^- mg/L	Cl^- mg/L	SO_4^{2-} mg/L	SO_4-S mg/L	Br mg/L	F^- mg/L	Si mg/l	Fe mg/l	Mn mg/L	Li mg/L
PFM000117	12095	1.5	2006-03-21	4.96	6.4	2.34	69.0	3.5	200	6.9	7.54	3.21	0.049	0.25	3.78	0.092	0.168	< 0.004
PFM000117	12251	0.5	2006-05-16	8.31	5.8	1.79	50.3	3.0	139	5.2	5.21	2.37	0.035	0.20	1.52	0.030	0.0104	< 0.004
PFM000117	12299	0.5	2006-06-12	6.81	6.0	1.77	43.2	2.8	126	5.3	4.82	2.04	0.031	0.20	0.41	< 0.02	0.0103	< 0.004
PFM102269	8886	0.5	2005-12-07	–2.28	1450	60.3	78.2	189	77.5	2760	372	140	9.70	0.33	0.31	< 0.02	< 0.003	0.025
PFM102269	12068	0.5	2006-01-24	–	–	–	–	–	80.1	–	–	–	–	–	–	–	–	–
PFM102269	12077	0.5	2006-02-21	–	–	–	–	–	78.8	–	–	–	–	–	–	–	–	–
PFM102269	12063	0.5	2006-03-21	–	–	–	–	–	79.8	2770	387	–	8.90	0.31	–	–	–	–
PFM102269	12238	0.5	2006-04-19	–	–	–	–	–	79.1	2770	383	–	9.05	0.33	–	–	–	–
PFM102269	12254	0.5	2006-05-15	–	–	–	–	–	77.3	2700	377	–	8.95	0.32	–	–	–	–
PFM102269	12305	0.5	2006-06-12	–	–	–	–	–	71.7	2470	338	–	8.15	0.33	–	–	–	–
PFM102270	12233	0.5	2006-04-18	4.21	13.3	2.37	46.0	4.1	128	21.0	13.0	4.91	< 0.2	0.24	4.04	0.128	0.0366	< 0.004

Idcode	Sample no.	Depth m	Sampling date	Sr mg/L	I^- mg/L	pH_L mg/L	pH_F mg/L	Temp_F °Cl	EC_L mS/m
PFM000117	12095	1.5	2006-03-21	0.065	0.006	7.30	7.41	3.9	36.3
PFM000117	12251	0.5	2006-05-16	0.049	0.005	8.32	8.42	13.5	25.4
PFM000117	12299	0.5	2006-06-12	0.046	0.005	8.54	8.68	22.4	22.9
PFM102269	8886	0.5	2005-12-07	1.07	0.015	8.16	8.06	30.0	881
PFM102269	12068	0.5	2006-01-24	–	–	7.70	7.86	11.5	922
PFM102269	12077	0.5	2006-02-21	–	–	7.72	7.95	11.5	888
PFM102269	12063	0.5	2006-03-21	–	–	7.79	7.97	11.8	1060
PFM102269	12238	0.5	2006-04-19	–	–	7.85	8.09	12.4	893
PFM102269	12254	0.5	2006-05-15	–	–	8.29	8.39	20.5	870
PFM102269	12305	0.5	2006-06-12	–	–	7.94	8.05	25.2	803
PFM102270	12233	0.5	2006-04-18	0.068	0.008	7.12	7.71	3.7	31.7

RCB = Relative Charge Balance error.
pH_L = lab. pH.
pH_F = field pH.
Temp_F = water temperature in the field.
EC = Electrical Conductivity.
< ”value” = below detection limit.

Table A5-2. Surface water suppliments.

Idcode	Sample no.	Sampling date	Depth m	NH_4_N mg/L	NO_2_N mg/L	NO_2_N+ NO_3_ 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	Chl. A µg/L	Chl. C µg/L	Pheop. µg/L
PFM000062	8936	2005-07-11	0.5	0.0012	–	0.0004	0.22	0.0090	0.0006	0.0048	0.0315	0.255	1.0	< 0.2	0.2
PFM000062	8953	2005-08-01	0.5	0.0014	–	0.0004	0.24	0.0106	0.0006	0.0063	0.0419	0.287	1.8	0.2	< 0.2
PFM000062	8959	2005-09-05	0.5	0.0008	–	0.0003	0.25	0.0120	0.0008	0.0063	0.0405	0.456	2.0	0.2	0.3
PFM000062	8971	2005-10-03	0.5	0.0015	0.0015	0.0174	0.23	0.0127	0.0043	0.0043	0.0247	0.494	1.3	0.2	< 0.2
PFM000062	8996	2005-10-31	0.5	0.0019	–	0.0068	0.22	0.0103	0.0020	0.0059	0.0380	0.408	2.5	0.4	0.4
PFM000062	12019	2005-11-28	0.5	0.0023	–	0.0282	0.25	0.0130	0.0040	0.0026	0.0219	0.510	1.6	0.3	1.1
PFM000062	12021	2005-12-19	0.5	0.0023	–	0.0370	0.28	0.0148	0.0049	0.0048	0.0289	0.604	1.9	0.3	0.4
PFM000062	12234	2006-04-18	0.5	0.0020	0.0031	0.0176	0.26	0.0115	0.0012	0.0057	0.0383	0.497	0.3	< 0.2	< 0.2
PFM000062	12249	2006-05-15	0.5	0.0013	–	0.0004	0.28	0.0149	0.0006	0.0066	0.0650	0.165	3.6	1.0	1.4
PFM000062	12297	2006-06-12	0.5	0.0021	–	0.0004	0.25	0.0113	0.0009	0.0064	–	0.206	1.3	0.2	< 0.2
PFM000066	8934	2005-07-12	0.1	0.0957	0.0031	0.0192	1.03	0.0215	0.0040	0.0119	0.1010	3.18	–	–	–
PFM000066	8952	2005-08-01	0.1	0.0478	–	0.0367	0.95	0.0157	0.0047	0.0050	0.0253	3.50	–	–	–

Idcode	Sample no.	Sampling date	Depth m	POC mg/L	TOC mg/L	DOC mg/L	DIC mg/L	O^2 mg/L	Abs. coeff. mg/L
PFM000062	8936	2005-07-11	0.5	0.19	3.8	3.9	13.6	–	0.24
PFM000062	8953	2005-08-01	0.5	0.30	3.8	3.9	13.6	–	0.18
PFM000062	8959	2005-09-05	0.5	0.29	3.7	3.7	14.5	–	0.08
PFM000062	8971	2005-10-03	0.5	0.20	3.5	3.5	14.5	–	0.30
PFM000062	8996	2005-10-31	0.5	0.29	3.6	3.5	16.8	–	0.24
PFM000062	12019	2005-11-28	0.5	0.21	3.5	3.4	15.9	–	0.14
PFM000062	12021	2005-12-19	0.5	0.20	3.9	2.9	14.3	–	0.24
PFM000062	12234	2006-04-18	0.5	0.24	3.9	4.1	13.0	–	0.22
PFM000062	12249	2006-05-15	0.5	0.60	4.7	4.7	14.5	–	0.28
PFM000062	12297	2006-06-12	0.5	–	4.7	4.6	12.6	–	0.44
PFM000066	8934	2005-07-12	0.1	0.89	18.6	18.6	29.6	–	2.76
PFM000066	8952	2005-08-01	0.1	0.20	18.3	18.4	32.9	7.15	2.62

Idcode	Sample no.	Sampling date	Depth m	NH_4_N mg/L	NO_2_N mg/L	NO_2_N+ NO_3_ 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	Chl. A µg/L	Chl. C µg/L	Pheop. µg/L
PFM000066	8955	2005-09-05	0.1	0.0370	–	0.0732	0.98	0.0147	0.0030	0.0047	0.0309	4.35	–	–	–
PFM000066	8993	2005-10-31	0.1	0.0016	–	0.0034	0.80	0.0102	0.0008	0.0044	0.0371	4.80	–	–	–
PFM000066	12016	2005-11-28	0.1	0.0108	–	0.0253	0.73	0.0075	0.0008	0.0029	0.0248	4.46	–	–	–
PFM000066	12022	2005-12-19	0.1	0.0062	–	0.2530	0.80	0.0069	0.0010	0.0024	0.0158	5.48	< 0.02	< 0.2	< 0.2
PFM000066	12042	2006-01-23	0.1	0.0067	0.0003	0.0016	0.78	0.0067	0.0006	0.0019	0.0149	6.31	–	–	–
PFM000066	12081	2006-02-20	0.1	0.0047	–	0.0021	0.65	0.0057	0.0007	0.0014	0.0122	5.62	–	–	–
PFM000066	12098	2006-03-20	0.1	0.0109	–	0.0018	0.66	0.0062	0.0007	0.0021	0.0190	5.75	–	–	–
PFM000066	12235	2006-04-18	0.1	0.0094	0.0019	0.0921	0.75	0.0160	0.0015	0.0082	0.0592	3.65	–	–	–
PFM000066	12253	2006-05-15	0.1	0.0153	–	0.0031	0.76	0.0088	0.0014	0.0025	0.0224	4.01	–	–	–
PFM000066	12298	2006-06-13	0.1	0.0870	–	0.0140	1.02	0.0163	0.0028	–	–	2.61	–	–	–
PFM000068	8932	2005-07-12	0.1	0.110	0.0055	0.0262	1.01	0.0252	0.0104	0.0068	0.0436	4.44	–	–	–
PFM000068	8951	2005-08-01	0.5	0.0601	–	0.0462	1.03	0.0291	0.0133	0.0074	0.0350	4.34	–	–	–
PFM000068	8960	2005-09-05	0.5	0.0212	–	0.0231	0.99	0.0166	0.0030	0.0061	0.0282	4.59	–	–	–

Idcode	Sample no.	Sampling date	Depth m	POC mg/L	TOC mg/L	DOC mg/L	DIC mg/L	O^2 mg/L	Abs. coeff. mg/L
PFM000066	8955	2005-09-05	0.1	0.25	17.3	16.7	32.9	5.80	2.26
PFM000066	8993	2005-10-31	0.1	0.24	17.0	17.0	28.6	–	2.12
PFM000066	12016	2005-11-28	0.1	0.18	15.3	15.2	29.5	–	1.90
PFM000066	12022	2005-12-19	0.1	0.09	17.5	19.1	37.7	–	2.56
PFM000066	12042	2006-01-23	0.1	0.12	19.4	19.2	45.6	0.70	2.54
PFM000066	12081	2006-02-20	0.1	0.09	16.3	15.8	41.9	–	2.12
PFM000066	12098	2006-03-20	0.1	0.11	16.5	16.3	47.7	1.60	2.20
PFM000066	12235	2006-04-18	0.1	0.37	14.5	14.4	24.4	–	2.48
PFM000066	12253	2006-05-15	0.1	0.16	18.2	18.6	38.1	–	2.68
PFM000066	12298	2006-06-13	0.1	–	18.3	17.8	31.4	–	2.94
PFM000068	8932	2005-07-12	0.1	0.42	19.5	19.6	30.2	3.70	3.92
PFM000068	8951	2005-08-01	0.5	0.28	20.9	20.1	37.5	–	4.06
PFM000068	8960	2005-09-05	0.5	0.26	19.5	15.2	32.4	–	3.42

Idcode	Sample no.	Sampling date	Depth m	NH_4_N mg/L	NO_2_N mg/L	NO_2_N+ NO_3_ 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	Chl. A µg/L	Chl. C µg/L	Pheop. µg/L
PFM000068	8977	2005-10-03	0.1	0.0098	0.0003	0.0006	1.04	0.0524	0.0253	0.0180	0.0900	6.74	–	–	–
PFM000068	9000	2005-10-31	0.5	0.0077	–	0.0083	0.90	0.0144	0.0022	0.0044	0.0312	5.18	–	–	–
PFM000068	8999	2005-11-28	0.5	0.0159	–	0.0789	0.90	0.0099	0.0012	0.0037	0.0258	4.50	–	–	–
PFM000068	12027	2005-12-19	0.1	0.0296	–	0.108	1.10	0.0090	0.0013	0.0030	0.0208	4.61	–	–	–
PFM000068	12045	2006-01-23	0.1	0.0337	0.0010	0.0748	1.08	0.0112	0.0009	0.0046	0.0337	5.37	–	–	–
PFM000068	12082	2006-02-20	0.1	0.0475	–	0.0606	0.94	0.0084	0.0008	0.0028	0.0214	4.86	–	–	–
PFM000068	12091	2006-03-20	0.1	0.0989	–	0.0704	1.00	0.0080	0.0014	0.0024	0.0220	5.30	–	–	–
PFM000068	12237	2006-04-19	0.1	0.0103	0.0033	0.212	0.95	0.0160	0.0016	0.0084	0.0564	3.39	–	–	–
PFM000068	12250	2006-05-15	0.1	0.0187	–	0.0059	0.93	0.0136	0.0021	0.0048	0.0306	4.24	–	–	–
PFM000068	12302	2006-06-12	0.1	0.0449	–	0.0065	0.98	0.0202	0.0046	0.0084	0.0517	5.50	–	–	–
PFM000069	8931	2005-07-12	0.1	0.0401	0.0021	0.0175	0.91	0.0200	0.0081	0.0038	0.0274	4.22	–	–	–
PFM000069	8947	2005-08-01	0.1	0.0275	–	0.0272	0.97	0.0225	0.0099	0.0035	0.0263	4.10	–	–	–
PFM000069	8956	2005-09-05	0.1	0.0093	–	0.0115	0.96	0.0145	0.0011	0.0029	0.0194	4.50	–	–	–

Idcode	Sample no.	Sampling date	Depth m	POC mg/L	TOC mg/L	DOC mg/L	DIC mg/L	O^2 mg/L	Abs. coeff. mg/L
PFM000068	8977	2005-10-03	0.1	0.92	23.1	22.8	36.7	1.10	5.02
PFM000068	9000	2005-10-31	0.5	0.24	20.2	20.1	28.2	–	3.40
PFM000068	8999	2005-11-28	0.5	0.24	17.8	17.3	28.7	–	2.66
PFM000068	12027	2005-12-19	0.1	0.17	21.8	21.7	34.9	–	2.76
PFM000068	12045	2006-01-23	0.1	0.24	21.5	20.8	37.3	2.80	2.78
PFM000068	12082	2006-02-20	0.1	0.18	19.0	19.1	35.9	–	2.40
PFM000068	12091	2006-03-20	0.1	0.18	20.0	20.1	37.4	–	2.54
PFM000068	12237	2006-04-19	0.1	0.38	18.1	18.0	17.0	–	3.70
PFM000068	12250	2006-05-15	0.1	0.24	21.1	20.9	29.7	–	3.70
PFM000068	12302	2006-06-12	0.1	0.40	21.6	21.6	31.3	–	4.26
PFM000069	8931	2005-07-12	0.1	0.26	19.1	19.1	33.1	–	3.60
PFM000069	8947	2005-08-01	0.1	0.24	20.3	18.1	37.5	–	3.62
PFM000069	8956	2005-09-05	0.1	0.19	19.9	19.8	32.3	–	3.36

Idcode	Sample no.	Sampling date	Depth m	NH_4_N mg/L	NO_2_N mg/L	NO_2_N+ NO_3_ 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	Chl. A µg/L	Chl. C µg/L	Pheop. µg/L
PFM000069	8974	2005-10-03	0.1	0.0295	0.0044	0.0550	1.07	0.0209	0.0045	0.0050	0.0431	6.52	–	–	–
PFM000069	8995	2005-10-31	0.1	0.0141	–	0.0076	0.90	0.0149	0.0016	0.0045	0.0299	5.99	–	–	–
PFM000069	12017	2005-11-28	0.1	0.0135	–	0.0243	0.82	0.0123	0.0021	0.0036	0.0198	6.14	–	–	–
PFM000069	12020	2005-12-19	0.1	0.0072	–	0.121	0.01	0.0098	0.0014	0.0028	0.0175	6.22	–	–	–
PFM000069	12043	2006-01-23	0.1	0.0067	0.0005	0.0014	0.93	0.0183	0.0012	0.0089	0.0557	7.82	–	–	–
PFM000069	12079	2006-02-20	0.1	0.0042	–	0.0035	0.72	0.0106	0.0013	0.0041	0.0273	6.79	–	–	–
PFM000069	12099	2006-03-20	0.1	0.0150	–	0.0033	0.76	0.0112	0.0010	0.0046	0.0321	7.39	–	–	–
PFM000069	12230	2006-04-19	0.1	0.0061	0.0052	0.356	1.08	0.0176	0.0013	0.0095	0.0644	3.87	–	–	–
PFM000069	12236	2006-05-15	0.1	0.0069	–	0.0014	0.87	0.0118	0.0017	0.0027	0.0228	5.32	–	–	–
PFM000069	12301	2006-06-12	0.1	0.0185	–	0.0029	0.94	0.0150	0.0034	0.0057	0.0272	5.64	–	–	–
PFM000070	8933	2005-07-12	0.1	0.1980	0.0006	0.0042	1.09	0.0142	0.0021	0.0065	0.0629	3.13	–	–	–
PFM000070	8954	2005-08-02	0.1	0.0737	–	0.0078	0.98	0.0095	0.0011	0.0046	0.0378	3.16	–	–	–
PFM000070	8957	2005-09-06	0.1	0.133	–	0.0132	1.00	0.0110	0.0017	0.0052	0.0449	2.78	–	–	–

Idcode	Sample no.	Sampling date	Depth m	POC mg/L	TOC mg/L	DOC mg/L	DIC mg/L	O^2 mg/L	Abs. coeff. mg/L
PFM000069	8974	2005-10-03	0.1	0.42	20.6	20.2	32.6	–	3.72
PFM000069	8995	2005-10-31	0.1	0.21	19.2	18.5	31.6	–	3.18
PFM000069	12017	2005-11-28	0.1	0.18	17.9	17.7	35.7	–	2.86
PFM000069	12020	2005-12-19	0.1	0.11	21.9	20.8	37.3	2.70	3.30
PFM000069	12043	2006-01-23	0.1	0.34	23.2	22.9	50.1	< 0.2	3.96
PFM000069	12079	2006-02-20	0.1	0.17	18.8	18.5	43.9	1.20	2.82
PFM000069	12099	2006-03-20	0.1	0.22	19.7	19.5	46.5	1.10	3.30
PFM000069	12230	2006-04-19	0.1	0.40	16.5	16.5	25.4	–	3.08
PFM000069	12236	2006-05-15	0.1	0.16	22.3	21.6	32.5	–	3.98
PFM000069	12301	2006-06-12	0.1	0.24	21.2	21.1	30.1	–	4.16
PFM000070	8933	2005-07-12	0.1	0.56	18.2	18.3	27.6	–	2.32
PFM000070	8954	2005-08-02	0.1	0.32	19.3	19.5	27.4	–	2.72
PFM000070	8957	2005-09-06	0.1	0.46	16.7	16.5	22.8	–	1.90

Idcode	Sample no.	Sampling date	Depth m	NH_4_N mg/L	NO_2_N mg/L	NO_2_N+ NO_3_ 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	Chl. A µg/L	Chl. C µg/L	Pheop. µg/L
PFM000070	8975	2005-10-04	0.1	0.174	0.0008	0.0091	1.00	0.0098	0.0012	0.0060	0.0483	3.90	–	–	–
PFM000070	8992	2005-11-01	0.1	0.0640	–	0.0516	1.07	0.0085	0.0010	0.0040	0.0375	2.18	–	–	–
PFM000070	12014	2005-11-28	0.1	0.166	–	0.0399	1.21	0.0070	0.0009	0.0029	0.0376	1.44	–	–	–
PFM000070	12025	2005-12-20	0.1	0.193	–	0.0396	1.33	0.0071	0.0010	0.0030	0.0365	1.90	–	–	–
PFM000070	12069	2006-01-24	0.1	0.315	0.0013	0.0323	1.48	0.0063	0.0014	0.0028	0.0355	1.88	–	–	–
PFM000070	12083	2006-02-21	0.5	0.236	–	0.0435	1.27	0.0074	0.0010	0.0020	0.0242	3.25	–	–	–
PFM000070	12092	2006-03-21	0.1	0.397	–	0.0298	1.42	0.0087	0.0005	0.0046	0.0463	3.54	–	–	–
PFM000070	12240	2006-04-19	0.1	0.0967	0.0012	0.0372	0.78	0.0120	0.0011	0.0057	0.0425	2.03	–	–	–
PFM000070	12252	2006-05-16	0.1	0.0573	–	0.0076	0.99	0.0120	0.0010	0.0055	0.0536	1.42	–	–	–
PFM000070	12304	2006-06-12	0.1	0.103	–	0.0082	0.96	0.0100	0.0016	–	0.0460	1.42	–	–	–
PFM000074	8937	2005-07-11	0.5	0.003	0.0002	0.0003	0.93	0.0112	0.0013	0.0051	0.0590	3.80	2.4	0.2	0.9
PFM000074	8948	2005-08-01	0.5	0.0054	–	0.0007	1.00	0.0121	0.0015	0.0055	0.0560	4.99	2.5	< 0.2	0.4
PFM000074	8962	2005-09-05	0.5	0.0042	–	< 0.0003	0.93	0.0079	< 0.0005	0.0032	0.0386	5.88	1.2	< 0.2	0.3

Idcode	Sample no.	Sampling date	Depth m	POC mg/L	TOC mg/L	DOC mg/L	DIC mg/L	O^2 mg/L	Abs. coeff. mg/L
PFM000070	8975	2005-10-04	0.1	0.56	17.5	17.6	24.9	–	2.48
PFM000070	8992	2005-11-01	0.1	0.31	15.3	15.1	19.9	–	1.20
PFM000070	12014	2005-11-28	0.1	0.35	15.8	15.6	19.4	–	0.64
PFM000070	12025	2005-12-20	0.1	0.29	19.7	19.2	21.6	–	1.66
PFM000070	12069	2006-01-24	0.1	0.32	18.7	18.7	22.3	–	0.94
PFM000070	12083	2006-02-21	0.5	0.20	22.4	21.0	28.1	–	2.54
PFM000070	12092	2006-03-21	0.1	0.35	21.6	21.8	29.0	2.00	3.54
PFM000070	12240	2006-04-19	0.1	0.29	15.2	15.3	13.0	–	2.82
PFM000070	12252	2006-05-16	0.1	0.40	17.8	17.8	26.5	–	2.04
PFM000070	12304	2006-06-12	0.1	0.38	17.4	17.4	27.5	–	2.26
PFM000074	8937	2005-07-11	0.5	0.43	19.5	18.3	33.1	–	2.84
PFM000074	8948	2005-08-01	0.5	0.42	19.2	19.1	36.1	–	2.54
PFM000074	8962	2005-09-05	0.5	0.34	18.6	18.4	37.2	–	2.36

Idcode	Sample no.	Sampling date	Depth m	NH_4_N mg/L	NO_2_N mg/L	NO_2_N+ NO_3_ 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	Chl. A µg/L	Chl. C µg/L	Pheop. µg/L
PFM000074	8976	2005-10-03	0.5	0.0058	< 0.0003	< 0.0003	0.89	0.0070	0.0008	0.0029	0.0381	7.16	1.5	< 0.2	0.2
PFM000074	8998	2005-10-31	0.5	0.0037	–	0.0011	0.78	0.0060	0.0004	0.0024	0.0321	6.46	1.2	0.2	0.2
PFM000074	12018	2005-11-29	0.5	0.0150	–	0.0106	0.74	0.0070	0.0010	0.0023	0.0172	5.91	0.5	0.2	0.2
PFM000074	12023	2005-12-20	0.5	0.0057	–	0.0459	0.78	0.0062	0.0007	0.0016	0.0089	5.54	0.3	< 0.2	0.4
PFM000074	12032	2006-01-24	0.5	0.0259	0.0010	0.0126	0.77	0.0062	0.0006	0.0016	0.0121	6.38	0.5	0.2	0.3
PFM000074	12080	2006-02-21	0.5	0.0055	–	0.0154	0.64	0.0046	0.0006	0.0007	0.0081	5.71	< 0.2	< 0.2	< 0.2
PFM000074	12200	2006-03-20	1.5	0.0149	–	0.0233	0.66	0.0050	0.0005	0.0013	0.0130	5.94	–	–	–
PFM000074	12232	2006-04-18	0.5	0.0055	0.0011	0.0865	0.67	0.0128	0.0010	0.0064	0.0469	3.67	0.3	< 0.2	< 0.2
PFM000074	12248	2006-05-15	0.5	0.0033	–	0.0005	0.77	0.0090	0.0011	0.0030	0.0300	4.31	1.0	< 0.2	0.2
PFM000074	12303	2006-06-13	0.5	0.0069	–	0.0004	0.94	0.0137	0.0015	0.0074	0.0395	3.59	2.4	0.2	0.9
PFM000082	12030	2006-01-23	0.5	0.0048	0.0015	0.0648	0.28	0.0143	0.0075	0.0019	–	0.733	1.1	0.3	0.2
PFM000082	12046	2006-01-23	6	0.0032	0.0018	0.0629	0.28	0.0149	0.0070	0.0028	0.0148	0.716	1.4	0.3	0.2
PFM000082	12084	2006-02-20	0.5	0.0022	–	0.0529	0.26	0.0130	0.0056	0.0033	0.0202	0.646	1.8	0.2	< 0.2

Idcode	Sample no.	Sampling date	Depth m	POC mg/L	TOC mg/L	DOC mg/L	DIC mg/L	O^2 mg/L	Abs. coeff. mg/L
PFM000074	8976	2005-10-03	0.5	0.29	18.5	18.0	29.1	–	2.06
PFM000074	8998	2005-10-31	0.5	0.23	16.2	15.8	30.3	–	1.90
PFM000074	12018	2005-11-29	0.5	0.12	16.6	16.3	41.9	3.30	2.00
PFM000074	12023	2005-12-20	0.5	0.05	18.5	18.4	38.2	3.00	2.38
PFM000074	12032	2006-01-24	0.5	0.08	19.2	18.8	49.2	0.40	2.28
PFM000074	12080	2006-02-21	0.5	0.06	15.6	15.5	45.4	2.80	1.92
PFM000074	12200	2006-03-20	1.5	0.08	16.2	16.1	46.8	2.60	1.94
PFM000074	12232	2006-04-18	0.5	0.28	13.5	13.5	26.0	–	2.24
PFM000074	12248	2006-05-15	0.5	0.19	18.5	17.9	38.7	–	2.88
PFM000074	12303	2006-06-13	0.5	0.28	18.8	18.1	36.3	–	2.78
PFM000082	12030	2006-01-23	0.5	–	3.7	3.7	13.9	–	0.24
PFM000082	12046	2006-01-23	6	0.12	3.8	3.8	14.2	–	0.26
PFM000082	12084	2006-02-20	0.5	0.17	3.7	3.7	10.1	–	0.24

Idcode	Sample no.	Sampling date	Depth m	NH_4_N mg/L	NO_2_N mg/L	NO_2_N+ NO_3_ 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	Chl. A µg/L	Chl. C µg/L	Pheop. µg/L
PFM000082	12085	2006-02-20	6	0.0031	–	0.0573	0.28	0.0135	0.0062	0.0033	0.0212	0.676	1.8	0.2	< 0.2
PFM000082	12097	2006-03-20	0.5	0.0042	–	0.0401	0.26	0.0102	0.0029	0.0025	0.0199	0.558	1.1	< 0.2	< 0.2
PFM000082	12090	2006-03-20	6	0.0093	–	0.0404	0.26	0.0114	0.0035	0.0038	0.0236	0.581	1.6	0.3	0.4
PFM000107	8938	2005-07-11	0.5	0.0116	0.0002	0.0007	1.03	0.0163	0.0016	0.0068	0.0548	0.383	1.4	< 0.2	< 0.2
PFM000107	8950	2005-08-01	0.5	0.0101	–	0.0003	1.09	0.0163	0.0018	0.0062	0.0547	0.327	2.0	0.2	< 0.2
PFM000107	8961	2005-09-05	0.5	0.0119	–	< 0.0003	1.02	0.0125	0.0007	0.0047	0.0167	0.305	1.2	< 0.2	0.2
PFM000107	8970	2005-10-03	0.5	0.0211	0.0007	0.0008	1.01	0.0131	0.0013	0.0044	0.0442	0.125	1.3	0.3	< 0.2
PFM000107	8997	2005-10-31	0.5	0.0082	–	0.0014	0.94	0.0117	0.0006	0.0038	0.0335	0.082	0.8	0.4	0.2
PFM000107	12015	2005-11-28	0.5	0.0255	–	0.0067	0.89	0.0091	0.0006	0.0019	0.0280	0.453	0.9	0.2	0.2
PFM000107	12024	2005-12-19	0.5	0.0214	–	0.132	1.14	0.0103	0.0010	0.0036	0.0292	4.92	1.9	0.4	< 0.2
PFM000107	12028	2005-12-19	1	0.108	–	0.0059	0.99	0.0091	0.0009	0.0028	0.0218	0.585	0.6	0.2	< 0.2
PFM000107	12044	2006-01-23	0.5	0.262	0.0005	0.0030	1.15	0.0117	0.0009	0.0033	0.0234	0.889	0.2	0.2	0.1
PFM000107	12047	2006-01-23	1	0.119	0.0015	0.0609	1.22	0.0101	0.0012	0.0029	0.0260	3.54	0.4	0.4	0.3

Idcode	Sample no.	Sampling date	Depth m	POC mg/L	TOC mg/L	DOC mg/L	DIC mg/L	O^2 mg/L	Abs. coeff. mg/L
PFM000082	12085	2006-02-20	6	0.14	3.6	3.8	12.8	–	0.22
PFM000082	12097	2006-03-20	0.5	0.13	3.7	3.8	14.7	–	0.24
PFM000082	12090	2006-03-20	6	0.17	3.8	3.6	12.6	–	0.24
PFM000107	8938	2005-07-11	0.5	0.39	16.0	15.5	14.7	–	1.10
PFM000107	8950	2005-08-01	0.5	0.39	16.5	16.4	18.6	–	0.94
PFM000107	8961	2005-09-05	0.5	0.19	15.6	15.2	15.9	–	0.78
PFM000107	8970	2005-10-03	0.5	0.33	15.5	15.6	16.9	–	1.00
PFM000107	8997	2005-10-31	0.5	0.28	14.8	14.7	17.0	–	0.70
PFM000107	12015	2005-11-28	0.5	0.22	14.3	13.9	22.2	–	0.80
PFM000107	12024	2005-12-19	0.5	0.19	21.7	23.4	29.5	–	3.22
PFM000107	12028	2005-12-19	1	0.14	14.8	14.6	26.1	–	0.98
PFM000107	12044	2006-01-23	0.5	0.16	16.0	16.2	30.9	0.80	1.16
PFM000107	12047	2006-01-23	1	0.21	22.1	21.0	33.5	3.80	2.46

Idcode	Sample no.	Sampling date	Depth m	NH_4_N mg/L	NO_2_N mg/L	NO_2_N+ NO_3_ 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	Chl. A µg/L	Chl. C µg/L	Pheop. µg/L
PFM000107	12078	2006-02-20	0.5	0.0959	–	0.0436	1.07	0.0120	0.0009	0.0036	0.0268	3.98	0.2	< 0.2	< 0.2
PFM000107	12086	2006-02-20	1	0.278	–	0.0007	1.18	0.0120	0.0006	0.0050	0.0366	1.37	< 0.2	< 0.2	< 0.2
PFM000107	12096	2006-03-20	0.5	0.0956	–	0.0306	0.96	0.0087	0.0005	0.0027	0.0324	4.36	0.1	< 0.2	< 0.2
PFM000107	12094	2006-03-20	1	0.272	–	0.0007	1.18	0.0125	0.0006	0.0062	0.0518	1.83	0.5	< 0.2	0.3
PFM000107	12231	2006-05-15	0.5	0.0104	–	0.0010	0.84	0.0142	0.0019	0.0051	0.0591	1.56	2.0	0.4	0.7
PFM000107	12300	2006-06-12	0.5	0.0067	–	0.0006	0.94	0.0158	0.0022	0.0087	0.0847	0.36	4.1	0.6	0.3
PFM000117	8935	2005-07-11	0.5	0.0119	< 0.0002	0.0012	1.12	0.0090	0.0010	0.0038	0.0765	0.633	2.2	< 0.2	< 0.2
PFM000117	8949	2005-08-02	0.5	0.0096	–	0.0008	1.16	0.0080	0.0009	0.0033	0.0575	0.99	1.9	0.2	< 0.2
PFM000117	8958	2005-09-06	0.5	0.0101	–	0.0003	1.14	0.0069	0.0009	0.0037	0.0589	1.25	1.2	< 0.2	< 0.2
PFM000117	8973	2005-10-04	0.5	0.0212	0.0002	0.0014	1.12	0.0065	0.0011	0.0026	0.0425	1.27	1.3	< 0.2	< 0.2
PFM000117	8994	2005-11-01	0.5	0.0761	–	0.0064	1.14	0.0059	0.0009	0.0024	0.0416	1.32	1.0	< 0.2	1.2
PFM000117	12013	2005-11-29	0.5	0.189	–	0.0124	1.23	0.0056	0.0008	0.0024	0.0318	1.41	1.8	0.2	< 0.2
PFM000117	12026	2005-12-20	0.5	0.461	–	0.0179	1.56	0.0081	0.0007	0.0032	0.0379	2.3	0.8	0.2	0.3

Idcode	Sample no.	Sampling date	Depth m	POC mg/L	TOC mg/L	DOC mg/L	DIC mg/L	O^2 mg/L	Abs. coeff. mg/L
PFM000107	12078	2006-02-20	0.5	0.20	20.2	19.7	34.8	1.40	2.40
PFM000107	12086	2006-02-20	1	0.28	16.9	16.9	33.6	< 0.2	1.28
PFM000107	12096	2006-03-20	0.5	0.27	18.8	18.2	33.1	1.50	2.40
PFM000107	12094	2006-03-20	1	0.44	17.4	16.7	31.9	< 0.2	1.64
PFM000107	12231	2006-05-15	0.5	0.37	17.6	17.2	23.2	–	2.60
PFM000107	12300	2006-06-12	0.5	0.56	18.2	18.2	17.2	–	2.00
PFM000117	8935	2005-07-11	0.5	0.60	17.5	17.7	14.4	–	0.98
PFM000117	8949	2005-08-02	0.5	0.52	18.2	18.3	15.4	–	0.82
PFM000117	8958	2005-09-06	0.5	0.55	17.4	16.9	14.1	–	0.68
PFM000117	8973	2005-10-04	0.5	0.41	16.9	16.8	14.9	–	0.70
PFM000117	8994	2005-11-01	0.5	0.37	16.2	16.0	14.8	–	0.68
PFM000117	12013	2005-11-29	0.5	0.29	15.7	15.9	20.5	–	0.76
PFM000117	12026	2005-12-20	0.5	0.30	19.5	19.3	24.4	–	1.74

Idcode	Sample no.	Sampling date	Depth m	NH_4_N mg/L	NO_2_N mg/L	NO_2_N+ NO_3_ 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	Chl. A µg/L	Chl. C µg/L	Pheop. µg/L
PFM000117	12031	2005-12-20	1.5	0.219	–	0.0178	1.33	0.0058	0.0009	0.0029	0.0335	1.55	1.9	0.4	< 0.2
PFM000117	12033	2006-01-24	0.5	0.700	0.0006	0.0098	1.75	0.0081	0.0014	0.0037	0.0438	2.88	0.8	0.3	0.3
PFM000117	12048	2006-01-24	1.5	0.322	0.0010	0.0254	1.48	0.0061	0.0011	0.0034	0.0331	1.94	1.1	0.4	0.3
PFM000117	12087	2006-02-21	0.5	0.468	–	0.0227	1.59	0.0069	0.0011	0.0022	0.0263	2.13	0.8	< 0.2	< 0.2
PFM000117	12088	2006-02-21	1.5	0.631	–	0.0121	1.67	0.0076	0.0012	0.0029	0.0331	2.58	0.5	< 0.2	0.3
PFM000117	12093	2006-03-21	0.5	0.335	–	0.0272	1.42	0.0156	0.0013	0.0041	0.0433	3.75	0.3	< 0.2	< 0.3
PFM000117	12095	2006-03-21	1.5	0.703	–	0.0004	1.77	0.0084	0.0005	0.0040	0.0594	3.46	0.8	< 0.2	0.2
PFM000117	12251	2006-05-16	0.5	0.0082	–	0.0024	0.96	0.0103	0.0007	0.0042	0.0755	1.27	2.7	0.4	1.7
PFM000117	12299	2006-06-12	0.5	0.0093	–	0.0007	1.09	0.0127	0.0019	0.0075	0.0960	0.388	4.8	0.5	< 0.2
PFM102270	12233	2006-04-18	0.5	0.0304	0.0036	0.154	0.99	0.0147	0.0011	0.0072	0.0464	3.72	0.5	< 0.2	< 0.2

Idcode	Sample no.	Sampling date	Depth m	POC mg/L	TOC mg/L	DOC mg/L	DIC mg/L	O^2 mg/L	Abs. coeff. mg/L
PFM000117	12031	2005-12-20	1.5	0.27	17.2	17.0	22.7	–	0.84
PFM000117	12033	2006-01-24	0.5	0.36	19.3	18.8	26.8	1.80	2.68
PFM000117	12048	2006-01-24	1.5	0.29	19.2	19.1	23.0	–	1.38
PFM000117	12087	2006-02-21	0.5	0.26	18.5	18.5	27.3	–	1.08
PFM000117	12088	2006-02-21	1.5	0.28	18.4	17.0	30.0	2.00	2.10
PFM000117	12093	2006-03-21	0.5	0.28	23.3	22.6	29.5	0.50	2.94
PFM000117	12095	2006-03-21	1.5	0.46	20.1	20.6	32.6	< 0.2	2.56
PFM000117	12251	2006-05-16	0.5	0.53	17.9	18.2	24.6	–	1.92
PFM000117	12299	2006-06-12	0.5	0.67	17.8	17.7	18.9	–	1.80
PFM102270	12233	2006-04-18	0.5	0.29	18.9	18.3	25.1	–	3.40

Chl. A = Chlorophyll a.
Chl. C = Chlorophyll c.
Pheop. = Pheopigment.
Abs. Coeff. = Absorption Coefficient 436 nm (colour).

Table A5-3. Isotopes I (H-, B-, S- and C-isotopes).

Idcode	Sample no	Depth m	Sampling date	^{14}C pmC	$\delta^{13}C$ ‰ PDB	$\delta^{34}S$ ‰ CDT	$\delta^{37}Cl$ ‰ SMOC	$^{87}Sr/^{86}Sr$ no unit	$\delta^{2}H$ ‰ SMOW	^{3}H TU	$\delta^{18}O$ ‰ SMOW
PFM000062	8936	0.5	2005-07-11	104.49	–2.23	19.5	–0.01	0.70947	–58.3	12.4	–8.2
PFM000062	8971	0.5	2005-10-03	–	–	–	–	–	–65.9	13.1	–7.9
PFM000062	12234	0.5	2006-04-18	–	–	–	–	–	–63.7	13.4	–8.2
PFM000066	8934	0.1	2005-07-12	–	–	–	–	–	–66.9	12.5	–9.1
PFM000066	12042	0.1	2006-01-23	–	–	–	–	–	–85.0	10.6	–12.2
PFM000066	12235	0.1	2006-04-18	–	–	–	–	–	–90.8	10.7	–12.6
PFM000068	8932	0.1	2005-07-12	–	–	–	–	–	–70.7	13.3	–10.3
PFM000068	8977	0.1	2005-10-03	–	–	–	–	–	–77.1	13.4	–9.8
PFM000068	12045	0.1	2006-01-23	–	–	–	–	–	–76.2	12.1	–10.3
PFM000068	12237	0.1	2006-04-19	–	–	–	–	–	–89.8	12.4	–12.2
PFM000069	8931	0.1	2005-07-12	–	–	–	–	–	–69.6	12.0	–10.3
PFM000069	8974	0.1	2005-10-03	–	–	–	–	–	–77.5	12.9	–9.9
PFM000069	12043	0.1	2006-01-23	–	–	–	–	–	–86.1	10.7	–12.3
PFM000069	12230	0.1	2006-04-19	–	–	–	–	–	–92.2	12.1	–12.6
PFM000070	8933	0.1	2005-07-12	–	–	–	–	–	–56.4	11.4	–7.2
PFM000070	8975	0.1	2005-10-04	–	–	–	–	–	–64.9	11.9	–6.5
PFM000070	12069	0.1	2006-01-24	–	–	–	–	–	–64.2	11.8	–7.6
PFM000070	12240	0.1	2006-04-19	–	–	–	–	–	–85.2	11.1	–12.3
PFM000074	8937	0.5	2005-07-11	115.77	–7.23	3.9	0.3	0.72274	–68.2	12.3	–9.4
PFM000074	8976	0.5	2005-10-03	–	–	–	–	–	–69.7	11.7	–8.3
PFM000074	12032	0.5	2006-01-24	–	–	–	–	–	–86.6	10.3	–12.1
PFM000074	12232	0.5	2006-04-18	–	–	–	–	–	–90.3	10.6	–12.5
PFM000082	12046	0.5	2006-01-23	–	–	–	–	–	–61.3	11.7	–8.2
PFM000082	12030	6	2006-01-23	–	–	–	–	–	–63.3	10.7	–8.2
PFM000107	8938	0.5	2005-07-11	111.01	–5.52	13.3	–0.03	0.71808	–51.8	10.4	–6.1
PFM000107	8970	0.5	2005-10-03	–	–	–	–	–	–56.7	11.7	–5.0
PFM000107	12047	0.5	2006-01-23	–	–	–	–	–	–72.1	11.7	–9.5
PFM000107	12044	1	2006-01-23	–	–	–	–	–	–59.4	13.2	–7.6
PFM000117	8935	0.5	2005-07-11	107.96	–9.64	3.8	0.42	0.72443	–53.8	10.8	–6.4
PFM000117	8973	0.5	2005-10-04	–	–	–	–	–	–57.0	13.4	–5.4
PFM000117	12048	0.5	2006-01-24	–	–	–	–	–	–59.3	12.6	–7.4
PFM000117	12033	1.5	2006-01-24	–	–	–	–	–	–65.9	10.3	–8.1
PFM102269	8886	0.5	2005-07-12	–	–	–	–	–	–59.8	120.7	–8.2
PFM102269	12068	0.5	2006-01-24	–	–	–	–	–	–	12.7	–
PFM102269	12077	0.5	2006-02-21	–	–	–	–	–	–	9.1	–
PFM102269	12063	0.5	2006-03-21	–	–	–	–	–	–	12.9	–
PFM102269	12238	0.5	2006-04-19	–	–	–	–	–	–	11.7	–
PFM102269	12254	0.5	2006-05-15	–	–	–	–	–	–	12.2	–
PFM102269	12305	0.5	2006-06-12	–	–	–	–	–	–	11.9	–
PFM102270	12233	0.5	2006-04-18	–	–	–	–	–	–88.1	10.3	–12.0

The units are explained in Appendix 1.

Table A5-4. Trace elements.

Idcode	Sample no.	Depth m	Sampling date	Al µg/L	Cd µg/L	Cr µg/L	Cu µg/L	Co µg/L	Hg µg/L	Ni µg/L	Zn µg/L	Pb µg/L	V µg/L	Mo µg/L	Nb µg/L	Ba µg/L
PFM000062	8936	0.5	2005-07-11	86	0.0852	0.126	0.59	< 0.04	< 0.002	0.715	< 2	3.10	0.18	1.77	–	19.4
PFM000062	8971	0.5	2005-10-03	6.56	0.0594	0.500	0.98	0.096	0.0092	1.47	2.33	1.01	0.99	1.74	–	18.1
PFM000062	12234	0.5	2006-04-18	3.00	0.0228	0.111	1.02	< 0.02	< 0.002	1.17	1.29	0.170	0.11	1.72	–	16.5
PFM000066	12042	0.1	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	0.011	–
PFM000068	12045	0.1	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	0.012	–
PFM000069	12043	0.1	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	0.014	–
PFM000070	12069	0.1	2006-01-24	–	–	–	–	–	–	–	–	–	–	–	0.005	–
PFM000074	8937	0.5	2005-07-11	128	0.0210	0.144	0.34	0.057	< 0.002	0.318	0.8	0.173	0.26	0.35	–	33.4
PFM000074	8976	0.5	2005-10-03	12.3	0.0047	0.094	0.17	0.055	0.0048	0.376	1.46	0.066	0.20	0.374	–	28.1
PFM000074	12032	0.5	2006-01-24	189	< 0.002	0.243	1.38	0.092	0.0039	0.739	1.24	0.160	0.21	0.416	0.011	29.5
PFM000074	12232	0.5	2006-04-18	22.9	0.0051	0.163	1.73	0.051	0.0024	0.468	1.10	0.064	0.23	0.48	–	17.0
PFM000082	12046	0.5	2006-01-23	5.98	0.0361	0.160	3.41	0.053	0.0035	1.61	1.15	0.209	6.27	1.53	< 0.005	16.4
PFM000082	12030	6	2006-01-23	156	0.0326	0.244	4.29	< 0.02	< 0.002	1.02	1.10	0.286	14.0	1.54	0.007	16.5
PFM000107	8938	0.5	2005-07-11	83.7	0.0281	0.134	0.64	0.059	< 0.002	0.416	0.49	0.369	0.45	0.788	–	22.7
PFM000107	8970	0.5	2005-10-03	15.6	0.0474	0.107	0.45	0.071	0.0048	0.526	0.96	0.411	0.26	0.705	–	18.8
PFM000107	12044	1	2006-01-23	7.62	< 0.002	0.105	0.44	0.058	0.0037	0.269	1.09	0.103	0.14	0.354	0.008	26.1
PFM000107	12047	0.5	2006-01-23	17.1	0.0022	0.163	1.19	0.110	0.0052	0.662	1.59	0.108	0.21	0.426	0.012	24.9
PFM000117	8935	0.5	2005-07-11	36.6	0.0164	0.077	0.45	0.039	< 0.002	0.229	0.38	0.048	0.27	0.272	–	10.5
PFM000117	8973	0.5	2005-10-04	19.1	0.0105	0.091	0.31	0.036	< 0.002	0.282	1.19	0.056	0.20	0.196	–	9.5
PFM000117	12033	1.5	2006-01-24	119	< 0.002	0.143	0.87	0.057	0.0039	0.328	0.66	0.086	0.18	0.211	0.008	21.0
PFM000117	12048	0.5	2006-01-24	5.83	0.0058	0.062	0.5	0.032	< 0.002	0.281	2.14	0.027	0.20	0.234	0.005	15.5
PFM102270	12233	0.5	2006-04-18	37.3	0.0081	0.189	1.36	0.072	0.0027	0.796	2.39	0.100	0.25	0.678	–	16.2

Idcode	Sample no.	Depth m	Sampling date	As µg/L	U µg/L	Th µg/L	Sc µg/L	Rb µg/L	Y µg/L	Zr µg/L	Sb µg/L	Cs µg/L	La µg/L	Hf µg/L	Tl µg/L	Ce µg/L
PFM000062	8936	0.5	2005-07-11	0.80	0.700	< 0.4	< 0.8	18.7	0.075	< 0.2	< 0.2	< 0.2	< 0.04	< 0.04	< 0.2	0.041
PFM000062	8971	0.5	2005-10-03	0.70	0.634	< 0.2	< 0.4	22.3	0.056	< 0.1	0.21	0.21	0.0736	< 0.02	< 0.03	0.111
PFM000062	12234	0.5	2006-04-18	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000066	12042	0.1	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000068	12045	0.1	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000069	12043	0.1	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000070	12069	0.1	2006-01-24	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000074	8937	0.5	2005-07-11	0.35	1.41	< 0.02	< 0.05	1.86	0.112	0.07	0.06	< 0.03	0.0501	0.006	< 0.03	0.072
PFM000074	8976	0.5	2005-10-03	0.30	1.58	< 0.02	< 0.05	1.81	0.048	0.09	0.04	< 0.03	0.0190	< 0.005	0.012	0.026
PFM000074	12032	0.5	2006-01-24	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000074	12232	0.5	2006-04-18	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000082	12046	0.5	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000082	12030	6	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000107	8938	0.5	2005-07-11	0.53	2.17	< 0.02	< 0.05	4.00	0.077	0.05	0.12	< 0.03	0.0619	< 0.005	< 0.03	0.087
PFM000107	8970	0.5	2005-10-03	0.50	1.63	< 0.02	< 0.05	4.14	0.091	0.14	0.12	< 0.03	0.136	< 0.005	0.016	0.192
PFM000107	12044	1	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000107	12047	0.5	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000117	8935	0.5	2005-07-11	0.31	1.23	< 0.02	< 0.05	2.05	0.036	0.05	0.09	< 0.03	0.0119	< 0.005	< 0.03	0.016
PFM000117	8973	0.5	2005-10-04	0.30	0.947	< 0.02	< 0.05	2.05	0.027	0.09	0.08	< 0.03	0.0196	< 0.005	0.012	0.030
PFM000117	12033	1.5	2006-01-24	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000117	12048	0.5	2006-01-24	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM102270	12233	0.5	2006-04-18	–	–	–	–	–	–	–	–	–	–	–	–	–

Idcode	Sample no.	Depth m	Sampling date	Pr µg/L	Nd µg/L	Sm µg/L	Eu µg/L	Gd µg/L	Tb µg/L	Dy µg/L	Ho µg/L	Er µg/L	Tm µg/L	Yb µg/L	Lu µg/L	In µg/L
PFM000062	8936	0.5	2005-07-11	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.2
PFM000062	8971	0.5	2005-10-03	0.0279	< 0.02	0.0228	< 0.02	0.024	< 0.02	0.0236	0.0243	0.022	< 0.02	0.0236	0.0875	< 0.2
PFM000062	12234	0.5	2006-04-18	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000066	12042	0.1	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000068	12045	0.1	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000069	12043	0.1	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000070	12069	0.1	2006-01-24	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000074	8937	0.5	2005-07-11	0.0139	0.059	0.0126	0.0066	0.015	< 0.05	0.0138	< 0.005	0.01	< 0.005	0.0110	< 0.005	< 0.05
PFM000074	8976	0.5	2005-10-03	0.0051	0.016	< 0.005	< 0.005	0.007	< 0.05	0.0077	< 0.005	0.006	< 0.005	0.0062	0.0072	< 0.05
PFM000074	12032	0.5	2006-01-24	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000074	12232	0.5	2006-04-18	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000082	12046	0.5	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000082	12030	6	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000107	8938	0.5	2005-07-11	0.0143	0.057	0.0101	0.0052	0.012	< 0.05	0.0105	< 0.005	0.0066	< 0.005	0.0079	< 0.005	< 0.05
PFM000107	8970	0.5	2005-10-03	0.0419	0.095	0.0399	0.0206	0.036	< 0.05	0.0332	0.0227	0.0285	0.0205	0.0249	0.119	0.061
PFM000107	12044	1	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000107	12047	0.5	2006-01-23	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000117	8935	0.5	2005-07-11	< 0.005	0.017	< 0.005	< 0.005	< 0.005	< 0.05	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.05
PFM000117	8973	0.5	2005-10-04	0.0067	0.009	0.0055	< 0.005	< 0.005	< 0.05	0.0060	< 0.005	< 0.005	< 0.005	< 0.005	0.0190	< 0.05
PFM000117	12033	1.5	2006-01-24	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM000117	12048	0.5	2006-01-24	–	–	–	–	–	–	–	–	–	–	–	–	–
PFM102270	12233	0.5	2006-04-18	–	–	–	–	–	–	–	–	–	–	–	–	–

< “value” = below reporting limit.
Yellow marked values are probably affected by contamination.

Table A5-5. Isotopes II (U-, Th-, Ra- and Rn-isotopes).

Idcode	Sample no.	Depth m	Sampling date	^{238}U mBq/L	^{234}U mBq/L	^{230}Th mBq/L	^{226}Ra Bq/L	^{222}Rn Bq/L
PFM000062	8936	0.5	2005-07-11	7.4	9.4	1.5	0.031	0.009
PFM000074	8937	0.5	2005-07-11	14.9	15.7	0.3	0.038	0.010
PFM000107	8938	0.5	2005-07-11	25.3	27.4	0.1	< 0.03	–
PFM000117	8935	0.5	2005-07-11	15.3	17.5	< 0.35	< 0.025	–