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Forsmark site investigation

Sampling and analyses of near surface groundwaters

Results from sampling of shallow soil monitoring wells, BAT pipes, a natural spring and private wells, May 2003–April 2005

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Abstract

A two year long investigation campaign concerning near surface groundwaters in Forsmark is reported. Sampling and analyses of water from a total of 44 shallow soil monitoring wells (repeated sampling in 24 of them), seven private wells, and one natural spring were performed in order to characterise the near surface groundwaters of the area. Stand pipes in three of the monitoring wells were equipped with BAT filter tips. The sampling activity was performed during the period May 2003 to April 2005.

The results obtained include field measurements of redox potential (ORP), pH, dissolved oxygen, electrical conductivity and water temperature, as well as chemical analyses of major constituents, nutrient salts, carbon species, trace metals and isotopes. A simple evaluation of the ORP-measurements suggests that the data may be used as an indication of whether reducing or oxidising conditions prevail in the groundwaters of the different sampling points, but great caution is needed.

The near surface groundwaters in the Forsmark area consist of two different water types, fresh dilute waters of Ca-HCO_3 type and brackish-saline waters of Na-HCO_3-Cl type affected by marine water. The Ca-HCO_3 character reflects the thick quaternary deposits in the area which contain calcite. The occurrence of brackish, near surface groundwater with, in a few cases, even higher salinity than the Baltic Sea, may be explained by either discharge of older groundwater from greater depth or, even more likely, the presence of trapped relict marine water (Littorina) in sediment layers of low permeability. The chemical character of the groundwaters from the different sampling objects is summarised in this report.

Sammanfattning

En två år lång undersökningskampanj rörande ytnära grundvatten i Forsmark rapporteras. Provtagning och analys av vatten från totalt 44 jordborrhål (varav 24 ingick i programmet för upprepad provtagning), sju privata brunnar och en naturlig källa har utförts för att karakterisera det ytnära grundvattnet i området. Tre av jordrören var utrustade med BAT filterspetsar. Provtagningsaktiviteten utfördes under perioden maj 2003 till april 2005.

Erhållna resultat omfattar fältmätningar av redox potential (ORP), pH, löst syre, elektrisk konduktivitet och vattentemperatur samt kemiska analyser av huvudkomponenter, närsalter, organiska kolföreningar, spårmetaller och isotoper. En enkel utvärdering av ORP-mätningarna tyder på att data kan användas, om än med stor försiktighet, som en indikation på om reducerande eller oxiderande förhållanden råder i grundvattnen i de olika provpunkterna.

Grundvattnen i Forsmarksområdet tillhör i huvudsak två olika vattentyper, sötvatten av Ca-HCO_3 typ och bräckt till salt vatten av Na-HCO_3-Cl typ med inslag av marint vatten. Ca-HCO_3 karaktären reflekterar de kalkhaltiga kvartära avlagringarna i området. Förekomsten av bräckt/salt grundvatten med, i ett fåtal fall, högre salinitet än Östersjön utanför Forsmark, kan förklaras med, endera uppåtströmmande äldre grundvatten från större djup eller, mer sannolikt, förekomst av inneslutet relikt marint vatten (Littorina) i sedimentlager med låg permeabilitet. En sammanställning av de kemiska egenskaperna hos grundvattnen från de olika provpunkterna ges i rapporten.

Contents

1 Introduction

This document reports performance and results from sampling and analyses of near surface groundwaters within the site investigation programme in Forsmark /1/. The work was conducted according to the activity plans listed in Table 1-1. The report presents hydrochemical data from shallow soil monitoring wells, Pipes with BAT-filter tips (special sampling system described in Section 4.3), private wells and one natural spring. The fieldwork was carried out during the period May 2003–April 2005.

The data reported originate from three types of sampling campaigns and different contractors/organisations were involved in the fieldwork:

1. Initial sampling following drilling and pipe installation in most of the drilled boreholes in soil, conducted by SWECO VIAK /2, 3, 4/.

2. Regular, repeated sampling within a two year long sampling programme for near surface groundwater in selected soil monitoring wells, selected private wells and one natural spring. This sampling was conducted by Sveriges vattenekologer AB. Sampling in three wells equipped with BAT-filter tips /5/ was, however, carried out by the Forsmark site organisation.

3. Occasional sampling when good opportunities arose or for special studies. For example, sampling of groundwater discharge at the bottom of an excavated trench and a special study of hydrological conditions in the vicinity of Lake Bolundsfjärden /6/.

All the different sampling objects (soil monitoring wells, private wells and one spring) are listed and described in Section 2 and a map showing their location is presented in Figure 2-1.

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

Activity plan	Number	Version
Provtagning och analys av ytnära grundvatten i jordrör, BAT-rör, källor och privata brunnar.	AP PF 400-03-33	1.0
Provtagning och analys av ytnära grundvatten 2004–2005.	AP PF 400-04-90	1.0
Jordborrning o. jordprovtagning samt installation av grundvattenrör och pegelrör.	AP PF 400-02-031 (initial sampling)	1.0
Installation av BAT-spetsar för ostörd grundvattenprovtagning i jordlager.	AP PF 400-03-028 (BAT)	1.0
Kompletterande jordborrning o. jordprovtagning samt installation av grundvattenrör och pegelrör.	AP PF 400-04-009 (initial sampling)	1.0
Kompletterande installation av grundvattenrör.	AP PF 400-04-015 (initial sampling)	1.0
Provpumpning av jord-bergbrunn SFM0074.	AP PF 400-04-050 (SFM0074)	1.0

2 Sampling objects

A total of 74 shallow soil monitoring wells were drilled in the investigation area /2, 3, 4/ during the reported period and water samples were collected from most of them initially following drilling and pipe installation. The initial sampling was normally carried out by the contractor performing the well drilling (except for wells at the drill sites). Twenty-four of these wells were then selected and sampled regularly, four times a year, during a two year long sampling programme. Since some of the wells were drilled after this activity started, they have not been sampled from the start of the programme.

The regular sampling programme included selected monitoring wells/stand pipes of the following types:

1. Stand pipes (made of HDPE) located close to the drill sites, see Appendix 1 for design, Figure A1-1.
2. Double stand pipes (made of HDPE), where one of the pipes is equipped with a permanently installed sensor for logging the groundwater pressure. The other pipe is intended to collect water samples for chemical analyses, see Appendix 1 for design, Figure A1-2. The drilling work and the initial sampling are reported in /2, 3, 4/.
3. Stand pipes located in lakes and bays were the pipe is installed in the sediment below the water layer. The pipes are made of ordinary iron, see Appendix 1 for design, Figure A1-3. The drilling work and the initial sampling are reported in /2/.
4. Pipes with BAT-filter tips as described in Section 4.3; the drilling work is reported in /5/. Three pipes were placed in till/clay below the groundwater level and also below the present sea water level.

For pipe types 1) to 3), the positions of the filter/screen part, and for type 4) the position of the BAT-filter tip, correspond to the upper and lower section limits (SECUP and SECLOW) in the SICADA database. The section limits were corrected in April 2005 and have since then been measured and reported as being from the top of the stand pipe (Top Of Casing or TOC).

Furthermore, out of the about forty wells and water prospecting holes that were invented during the preinvestigation phase, five private wells were selected and included in the programme /7/. Wells that were located within or close to the candidate area were selected preferentially. Two additional rediscovered old private wells and one natural spring were also included; see Appendix 2, photos no 26, 27 and 25. Sampling of water from the spring was not possible at all occasions.

Besides the sampling programme, occasional water sampling was conducted from a groundwater discharge point at the bottom of an excavated trench /8/ and also from the shallow wells SFM0074, SFM0031–0032 and SFM0061–0063 during a special hydraulic pumping test in the vicinity of Lake Bolundsfjärden /6/. Pumping was performed in SFM0074 and the other boreholes served as monitoring wells. Sampling of water from the pumping well was conducted during the pumping test while the monitoring wells were sampled on completion of the recovery measurements.

The locations of the different sampling objects are shown in Figure 2-1 and listed in Table 2-1. Total depths and filter/screen depths, as well as coordinates for the different stand pipes, are given in Appendix 1 together with schematic presentations of the different pipe types.

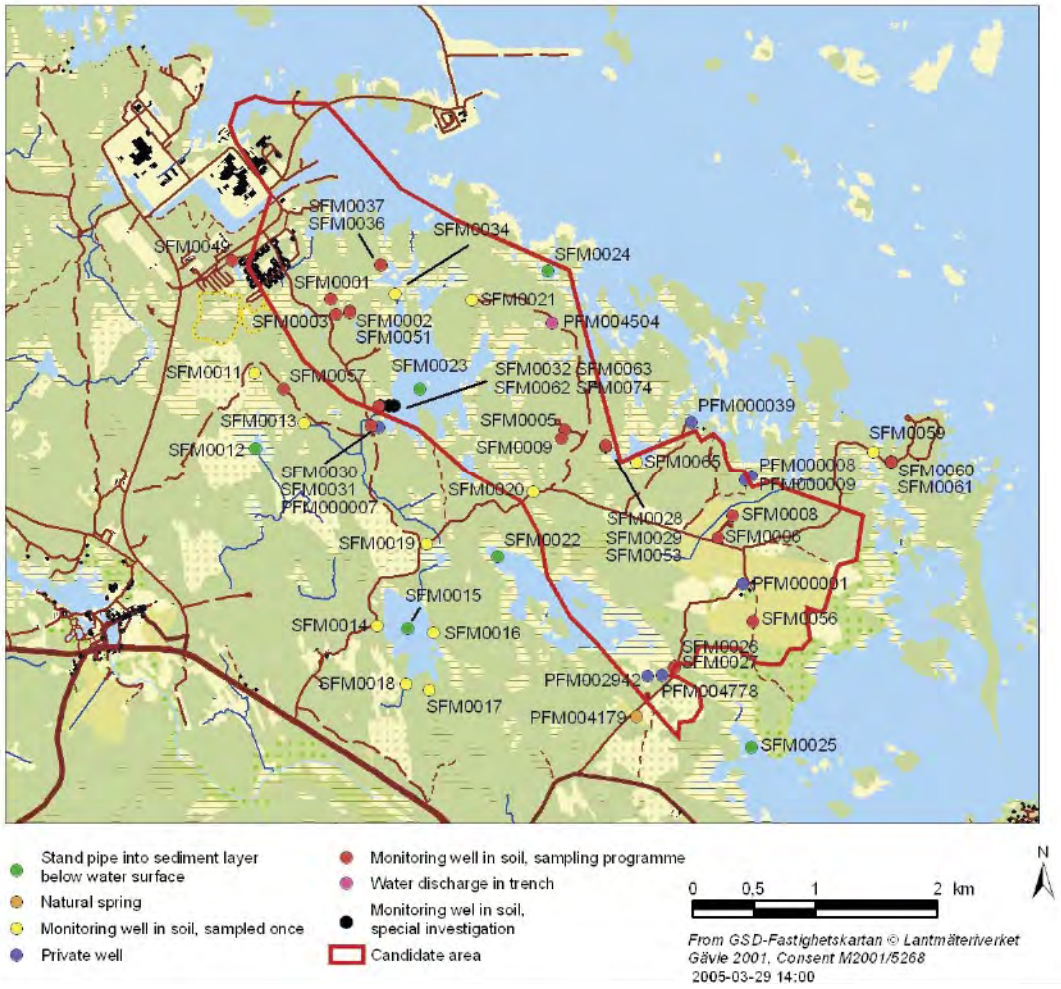

Figure 2-1. *Location of sampling objects for near surface groundwater, including different types of soil monitoring wells, private wells, discharge in an excavated trench and one natural spring. The wells SFM0051, SFM0053 and SFM0056 are equipped with BAT-filter tip installations.*

Table 2-1. List of sampling objects, type of sampling and type of object.

Id code	Comments on sampling	Comments on sampled object	Type*
SFM0001	Chemical sampling programme.	Stand pipe connected to drill site.	A
SFM0002	Chemical sampling programme.	Stand pipe connected to drill site.	A
SFM0003	Chemical sampling programme.	Stand pipe connected to drill site.	A
SFM0004	Not sampled, no water.	Stand pipe connected to drill site.	–
SFM0005	Chemical sampling programme.	Stand pipe connected to drill site.	A
SFM0006	Chemical sampling programme.	Stand pipe connected to drill site.	A
SFM0007	Not sampled, no water.	Stand pipe connected to drill site.	–
SFM0008	Chemical sampling programme.	Stand pipe connected to drill site.	A
SFM0009	Chemical sampling programme.	Stand pipe connected to drill site.	A
SFM0010	Not sampled.		–
SFM0011	Not included in sampling programme, sampled once.		–
SFM0012	Chemical sampling programme.	Stand pipe in sediment below water surface.	C
SFM0013	Not included in sampling programme, sampled once.		–
SFM0014	Not included in sampling programme, sampled once.		–
SFM0015	Chemical sampling programme.	Stand pipe in sediment below water surface.	C
SFM0016	Not included in sampling programme, sampled once.		–
SFM0017	Not included in sampling programme, sampled once.		–
SFM0018	Not included in sampling programme, sampled once.		–
SFM0019	Not included in sampling programme, sampled once.		–
SFM0020	Not included in sampling programme, sampled once.		–
SFM0021	Not included in sampling programme, sampled once.		–
SFM0022	Chemical sampling programme.	Stand pipe in sediment below water surface.	C
SFM0023	Chemical sampling programme.	Stand pipe in sediment below water surface.	C
SFM0024	Chemical sampling programme.	Stand pipe in sediment below water surface, lifted by ice winter 2003/2004.	C
SFM0025	Chemical sampling programme.	Stand pipe in sediment below water surface.	C
SFM0026	Not included in sampling programme, sampled once.		–
SFM0027	Chemical sampling programme.	Double-pipe for chemistry.	B
SFM0028	Not included in sampling programme, sampled once.		–
SFM0029	Chemical sampling programme.	Double-pipe for chemistry.	B
SFM0030	Not included in sampling programme, sampled once.		–
SFM0031	Chemical sampling programme.	Double-pipe for chemistry.	B
SFM0032	Chemical sampling programme.	Double-pipe for chemistry.	B
SFM0033	Not sampled.		–
SFM0034	Not included in sampling programme, sampled once.		–
SFM0035	Not sampled.		–
SFM0036	Not included in sampling programme, sampled once.		–

Id code	Comments on sampling	Comments on sampled object	Type*
SFM0037	Chemical sampling programme.	Double-pipe for chemistry .	B
SFM0038–SFM0048	No water sampling.		–
SFM0049	Chemical sampling programme.	Double-pipe for chemistry.	B
SFM0050	No water sampling.		–
SFM0051	Chemical sampling programme.	BAT-system, drill site 1.	D
SFM0052	No water sampling.	Pipe installation failed, no BAT-pipe.	–
SFM0053	Chemical sampling programme.	BAT-system, close to Lillfjärden.	D
SFM0054–SFM0055	No water sampling.		–
SFM0056	Chemical sampling programme.	BAT-system, Storskäret.	D
SFM0057	Chemical sampling programme.	Stand pipe connected to drill site.	A
SFM0058	No water sampling.		–
SFM0059	Not included in sampling programme, sampled once.		–
SFM0060	Chemical sampling programme.	Double-pipe for chemistry.	B
SFM0061	Special sampling to investigate hydrogeological properties.		–
SFM0062	Special sampling to investigate hydrogeological properties.		–
SFM0063	Special sampling to investigate hydrogeological properties.		–
SFM0064	No water sampling.		–
SFM0065	Not included in sampling programme, sampled once.		–
SFM0066–SFM0073	No water sampling .		–
SFM0074	Special sampling to investigate hydrogeological properties.		–
PFM000001	Chem sampl prog once a year, drinking water qual.	Private well, drilled, depth 45 m.	–
PFM000007	Chem sampl prog once a year, drinking water qual.	Private well, dug, depth 3.7 m.	–
PFM000008	Chem sampl prog once a year, drinking water qual.	Private well, dug, depth 1.5 m.	–
PFM000009	Chem sampl prog once a year, drinking water qual.	Private well, drilled, depth 70 m.	–
PFM000039	Chem sampl prog once a year, drinking water qual.	Private well, drilled, depth 60 m.	–
PFM002942	Chem sampl prog once a year, drinking water qual.	Old, not used, dug well, depth unknown.	–
PFM004179	Chem sampl prog, sampled when possible.	Natural spring.	–
PFM004504	One sampling occasion.	Water discharge in machine cut trench.	–
PFM004778	Chem sampl prog once a year, no drinking water qual.	Old, not used, depth unknown.	–

* Code used to distinguish between different types of soil monitoring wells/stand pipes included in the sampling programme, see Tables 5-1 and 5-2 and Appendix 1.

3 Objectives and scope

Near surface groundwaters are investigated in order to increase understanding of processes that occur at the interface between the geosphere and the near surface ecosystem. Furthermore, sampling and analyses of groundwaters from shallow monitoring wells may be used to identify discharge areas.

The two year long regular sampling programme was aimed at characterising near surface groundwaters in different types of environments within the candidate area. The programme included shallow soil monitoring wells (stand pipes), private wells and pipes equipped with BAT-filter tips. The BAT-pipes were used to perform undisturbed soil water sampling in till/clay of low permeability.

The sampling of private wells is mainly performed in order to obtain initial information on the drinking water quality and then to monitor eventual changes in the water composition during the site investigation period. The private well data are of limited use for the chemical modelling as they are more or less affected by human activities. However, some additive information on the salinity distribution in the candidate area may be gained.

Besides the general objectives, the soil monitoring wells that are in the vicinity of the drill sites are also monitored in order to identify eventual changes in the water composition due to drilling activities. The changes may be caused either by altered hydraulic conditions or, however more unlikely, by contamination from fuel or lubricants for example.

Sampling and analyses of near surface groundwaters included in the regular sampling programme were performed four times a year. The other sampling objects were generally sampled at one occasion only, see Table 2-1. The activity included water sampling for chemical analysis as well as direct measurements of parameters such as ORP (redox potential), pH, dissolved oxygen, electrical conductivity and water temperature. The extent of the sampling differed. Major constituents and surface water supplements (nutrient salts, silica, carbon species etc) were determined at all sampling occasions while isotopes and trace metals were determined less frequently, see Tables 5-1 and 5-2.

Furthermore, water sampling was performed in the shallow wells SFM0074, SFM0031–0032 and SFM0062–0063 in the vicinity of Lake Bolundsfjärden /6/ during a special hydrological study (pumping test). The sampling and analyses were performed in order to examine possible hydraulic contact between Lake Bolundsfjärden and the aquifer penetrated by SFM0074. The analyses included major constituents, tritium, deuterium and oxygen-18.

A good opportunity to collect groundwater samples unaffected by drilling occurred when groundwater was discharged through fractures in rock exposed in a trench excavated for lineament investigations. The flow rate was as high as five litres per minute and it was possible to obtain an SKB class 5 sample.

4 Equipment

4.1 Sampling equipment

Groundwater samples from the shallow soil monitoring wells/stand pipes and natural wells were collected using four online pumping setups, each one consisting of a submersible electrical pump (12V, Awimex) connected to a 10–20 m long polyamide-tube (Tecalan) of 8 mm diameter. The inner metal part of the pumps was coated by Teflon. Manually operated electrical regulators (powered by 12V, 7Ah cells) were used to adjust the water flow to a maximum of 1 litre/minute. Disposable filters (Millipore, 0.40 µm, ∅ = 22 mm) were fitted directly to the tube from the pump when collecting the sample portions for trace metals and ferrous iron. A separate sampling set-up was used for the stand pipes in the lakes, as these pipes were made from ordinary iron, in order to minimise the risk to contaminate other samples. Groundwater samples from some of the private wells were collected directly from the tap.

4.2 Multi-parameter sondes

Field measurements were performed with two multi-parameter 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 4-1. Calibration of the sondes was conducted according to the measurement system description SKB MD 910.003 (SKB internal controlling document). The measured parameters in near surface groundwaters included pH, water temperature, oxygen, ORP (redox potential) as well as electrical conductivity and were conducted in a simple flow-through cell constructed from a plastic bottle. The upper part of the bottle fitted tightly to the sonde and had a narrow outlet for the circulating water.

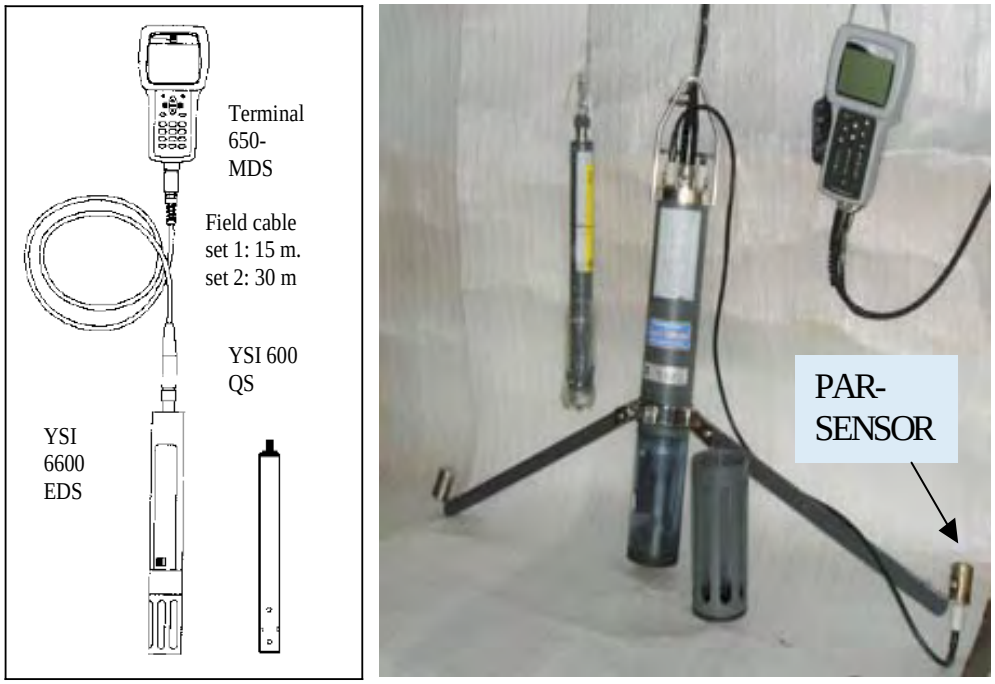

Figure 4-1. *Details of the measurement sonde.*

4.3 BAT-equipment

Water sampling in the stand pipes equipped with BAT-filter tips was performed by a GeoN BAT-type groundwater sampler. The sampler carries an evacuated and hermetically closed glass sample container (500 mL) and a vial. The vial is fitted with a cap with a rubber disc, similar to the disc in the filter tip. The needle of the sampler, which is “double-ended”, penetrates through the two rubber discs thus connecting the filter tip to the vial cap, see Figure 4-2. Due to the vacuum in the vial, water will be sucked from the aquifer, through the filter and the needle, into the vial.

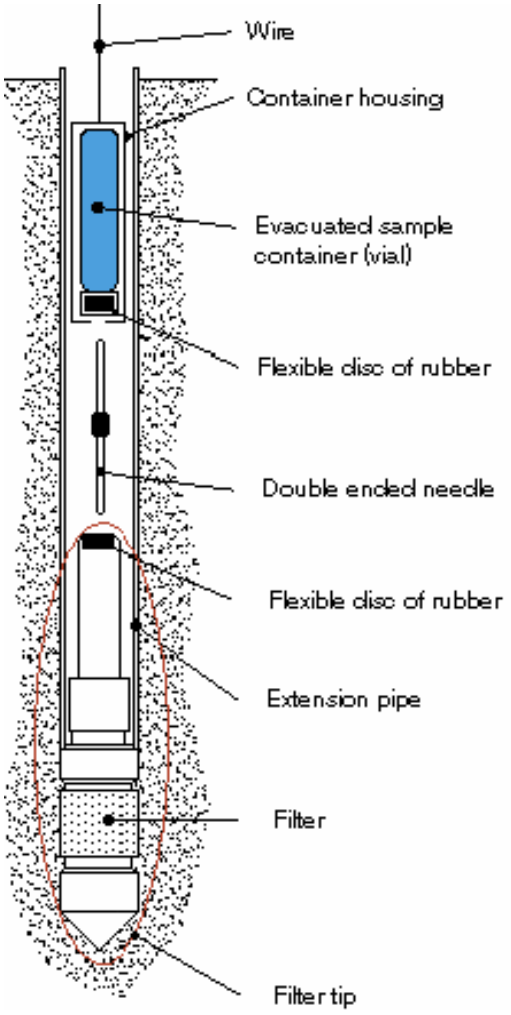

Figure 4-2. *Outline of BAT-sampler system and the BAT-filter tip.*

5 Performance

5.1 Initial sampling

The initial sampling was conducted shortly after drilling, installation of the soil pipe and the function test. The procedure involved the following: a) water was pumped initially out from the well and if less than 20% of the drawdown was recovered after one hour, the well was topped up using water from another borehole or lake water, b) pumping was then performed until the initial electrical conductivity of the groundwater was obtained or until at least five times the volume of water used to top up the well was pumped out, and c) groundwater samples (SKB class 3) were collected. Submersible pumps (type Grundfos MP 1 or Awimex Amazon) were used for the pumping.

5.2 Regular sampling programme

Sampling scheme

The sampling schemes for the two year long sampling programme are given in Tables 5-1 and 5-2. Since it was not always possible to collect samples from all sampling locations, the omitted sampling objects and the reasons for deviation from the sampling scheme are stated in Tables 5-4 and 5-5.

Table 5-1. Sampling scheme May 2003–May 2004.

Year	Month	Week	Sampling object***	Sampling and analysis class & options /1/
2003	May	19	Shallow monitoring wells, A, B	*
2003	June	23	Shallow monitoring wells, A, B	SKB class 5**
			Shallow monitoring wells, C	SKB class 3 &.isotopes**
2003	July	28	Shallow monitoring wells, A, B	SKB class 5
			Shallow monitoring wells, C	SKB class 3 &.isotopes
2003	October	44	Shallow monitoring wells, A, B	SKB class 5+
			Shallow monitoring wells, C	SKB class 3 &.isotopes
			Private wells	SKB class 3, isotopes& drinking water
2004	January	3	Shallow monitoring wells, A, B	SKB class 5
			Shallow monitoring wells, C	SKB class 3 &.isotopes
2004	April	17	Shallow monitoring wells, A, B	SKB class 5
			Shallow monitoring wells, C	SKB class 3 &.isotopes
			Private wells, natural spring	SKB class 3 &.isotopes

* Test session I (one sample was collected).
** Test session II.
*** The sampling object types A, B, C and D are defined in Table 2-1.

Table 5-2. Sampling scheme July 2004–April 2005.

Year	Month	Week	Sampling object*	Sampling and analysis class & options
2004	July	28	Shallow monitoring wells, A, B	SKB class 5
			Shallow monitoring wells, C	SKB class 3 & isotopes
2004	October	42	Shallow monitoring wells, A, B	SKB class 5+
			Shallow monitoring wells, C	SKB class 3 & isotopes
			Private wells, natural well	SKB class 3, isotopes& drinking water
2005	January	3	Shallow monitoring wells, A, B	SKB class 3 & isotopes
			Shallow monitoring wells, C	SKB class 3 & isotopes
2005	April	14	Shallow monitoring wells, A, B	SKB class 5
			Shallow monitoring wells, C	SKB class 3 & isotopes

*The sampling object types A, B, C and D are defined in Table 2-1.

Presampling preparations

Prior to the sampling campaign, sample bottles were cleaned according to established routines (SKB MD 452.001-018), labelled and packed in insulated boxes/bags. Acid additions were made in advance in the bottles intended for trace metal analyses.

The different pumping setups were washed and rinsed with deionised water before use and all parts of equipment were kept well protected in plastic bags or in tight containers. The disposable filters (Nuclepore) were rinsed with deionised water and placed in plastic bags to prevent contamination. Calibration of the sonde was performed according to the measurement system description SKB MD 910.003.

Sampling and measurements

The groundwater sampling procedure as described below was generally applied in groundwater pipes and wells, except for BAT-pipes and a few drilled private wells where the water was collected directly from the tap.

First, the groundwater level in the pipe was established by sounding and the water volume of the pipe was calculated. The pump with its tubing was lowered carefully in order to prevent dirt from entering the pipe. The water inlet of the submersible pump (Awimex) was lowered to the filter/screen section of the pipe or just above. Pumping was then performed at a maximum flow rate of one litre per minute. The pumped water was disposed of at least 10 m away from the sampling object were it infiltrated back into the ground. The pumping phases were as follows:

- *Exchange of water volume in pipe and tubes:* The water volume was exchanged three to five times (depending on the exchange/recovery time) prior to the actual sampling.
- *Sampling:* All sample bottles, except the ones with added acid, were rinsed three times with pumped water. Disposable filters were used for filtration of water portions for trace metals, Fe(+II) and DOC/DIC. The filters were fitted directly on the outlet tube from the pump. Each filter was rinsed with sample water (approx. 30 mL) before the sample portion/filtrate was collected. The bottles containing acid were the last ones to be filled in order to prevent acid contamination of the other sample portions. Disposable plastic gloves were used during the sampling. The samples were transported back from the field in insulated bags with ice packs.

- *Field measurement:* A flow-through cell was connected to the pumping setup and measurements were performed with the sonde (YSI 600 QS). The results were recorded when the electrodes and sensors in the flow-through cell showed stable values (minimum 10 minutes). A judgement of the plausibility of the values was made in the field and accepted values were noted in the field protocol.

Table 5-3. Sample portions/bottles and preparation procedures for class 3, class 5 and 5+ /1/.

Class 3, 5, 5+:
Class 5, 5+:
Class 5+:

Bottle volym (mL)	Number of bottles	SKB-label	Components	Preparation	Filling instructions
100	1	Red	ICP; cations and S, Si.	Acid addition (1 mL conc. HNO_3) Filtering with syringe/0.45 µm,	Fill up
100	1	Green	Br, I.		
250	2	Green	Alkalinity, pH, Conductivity	–	Fill up
			Anions (Br, SO_4, Cl, F)		
25	4	Green	Ammonia, NOx, Silicate	Filtering with syringe/0.45 µm filter	
100	1	Green	Tot-N, Tot-P	–	Leave 1 cm
50	1	Green	TOC	–	Leave 1cm
50	2	Green	DIC/DOC	Filtering with syringe/0.45 µm filter	Leave 1cm
500	1	Green	Tritium	–	Flow over x 1
100	1	Green	Deuterium, O–18	–	Fill up from bottom
100	2	Red	Archive	Acid addition (1 mL conc. HNO_3) Filtering with syringe/0.45 µm,)	Fill up
250	2	Green	Archive	–	Fill up
100[1]	1	Red	ICP; cations and S, Si, Br, I. trace metals, $^{10}B/^{11}B$	Acid addition (1 mL conc. HNO_3) Filtering with syringe/0.45 µm,	Fill up
500	1	Red	Fe(II)/Fetot	Acid addition (1 mL conc. HCl) Filtering with syringe/0.45 µm,	Fill up
Winkler bottles	2	Green	H_2S	1 ml ZnAc + 1 ml 1M NaOH and mix	Flow over x 3
Winkler bottles[2]	2	Green	Oxygen	1 ml Mn(II) reagent + 2 ml alkaline iodine reagent and mix	Flow over 3 x
100	2	Green	^{13}C, pmC	–	Fill up
1,000	1	Green	^{34}S	–	Fill up
100	1	Green	^{37}Cl	–	Fill up
100	1	Green	$^{87}Sr/^{86}Sr$	–	Fill up
1,000	1	Green	U- and Th- isotopes	–	Fill up
1,000	1	Green	Ra- and Rn-isotopes	–	Fill up

1: Same bottle as the first SKB class 3 one. Analyses of trace metals Al, As, Ba, B, Cd, Co, Cr, Cu, Hg, Mo, Ni, P, Pb, V, Zn, Sc, Rb, Y, Zr, Sb, Cs, La, Hf, Tl, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, U, Th.
2: Oxygen samples were collected only at one sampling occasion (April 2005).

Table 5-4. List of collected samples during the period May 2003 to May 2004 and reasons for sampling failures.

Id code	Name	Week/ year						Sum (x)
		19/03	23/03	28/03	44/03	3/04	17/04	
Sondes								
YSI 6600				X				
YSI 600 QS		X	X	X	X	X	X	
Soil wells								
SFM0001	Drill site 1		X	X	X	X		4
SFM0002	Drill site 1		X	X	X	X		4
SFM0003	Drill site 1		X	X	X	X		4
SFM0005	Drill site 2		X	E	E	X		2
SFM0006	Drill site 3	X	X	E	E	X		3
SFM0007	Drill site 3	E	E	E	E	E		0
SFM0008	Drill site 3	D	X	X	X	X		4
SFM0009	Drill site 2	D	–	X	X	X		3
SFM0012	Gällsbo träsk		X	X	X	X		4
SFM0015	Eckarfjärden		X	X	X	X		4
SFM0023	Bolundsfjärden			X	X	X		3
SFM0024	Stånggrund			X	X	F		2
SFM0025	Vargudden			X	X	X		3
SFM0027	–			X	X	X		3
SFM0029	–	D		X	X	X		3
SFM0031	–	D		X	X	X		3
SFM0032	–	D		X	X	X		3
SFM0035	N – Bolundsfjärden	C		E	E	E		0
SFM0037	N – Bolundsfjärden	C		X	X	X		3
SFM0057	Drill site 4				X	X		2
SFM0060	N – Kasudden					X		1
Private wells								
PFM000001	–				X			1
PFM000007	S – Bolundsfjärden				X			1
PFM000008	–				X			1
PFM000009	–				X			1
PFM000038	N – Kasudden				C			0
PFM000039	Tixelfjärden				X			1
PFM002942	So – Fiskarfjärden				X			1
PFM004149	Nv – Fiskarfjärden				E			0
PFM004778	So – Fiskarfjärden				X			1
Sum (X)		1	8	15	23	18		65

Explanation:
X: collected sample.
A: no sample, pipe lost.
B: no sample due to sensitive wildlife.
C: no sample, due to no access.
D: no sample, due to no, or small yield of water.

Table 5-5. List of collected samples during the period June 2004 to May 2005 and reasons for sampling failures.

Id code	Name	Week/Year Sum (X)				
		28/04	42/04	3/05	14/05	
Sondes						
YSI 6600 EDS				X		
YSI 600 QS		X	X	X	X	
Soil wells						
SFM0001	Drill site 1	X	X	X	X	4
SFM0002	Drill site 1	X	X	X	X	4
SFM0003	Drill site 1	X	X	X	X	4
SFM0005	Drill site 2	X	D	X	X	3
SFM0006	Drill site 3	D	D	X	X	2
SFM0007	Drill site 3	D	D	D	D	0
SFM0008	Drill site 3	X	X	X	X	4
SFM0009	Drill site 2	X	X	X	X	4
SFM0012	Gällsbo träsk	X	X	X	X	4
SFM0015	Eckarfjärden	X	X	X	X	4
SFM0022	Fiskarfjärden	X	X	X	B	3
SFM0023	Bolundsfjärden	X	X	X	X	4
SFM0024	Stånggrund	A	A	A	A	0
SFM0025	Vargudden	X	X	X	X	4
SFM0027	–	X	X	X	X	4
SFM0029	O – Borrplats 2	X	X	X	X	4
SFM0031	V – Bolundsfjärden	X	X	X	X	4
SFM0032	SV – Bolundsfjärden	X	X	X	X	4
SFM0035	N – Bolundsfjärden	D	D	D	D	0
SFM0037	N – Bolundsfjärden	X	X	X	X	4
SFM0049	Bostadsområdet	X	X	X	X	4
SFM0057	Borrplats 4	X	X	X	X	4
SFM0060	N – Kasudden	X	X	X	X	4
Private wells						
PFM000001	–		X			1
PFM000007	S – Bolundsfjärden		X			1
PFM000008	–		X			1
PFM000009	–		X			1
PFM000038	N – Kasudden		C			0
PFM000039	Tixelfjärden		X			1
PFM002942	SO – Fiskarfjärden		X			1
PFM004149	NV – Fiskarfjärden		D			0
PFM004179	–		X			1
PFM004778	SO – Fiskarfjärden		X			1
PFM004504	excavated trench		X			1
Sum (X)		19	27	20	19	85

Explanation:
X: collected sample.
A: no sample, pipe lost.
B: no sample due to sensitive wildlife .
C: no sample, due to no access.
D: no sample, due to no, or small yield of water.

Sampling performance using BAT-system

Sampling of the BAT-filter tip pipes followed the sampling scheme for the ordinary shallow soil wells but after one or two weeks delay. Due to different types of overburden (till, clay) at the three BAT-filter tip locations and thereby different water permeability, the time needed for sampling varied. The approximate filling times are given in Table 5-6.

Table 5-6. Filling time at different BAT filter tip locations.

Id code	Approx filling time for one 500 mL container	Description
SFM0051	20–30 min	Drill site 1
SFM0053	1 h	Close to Lake Lillfjärden
SFM0056	40 h	Storskäret

The sample container was filled four times from each BAT-pipe in order to obtain enough water volume for the analyses. The use of the sample volumes and the analyses performed are listed in Table 5-7.

Table 5-7. Sample containers and analyses.

Sample container no	Analyses and determinations			Total volume
1	Major constituents, $^{10}B/^{11}B$, U and Th isotopes by ICP AES/MS.	Chloride, bromide, fluoride and sulphate by IC. Alkalinity titr, pH and EC.	$\delta^{2}H$, $\delta^{18}O$	400 mL. Nutrient salts may be included if the volume is enough.
	(100 mL)	(200 mL)	(100 mL)	
2	Tritium (500 mL)			Approx 500 mL.
3	Fe (+II), (Fe(tot) (200 mL)	5 mL conc. HCl is added to the glass container prior to sampling .		450 mL
4	$\delta^{13}C$, pmC (^{14}C) (250 mL)	$\delta^{37}Cl$ (100 mL)	$\delta^{87}Sr$ (100 mL)	450 mL

5.3 Sample handling and analyses

Measurements/analyses of $pH_{(lab)}$, electrical $conductivity_{(lab)}$ and alkalinity as well as spectrophotometric analyses of total iron and ferrous iron (Fe+II) were conducted immediately at the site. An overview of sample treatment and analytical routines for major constituents, minor anions, trace metals and isotopes is given in Appendix 3. The routines are applicable independent of sampling method or type of sampling object.

5.4 Data handling

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

Several components are determined by more than one method and/or laboratory. Moreover, control analyses by an independent laboratory are performed as a standard procedure on each fifth or tenth collected sample.

All analytical results were 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 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. Relative errors within ± 5% are considered acceptable (in surface waters ± 10%).

$$rel.error(\%) = 100 \times \frac{\sum cation(equivalents) - \sum anions(equivalents)}{\sum cation(equivalents) + \sum anion(equivalents)}$$

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

All results from "biochemical" components and 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 5-1.

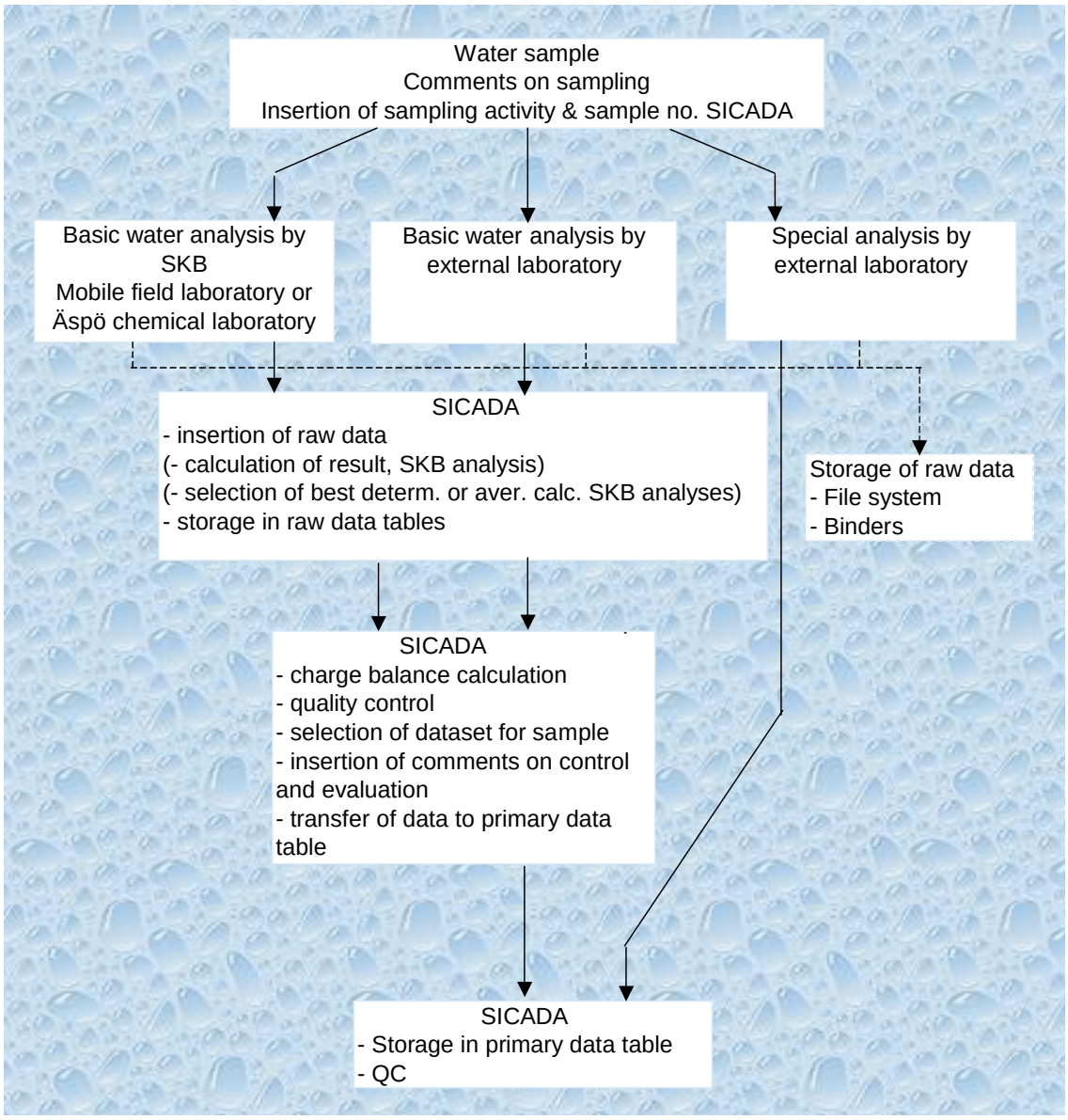

Figure 5-1. *Overview of data management for hydrochemical data.*

5.5 Nonconformities

The nonconformities that occurred all concerned samples that were not collected. Typical reasons are problems with below feeezing temperatures, wild life considerations etc, see Tables 5-2 and 5-3. Initially, borehole length data such as ‘Secup’ and ‘Seclow’ in the SICADA database were measured from the ground surface. This zero point was changed in April 2005 to ‘Top Of Casing’ (TOC).

6 Results

6.1 Chemical description of the waters

The near surface groundwaters in the Forsmark area can be divided into two different water types, fresh dilute Ca-HCO_3 type and brackish-saline waters of Na-HCO_3-Cl type affected by marine water. The sampling points, including shallow soil monitoring wells, private wells, one natural spring and one discharge in an excavated trench, are shown on the topographic map in Figure 6-1. A colour scale indicates the chloride concentration. Generally, waters having a chloride concentration higher than 200 mg/L belong to the Na-HCO_3-Cl type. The Ca-HCO_3 character reflects the thick quaternary deposits in the area which contain calcite. The occurrence of brackish near surface groundwater with, in a few cases, even higher salinity than the Baltic Sea outside Forsmark, may be explained by either discharge of older groundwater from greater depth or, more likely, the presence of trapped relict marine water (Littorina) in sediment layers of low permeability.

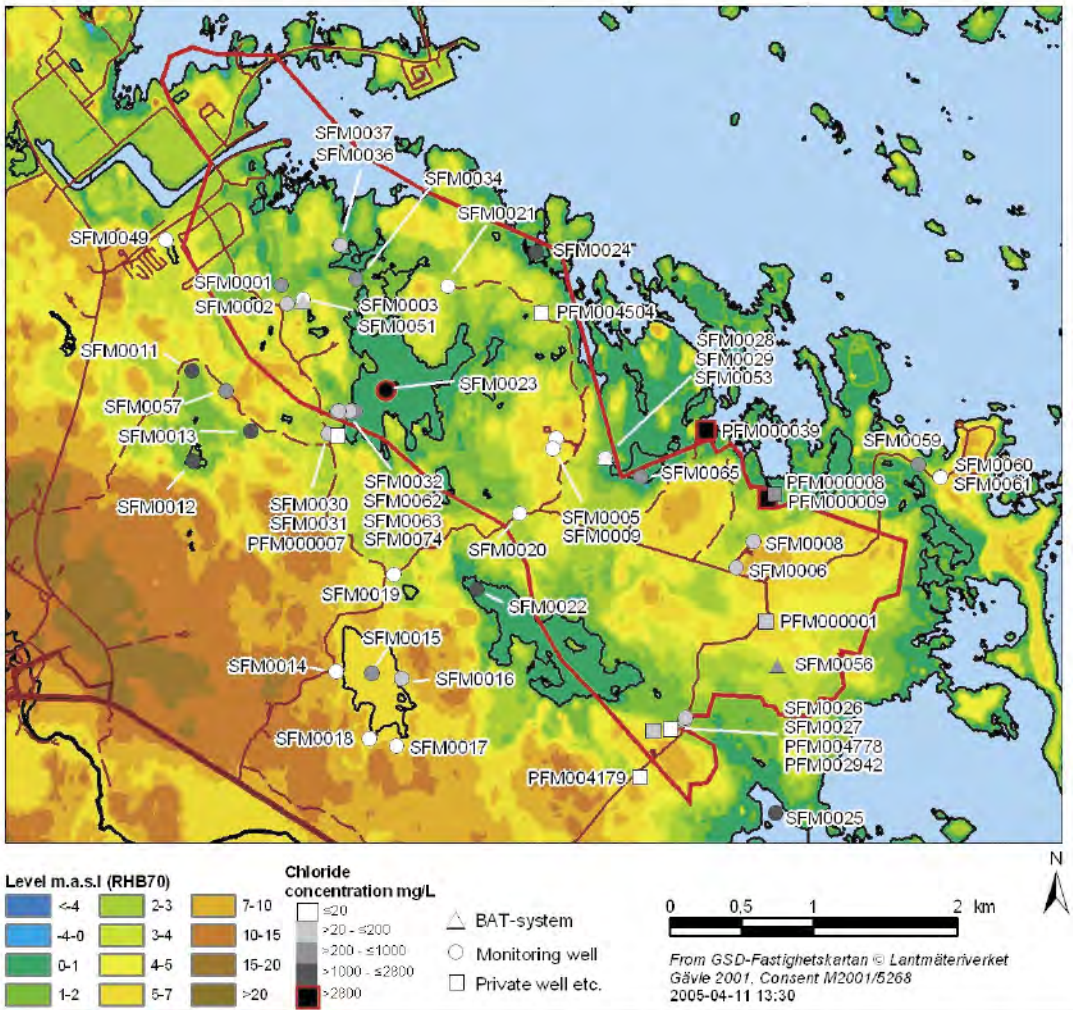

Figure 6-1. *Topographic map showing the locations of the soil monitoring wells (SFM*) and other sampling points (PFM*) for near surface groundwaters. The water type is indicated by means of a colour scale from white to black (red frame) for low to high chloride concentration. The red framed black points denote chloride concentrations higher than the Baltic Sea.*

Some characteristics of the waters from the shallow soil monitoring wells, as well as a few private wells, included in the two year long regular sampling programme, are summarised in Table 6-1. The concentrations given are calculated averages (a few outliers are omitted). Generally, the water composition varies somewhat more for sampling points with Ca-HCO_3 type of water but average values are clearly representative and distinctive. Sampling objects with groundwater of an obvious deep, old and saline character are indicated by a yellow colour code while green colour indicates clearly fresh and young dilute waters.

The indicated redox condition in the waters is presented in Figure 6-2 where a colour code indicates negative or positive redox potentials. The water type classification is based on comparison of sodium, calcium, bicarbonate and chloride concentrations as presented in Figures 6-3.

Table 6-1. Characteristics of the waters in selected shallow soil monitoring wells and some other sampling points included in the regular sampling programme.

Id code	Depth (m)	Chloride (mg/L)	R or D*	Water type	Red or ox conditions**	Tritium TU	$\delta^{18}O$ ‰ SMOW	^{14}C as pmC
SFM0001	4.80	328	R	Na-HCO_3-Cl	Red.	12.6	–11.1	91.5
SFM0002	4.80	71	R	Ca-HCO_3	Red.	11.6	–12.1	86.5
SFM0003	10.20	13	R	Ca-HCO_3	Red.	14.4	–9.8	90.2
SFM0005	2.40	11	R	Ca-HCO_3	Ox.	11.4	–12.4	95.0
SFM0006	4.20	48	R	Ca-HCO_3	Ox.	10.2	–12.8	104
SFM0008	6.14	124	R	Ca-HCO_3	Red.	10.4	–12.3	97.9
SFM0009	3.70	9	R	Ca-HCO_3	Ox.	11.6	–12.0	93.1
SFM0012	5.33	2,232	D	Na-HCO_3-Cl	Red.	–0.8	–9.6	54.0
SFM0015	6.75	314	D	Na-HCO_3-Cl	Red.	3.4	–7.7	83.3
SFM0022	5.80	1,136	D	Na-HCO_3-Cl	Red.	1.2	–10.0	66.8
SFM0023	4.32	3,867	D	Na-HCO_3-Cl	Red.	2.8	–9.0	44.4
SFM0024	2.41	1,715	D	Na-HCO_3-Cl	Red.	4.8	–9.9	88.9
SFM0025	5.75	1,908	D	Na-HCO_3-Cl	Red.	7.3	–11.8	47.7
SFM0027	8.16	63	D	Na-HCO_3-Cl	Red.	10.6	–12.0	79.8
SFM0029	8.13	24	R	Ca-HCO_3	Red.	12.0	–12.0	93.4
SFM0031	4.61	8	R	Ca-HCO_3	Red.	12.3	–10.2	95.5
SFM0032	3.94	26	R	Ca-HCO_3	Red.	11.4	–11.6	96.8
SFM0037	3.10	79	D	Ca-HCO_3	Red.	12.6	–10.9	103
SFM0049	4.90	15	R	Ca-HCO_3	Red.	12.2	–10.0	114
SFM0051	4.58	44	R	Ca-HCO_3	–	10.1	–12.2	87.3
SFM0053	4.98	11	R	Ca-HCO_3	–	8.8	–12.1	94.0
SFM0056	5.26	433	D	Na-HCO_3-Cl	–	–0.8	–11.5	–
SFM0057	4.55	315	D	Ca-HCO_3	Ox.	10.2	–12.5	94.4
SFM0060	6.95	28	R	Ca-HCO_3	Ox.	10.2	–12.4	88.9
PFM002942	–	23		Ca-HCO_3	Red.	6.4	–11.9	–
PFM004179	–	5		Ca-HCO_3	Ox.	–	–	–
PFM004504	–	12		Ca-HCO_3	–	–	–	–
PFM004778	–	7		Ca-HCO_3	Red.	1.8	–12.8	–

* R = recharge and D = discharge according to /9/.
** Some of the wells without colour indication show seasonal varation.

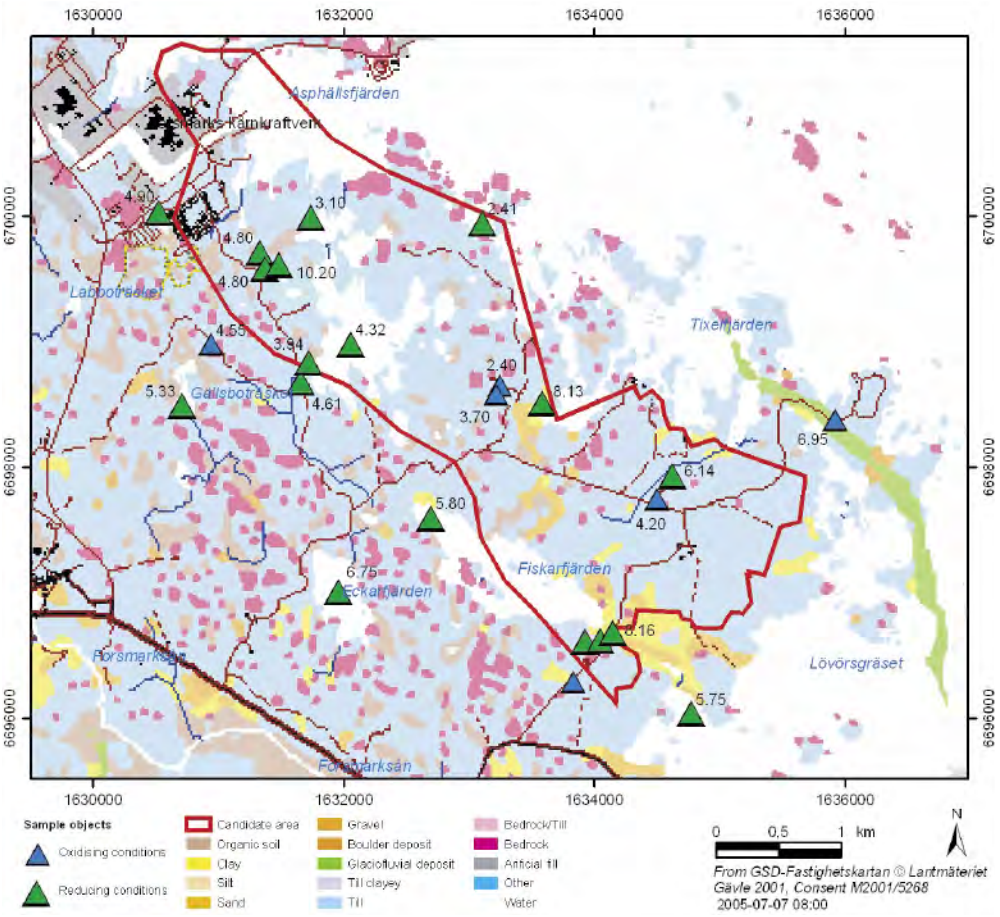

Figure 6-2. *The redox status of near surface groundwaters in soil monitoring wells (SFM*) and in a few old private wells (PFM*) is presented on a soil type map, indicated by a colour scale. The depths of the wells are given also on the map, close to each sampling point.*

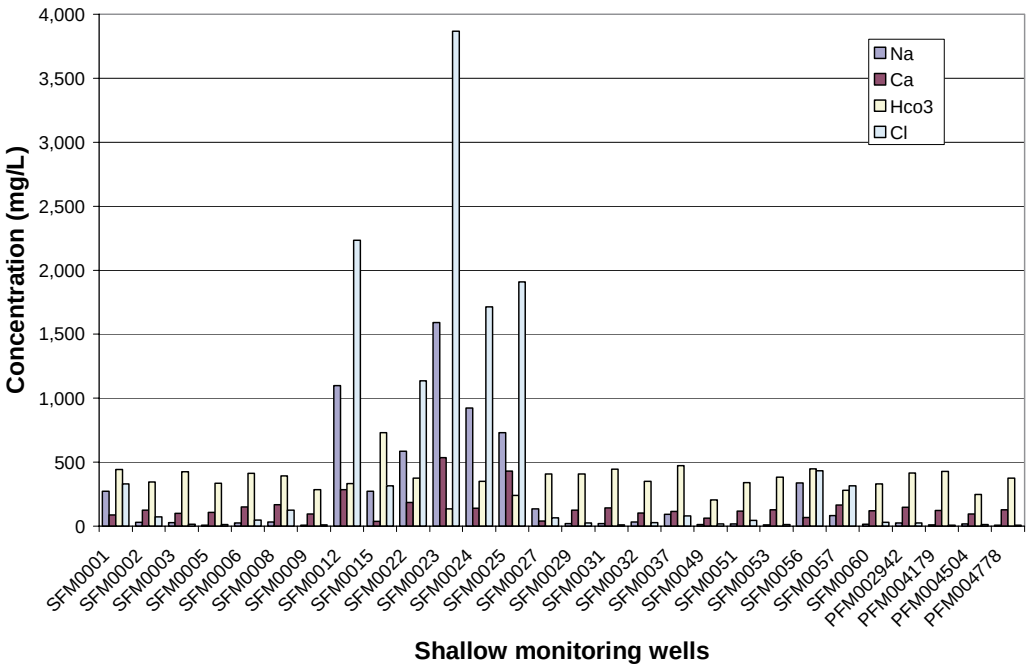

Figure 6-3. *Comparison of sodium, calcium, bicarbonate and chloride concentrations between different sampling points. Average concentrations are used.*

6.2 Field measurements

The results from the field measurements include pH, electrical conductivity, dissolved oxygen and water temperature; pH and water temperature are included in Appendix 4, Table A4-1. In addition, the redox potential (ORP) is also measured and these are discussed in Section 6.3.

pH-measurement

Field measurements of pH are plotted against the corresponding laboratory values in Figure 6-4. The observed disagreement is reasonable considering the change of water temperature, change of pressure 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, plotted against the corresponding laboratory values in Figure 6-5, show good agreement.

Dissolved oxygen

The field measurements of dissolved oxygen were expected to be less reliable, especially at low concentration (< 4 mg/L). Oxygen analyses were performed in the laboratory on the samples collected in April 2005 in order to check the consistency. The result is presented in Figure 6-6, where measured oxygen concentrations are plotted against corresponding analytical results. Generally, the field measurements show somewhat higher values and in one case the difference is considerable (3.5 mg/L compared to <0.2 mg/L). The measurements in April are probably more reliable than earlier measurements as more time was taken and, generally, if a measurement shows 4 mg/L the true value may be well below the detection limit or even zero.

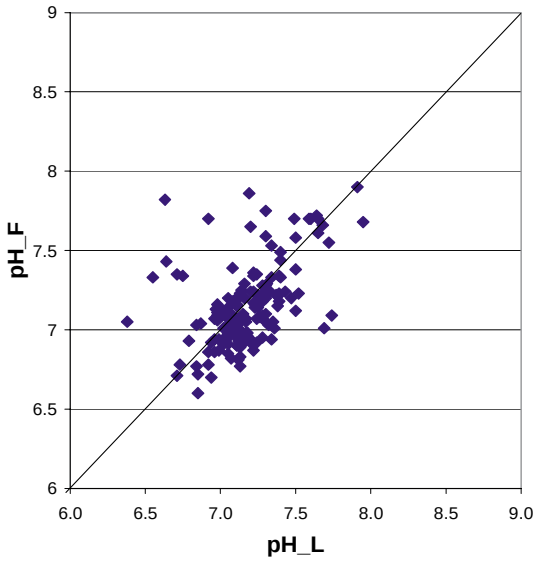

Figure 6-4. *Field-pH (pH_F) values versus laboratory-pH (pH_L) values. Field-pH and laboratory-pH values are measured at prevailing water temperature and at 25°C respectively.*

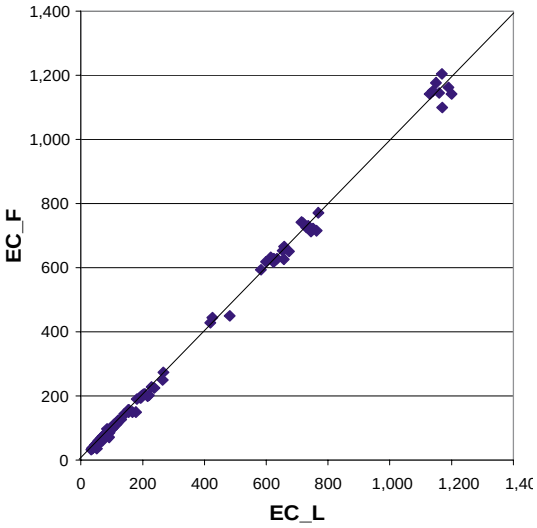

Figure 6-5. *Electrical conductivity (25°C). Field measurements versus laboratory values.*

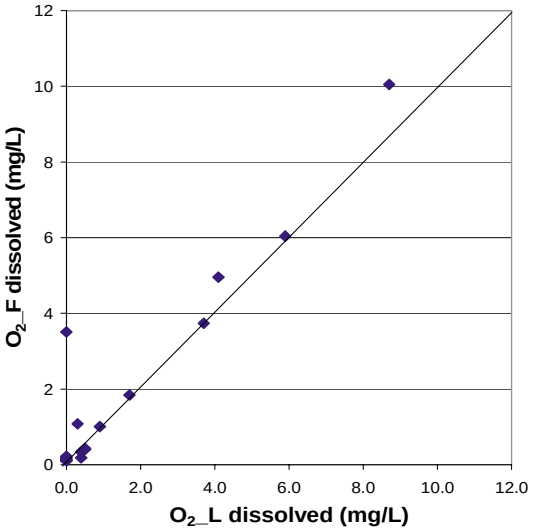

Figure 6-6. *Dissolved oxygen. Field measurement (O_2_F) versus analytical results (O_2_L). Values below detection limit are plotted as zero. (Results from one sampling occasion in April 2005).*

6.3 ORP-measurements and redox conditions

It is difficult and often very time consuming to measure reliable redox potentials (Eh). Redox potential measurements or preferably ORP-measurements (Oxidising-Reducing Potential) have been conducted using the multipurpose measurement sonde in near surface groundwaters from stand pipes and from three old unused private wells. The recorded ORP-values should be used with great caution and merely considered as an indication of the redox conditions in the waters, rather than actual Eh-values. Due to these circumstances, the denotation ORP-value will be used instead of Eh-value in the following text. This section presents a simple evaluation of the ORP-data based on knowledge of measurement conditions and difficulties due to the type of sampling object, as well as comparison to oxygen measurements and iron analyses. Other constituents involved in redox processes in near surface groundwater like hydrogen sulphide and ammonium are not considered.

A factor that complicates the evaluation is that the sonde measurements of dissolved oxygen show poor reliability especially at low concentrations (< 4 mg/L), see evaluation of the equipment (Jämförelse mellan sondmätningar och laboratorieresultat i Forsmark och Simpevarp 2002–2003, Ulf Ericsson, Medins Sjö- och Åbiologi AB, 2003-06-03). The possibility of having negative redox potential in the presence of dissolved oxygen, as in surface waters, is considered less relevant for near surface groundwaters.

Factors that affect the quality of the ORP-values are, in the order of importance:

- Short measurement time (10–15 minutes). It is not possible to measure over the time range required to achieve stability.
- Difficult pumping and flow rate conditions. Some soil pipes yield very little water and are emptied several times during the pumping/measurement period.
- The flow-through cell is simply constructed. If the two factors above can be resolved, a tighter fitting between the sonde and the flow-through cell might also improve the measurements.

ORP-values are plotted against dissolved oxygen in Figure 6-7. A colour code reflecting the probability of negative/reducing conditions or positive/oxidising conditions is illustrated. This probability judgement considers also the corresponding ferrous iron analyses (Fe+II). From the diagram it can be concluded that:

- Negative ORP values may generally be regarded as indicating reducing conditions.
- Waters showing ORP values between 0 and 100 mV are probably also reducing as the measurements are likely to result in too high values.
- Eh values higher than 100 mV probably indicate oxidising conditions.

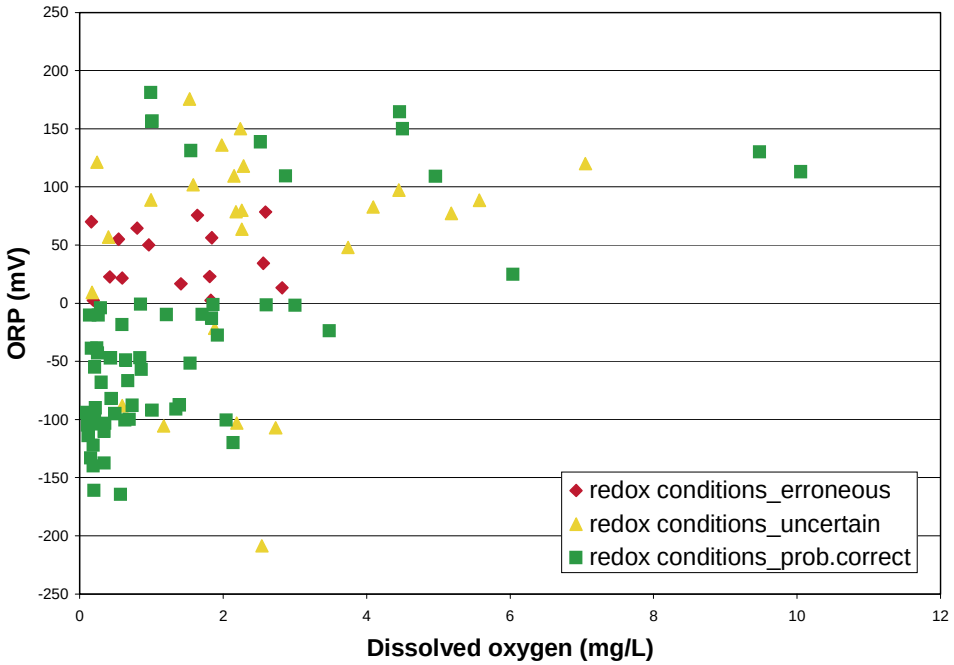

Figure 6-7. *Measured ORP versus oxygen concentrations. The corresponding ferrous iron(FeII) concentrations are considered when evaluating the reliability. The colour code is used as follows: red = redox status is probably incorrect, yellow = uncertain redox status, green = redox status is probably correct.*

6.4 Water analyses

Basic 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 in Appendix 4, Table A4-1.

The charge balance errors give an indication of the quality and uncertainty of the analyses of major constituents; normal acceptance is ± 5%. The errors exceed ± 5% in ten cases and ± 10% in two cases out of 257 data sets. Furthermore, duplicate analyses by a second laboratory are conducted for approximately every tenth sample. A comparison between results from different laboratories and methods shows that the agreement is acceptable in most cases. Generally, the difference in concentrations between laboratories/methods for each analysed constituent is less than ±10%. Constituents showing larger deviations are bromide and iron; see Figures 6-10 and 6-12.

The chloride concentrations are plotted against the corresponding electrical conductivity values in Figure 6-8. This gives a rough check of the data which shows that the near surface groundwater data agree well with a thought regression line.

The bromide analyses are often uncertain, for example the detection limit of bromide by ion chromatography (< 0.2 mg/L) is often too high for fresh waters. Therefore, duplicate analyses by ICP (bromine) have been performed on most samples. Selected bromide/bromine values for each sample are plotted against the corresponding chloride concentrations in Figure 6-9 as a consistency check. Points that differ significantly from the linear trend are probably somewhat erroneous (sample numbers 8685, 8861 and 8864). A comparison of the analytical results by ion chromatography (IC) and by ICP is presented in Figure 6-10. As shown, the spread is considerable.

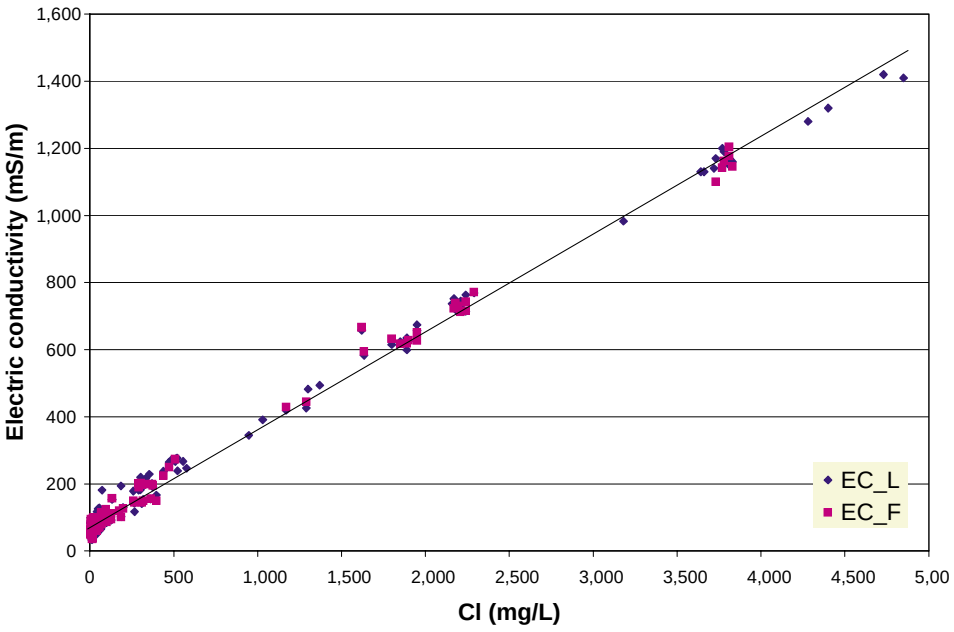

Figure 6-8. *Electrical conductivity values versus chloride concentrations. EC_L = Laboratory value, EC_F = Field value.*

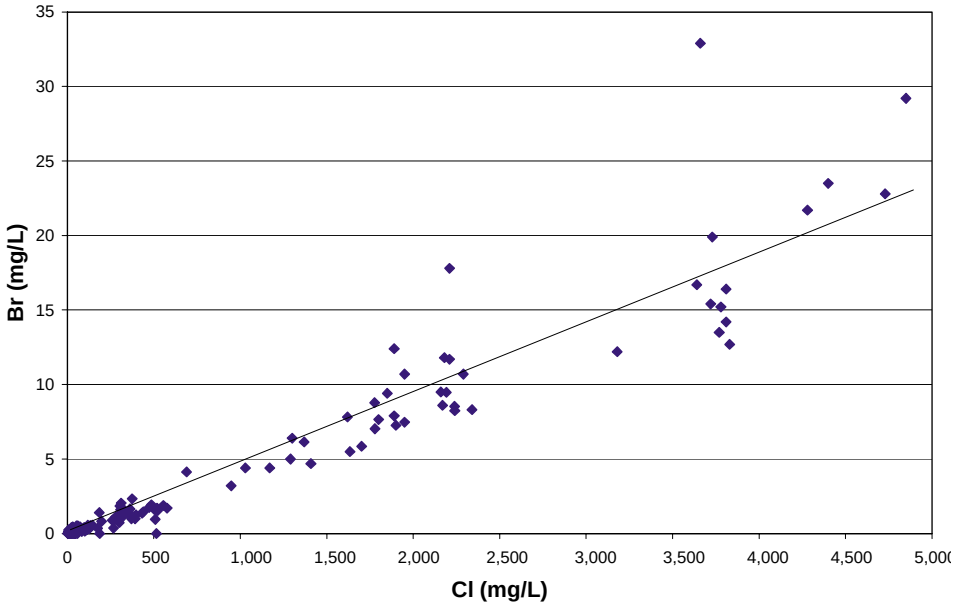

Figure 6-9. *Bromide concentrations versus chloride concentrations. Bromide concentrations below the detection limit (< 0.2 mg/L) are plotted as zero (IC-method).*

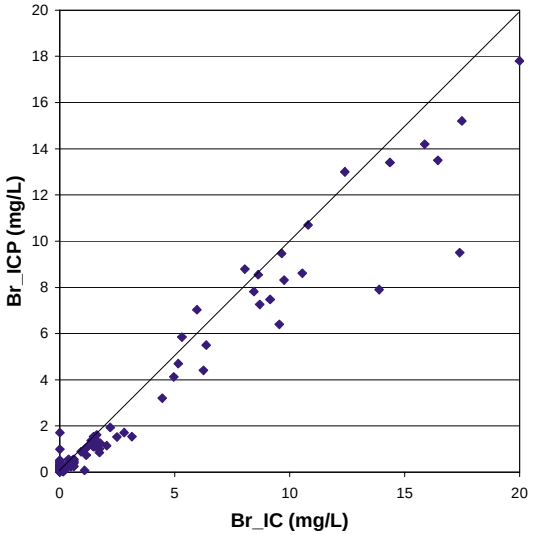

Figure 6-10. *Bromide by IC versus bromine by ICP. Values below the detection limit < 0.2 mg/L (IC) are plotted as zero.*

Sulphate by ion chromatography and sulphate calculated from total sulphur by ICP are compared in Figure 6-11 showing a satisfactory agreement.

Total silicon concentrations by ICP, and SiO_2 as silicon concentrations (SiO_2-Si) by spectrophotometry, are compared in Figure 6-12. Also here the values diverge but somewhat higher total silicon concentrations may be expected/explained. However, repeated silicon analyses by ICP technique often show quite a large spread of values.

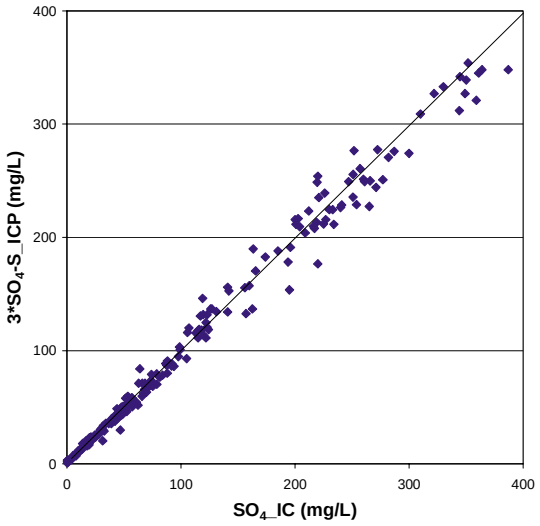

Figure 6-11. *Sulphate (SO_4 by IC) versus sulphate calculated from total sulphur ($3\times SO_4$-S) by ICP.*

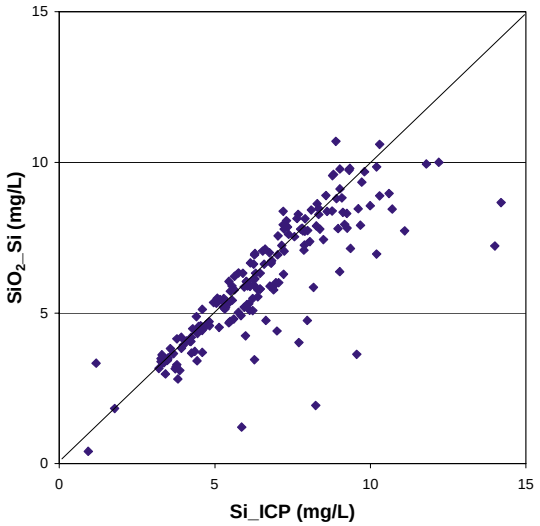

Figure 6-12. *SiO_2-Si determined by spectrophotometry versus total Si analysed by ICP.*

The iron concentrations determined by ICP-AES (total Fe) and by spectrophotometry (Fe(+II) and Fe-tot) are compared in Figures 6-13 and 6-14. Figure 6-13 shows all the iron data over the whole concentration range and includes some very high ICP-values, while Figure 6-14 presents a more narrow concentration range. The total iron concentrations determined by ICP agree reasonably well with the results obtained by spectrophotometry except for a few samples, most of them originating from the BAT-filter tip sampling system. These deviations may be due to:

- The presence of colloidal iron which causes high iron concentrations by the ICP technique compared to spectrophotometry. The spectrophotometric method excludes (or only partly includes) colloids, while the ICP technique makes no distinction between different iron-containing species.
- Two different BAT-ampoules are used for ICP-analyses and spectrophotometric determinations respectively.
- The BAT-sample portions intended for ICP analyses are filtered before adding acid while the corresponding portions for spectrophotometry are acidified without any filtration. However, the consequence should be increased spectrophotometric concentrations.

Generally, all analyses show somewhat lower Fe(+II) concentrations compared to total iron concentrations. The difference may reflect the Fe(+III) concentration of representative groundwater, but a more likely explanation is that oxidation of Fe(+II) has occurred prior to the analyses due to unavoidable time delays between sampling and reagent addition.

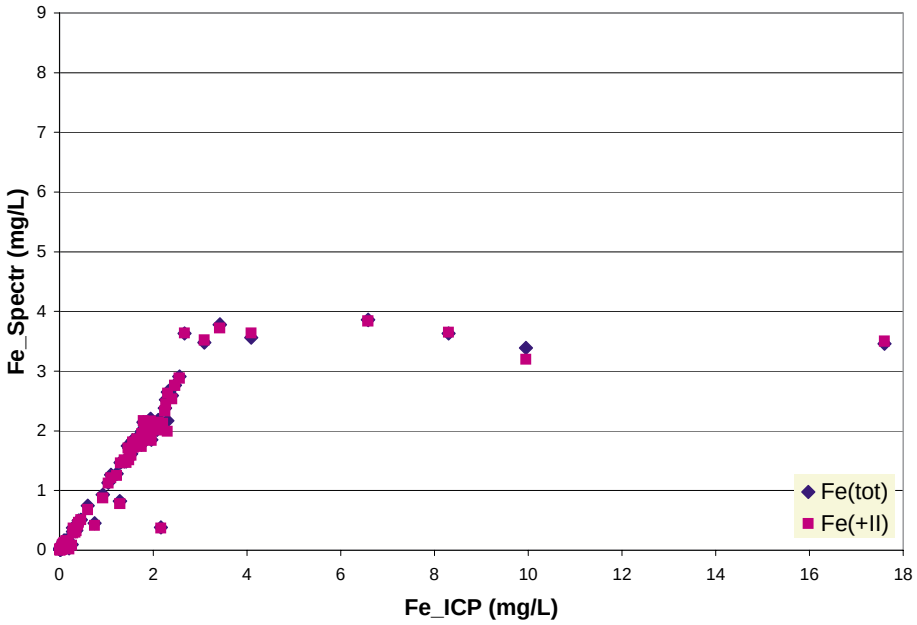

Figure 6-13. *Comparison of iron concentrations obtained by ICP and by spectrophotometry (Fetot and FeII). (All available data).*

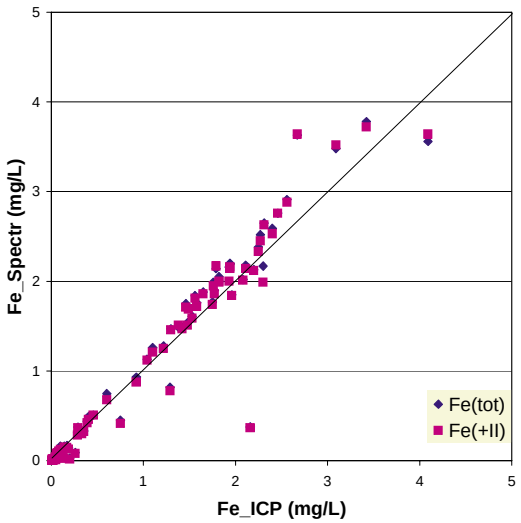

Figure 6-14. *Comparison of iron concentrations obtained by ICP and spectrophotometry (Fetot and FeII). (Reduced concentration range).*

Drinking water quality (private wells)

Data on drinking water quality parameters/components for the investigated private wells are presented in Appendix 4, Table A4-2.

Surface water supplements

Shallow groundwater analysis includes the surface water supplements/options 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 occasionally at a few sampling occasions also dissolved oxygen. The analysis data are compiled in Appendix 4, Table A4-3. The DIC values should be used with care and bicarbonate values (by alkalinity titration) are considered more reliable.

The concentrations of the different nitrogen, phosphorous and carbon compounds are expected to show seasonal variation depending on decomposition processes and the presence of oxygen. However, this variation is more pronounced in surface waters than in the present shallow groundwaters. Figures 6-15 to 6-17 show the variation of total nitrogen, ammonium and phosphate in selected monitoring wells.

Figure 6-18 compares the average DOC-concentrations between different sampling objects.

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 4.

These elements are generally present at low concentrations in the groundwater and the risk for contamination is high. Especially data on common metals such as Al, Cr, Cu, Co, Ni and Zn must be used with caution. Generally, the borehole data conform well but outliers exist, most of them from the first sampling occasions in the first three monitoring wells SFM0001 to SFM0003. Significantly deviating and larger concentrations are not included in the SICADA database.

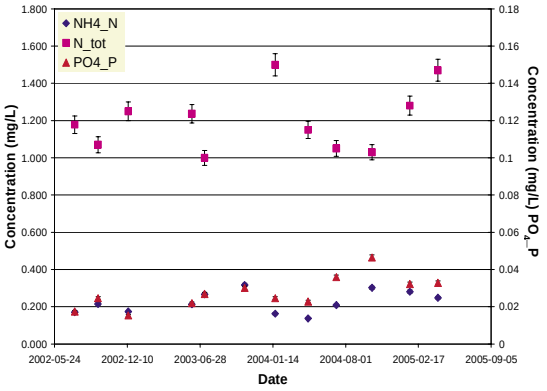

Figure 6-15 a. *SFM0001.*

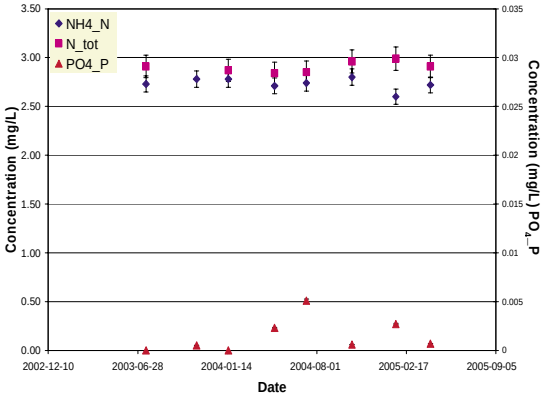

Figure 6-15 b. *SFM0023; most of the high nitrogen conc. is present as NH_4^+.*

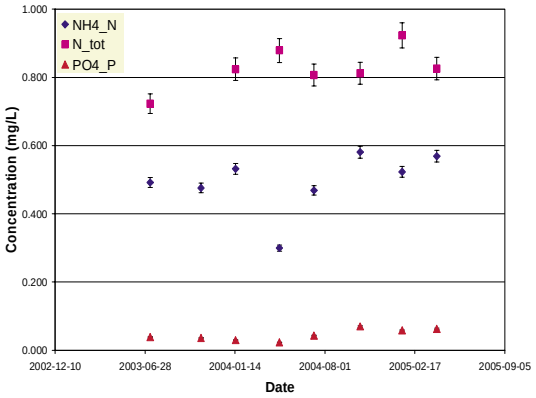

Figure 6-16 a. *SFM0027.*

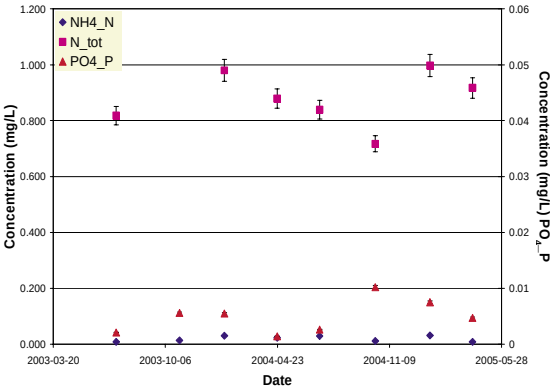

Figure 6-16 b. *SFM0037.*

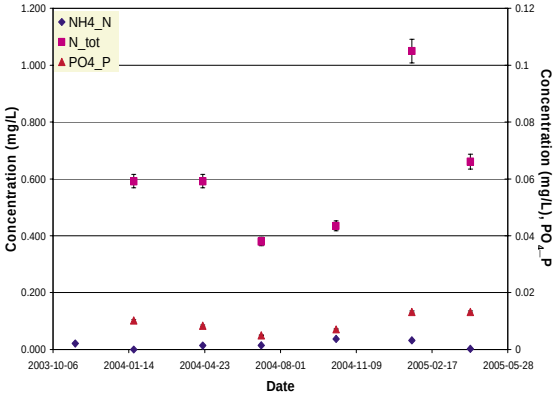

Figure 6-17 a. *SFM0057; Very low NH_4 conc. suggests oxidising conditions.*

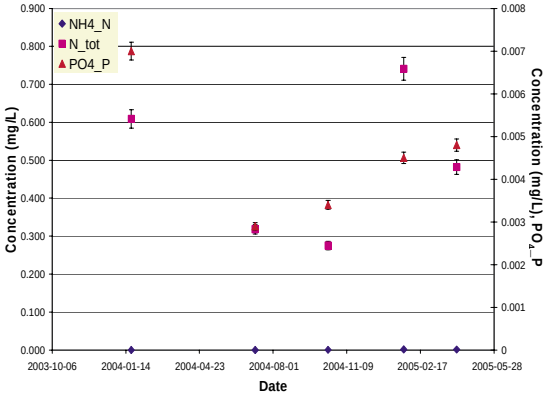

Figure 6-17 b. *SFM0060; Very low NH_4 conc. suggests oxidising conditions.*

Figures 6-15 to 6-17. *Ammonium, total nitrogen and phosphate concentrations versus sampling date. Note that phosphate concentrations refer to the secondary Y-axis except in Figure 6-16 a.*

The average concentration of iron, aluminium and uranium for each sampling point is presented in Figure 6-19. High iron and high aluminium concentrations coincide, a trend which is not reflected by uranium, which is not unexpected considering the prevailing redox conditions. Neither patterns coincides with the DOC pattern, see Figure 6-18.

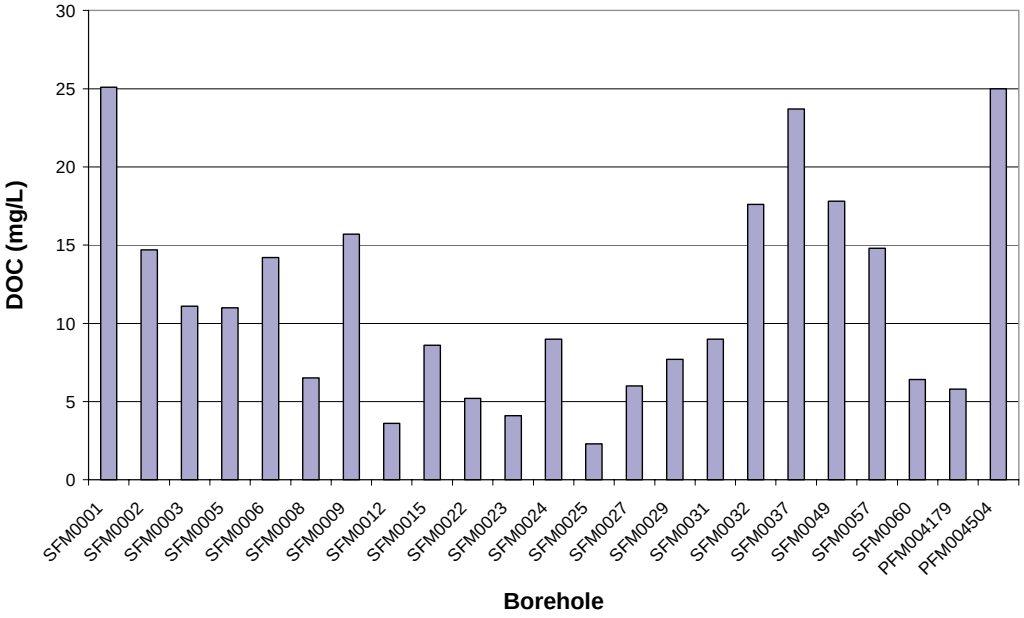

Figure 6-18. *Comparison of DOC concentrations between different sampling points. Average concentrations are used.*

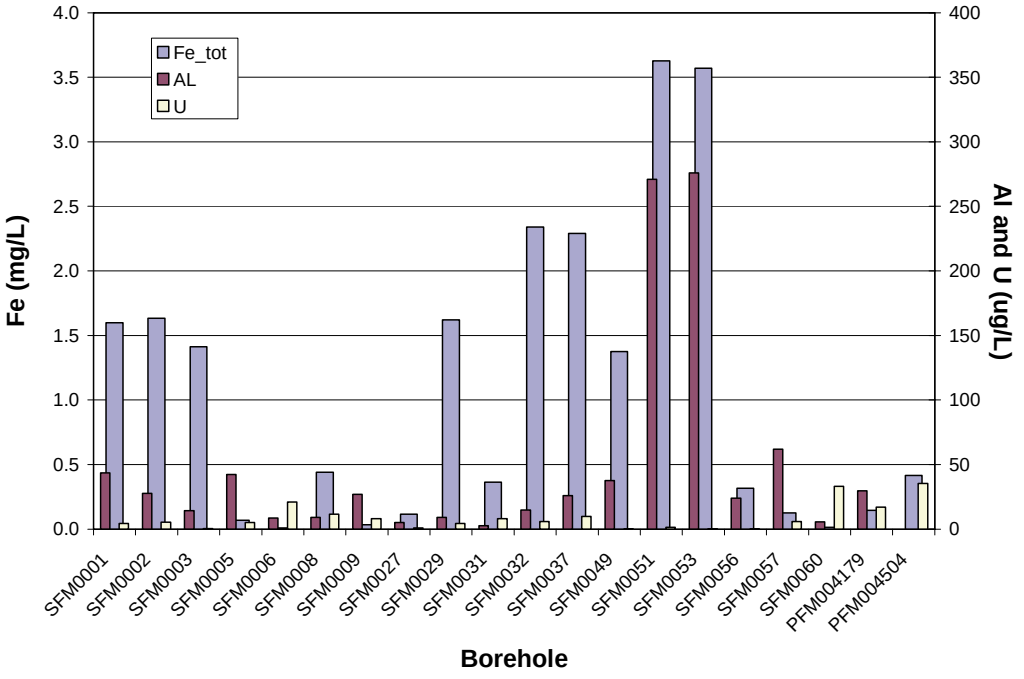

Figure 6-19. *Comparison of iron, aluminium and uranium concentrations between different sampling points. Average concentrations are used.*

Isotopes

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), ^{14}C (pmC), ^{238}U, ^{235}U, ^{234}U, ^{232}Th, ^{230}Th, ^{226}Ra and ^{222}Rn. The isotope data available at the printing date of this report are compiled in Appendix 4.

The tritium analyses in surface waters (lakes, stream water, sea bays) have been questioned due to large variations in values. However, the spread of the tritium values for the different shallow groundwaters is generally not unexpectedly large as shown in Table 6-2. Therefore, large variations in tritium seem to be something specific for surface waters, at least close to the Forsmark nuclear power facility, and not related to the quality of the analyses.

The early results (until 2003-06-05) of uranium and thorium isotope determinations are regarded as questionable since the same value of ^{238}U and ^{234}U in all samples was reported; in addition, most of the data are below the detection limit. The data are included, however, (in italics) in Appendix 4, Table A4-7. A change of laboratory for uranium and thorium isotopes resulted in sufficiently low detection limits to distinguish between ^{238}U and ^{234}U values; unfortunately ^{235}U and ^{232}Th determinations are not carried out. The ICP analyses of uranium and the new ^{238}U-determinations are compared in Table 6-3 were agreement is very good and verifies the reliability of both determinations.

Table 6-2. Tritium; average and median value, standard deviation and variance in different shallow soil monitoring wells.

Id code	No of records	Average tritium (TU)	Median tritium (TU)	St dev (TU)	Rel st dev (%)	Variance
SFM0001	12	12.4	12.2	1.2	9.5	1.4
SFM0002	12	11.6	11.6	1.3	11	1.6
SFM0003*	11	15.8	14.8	3.3	21	11.0
SFM0005	7	11.4	11.3	0.3	2.8	0.1
SFM0006	6	10.2	10.3	1.6	16	2.6
SFM0008	9	10.5	10.6	1.2	11	1.4
SFM0009	9	11.8	11.7	0.8	6.4	0.6
SFM0012**	10	2.9	1.0	4.1	140	16.6
SFM0015*	9	4.1	4.3	2.4	60	5.8
SFM0023*	9	4.1	2.9	3.5	87	12.6
SFM0025*	9	8.1	7.4	3.0	37	8.8
SFM0027	9	10.4	10.1	1.3	13	1.8
SFM0029	8	12.0	11.7	1.2	10	1.5
SFM0031	8	12.6	12.4	1.1	8.6	1.2
SFM0032	10	11.5	12.3	2.7	24	7.5
SFM0037	8	12.6	12.7	0.9	6.8	0.7
SFM0049	6	11.8	12.9	1.8	16	3.4
SFM0051	7	10.3	10.4	1.5	14	2.1
SFM0053	7	10.5	10.2	0.9	8.2	0.7
SFM0056***	7	1.1	0.8	0.7	64	0.5
SFM0057	7	10.4	10.2	1.3	13	1.8
SFM0060	5	10.2	10.1	0.4	4.0	0.2
SFM0074	11	10.3	10.8	1.1	11	1.3

* One outlier exists and is included.
** Variation between <0.8 TU and 12.4 TU.
*** All values <0.8 TU except one (2.6 TU).

Table 6-3. Comparison of uranium (µg/L) calculated from ^{238}U determinations and uranium (µg/L) by ICP-MS. The expression used is given in Appendix 3.

Id code	Date	Sample no	U-238 (mBq/kg)	U (µg/L) calc from U-238	U (µg/L) ICP
SFM0001	2004-10-12	8661	63	5.08	4.39
SFM0002	2004-10-12	8659	72	5.81	5.27
SFM0003	2004-10-12	8660	5.7	0.46	0.42
SFM0008	2004-10-15	8672	118	9.52	9.59
SFM0009	2004-10-13	8666	112	9.03	7.69
SFM0027	2004-10-18	8664	12	0.968	0.725
SFM0029	2004-10-13	8668	75	6.05	6.65
SFM0031	2004-10-14	8667	103	8.31	8.68
SFM0032	2004-10-14	8669	60	4.84	4.13
SFM0037	2004-10-14	8673	123	9.92	9.25
SFM0049	2004-10-12	8665	2.4	0.194	0.172
SFM0057	2004-10-13	8663	88	7.10	7.22
SFM0060	2004-10-14	8671	418	33.7	33.7

7 Summary and discussion

The two year long water sampling campaign to characterise the near surface groundwaters in the Forsmark area has been completed and a considerable amount of data has been collected. From July 2005 and onwards the sampling programme will continue at a reduced level as a check on prevailing conditions. This will imply an overall decrease in the number of sampling points (e.g. five soil monitoring wells and one of the BAT- pipes), all of them in the prioritised north western part of the candidate area. Furthermore, three private wells will be sampled once a year to check the drinking water quality.

The main experience gained and the conclusions from the two year long programme are summarised below:

- The near surface groundwaters in the Forsmark area can be divided into two different water types, fresh dilute waters of Ca-HCO_3 type and brackish-saline waters of Na-HCO_3-Cl type affected by marine water. The Ca-HCO_3 waters reflect the thick quaternary deposits in the area which contain calcite.
- The occurrence of brackish near surface groundwater with, in a few cases, even higher salinity than the Baltic Sea (SFM0023, SFM0012, SFM0025, SFM0024, SFM0022), may be explained by either discharge of older groundwater from greater depth or, more likely, the presence of trapped relict marine water (Littorina) in sediment layers of low permeability. Further investigations are needed in order to understand this phenomenon.
- ORP-measurements (Eh) may be used as an indication to whether reducing or oxidising conditions prevail in the near surface groundwaters. However, the data should be used with great caution. As expected, the errors tend to be in one direction, i.e. towards more positive values and the actual numbers/values should not be trusted.
- Reducing conditions prevail in the main part of the shallow soil monitoring wells. The deep water character (high salinity, reducing conditions and low tritium and pmC values) is most obvious in the stand pipes in the sediment layer below the water level (SFM0012, SFM0015 and SFM0022–SFM0025) and in one of the BAT-pipes (SFM0056). Reliable oxidising conditions are found in SFM0005 (drill site 2), SFM0006 (drill site 3), SFM0057 (drill site 4) and SFM0060 (N Kasudden); the three drill site wells are relatively shallow and the third well is located on an esker with high water permeability.
- The groundwater of the shallow soil monitoring well SFM0060 and the discharge in the excavated trench PFM004504 are distinguished by comparatively high uranium concentrations, 34 and 35µg/L respectively.
- The carbon-13 signature of the soil monitoring well SFM0015 differs from all the other wells by being positive; all six determinations show $\partial^{13}C$ values between +6.77 and +8.25‰ PDB.

8 References

/1/ **SKB, 2001.** Generellt genomförande program för platsundersökningar. SKB R 01-10 (in Swedish), Svensk Kärnbränslehantering AB.

/2/ **Johansson P-O, 2003.** Forsmark site investigation. Drilling and sampling in soil. Installation of groundwater monitoring wells and surface water level gauges. SKB P-03-64. Svensk Kärnbränslehantering AB.

/3/ **Werner K, Lundholm L, 2004.** Forsmark site investigation. Supplementary drilling and soil sampling, installation of groundwater monitoring wells, a pumping well and surface water level gauges. SKB P-04-139. Svensk Kärnbränslehantering AB.

/4/ **Werner K, Lundholm L, Johansson P-O, 2004.** Forsmark site investigation. Drilling and pumping test at Börstilåsen. SKB P-04-138. Svensk Kärnbränslehantering AB.

/5/ **Johansson P-O, 2004.** Forsmark site investigation. Undisturbed pore water sampling and permeability measurements with BAT filter tips. SKB P-04-136. Svensk Kärnbränslehantering AB.

/6/ **Werner K, Lundholm L, 2004.** Forsmark site investigation. Pumping test in well SFM0074. SKB P-04-142. Svensk Kärnbränslehantering AB.

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/9/ **SKB, 2005.** Hydrogeochemical evaluation. Preliminary site description, Forsmark area-version 1.2. SKB R-05-17, Svensk Kärnbränslehantering AB.

Appendix 1

Sampling objects; coordinates and installation designs

Table A-1. Sampling object coordinates, depth to the upper (SECUP) and lower (SECLOW) limits of the filter sections and total depths.

Sampling object*	Coordinates (RT90–RHB70)**			Depths		
Id code	Northing (m)	Easting (m)	Elevation (m a s l)	Secup*** (m)	Seclow*** (m)	Depth**** (m)
SFM0001	6699713	1631335	1.1	3.95	4.95	4.95
SFM0002	6699585	1631377	2.0	4.21	5.21	5.21
SFM0003	6699614	1631487	1.9	8.98	10.98	10.98
SFM0005	6698648	1633252	6.8	2.21	3.21	3.21
SFM0006	6697747	1634502	6.3	3.21	4.21	4.21
SFM0007	6697689	1634780	7.0	5.11	6.11	6.11
SFM0008	6697931	1634623	3.8	5.14	6.14	6.14
SFM0009	6698578	1633224	4.6	2.00	3.00	4.00
SFM0010	6697314	1630735	13.5	1.00	2.00	3.00
SFM0011	6699117	1630711	6.4	3.50	4.50	5.50
SFM0012	6698492	1630719	2.8	5.35	6.35	6.35
SFM0013	6698699	1631123	4.4	4.48	5.48	6.50
SFM0014	6697027	1631716	6.6	2.00	3.00	4.00
SFM0015	6697010	1631964	5.8	6.34	7.34	7.34
SFM0016	6696976	1632174	6.2	7.50	8.50	9.50
SFM0017	6696505	1632138	6.7	4.00	5.00	6.00
SFM0018	6696558	1631950	6.7	4.50	5.50	6.50
SFM0019	6697701	1632118	4.8	4.50	5.50	6.50
SFM0020	6698127	1632994	2.2	3.00	4.00	5.00
SFM0021	6699706	1632493	2.0	2.00	3.00	4.00
SFM0022	6697598	1632697	1.5	5.30	5.80	5.80
SFM0023	6698983	1632064	1.1	4.42	5.42	5.42
SFM0024	6699944	1633109	0.5	2.71	3.21	3.21
SFM0025	6696039	1634774	0.9	6.06	7.06	7.06
SFM0026	6696703	1634152	1.6	16.00	17.00	18.00
SFM0027	6696685	1634147	1.7	7.00	8.00	9.00
SFM0028	6698508	1633589	1.1	7.00	8.00	9.00
SFM0029	6698510	1633589	1.1	7.00	8.00	9.00
SFM0031	6698682	1631661	2.6	3.50	4.50	5.50
SFM0032	6698838	1631726	1.6	3.00	4.00	5.00
SFM0034	6699757	1631859	1.6	2.00	3.00	4.00
SFM0035	6699756	1631859	1.5	2.00	3.00	4.00
SFM0036	6699992	1631746	1.5	1.99	2.00	4.00
SFM0037	6699992	1631744	1.5	2.00	3.00	4.00
SFM0049	6700028	1630533	4.0	4.00	5.00	6.00
SFM0051	6699600	1631488	2.2	5.02	5.18	5.27
SFM0053	6698516	1633590	1.0	6.01	6.17	6.27
SFM0056	6697068	1634792	3.9	6.01	6.17	6.27

Sampling object* Id code	Coordinates (RT90–RHB70)** Northing (m)	Easting (m)	Elevation (m a s l)	Depths Secup*** (m)	Seclow*** (m)	Depth**** (m)
SFM0057	6698980	1630949	4.8	3.45	4.45	**4.55**
SFM0059	6698464	1635777	4.5	4.88	5.88	**5.88**
SFM0060	6698380	1635924	4.9	6.60	7.60	**7.60**
SFM0061	6698377	1635924	5.4	6.03	8.07	**8.07**
SFM0062	6698839	1631808	1.2	3.25	3.65	**3.75**
SFM0063	6698839	1631851	1.3	3.22	3.72	**3.82**
SFM0065	6698381	1633842	1.0	4.45	4.85	**4.85**
SFM0074	6698839	1631738	0.8	2.00	4.70	**4.70**
PFM000038	6698505	1636072		46		
PFM000007	6698664	1631730		3.7		
PFM000001	6697373	1634709		45		
PFM000009	6698227	1634724		70		
PFM000008	6698261	1634773		1.5		
PFM000039	6698705	1634288		60		
PFM002942	6696621	1634048		Unknown	Old, dug, rediscovered private Well	
PFM004179	6696290	1633836		–	Natural spring	
PFM004504	6696290	1633836		–	Discharge in machine cut trench	
PFM004778	6696614	1633928		Unknown	Old, dug, rediscovered private Well	

* The designs of the different types (A, B and C) of monitoring wells/stand pipes are presented in Figures A1-1, A1-2 and A1-3. Typ D = BAT filter tip installation is described in Section 4.3.
** Northing, easting and elevation for the reference point TOC (Top of Casing).
*** SECUP = length from TOC to filter/screen part of the pipe (upper section limit).
*** SECLOW = length from TOC to end of filter/screen part of the pipe (lower section limit)
**** Length/depth of casing/pipe from TOC.

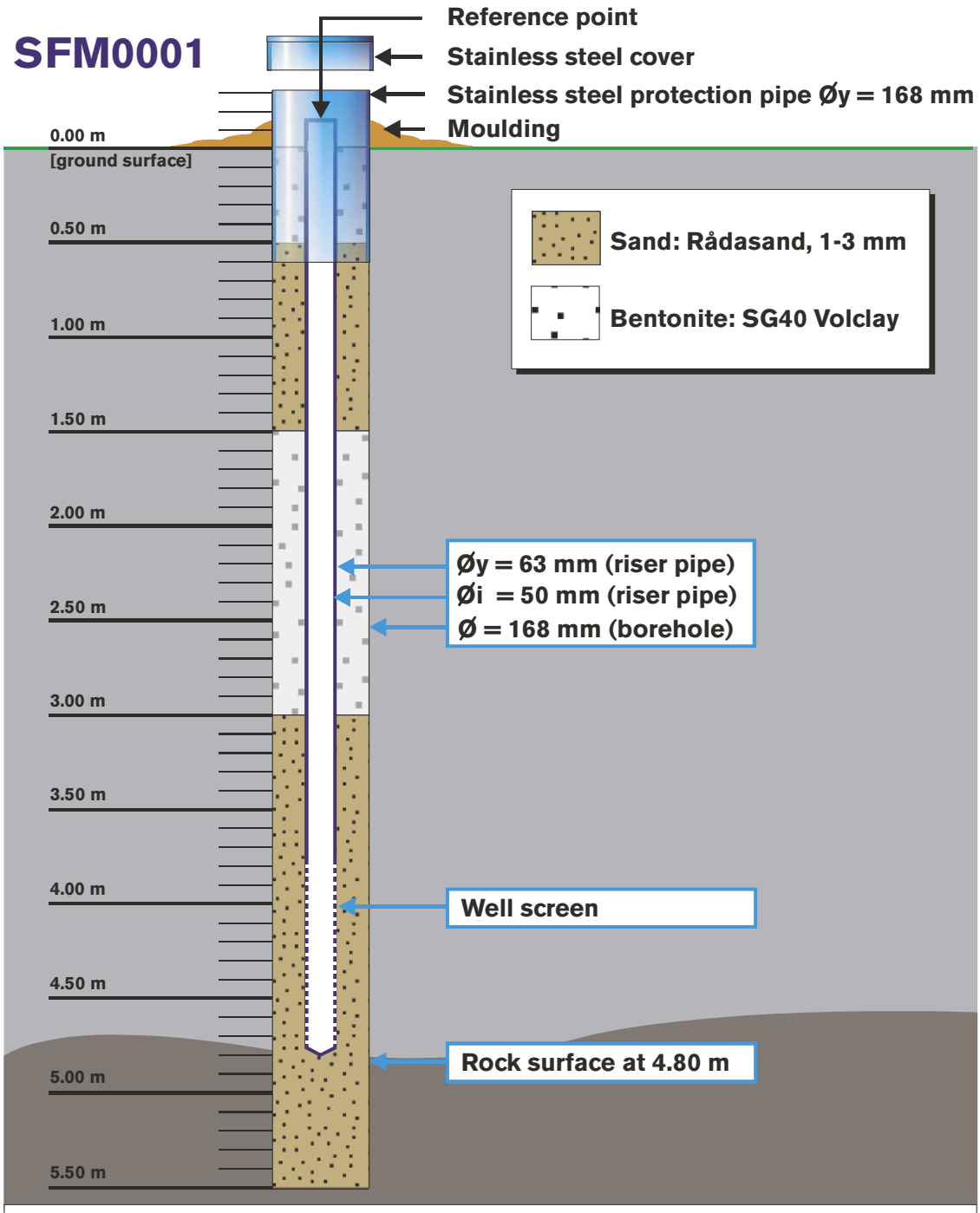

Figure A1-1. *Design of an A-type, drill site connected shallow soil monitoring well (SFM0001). The filter/screen section is placed at the bottom of the pipe. Note that all length information given in the database SICADA refers to the reference point as zero point.*

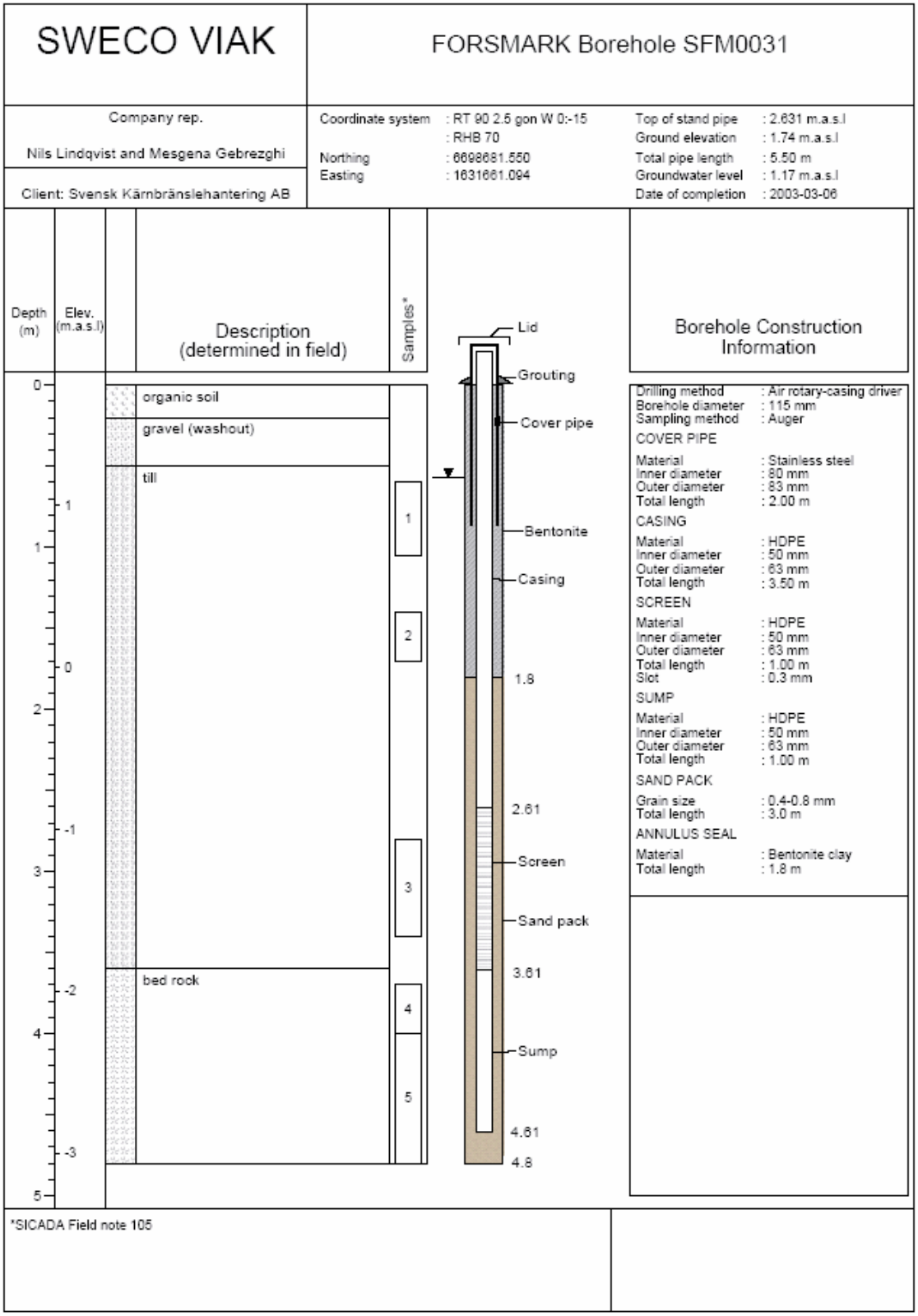

Figure A1-2. *Design of a B-type, double stand pipe for sampling of water. The filter section is placed one metre up from the bottom of the pipe. Note that all length information given in the database SICADA refers to Top Of Casing as zero point.*

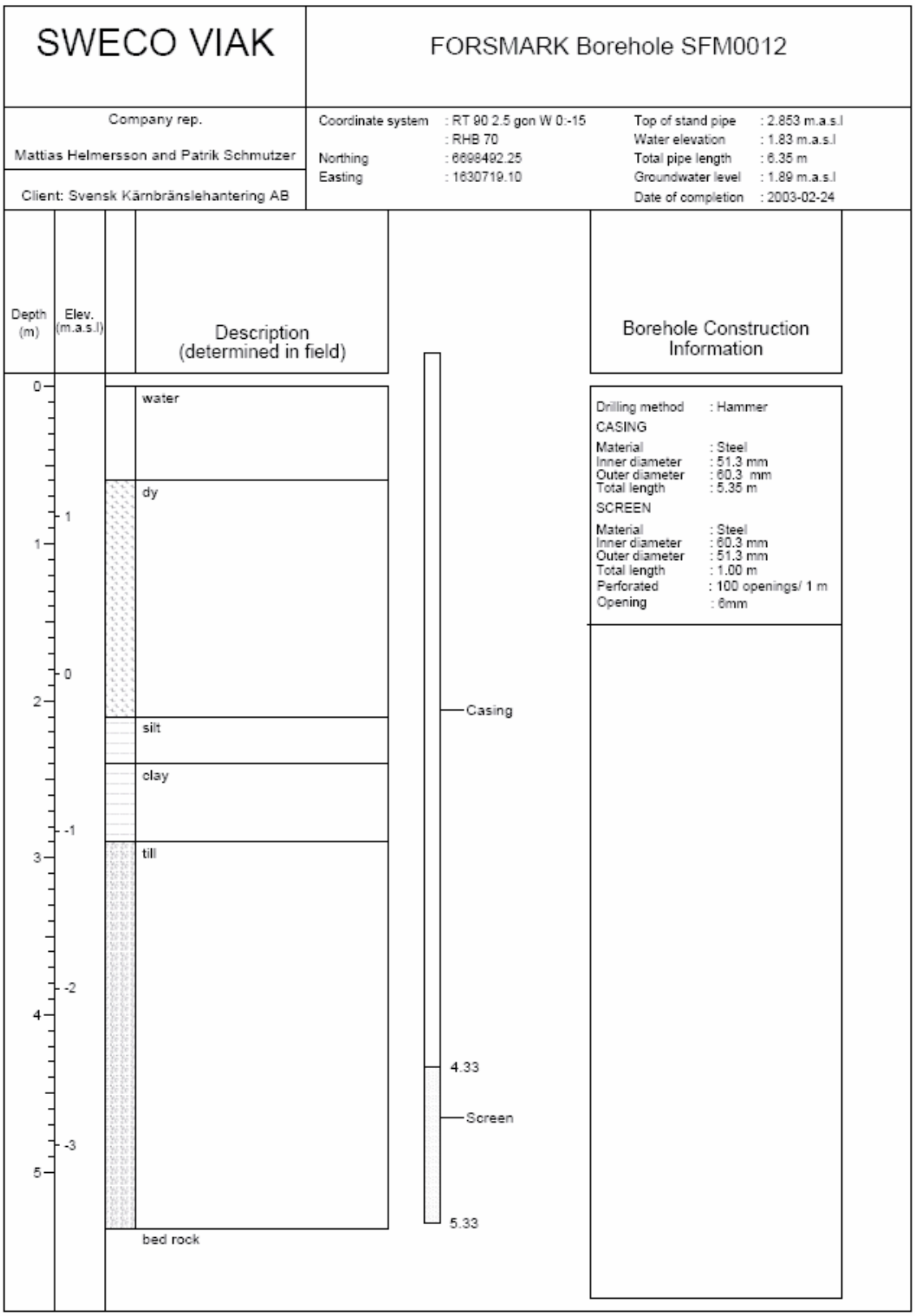

Figure A1-3. *Design of a C-type, stand pipe in sediment layer below open water. Note that all length information given in the database SICADA refers to Top Of Casing as zero point.*

Appendix 2

Sampling objects; selected photos presenting sampling locations

Photo no 1 (1215). *Sampling point SFM0001 (photo J. Skarp).*

Photo no 2 (1210). *Sampling point SFM0002 (photo J. Skarp).*

Photo no 3 (1214). *Sampling point SFM0003 (photo J. Skarp).*

Photo no 4 (1232). *Sampling point SFM0005 (photo J. Skarp).*

Photo no 5 (1241). *Sampling point SFM0006 (photo J. Skarp).*

Photo no 6 (1253). *Sampling point SFM0008 (photo J. Skarp).*

Photo no 7 (1236). *Sampling point SFM0009 (photo J. Skarp).*

Photo no 8 (1434). *Sampling point SFM0012 (photo J. Skarp).*

Photo no 9 (1446). *Sampling point SFM0015, turnover pumping (photo J. Skarp).*

Photo no 10 (1461). *Sampling point SFM0023, turnover pumping (photo J. Skarp).*

Photo no 11 (1414). *Sampling point SFM0025 (photo J. Skarp).*

Photo no 12 (1220). *Sampling point SFM0027 (photo J. Skarp).*

Photo no 13 (1253). *Sampling point SFM0029 (photo J. Skarp).*

Photo no 14 (1272). *Sampling point SFM0031 (photo J. Skarp).*

Photo no 15 (1282). *Sampling point SFM0032 (photo J. Skarp).*

Photo no 16 (1223). *Sampling point SFM0035 (photo J. Skarp).*

Photo no 17 (1302). *Sampling point SFM0037, turnover pumping (photo A. Spets).*

Photo no 18 (1269). *Sampling point SFM0057 (photo J. Skarp).*

Photo no 19 (1257). *Sampling point SFM0060 (photo J. Skarp).*

Photo no 20 (1334). *Sampling point PFM000007, turnover pumping (photo J. Skarp).*

Photo no 21 (1452). *Sampling point PFM000008 (photo J. Skarp).*

Photo no 22 (1458). *Sampling point PFM000009 (photo J. Skarp).*

Photo no 23. *Sampling point PFM000038 (photo M. Borgiel).*

Photo no 24 . *Sampling point PFM000039 (photo M. Borgiel).*

Photo no 25 (1375) *Sampling at sampling point PFM004179 (photo J. Skarp).*

Photo no 26 (1351). *Sampling point PFM002942 (photo J. Skarp).*

Photo no 27 (1343). *Sampling point PFM004778 (photo J. Skarp).*

Photo no 28. *January 2004 close to sampling point SFM0023 (photo A. Spets).*

Photo no 29. *Defrosting ice inside sampling object, located on lake, with a gasol burner (photo A. Spets).*

Photo no 30. *Steam was a useful method to defrost the ice inside the tubes when the wheather was hard (photo J. Skarp).*

Photo no 31. *A tent over the sampling object made sampling much easier in cold wheather conditions (photo J. Skarp).*

Photo no32. *Samling set up inside the tent, January 2004 (photo J. Skarp).*

Photo no 33. *Steam in action at night – trying to defrost sampling point SFM0025, Vargudden, in hard weather conditions (photo A. Spets).*

Photo no 34. *Sampling in winter is a real challenge sometimes – but fun (photo J. Skarp).*

Photo no 35. *Sampling point PFM002942, an old digged well, not in use for long time, had to be cleaned before any sampling action could be performed (photo A. Spets).*

Appendix 3

Sampling and analytical methods

Table A3-1. 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^-, SO4, 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	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	100	Yes	Yes (1 mL HNO_3)	ICP-AES ICP-MS	Not critical (month)

Component group	Component/ element	Sample container (material)	Volume (mL)	Filtering	Preparation/ conservation*	Analysis method	Analysis within – or delivery time to lab.
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,	^{3}H (enhanced.)	Plastic (dry bottle) Plastic	500	No	–	LSC	Not critical (month)
Chlorine-37	Chlorine-37		100	No	–	ICP MS	
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, ICP 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

Component group	Component/ element	Sample container (material)	Volume (mL)	Filtering	Preparation/ conservation*	Analysis method	Analysis within – or delivery time to lab.
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 immedia-tely***	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 concentra-tions of Nitrogen and Phosphorous	N-tot, P-tot	Plastic	100	No	No, frozen immedia-tely***	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 immedia-tely 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 immedia-tely	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 A3-2. 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%[5]
P	ICP	1		µg/L	6%	10%

Component	Method	Reporting limits or range		Unit	Measurement uncertainty [2]	"Total" uncertainty [3]
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	0.0051	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	ICP MS	0.2‰ (20 mg/L)		‰ SMOC[7]	–	–
$\delta^{13}C$	A (MS)	–		‰ PDB[8]	–	–
^{14}C pmc	A (MS)	–		PMC[9]	–	–
$\delta^{34}S$	ICP 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 4

Compilation of water analysis data

Table A4-1. Water compositon.

Idcode	Secup m	Seclow m	Date yyyy–mm–dd	Sample no	Charge Bal %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3 mg/L	Cl mg/L	SO_4 mg/L	SO_4–S mg/L	Br mg/l	F^- mg/L	Si mg/L	Fe mg/L	Fe(tot) mg/L	Fe(+II) mg/L	Mn mg/L	Li mg/L	Sr mg/L	pH (lab)	pH (Field)	Temp °C (Field)	El. Cond (lab) mS/m	HS^- mg/L	I^- mg/L
PFM000001			2003-11-03	8073	–1.4	46.7	31.8	162	32.8	615	50.3	123	40.2	0.29	0.42	6.29					0.027	0.466	6.99			126		
PFM000001			2004-04-27	8434	–2.1	40.8	27.4	149	30.2	585	43.7	99.1	33.6	–0.2	0.56	6.83					0.025	0.438	7.04			117		
PFM000001			2004-10-19	8687	–5.8	40.7	37.6	167	32.8	659	57.4	119	48.7	–0.2	0.42	7.56					0.027	0.480	6.86			128		
PFM000007			2003-11-03	8046	–0.04	7.1	9.8	207	6.9	519	4.8	131	44.8	–0.2	0.56	6.14					0.003	0.342	6.84			99.6		
PFM000007			2004-04-23	8435	–0.3	4.6	6.7	172	6.2	482	4.8	71.1	23.2	–0.2	0.68	6.26					–0.004	0.234	6.95			83.3		
PFM000007			2004-10-12	8680	–1.2	5.7	8.4	180	6.6	539	4.4	65.9	19.9	–0.2	0.69	7.23					–0.004	0.252	6.88			85.6		
PFM000008			2003-11-03	8050	–1.7	478	18.8	222	60.4	335	1,030	196	63.7	4.40	0.55	3.78					0.019	0.492	6.95			391		
PFM000008			2004-04-27	8437	–1.0	46.1	6.6	132	16.3	413	73.0	73.1	23.1	0.46	0.50	4.57					0.011	0.225	6.97			181		
PFM000008			2004-10-19	8682	–2.8	651	24.2	218	80.6	325	1,370	271	81.4	6.15	0.50	4.08					0.018	0.638	6.90			494		
PFM000009			2003-11-03	8078	0.4	1,860	27.4	894	193	61.3	4,730	310	103	22.8	0.70	5.94					0.048	8.12	6.99			1,420		
PFM000009			2004-04-27	8439	–2.2	1,330	22.3	1,010	176	51.9	4,400	220	58.9	23.5	1.30	5.84					0.041	8.73	6.79			1,320		
PFM000009			2004-10-18	8685	–2.3	1,840	26.9	843	189	73.6	4,850	359	107	29.2	0.85	6.45					0.044	7.71	7.13			1,410		
PFM000039			2003-09-04	4987		584	16.6	300	60.5		1,409	165	56.8	4.70	0.53	6.23					0.017	1.70						0.013
PFM000039			2003-11-03	8076	–0.3	1,350	25.9	762	159	161	3,640	287	92.0	16.7	–0.2	7.03					0.041	6.26	6.90			1,130		
PFM000039			2004-05-04	8438	–1.2	1,570	28.5	854	179	125	4,280	344	104	21.7	1.00	8.38					0.044	8.05	7.04			1,280		
PFM000039			2004-10-19	8686	–2.8	1,200	26.0	572	142	182	3,180	300	91.4	12.2	–0.2	7.15					0.030	4.50	6.92			983		
PFM002942			2003-11-04	8092	–1.2	28.6	9.6	158	16.0	310	23.5	266	83.3	–0.2	–0.2	3.27					0.010	0.250	7.25	7.13	6.6	99.4		
PFM002942			2004-04-26	8430	–1.6	14.0	3.2	127	10.9	375	20.7	74.7	23.1	–0.2	0.22	3.48					0.005	0.168	7.18	7.12	3.6	74.2		
PFM002942			2004-10-19	8684	–4.5	26.1	11.7	158	15.9	556	24.7	87.5	29.0	–0.2	–0.2	6.01					0.009	0.240	7.10	7.07	8.5	101		
PFM004179			2004-04-23	8432	–1.4	6.3	3.7	99.7	10.9	350	3.9	28	8.8	–0.2	0.37	4.76					0.010	0.169	7.31	7.33	5.6	59.2		
PFM004179			2004-10-18	8683	–0.9	9.8	5.1	145	16.4	504	6.6	43.2	13.5	0.07	0.36	5.56	0.141			0.024	0.012	0.253	6.90	6.84	9.0	81.7		0.005
PFM004504			2004-10-13	8662	1.1	15.4	4.1	93.8	6.9	247	12.1	68.4	23.7	0.07	0.40	5.27	0.415			0.092	–0.004	0.131	7.08	7.17	7.4	53.9		0.005
PFM004778			2003-11-03	8077	0.8	7.7	21.7	112	8.9	313	7.4	64	28.0	–0.2	0.34	3.27					0.009	0.160	7.28	7.02	6.4	65.5		
PFM004778			2004-04-23	8436	–0.8	5.7	17.9	99.7	8.0	346	7.6	27.1	8.6	–0.2	0.35	3.50					0.007	0.144	7.28	7.20	4.7	61.7		
PFM004778			2004-10-18	8670	–0.6	8.1	22.1	133	10.3	467	7.2	31.5	10.1	–0.2	0.31	4.73					0.008	0.187	6.97	6.94	8.3	75.6		
SFM0001	3.95	4.95	2002-07-18	4219	1.6	242	15.9	103	33.7	420	301	163	45.6	0.74	0.67	7.97	2.17			0.186	0.016	0.316	7.60	7.75	7.6	183	0.054	0.009
SFM0001	3.95	4.95	2002-09-20	4316	0.4	321	18.9	91.7	40.6	476	392	160	52.4	1.00	0.86	7.70	1.79			0.195	0.019	0.377	7.30					0.008
SFM0001	3.95	4.95	2002-12-12	4403	–4.5	254	16.9	89.1	36.5	428	371	195	51.2	1.00	0.59	6.64	1.73			0.173	0.014	0.349	7.30	7.59	7.7		0.054	0.005
SFM0001	3.95	4.95	2003-06-05	4808	2.9	255	15.1	80.5	32.0	422	259	126	45.6	0.89	0.59	6.25	1.06			0.244	0.013	0.314	7.47	7.20	5.6	179	0.050	0.005

Idcode	Secup m	Seclow m	Date yyyy–mm–dd	Sample no	Charge Bal %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3 mg/L	Cl mg/L	SO_4 mg/L	SO_4–S mg/L	Br mg/l	F^- mg/L	Si mg/L	Fe mg/L	Fe(tot) mg/L	Fe(+II) mg/L	Mn mg/L	Li mg/L	Sr mg/L	pH (lab)	pH (Field)	Temp °C (Field)	El. Cond (lab) mS/m	HS^- mg/L	I^- mg/L
SFM0001	3.95	4.95	2003-07-10	4900	–2.5	343	19.6	86.2	41.2	494	438	174	60.9	1.46	0.58	6.31					0.016	0.377	7.43	7.24	7.4	238		0.010
SFM0001	3.95	4.95	2003-10-28	8069	–1.3	408	23.7	98.0	51.9	582	509	216	69.9	0.95	0.70	7.20	1.96	1.85	1.84	0.221	0.023	0.500	7.24	7.18	8.0	267	0.058	
SFM0001	3.95	4.95	2004-01-20	8242	–0.8	126	12.3	64.4	21.7	331	127	97.8	31.6	0.47	0.57	6.39	1.10	1.26	1.21	0.181	0.009	0.237	7.34	7.33	5.7	111	0.085	0.007
SFM0001	3.95	4.95	2004-04-19	8418	5.0	118	11.0	80.1	22.2	272	118	113	38.5	0.55	0.54	6.46	1.42	1.49	1.47	0.153	0.009	0.254	7.25	7.22	5.0	107	0.064	0.006
SFM0001	3.95	4.95	2004-07-06	8583	0.2	258	15.8	85.0	32.4	430	291	156	51.8	0.99	0.70	6.59	1.38	1.49	1.51	0.177	0.015	0.316	7.37	7.22	6.8	181		0.008
SFM0001	3.95	4.95	2004-10-12	8661	–2.4	380	22.2	91.1	46.8	550	473	219	71.1	1.75	0.56	7.76	1.76	1.99	1.95	0.206	0.019	0.419	7.30	7.23	8.3	265		0.011
SFM0001	3.95	4.95	2005-01-24	8775	–2.0	301	20.8	108	45.7	561	354	200	71.9	1.43	0.70	8.96					0.015	0.445	7.12	7.05	5.4	229		0.018
SFM0001	3.95	4.95	2005-04-11	8853	8.0	245	18.7	108	42.3	486	185	185	62.7	1.41	0.62	8.49	2.56	2.91	2.88	0.233	0.018	0.404	7.08	7.18	5.0	194	0.102	0.019
SFM0002	4.21	5.21	2002-07-18	4220		40.7	6.2		11.8	330	126	19.6	7.3	0.33	0.58	8.24	3.46			0.420	0.006	0.254	7.50	7.65	10.2	91.7		0.008
SFM0002	4.21	5.21	2002-09-20	4318	–4.0	43.1	5.4	129	9.5	390	113	18	6.2	0.34	0.63	6.27	2.26			0.240	0.005	0.204	7.20					0.010
SFM0002	4.21	5.21	2002-12-12	4405	1.6	46.7	6.1	131	9.7	351	100	46.9	9.9	0.33	0.66	5.99	1.10			0.333	0.005	0.209	7.40	7.33	7.1			0.007
SFM0002	4.21	5.21	2003-06-04	4806	–0.6	21.8	4.1	108	8.0	341	40.6	18.1	6.8	0.10	0.70	5.05	1.32			0.186	–0.004	0.167	7.36	7.01	6.7	68.4	0.070	0.005
SFM0002	4.21	5.21	2003-07-09	4898	–0.5	22.0	4.5	117	8.1	357	48.4	16.8	6.8	0.13	0.28	5.08					–0.004	0.173	7.28	6.95	10.4	71.5		0.007
SFM0002	4.21	5.21	2003-10-28	8067	–0.3	36.9	5.2	129	9.2	342	99.8	29.9	9.9	0.42	0.54	5.45	2.30	2.17	1.99	0.179	0.005	0.194	7.05	6.97	8.7	84.4		
SFM0002	4.21	5.21	2004-01-14	8238	–2.6	26.2	4.3	105	7.5	335	57.5	21.6	6.8	0.14	0.47	5.29		1.94	1.88	0.168	0.003	0.152	7.09	7.17	6.5	71.9	0.049	0.006
SFM0002	4.21	5.21	2004-04-19	8414	0.1	17.1	3.9	103	7.4	320	35.8	19.1	5.8	0.15	0.54	5.35	1.75	1.77	1.74	0.157	0.003	0.161	7.12	6.99	6.1	62.0	0.021	0.006
SFM0002	4.21	5.21	2004-07-06	8586	1.3	16.8	3.8	109	7.5	324	37.2	19.3	6.4	0.15	0.47	5.41	1.77	1.90	1.86	0.156	0.004	0.162	7.12	6.93	8.5	65.9		0.005
SFM0002	4.21	5.21	2004-10-12	8659	–0.7	21.7	4.8	115	7.8	346	51.4	22.5	7.7	0.21	0.45	6.04	1.94	2.20	2.14	0.149	–0.004	0.171	7.08	7.03	9.1	70.8		0.009
SFM0002	4.21	5.21	2005-01-20	8767	–1.3	15.2	4.3	114	8.0	362	30.8	23.0	7.7	0.39	0.42	6.22					–0.004	0.167	7.05	7.14	6.1	67.6		0.016
SFM0002	4.21	5.21	2005-04-11	8858	2.4	13.1	4.2	112	8.3	342	23.1	19.9	6.7	0.19	0.45	6.03	1.82	2.00	1.99	0.142	0.004	0.160	7.06	7.11	5.8	63.5	0.038	0.011
SFM0003	8.98	10.98	2002-07-18	4221		33.4	15.8		31.2	410	18.6	81.4	25.5	0.02	0.78	14.0	5.74			0.362	0.020	0.499	7.60	7.49	7.5	83.5	–0.002	0.004
SFM0003	8.98	10.98	2002-09-20	4317	–2.8	33.5	13.7	97.3	27.0	454	17.9	75.3	22.8	0.10	0.77	9.56	1.48			0.197	0.013	0.446	7.40	6.93	8.5		–0.002	0.005
SFM0003	8.98	10.98	2002-12-12	4404	–0.5	31.1	13.6	93.0	25.2	426	12.7	60.8	18.2	0.08	0.69	9.25	1.33			0.166	0.014	0.422	7.40	7.44	7.5		–0.002	0.004
SFM0003	8.98	10.98	2003-06-04	4807	0.0	27.6	13.4	92.4	26.8	429	8.8	49.3	16.9	0.07	0.78	9.32	1.06			0.182	0.015	0.461	7.52	7.23	6.6	75.4	0.011	0.005
SFM0003	8.98	10.98	2003-07-09	4902	–3.5	23.7	13.3	92.5	25.9	433	19.0	47.9	16.7	–0.2	0.64	8.78					0.013	0.464	7.38	7.21	6.7	76.0		0.029
SFM0003	8.98	10.98	2003-10-28	8065	–0.3	25.2	13.5	94.5	27.3	425	12.9	57.9	18.8	–0.2	0.57	9.02	1.58	1.76	1.72	0.168	0.016	0.439	7.30	7.20	6.7	74.8	0.011	
SFM0003	8.98	10.98	2004-01-19	8240		24.3	12.9	86.9	25.3	420	12.8	57.7	17.4	0.08	0.69	9.34		1.64	1.65	0.170			7.39	7.18	6.2	75.3	0.007	0.008
SFM0003	8.98	10.98	2004-04-19	8415	0.3	26.0	13.2	90.7	25.8	410	11.2	53.3	17.0	0.06	0.70	10.2	1.48	1.54	1.51	0.184	0.015	0.466	7.28	7.28	6.7	72.5	0.003	0.006
SFM0003	8.98	10.98	2004-07-06	8585	–0.1	24.4	12.5	92.0	26.0	418	9.5	51.0	16.9	0.06	0.58	9.81	1.53	1.61	1.59	0.185	0.014	0.455	7.26	7.08	6.6	73.7		0.005
SFM0003	8.98	10.98	2004-10-12	8660	–0.1	24.3	13.7	93.3	26.4	418	11.3	56.2	18.3	0.06	0.57	10.3	1.65	1.88	1.86	0.185	0.016	0.466	7.28	7.09	6.7	75.9		0.006
SFM0003	8.98	10.98	2005-01-24	8778	–0.2	25.0	14.4	98.1	25.6	422	11.8	56.8	19.5	0.20	0.57	11.8					0.013	0.480	7.28	7.23	6.3	76.0		0.011
SFM0003	8.98	10.98	2005-04-06	8851	2.8	26.2	15.4	104	28.2	430	11.1	53.4	19.9	0.11	0.48	12.2	1.46	1.75	1.71	0.205	0.015	0.499	7.22	7.34	6.4	75.8	–0.002	0.009
SFM0005	2.21	3.21	2002-12-16	4432	2.1	5.8	1.9	85.6	5.4	261	7.4	13.6	4.8	0.05	0.35	3.81	0.043			0.030	–0.004	0.109	7.49	7.70	5.3		–0.002	0.005
SFM0005	2.21	3.21	2003-06-03	4805	1.3	8.3	1.9	104	4.8	319	8.9	16.8	6.0	0.003	–0.2	3.92	0.132	0.053	0.024	0.352	–0.004	0.111	7.19	6.89	6.8	55.7	0.010	0.005
SFM0005	2.21	3.21	2004-01-12	8232	–3.1	8.7	1.7	111	5.2	362	17.1	19.5	6.2	0.08	–0.2	4.29	0.052	0.056	0.027	0.051	0.002	0.110	6.96	6.94	4.3	63.0	0.011	0.018

Idcode	Secup m	Seclow m	Date yyyy–mm–dd	Sample no	Charge Bal %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3 mg/L	Cl mg/L	SO_4 mg/L	SO_4–S mg/L	Br mg/l	F^- mg/L	Si mg/L	Fe mg/L	Fe(tot) mg/L	Fe(+II) mg/L	Mn mg/L	Li mg/L	Sr mg/L	pH (lab)	pH (Field)	Temp °C (Field)	El. Cond (lab) mS/m	HS^- mg/L	I^- mg/L
SFM0005	2.21	3.21	2004-04-20	8426	1.1	7.7	1.7	125	6.2	376	17.0	15.5	5.3	0.09	–0.2	4.44	0.050	0.055	0.039	0.105	0.003	0.127	6.84	6.77	3.8	63.5	0.004	0.021
SFM0005	2.21	3.21	2004-07-13	8598	0.9	5.4	2.1	111	4.7	356	4.7	8.09	2.3	0.06	–0.2	4.69	0.065	0.065	0.035	0.038	0.008	0.106	6.92	6.86	8.4	54.9		0.018
SFM0005	2.21	3.21	2005-01-24	8771	0.1	6.4	1.9	126	6.1	406	7.3	11.9	3.9	0.25	–0.2	5.45					–0.004	0.121	6.73	6.78	4.2	64.1		0.063
SFM0005	2.21	3.21	2005-04-08	8854	3.4	6.0	1.6	92.9	4.2	279	4.4	10.0	3.9	0.04	–0.2	4.35	0.082	0.139	0.106	0.073	0.002	0.084	6.84	7.03	3.5	46.4	–0.002	0.017
SFM0006	3.21	4.21	2003-05-07	4764	2.6	23.2	21.4	143	12.6	353	56.4	88.8	29.4	0.21	0.55	5.32	0.013			0.003	0.003	0.237	7.50	7.12	6.5	91.5	0.006	0.003
SFM0006	3.21	4.21	2003-06-03	4810	0.3	29.6	24.6	170	14.1	435	68.1	106	38.7	0.34	0.54	5.55	0.015	0.018		0.339	–0.004	0.263	7.69	7.01	6.7	113	0.006	0.003
SFM0006	3.21	4.21	2004-01-15	8234	–2.4	20.4	25.7	137	8.7	442	28.1	74	24.1	0.15	0.23	5.50	0.007	0.010	0.003	0.103	0.003	0.170	7.30	7.28	4.8	90.1	0.006	0.003
SFM0006	3.21	4.21	2004-04-21	8413	1.1	18.3	25.6	146	10.0	411	40.1	62.9	23.7	–0.2	0.30	6.01	0.007	0.014	0.005	0.065	0.003	0.188	7.17	7.07	4.9	82.9	0.006	
SFM0006	3.21	4.21	2005-01-19	8763	–2.1	9.5	26.5	125	8.0	369	30.8	70.6	22.3	0.45	0.27	6.09					–0.004	0.149	7.16	7.20	5.0	85.1		0.014
SFM0006	3.21	4.21	2005-04-08	8855	4.2	8.9	26.0	131	8.8	344	28.0	51.5	19.3	0.09	0.21	5.94	0.010	0.016	–0.004	0.004	0.007	0.154	7.16	7.29	4.2	71.3	–0.002	0.002
SFM0008	5.14	6.14	2003-06-02	4812	–1.2	9.2	7.1	140	17.6	441	18.3	74.9	23.5	0.06	0.73	5.17	0.593			0.165	0.013	0.229	7.20	6.92	6.0	81.4	–0.002	–0.001
SFM0008	5.14	6.14	2003-07-07	4895	0.6	12.1	7.3	152	17.7	445	18.9	93.9	28.7	0.07	0.33	4.96					0.011	0.238	7.22	6.87	6.4	84.3		0.001
SFM0008	5.14	6.14	2003-10-29	8070	2.9	63.6	7.5	186	18.2	356	198	73.8	24.6	0.82	0.31	4.60	0.287	0.312	0.284	0.152	0.011	0.303	6.99	6.94	7.6	130	0.006	
SFM0008	5.14	6.14	2004-01-13	8236	–4.5	33.1	7.4	212	17.6	345	266	91.9	28.8	0.37	0.24	4.48	0.752	0.452	0.415	0.118	0.011	0.275	7.05	6.98	6.5	142	0.005	0.001
SFM0008	5.14	6.14	2004-04-20	8416	–2.5	29.6	6.7	183	16.8	365	175	88.1	26.7	0.37	0.42	4.59	0.457	0.506	0.508	0.086	0.011	0.263	7.07	6.97	5.3	118	0.002	
SFM0008	5.14	6.14	2004-07-05	8584	–0.2	25.8	6.0	154	15.4	396	82.0	78.9	23.4	0.14	0.32	4.54	0.390	0.441	0.423	0.114	0.008	0.226	7.13	6.83	6.3	102		0.001
SFM0008	5.14	6.14	2004-10-15	8672	–3.5	39.4	5.9	138	12.2	385	113	51.9	15.6	0.27	0.32	4.55	0.406	0.494	0.462	0.132	0.004	0.199	7.06	6.97	8.0	92.5		0.007
SFM0008	5.14	6.14	2005-01-25	8779	1.8	23.0	7.4	170	16.7	364	107	74.2	26.3	0.24	0.53	5.49					0.010	0.255	7.08	7.09	5.5	108		0.007
SFM0008	5.14	6.14	2005-04-07	8845	2.1	20.1	6.9	169	16.4	359	101	78.7	26.5	0.15	0.45	5.14	0.602	0.747	0.678	0.068	0.011	0.235	7.00	7.10	5.3	101	–0.002	0.004
SFM0009	2.00	3.00	2003-03-31	4674	–1.6	4.7	2.4	80.8	5.6	260	4.8	20.9	7.9	0.04	0.44	3.40					–0.004	0.099						0.003
SFM0009	2.00	3.00	2003-07-08	4897	–1.3	5.1	2.7	88.3	5.5	280	6.2	21.5	7.8	0.05	0.55	3.57					–0.004	0.093	7.30	7.05	8.3	45.0		0.010
SFM0009	2.00	3.00	2003-10-29	8066	0.1	7.2	3.2	117	7.8	327	4.2	68.0	21.9	–0.2	0.27	4.41	0.039	0.058	0.021	0.060	0.004	0.126	7.11	7.04	8.1	62.4	0.048	
SFM0009	2.00	3.00	2004-01-12	8233	–2.6	5.9	1.9	84.6	5.5	276	13.4	16.7	5.4	0.08	0.21	4.23	0.201	0.029	0.017	0.005	0.003	0.087	7.39	7.23	5.9	51.0	0.050	0.004
SFM0009	2.00	3.00	2004-04-20	8427	3.3	5.9	1.9	88.5	5.8	252	13.4	18.1	5.5	0.04	0.30	3.93	0.019	0.030	0.023	0.005	0.004	0.096	7.22	7.24	5.3	47.9	0.005	0.003
SFM0009	2.00	3.00	2004-07-13	8596	0.8	6.2	2.7	92.5	5.9	286	9.8	18.3	6.2	0.07	0.29	4.20	0.029	0.027	0.010	0.033	0.008	0.098	7.24	7.07	7.7	50.0		0.005
SFM0009	2.00	3.00	2004-10-13	8666	–0.8	6.4	2.7	103	6.5	320	8.4	29.0	9.9	–0.20	0.28	4.82	0.049	0.025	0.010	0.047	0.004	0.111	7.07	7.07	9.1	53.5	0.007	0.009
SFM0009	2.00	3.00	2005-01-24	8777	1.0	5.2	2.4	87.5	5.8	244	10.8	32.1	11.3	0.19	0.35	4.60					–0.004	0.091	7.30	7.10	5.9	46.3		0.010
SFM0009	2.00	3.00	2005-04-07	8846	3.5	5.1	2.4	92.4	6.4	258	9.8	24.5	8.5	0.06	0.30	4.25	0.016	0.018	0.000	0.005	0.004	0.093	7.24	7.35	4.8	48.5	–0.002	0.006
SFM0010	1.00	2.00	2003-04-03	4672		2.2	2.2	66.1	4.2	240			2.9	0.01		4.07					–0.004	0.077						
SFM0011	3.50	4.50	2003-03-31	4668	–2.1	1,020	24.2	148	72.1	326	1,778	219	82.9	7.03	0.48	5.47					0.026	1.13						0.021
SFM0012	5.35	6.35	2003-04-24	4730	–1.8	1,090	34.8	341	95.4	295	2,340	226	79.7	8.31	0.70	5.68					0.034	2.30						0.042
SFM0012	5.35	6.35	2003-06-04	4809	–0.1	1,160	34.0	287	92.8	344	2,240	203	72.2	8.54	0.52	6.75					0.035	2.03	7.23	7.16	8.8	763	0.133	0.048
SFM0012	5.35	6.35	2003-07-14	4921	–2.2	1,080	33.8	274	89.0	344	2,192	201	70.5	9.47	0.46	6.81					0.032	1.92	7.34	6.94	10.9	736		0.058
SFM0012	5.35	6.35	2003-11-05	8080	–1.3	1,100	34.5	272	90.7	349	2,180	209	68.0	11.8	0.60	7.20					0.035	1.94	6.94	6.92	9.5	719		
SFM0012	5.35	6.35	2004-01-19	8249	–2.2	1,100	34.7	296	90.5	299	2,290	227	71.9	10.7		6.77					0.031	2.07	6.98	7.16	6.2	769		0.071

Idcode	Secup m	Seclow m	Date yyyy–mm–dd	Sample no	Charge Bal %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3 mg/L	Cl mg/L	SO_4 mg/L	SO_4–S mg/L	Br mg/l	F^- mg/L	Si mg/L	Fe mg/L	Fe(tot) mg/L	Fe(+II) mg/L	Mn mg/L	Li mg/L	Sr mg/L	pH (lab)	pH (Field)	Temp °C (Field)	El. Cond (lab) mS/m	HS^- mg/L	I^- mg/L
SFM0012	5.35	6.35	2004-04-26	8424	–2.4	1,080	34.3	278	89.4	344	2,210	234	70.5	11.7	1.00	7.88					0.033	1.99	7.14	6.99	8.1	745		
SFM0012	5.35	6.35	2004-07-08	8593	–2.3	1,070	36.3	267	89.3	348	2,170	217	69.3	8.61	0.75	7.30					0.037	1.86	7.18	6.96	9.5	752		0.055
SFM0012	5.35	6.35	2004-10-14	8676	–2.9	1,090	33.9	272	88.4	341	2,240	225	70.6	8.25	0.75	7.86					0.032	1.90	7.17			714		
SFM0012	5.35	6.35	2005-01-19	8768		1,150	37.0		96.7	364	2,160	212	74.4	9.50		10.2					0.034	2.26	7.14	7.06	7.4	737		0.059
SFM0012	5.35	6.35	2005-04-05	8864	–0.6	1,090	35.4	309	88.4	345	2,210	204	69.8	8.90	0.89	9.36					0.034	2.13	7.13	7.23	8.7	730		0.181
SFM0013	4.48	5.48	2003-03-31	4671	–2.1	794	30.9	250	96.2	242	1,777	163	63.3	8.79	0.96	5.08					0.025	2.37						0.027
SFM0014	2.00	3.00	2003-02-18	4513	–1.6	14.9	5.2	85.3	7.1	317	7.2	13.8	6.0	0.05	0.68	4.53					0.005	0.171	7.65			53.4		0.006
SFM0015	6.34	7.34	2003-02-26	4517	–3.7	245	27.9	35.7	57.2	688	277	3.41	1.5	1.09	0.61	7.98					0.019	0.480						0.072
SFM0015	6.34	7.34	2003-06-04	4811	0.7	320	28.4	34.5	60.8	709	333	1	0.53	1.54	0.88	7.81					0.018	0.481	7.50	7.38	10.6	216	0.091	0.089
SFM0015	6.34	7.34	2003-07-14	4922	–3.7	274	28.9	34.7	59.8	741	304	0.65	0.50	1.30	0.59	8.05					0.017	0.498	7.38	7.15	14.2	220		0.087
SFM0015	6.34	7.34	2003-11-05	8079	–4.7	262	28.8	35.3	60.7	733	307	0.33	0.72	1.59	0.52	8.29					0.018	0.496	7.15	7.10	8.7	194		
SFM0015	6.34	7.34	2004-01-15	8251	–5.0	259	28.0	33.1	57.9	738	290	–0.2	0.47	1.10	0.49	8.26					0.015	0.428	7.34	7.53	3.6	197		0.086
SFM0015	6.34	7.34	2004-07-13	8591	–4.4	271	29.2	40.3	63.2	773	313	–0.2	0.47	1.21	0.28	8.77					0.024	0.537	7.28	7.18	14.7	196		0.081
SFM0015	6.34	7.34	2004-10-15	8677	–7.7	266	29.0	39.7	61.6	730	375	0.33	0.25	2.34	0.26	9.08					0.018	0.534	7.20	7.24	10.6	191		
SFM0015	6.34	7.34	2005-01-18	8762	21.6	459	50.3	62.8	95.8	740	303	–0.2	1.0	1.85	0.80	14.2					0.026	0.830	7.22	7.36	7.4	202		0.106
SFM0015	6.34	7.34	2005-04-05	8863	–3.1	283	29.6	38.8	62.5	739	327		0.50	1.52	0.80	9.99					0.019	0.506	7.25	7.14	9.5	207		0.153
SFM0016	7.50	8.50	2003-02-27	4512	–3.2	23.0	3.6	90.0	7.5	335	26.0	14.7	5.8	0.08	0.45	4.90					–0.004	0.179	7.58			68.0		0.006
SFM0017	4.00	5.00	2003-02-25	4515	2.5	153	8.6	44.3	11.3	536	17.7	7.42	2.8	0.07	1.22	7.19					0.007	0.169						0.008
SFM0018	4.50	5.50	2003-02-27	4519	–2.3	129	6.1	29.0	4.4	429	11.8	19.8	7.7	0.05	1.48	4.16					–0.004	0.080						0.006
SFM0019	4.50	5.50	2003-03-25	4667	–3.2	7.0	5.9	97.8	9.6	348	5.1	29.9	10.3	0.10	0.63	5.02					0.005	0.272						0.007
SFM0020	3.00	4.00	2003-03-19	4631	–2.1	8.0	5.1	116	8.1	366	10.9	43.1	14.3	0.06	0.68	4.46					0.005	0.179						0.003
SFM0021	2.00	3.00	2003-04-08	4725		10.6	4.9	116	11.5	378			14.3	0.04		4.29					0.007	0.184						0.002
SFM0022	5.30	5.80	2004-02-05	8263	–3.9	495	26.7	117	48.8	387	947	83.9	26.1	3.20	0.28	6.82					0.019	1.48	7.39			345		0.061
SFM0022	5.30	5.80	2004-07-13	8594	–1.0	627	30.9	149	61.4	373	1,170	98.7	34.4	4.40	1.00	8.34					0.027	2.03	7.39	7.34	11.3	419		0.056
SFM0022	5.30	5.80	2004-10-15	8675	2.9	629	30.8	282	63.5	366	1,290	122	37.1	5.00	1.45	9.61					0.025	2.26	7.31	7.29	9.6	426		
SFM0022	5.30	5.80	2005-01-18	8761	9.5	688	32.4	356	67.8	321	1,300	117	43.5	6.40	0.80	11.1					0.030	2.62	7.15			482		0.072
SFM0023	4.42	5.42	2003-03-04	4516		1,600	63.3	512	178	152		345	114	13.4	0.80	4.89					0.057	3.56						0.048
SFM0023	4.42	5.42	2003-07-16	4920	–1.8	1,600	66.3	543	174	117	3,810	352	118	14.2	0.64	5.86					0.057	3.67	6.38	7.05	16.9	1,169		0.048
SFM0023	4.42	5.42	2003-11-06	8083	–1.0	1,630	66.2	558	179	170	3,810	350	113	16.4	0.35	4.83					0.054	3.76	6.55	7.33	8.7	1,150		
SFM0023	4.42	5.42	2004-01-16	8252	–2.1	1,580	64.9	546	173	166	3,780	364	116	15.2	–0.2	4.43					0.047	3.76	6.92	7.70	5.3	1,190		0.058
SFM0023	4.42	5.42	2004-04-28	8440	–1.6	1,570	63.9	544	174	147	3,730	387	116	19.9	1.00	7.00					0.054	3.75	6.75	7.34	9.7	1,170		
SFM0023	4.42	5.42	2004-07-08	8545	–2.2	1,570	69.6	520	176	113	3,770	361	115	13.5	–0.2	6.38					0.060	3.49	6.87	7.04	17.3	1,200		0.048
SFM0023	4.42	5.42	2004-10-18	8678	–2.5	1,580	64.2	518	173	71.6	3,830	349	109	12.7	–0.2	1.19					0.053	3.49	6.64	7.43	9.3	1,160		
SFM0023	4.42	5.42	2005-01-24	8774	–1.3	1,620	65.2	497	169	110	3,720	330	111	15.4	–0.2	1.78					0.048	3.48	6.63	7.82	6	1,140		0.056
SFM0023	4.42	5.42	2005-04-11	8861	–1.0	1,580	69.5	496	167	46.3	3,660	322	109	16.4	0.42	0.93					0.055	3.93	6.71	7.35	7.7	1,130		0.291

Idcode	Secup m	Seclow m	Date yyyy–mm–dd	Sample no	Charge Bal %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3 mg/L	Cl mg/L	SO_4 mg/L	SO_4–S mg/L	Br mg/l	F^- mg/L	Si mg/L	Fe mg/L	Fe(tot) mg/L	Fe(+II) mg/L	Mn mg/L	Li mg/L	Sr mg/L	pH (lab)	pH (Field)	Temp °C (Field)	El. Cond (lab) mS/m	HS^- mg/L	I^- mg/L
SFM0024	2.71	3.21	2003-03-26	4670	–1.7	918	38.8	136	120	349	1,702	252	92.2	5.85	0.36	5.62					0.029	1.01						0.012
SFM0024	2.71	3.21	2003-07-14	4918	–2.0	880	42.0	139	111	352	1,634	272	92.5	5.50	0.32	6.46					0.026	0.990	7.74	7.09	17.0	583		0.011
SFM0024	2.71	3.21	2003-11-06	8082	–1.5	970	43.3	141	121	348	1,800	282	90.2	7.65	–0.2	6.27					0.029	1.07	7.08	7.39	8.3	615		
SFM0025	6.06	7.06	2003-03-20	4634	6.1	354	13.0	195	41.3	197	690	157	44.2	4.13	1.31	5.49					0.015	1.90						0.021
SFM0025	6.06	7.06	2003-07-09	4901	5.3	728	18.3	439	79.2	246	1,620	265	75.8	7.82	0.36	8.10					0.023	4.37	7.13	6.91	10.1	658		0.029
SFM0025	6.06	7.06	2003-11-04	8081	–1.7	723	18.8	415	75.2	240	1,850	230	74.8	9.40	0.60	8.89					0.024	4.25	7.07	6.82	10.7	624		
SFM0025	6.06	7.06	2004-01-14	8248	–2.6	722	18.5	420	76.6	245	1,900	233	74.8	7.26	0.20	8.57					0.022	4.37	7.07	7.10	8.2	625		0.030
SFM0025	6.06	7.06	2004-04-26	8425	–1.3	748	18.2	446	81.9	232	1,950	254	76.3	10.7	0.85	9.24					0.023	4.59	6.99	6.87	7.8	657		
SFM0025	6.06	7.06	2004-07-09	8592	–1.9	736	19.4	443	81.1	243	1,950	240	75.5	7.47	–0.2	8.81					0.025	4.36	7.05	6.91	10	674		0.028
SFM0025	6.06	7.06	2004-10-14	8674	–2.9	716	18.6	415	75.5	240	1,890	241	76.2	12.4		9.72					0.022	4.16	7.02	7.12	10.4	599		
SFM0025	6.06	7.06	2005-01-20	8770	–0.7	751	19.2	435	78.6	245	1,890	221	78.4	7.90	–0.2	9.12					0.021	4.31	7.05	6.95	8.1	635		0.033
SFM0025	6.06	7.06	2005-04-13	8862		776	20.6	450	78.9	245		220	84.7	13.0		10.7					0.024	5.38	6.97	7.13	7.3	654		0.039
SFM0026	16.0	17.0	2003-03-24	4633	–3.5	73.4	8.2	98.8	12.9	383	96.7	50.1	16.9	0.30	0.48	5.59					0.010	0.381						0.006
SFM0027	7.00	8.00	2003-04-25	4729	–1.5	143	8.6	34.7	12.0	403	63.3	50.2	16.4	0.18	0.52	7.71					0.014	0.235						0.006
SFM0027	7.00	8.00	2003-07-09	4896	–1.0	142	8.3	35.9	12.0	406	59.7	46.8	16.1	0.19	0.20	7.34					0.011	0.244	7.95	7.68	10.3	90.0		0.005
SFM0027	7.00	8.00	2003-10-30	8071	–1.2	140	8.2	36.2	12.2	402	62.3	47.5	15.5	0.26	0.43	7.64	0.026	0.049	0.022	0.077	0.011	0.238	7.64	7.72	5.4	87.6		
SFM0027	7.00	8.00	2004-01-15	8241	–4.5	129	7.8	35.2	11.7	407	61.9	47.4	14.3	0.23	0.48	7.90	0.057	0.099	0.080	0.101	0.006	0.191	7.91	7.90	5.6	92.5	0.008	0.007
SFM0027	7.00	8.00	2004-04-21	8422	–2.8	128	8.2	43.8	14.0	417	64.6	52.4	15.4	0.36	0.46	9.01	0.188	0.146	0.130	0.074	0.013	0.312	7.68	7.66	6.6	86.2	0.009	
SFM0027	7.00	8.00	2004-07-07	8588	–2.3	125	8.0	44.0	14.0	409	62.0	48.5	15.1	0.20	0.37	8.61	0.100	0.164	0.127	0.073	0.012	0.302	7.72	7.55	11.9	89.9		0.006
SFM0027	7.00	8.00	2004-10-18	8664	–3.4	128	8.2	42.4	13.5	416	65.4	49.9	15.3	0.25	0.48	9.02	0.252			0.068	0.010	0.294	7.65	7.61	7.7	87.4	0.023	0.007
SFM0027	7.00	8.00	2005-01-19	8764	5.7	123	8.7	47.6	13.8	328	60.5	48.2	16.1	0.51	0.32	10.3					0.010	0.315	7.65	7.70	5.8	89.4		0.017
SFM0027	7.00	8.00	2005-04-06	8848	10.51	125	9.3	51.3	15.5	301	61.5	48.4	16.5	0.32	0.29	10.6	0.334	0.316	0.301	0.070	0.014	0.336	7.59	7.70	7.7	89.3	0.020	0.009
SFM0028	7.00	8.00	2003-03-17	4636	–1.8	16.3	5.7	112	11.7	384	13.1	46.3	16.0	0.07	0.46	5.42					0.007	0.212						0.007
SFM0029	7.00	8.00	2003-07-08	4893	–0.6	15.5	4.7	127	11.1	401	18.4	50.3	16.4	0.08	0.38	5.02					0.008	0.196	7.13	6.89	10	70.5		0.007
SFM0029	7.00	8.00	2003-10-28	8068	–1.3	33.4	5.4	121	12.9	403	42.5	55.3	18.1	–0.2	0.31	5.63	2.16	0.378	0.366	0.159	0.009	0.215	7.09	7.06	6.7	78.3		
SFM0029	7.00	8.00	2004-01-20	8237	–3.0	17.2	4.6	112	10.7	392	18.7	48.6	14.5	0.09	0.31	5.63	1.56	1.84	1.81	0.237	0.006	0.189	7.11	6.90	6.6	72.1	0.015	0.007
SFM0029	7.00	8.00	2004-04-20	8419	0.5	14.7	4.6	122	11.2	389	15.4	49.7	15.1	–0.2	0.40	6.13	2.08	2.02	2.01	0.204	0.008	0.201	7.09	6.97	6.8	70.2	0.005	
SFM0029	7.00	8.00	2004-07-13	8595	–0.1	14.9	5.1	133	12.0	430	13.8	51.9	16.7	0.04	0.33	5.82	1.93	2.16	2.00	0.179	0.013	0.204	7.02	6.91	6.6	74.1		0.008
SFM0029	7.00	8.00	2004-10-13	8668	–2.1	28.3	5.3	127	12.9	430	35.7	57.7	18.3	0.15	0.36	6.29	1.49	1.71	1.69	0.205	0.007	0.219	7.05	6.98	7.0	78.7	0.012	0.011
SFM0029	7.00	8.00	2005-01-21	8773	–1.6	16.8	5.1	133	11.6	435	16.8	52.7	17.6	0.27	0.30	7.05					0.007	0.210	6.96	7.07	6.5	78.4		0.017
SFM0029	7.00	8.00	2005-04-07	8852	2.3	17.1	5.2	134	12.1	415	14.8	49.9	16.4	0.10	0.29	6.97	1.82	2.05	2.00	0.218	0.008	0.206	7.01	7.11	6.2	75.0	–0.002	0.011
SFM0030	4.00	5.00	2003-03-11	4616	–2.4	111	12.8	67.3	19.3	406	69.4	105	31.0	0.27	1.03	6.05					0.011	0.354						0.008
SFM0031	3.50	4.50	2003-07-09	4899	–0.7	15.1	10.3	160	15.9	468	7.7	124	39.5	0.05	0.22	7.23					0.011	0.395	7.24	6.92	9.5	90.5		0.004
SFM0031	3.50	4.50	2003-10-30	8072	–0.7	18.6	10.5	150	17.6	457	7.4	115	39.3	–0.2	0.50	7.68	0.261	0.092	0.082	0.248	0.011	0.391	6.98	7.06	6.5	86.3		
SFM0031	3.50	4.50	2004-01-20	8245	–3.6	17.3	9.1	137	16.9	450	8.0	115	37.1	0.06	0.42	7.37	0.924	0.932	0.875	0.209	0.010	0.365	7.17	6.98	4	89.4	0.043	0.004

Idcode	Secup m	Seclow m	Date yyyy–mm–dd	Sample no	Charge Bal %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3 mg/L	Cl mg/L	SO_4 mg/L	SO_4–S mg/L	Br mg/l	F^- mg/L	Si mg/L	Fe mg/L	Fe(tot) mg/L	Fe(+II) mg/L	Mn mg/L	Li mg/L	Sr mg/L	pH (lab)	pH (Field)	Temp °C (Field)	El. Cond (lab) mS/m	HS^- mg/L	I^- mg/L
SFM0031	3.50	4.50	2004-04-22	8421	0.3	22.9	9.4	139	21.0	434	8.9	116	39.6	–0.2	0.69	7.89	0.356	0.331	0.328	0.278	0.010	0.466	7.23	7.14	3.7	89.3	0.004	
SFM0031	3.50	4.50	2004-07-07	8589	–0.5	19.3	9.5	142	19.2	443	8.1	120	37.8	0.05	0.57	8.34	0.290	0.374	0.368	0.237	0.012	0.448	7.17	6.93	10.8	89.3		0.004
SFM0031	3.50	4.50	2004-10-14	8667	–0.8	23.7	10.6	130	20.2	421	8.4	118	39.4	0.04	0.62	8.91	0.068	0.092	0.088	0.217	0.011	0.453	7.35	7.05	9.1	81.8	0.024	0.004
SFM0031	3.50	4.50	2005-01-20	8769	–0.2	20.0	9.8	147	18.2	422	10.9	123	43.9	0.26	0.53	9.17					0.009	0.431	7.11	7.15	6.0	86.7		0.011
SFM0031	3.50	4.50	2005-04-06	8847	2.7	22.4	10.2	153	21.3	421	11.7	127	45.6	0.12	0.51	9.68	1.29	0.820	0.779	0.248	0.012	0.470	7.11	7.19	4.8	86.0	–0.002	0.005
SFM0032	3.00	4.00	2003-03-04	4514	–1.4	25.3	5.4	99.3	8.8	356	17.8	34.2	12.0	0.11	0.71	5.53					0.008	0.200	7.52			67.5		0.005
SFM0032	3.00	4.00	2003-07-08	4894	–0.2	26.9	4.9	99.5	7.8	355	19.7	26.4	8.4	0.11	0.63	6.54					0.007	0.188	7.18	6.98	10.5	64.1		0.005
SFM0032	3.00	4.00	2003-10-30	8074	0.6	48.1	6.1	98.9	9.1	364	32.5	43.8	16.2	–0.2	0.55	6.62	1.79	2.14	2.17	0.294	0.012	0.205	7.03	7.09	7.4	71.2	0.050	
SFM0032	3.00	4.00	2004-01-13	8235	–2.3	28.8	5.2	94.0	8.2	345	25.9	38.9	11.8	0.14	0.76	5.90		2.29	2.27	0.198	0.006	0.172	7.33	7.24	5	67.0	0.043	0.005
SFM0032	3.00	4.00	2004-04-21	8423	1.2	23.9	4.9	101	8.4	327	22.8	42.1	12.6	–0.2	0.71	6.06	2.25	2.38	2.33	0.204	0.006	0.193	7.22	7.17	4.3	63.9	0.037	
SFM0032	3.00	4.00	2004-05-11	8469	0.7	23.3	4.9	105	8.5	339	20.6	40.5	12.9	0.12	0.60	5.90					0.006	0.188	7.43			64.9		0.004
SFM0032	3.00	4.00	2004-07-08	8587	1.1	36.2	5.8	104	9.7	353	36.4	39.7	12.5	0.15	0.67	7.02	2.20	2.13	2.12	0.210	0.007	0.212	7.21	6.93	10.1	74.5		0.005
SFM0032	3.00	4.00	2004-10-14	8669	0.0	32.0	5.8	101	8.8	350	32.0	36.7	11.9	0.15	0.65	7.98	2.46	2.76	2.76	0.246	0.007	0.206	7.05	7.03	9.6	66.1	0.128	0.008
SFM0032	3.00	4.00	2005-01-19	8766	–0.5	24.9	5.4	108	8.9	358	24.3	39.4	13.3	0.41	0.58	7.21					0.007	0.194	7.11	7.16	3.6	66.8		0.015
SFM0032	3.00	4.00	2005-04-12	8856	3.3	23.8	5.5	116	9.5	358	22.2	39.8	13.2	0.19	0.58	6.96	2.27	2.52	2.45	0.196	0.007	0.200	7.14	7.25	3.6	67.9	0.143	0.012
SFM0034	2.00	3.00	2003-03-11	4617	–2.7	255	14.5	104	35.6	456	432	48.7	15.6	1.37	0.59	4.99					0.014	0.400						0.008
SFM0036	1.99	2.99	2003-03-12	4632	–3.7	129	12.2	110	32.6	521	146	107	40.0	0.56	0.64	5.48					0.014	0.401						0.007
SFM0037	2.00	3.00	2003-07-10	4919	–3.8	156	12.5	127	32.7	665	133	119	43.9	0.53	0.61	6.89	2.80			0.306	0.017	0.411	7.12	6.81	11.4	154		0.006
SFM0037	2.00	3.00	2003-10-31	8075	–3.2	89.9	9.1	102	23.9	451	68.3	122	41.6	0.34	0.67	5.76					0.011	0.322	7.02	7.01	7.4	103		
SFM0037	2.00	3.00	2004-01-19	8239	–1.5	48.4	7.0	106	17.6	370	51.5	92.2	29.4	0.27	0.66	6.22		2.13	2.06	0.267	0.008	0.263	7.13	7.05	3.9	87.5	0.254	0.007
SFM0037	2.00	3.00	2004-04-22	8420	–0.8	49.0	6.8	112	17.9	376	53.8	88.2	30.3	0.27	0.66	5.32	2.11	2.18	2.14	0.192	0.008	0.265	7.32	7.03	4.3	91.9		
SFM0037	2.00	3.00	2004-07-07	8581	–0.1	93.5	9.0	124	26.3	430	69.8	194	59.4	0.25	0.58	6.81	1.94	2.19	2.16	0.214	0.012	0.340	7.05	6.85	9.6	118		0.005
SFM0037	2.00	3.00	2004-10-14	8673	–1.9	111	12.1	119	32.0	539	95.2	141	44.7	0.39	0.49	7.83	2.31	2.65	2.63	0.244	0.013	0.403	6.98	7.09	9.1	121	0.083	0.004
SFM0037	2.00	3.00	2005-01-20	8765	5.7	67.9	8.5	157	23.5	412	53.4	141	52.0	0.51	0.60	8.17					0.009	0.344	7.03	6.95	3.6	104		0.014
SFM0037	2.00	3.00	2005-04-06	8850	1.4	58.3	8.2	129	24.0	374	58.3	142	50.9	0.33		6.12	2.40	2.59	2.53	0.226	0.010	0.320	6.98	7.11	3.500	101	0.101	0.004
SFM0049	4.00	5.00	2003-04-01	4673	–1.0	11.5	2.5	64.9	4.7	235	11.4	4.0	1.3	0.05	0.35	4.72					–0.004	0.094						0.004
SFM0049	4.00	5.00	2004-05-27	8497	3.4	11.8	3.0	57.6	4.2	185	15.8	0.55	1.1	–0.2	0.34	5.03	1.42			0.152	0.003	0.075	6.95	6.70	12.3	35.5		
SFM0049	4.00	5.00	2004-07-12	8597	3.6	12.5	3.2	60.4	4.4	196	16.6	1.04	1.1	0.06	0.33	4.44	1.22	1.28	1.25	0.139	0.009	0.081	6.94	6.71	10.7	37.6		0.002
SFM0049	4.00	5.00	2004-10-12	8665	3.1	12.1	1.8	63.4	4.4	198	17.6	5.39	2.4	–0.2	0.29	3.99	1.30	1.47	1.46	0.126	–0.004	0.084	6.71			36.7	0.439	0.004
SFM0049	4.00	5.00	2005-01-25	8776	1.2	10.8	2.7	60.5	4.9	204	15.2	2.55	1.3	0.18	0.20	5.76					–0.004	0.082	6.92	6.78	1.8	37.5		0.010
SFM0049	4.00	5.00	2005-04-12	8859	4.3	10.2	2.2	54.4	4.5	179	11.6	0.58	0.90	0.04	0.27	5.61	1.04	1.13	1.12	0.123	0.002	0.071	6.79	6.93	2.1	33.4	0.188	–0.002
SFM0051	5.02	5.18	2003-06-25	4855	–1.0	15.8	5.1	110	7.9	332	47.0	13.6	4.9	–0.2	0.58	7.00					0.006	0.190	7.50			69.3		
SFM0051	5.02	5.18	2003-10-22	8062	1.5	15.8	5.0	113	6.9	325	40.7	15.3	5.2	–0.2	0.53	6.95					0.007	0.181	7.47			66.2		
SFM0051	5.02	5.18	2004-01-27	8254	2.9	17.3	4.9	122	7.2	337	48.6	16.3	5.5	–0.2	0.47	7.74	4.09	3.56	3.64	0.243	0.006	0.159	7.39			68.0		
SFM0051	5.02	5.18	2004-05-11	8473	4.4	20.8	5.1	127	7.9	347	47.4	19.5	6.7	0.18	0.53	7.91	8.30	3.63	3.65	0.274	0.008	0.192	7.65			70.4		0.006

Idcode	Secup m	Seclow m	Date yyyy–mm–dd	Sample no	Charge Bal %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3 mg/L	Cl mg/L	SO_4 mg/L	SO_4–S mg/L	Br mg/l	F^- mg/L	Si mg/L	Fe mg/L	Fe(tot) mg/L	Fe(+II) mg/L	Mn mg/L	Li mg/L	Sr mg/L	pH (lab)	pH (Field)	Temp °C (Field)	El. Cond (lab) mS/m	HS^- mg/L	I^- mg/L
SFM0051	5.02	5.18	2004-08-03	8599	–0.3	19.2	5.1	116	7.1	364	42.0	19.4	5.6	0.15	0.58	7.71	6.58	3.86	3.84	0.246	0.008	0.174	7.34			75.4		0.006
SFM0051	5.02	5.18	2004-11-02	8714	–0.3	5.1	7.6	114	6.7	332	35.9	17.9	5.7	0.13	0.56	9.10	17.6	3.46	3.50	0.248	0.007	0.171	7.27			63.8		0.005
SFM0051	5.02	5.18	2005-02-03	8788	–6.6	16.5	5.0	104	6.8	401	32.1	18.0	5.8	–0.2	0.47	7.60		8.24	7.91	0.208	0.006	0.165	7.27			64.9		
SFM0051	5.02	5.18	2005-05-11	8889	3.3	16.7	5.0	125	8.0	366	37.8	18.5	7.0	–0.2	0.47	8.50	5.81	8.27	7.70	0.265	0.006	0.179	7.18			68.2		
SFM0053	6.01	6.17	2003-06-26	4856	–2.6	9.6	4.6	116	10.5	396	9.6	38.3	12.6	–0.2	0.39	5.07					0.006	0.179	7.69			66.2		
SFM0053	6.01	6.17	2003-10-22	8061	0.3	11.3	4.8	123	10.6	393	10.2	42.1	13.3	–0.2	0.39	5.74					0.009	0.186	7.30			72.0		
SFM0053	6.01	6.17	2004-01-28	8256	–1.2	9.4	4.2	114	9.8	376	11.7	43.7	13.1	–0.2	0.26	5.25	3.09	3.48	3.52	0.141	0.007	0.149	7.31			68.1		
SFM0053	6.01	6.17	2004-05-11	8472	2.6	9.9	4.5	130	11.2	396	10.3	42.1	14.2	0.06	0.38	5.75	2.67	3.63	3.64	0.158	0.010	0.184	7.52			69.4		0.007
SFM0053	6.01	6.17	2004-08-03	8600	3.8	9.6	5.0	135	11.3	396	12.3	44.9	14.1	0.11	0.35	5.87	3.42	3.78	3.72	0.151	0.016	0.186	7.13			76.3		0.008
SFM0053	6.01	6.17	2004-11-03	8715	7.7	4.6	3.9	132	10.8	336	13.3	43.7	13.8	0.07	0.36	6.25	9.95	3.39	3.20	0.150	0.009	0.184	7.25			71.6		0.007
SFM0053	6.01	6.17	2005-02-10	8789	–0.7	10.4	4.9	130	11.3	413	20.8	46.8	15.0	–0.2	0.28	6.15		5.48	5.43	0.154	0.007	0.190	7.55			74.2		
SFM0053	6.01	6.17	2005-05-11	8890	3.4	13.1	5.0	142	11.4	415	18.4	46.7	16.0	–0.2	0.25	6.78	5.14	5.15	5.07	0.163	0.009	0.190	7.43			76.3		
SFM0056	6.01	6.17	2003-06-25	4857	–3.9	499	9.8	54.8	20.2	463	555	247	83.1	1.89	0.43	7.33					0.017	0.401	8.02			267		
SFM0056	6.01	6.17	2003-06-22	8063	–1.1	494	10.0	53.8	19.6	454	503	251	78.5	1.61	0.76	7.32					0.019	0.401	8.04			270		0.012
SFM0056	6.01	6.17	2004-01-27	8255	–3.4	9.3	4.2	114	9.8	387	11.8	44.0	13.3	–0.2	0.27	5.20	2.74			0.129	0.006	0.149	7.36			68.2		
SFM0056	6.01	6.17	2004-05-10	8474	0.6	500	9.7	57.3	20.9	443	486	260	83.8	1.93	0.75	8.65	0.349			0.069	0.017	0.414	7.96			272		0.012
SFM0056	6.01	6.17	2004-08-02	8601	–2.0	502	10.2	56.5	20.5	470	522	261	83.1	1.54	0.70	8.89	0.284			0.068	0.024	0.400	7.79			239		0.010
SFM0056	6.01	6.17	2004-11-01	8713				57.4	20.5	460	519	257	86.9	1.71	0.55	9.38				0.069	0.016	0.409	7.87			277		0.011
SFM0056	6.01	6.17	2005-02-01	8787	0.7	528	10.2	57.5	21.2	463	515	251	85.2		0.60	10.3	0.032			0.067	0.018	0.416	8.08			276		
SFM0056	6.01	6.17	2005-05-11	8891	–2.3	496	9.8	58.1	20.2	460	506	240	85.0	2.76	0.59	9.83	0.135			0.063	0.020	0.385	7.80			275		
SFM0057	3.45	4.45	2003-11-04	8091	1.3	70.8	4.6	116	7.4	226	187	17.1	6.0	–0.2		3.30	0.151			0.067	0.001	0.179	7.11	6.90	8.1	102	0.007	
SFM0057	3.45	4.45	2004-01-20	8243	–2.7	106	4.7	184	13.0	252	396	25.1	8.1	1.25	–0.2	3.41	0.141	0.161	0.152	0.113	0.001	0.299	7.13	6.77	5.6	167	0.010	0.013
SFM0057	3.45	4.45	2004-04-20	8412				151	7.5	265	362	31.3	6.8	1.65	–0.2	3.20	0.043	0.058	0.038	0.078	0.002	0.218	6.96	6.86	4.5	155	0.005	
SFM0057	3.45	4.45	2004-07-06	8582	–2.2	83.1	4.7	190	10.5	320	318	25.0	7.9	1.10	–0.2	3.67	0.120	0.106	0.084	0.091	0.004	0.275	6.85	6.60	7.4	154		0.010
SFM0057	3.45	4.45	2004-10-13	8663	–2.2	92.0	5.9	182	11.4	335	311	25.7	8.4	2.04	–0.2	4.24	0.171	0.168	0.147	0.128	–0.004	0.287	6.85	6.72	8.1	141	–0.002	0.012
SFM0057	3.45	4.45	2005-01-21	8772	1.7	36.9	3.0	87.5	5.2	249	66.7	13.4	4.4	0.42	0.45	3.76					–0.004	0.128	7.04	7.08	4.1	65.8		0.014
SFM0057	3.45	4.55	2005-04-08	8857	1.2	26.8	2.7	76.4	4.7	232	43.6	12.4	4.4	0.14		3.73	0.127	0.089	0.050	0.022	0.001	0.106	7.05	7.20	4.2	52.1	–0.002	0.003
SFM0059	4.88	5.88	2003-12-02	8165	–2.1	266	12.5	209	43.3	334	576	277	83.6	1.71	0.65	6.98					0.021	0.457	6.89			247		0.009
SFM0060	6.60	7.60	2004-01-21	8244	–2.9	6.6	5.1	114	8.3	336	7.2	71.4	23.1	0.04	0.77	3.32	0.009	0.017	0.016	0.044	0.004	0.137	7.17	7.05	7.7	67.4	0.018	0.002
SFM0060	6.60	7.60	2004-07-07	8590	–0.4	5.8	4.3	120	7.7	337	6.8	67.2	20.8	0.04	0.70	3.36	0.020	0.016	0.005	0.010	0.004	0.135	7.16	6.93	7.2	67.6		0.002
SFM0060	6.60	7.60	2004-10-14	8671	–2.5	26.3	6.1	124	9.1	319	71.3	70.1	22.2	0.25	0.71	3.47	0.023	0.006	–0.002	0.020	0.005	0.152	7.10	7.03	8.8	77.7		0.003
SFM0060	6.60	7.60	2005-01-25	8780	1.8	14.1	5.4	123	8.5	325	26.6	57.3	19.3	0.22	0.66	3.78					–0.004	0.141	7.15	6.96	6.5	68.3		0.008
SFM0060	6.60	7.60	2005-04-07	8849	4.2	8.7	5.6	124	9.1	308	10.4	66.0	23.7	0.06	0.67	3.87	0.014	0.012	–0.005	0.004	0.005	0.138	7.12	7.21	6.1	61.7	–0.002	–0.002
SFM0061	6.03	8.06	2003-12-04	8166	1.1	11.0	4.4	103	6.5	282	17.3	51.7	15.6	0.08	0.77	3.00					0.004	0.119	7.16			59.6		0.002
SFM0061	6.03	8.06	2003-12-02	8167	2.0	6.5	4.7	119	7.5	313	7.1	69.7	21.1	0.05	0.64	3.75					0.005	0.138	7.17			62.5		0.002

Idcode	Secup m	Seclow m	Date yyyy–mm–dd	Sample no	Charge Bal %	Na mg/L	K mg/L	Ca mg/L	Mg mg/L	HCO_3 mg/L	Cl mg/L	SO_4 mg/L	SO_4–S mg/L	Br mg/l	F^- mg/L	Si mg/L	Fe mg/L	Fe(tot) mg/L	Fe(+II) mg/L	Mn mg/L	Li mg/L	Sr mg/L	pH (lab)	pH (Field)	Temp °C (Field)	El. Cond (lab) mS/m	HS^- mg/L	I^- mg/L
SFM0061	6.03	8.06	2003-12-03	8168	0.3	9.4	4.4	104	6.5	290	13.0	57.3	16.8	0.05	0.85	2.99					–0.004	0.120	7.17			59.5		0.001
SFM0062	3.25	3.65	2004-02-18	8264	1.0	22.9	6.1	85.5	7.4	277	27.1	32.6	9.6	0.11	0.28	4.44	–0.02			0.303	0.006	0.169	7.22			57.7		0.006
SFM0062	3.25	3.65	2004-05-11	8468	1.9	26.7	5.2	101	9.1	314	29.0	41.7	13.2	0.15	0.69	3.32	9.43			0.086	0.007	0.188	7.36			63.4		0.006
SFM0062	3.25	3.65	2004-05-28	8498	1.6	25.5	5.3	88.2	8.5	280	27.0	39.0	12.3	0.13	0.66	2.72	4.43			0.041	0.007	0.168	7.21			57.8		0.008
SFM0063	3.22	3.72	2004-02-18	8261	1.4	16.5	4.9	66.2	6.5	217	23.4	17.6	5.3	0.10	–0.2	3.71					0.005	0.159	7.45			48.4		0.007
SFM0063	3.22	3.72	2004-05-11	8466	–5.0	106	9.0	83.6	18.1	181	267	62.3	17.3	0.85	0.74	1.01					0.012	0.425	7.40			117		0.010
SFM0065	4.45	4.85	2004-02-18	8262	–1.1	217	14.4	82.8	37.5	313	370	86.6	29.5	1.20	–0.2	2.97	–0.02			0.634	0.013	0.363	7.52			201		0.008
SFM0074	2.00	4.70	2004-05-18	8461	–4.7	44.4	5.6	106	10.1	392	58.5	44.8	14.3	0.24	0.60	6.40					0.007	0.218	7.36			76.2		0.006
SFM0074	2.00	4.70	2004-05-14	8462	–1.8	39.5	5.5	106	9.7	361	50.0	44.2	14.1	0.21	0.58	6.34					0.007	0.211	7.35			74.5		0.005
SFM0074	2.00	4.70	2004-05-17	8463	–0.8	43.1	5.5	105	9.9	348	56.2	44.7	14.2	0.23	0.63	6.41					0.008	0.216	7.34			76.2		0.006
SFM0074	2.00	4.70	2004-05-13	8464	–0.1	37.8	5.4	107	9.6	347	47.2	43.9	14.0	0.21	0.62	6.29					0.007	0.209	7.33			101		0.006
SFM0074	2.00	4.70	2004-05-16	8465	–0.3	42.0	5.5	106	9.8	346	54.1	44.5	14.2	0.22	0.62	6.38					0.006	0.214	7.33			75.0		0.006
SFM0074	2.00	4.70	2004-05-11	8467	1.2	25.1	5.0	110	8.7	348	24.3	41.3	13.2	0.14	0.63	6.13					0.007	0.194	7.51			67.5		0.005
SFM0074	2.00	4.70	2004-05-12	8470	0.3	34.0	5.3	107	9.3	343	41.2	43.0	13.7	0.19	0.62	6.22					0.007	0.205	7.45			71.3		0.006
SFM0074	2.00	4.70	2004-05-11	8471		22.1	5.2		9.1	349	21.0	39.9	12.7	0.12	0.63	7.01					0.008	0.222	7.42			64.8		0.005
SFM0074	2.00	4.70	2004-05-19	8494	–0.9	45.0	5.6	105	10.1	348	59.9	44.9	14.3	0.23	0.61	6.45					0.007	0.218	7.31			78.3		0.005
SFM0074	2.00	4.70	2004-05-21	8495	–0.8	46.2	5.7	105	10.2	348	61.8	44.5	14.3	0.23	0.61	6.49					0.008	0.221	7.29			76.6		0.006
SFM0074	2.00	4.70	2004-05-24	8496	–0.1	47.1	5.7	105	10.3	340	63.5	45.3	14.5	0.24	0.61	6.50					0.007	0.222	7.30			78.7		0.005

Table A4-2. Drinking water quality.

Id code	Date	Sample no	Hbact (no/100ml)	Kbact (no/100ml)	Microbes (no/100ml)	Ecoli (no/100ml)	Temp_Field (°C)	Smell_Lab	Sediment/mud	Colour (number)	pH_L	Temp_pH (°C)	Alk (mg/L)	EC_L (mS/m)	Ca (mg/L)	Cl (mg/L)	COD (mg/L)	Cu (mg/L)
PFM000001	2003-10-30	8086	26,000	20		–1	10	No smell	No	120	7.2		610	127	150	47	5.6	–0.02
PFM000001	2005-10-19	8689		550	640	3	9.4	No smell	Traces. opal.	30	7.1	25	310	510	190	1,400	7.7	–0.02
PFM000007	2003-10-30	8087	1,000,000	–1		–1	10	Musty	Yellow. opal.	780	6.9		420	105	200	6.0	17	–0.02
PFM000007	2004-10-19	8688		10	7,200	4	9.3	Weak	Evident. black	47	7.3	25	48	87	15	4.0	9.8	–0.02
PFM000008	2003-10-30	8085	116,000	11		–1	6	No smell	Traces. black	60	7.4		28	530	790	4,700	15	–0.02
PFM000008	2004-10-19	8690		10	600	–1	7.7	Weak	Evident. opal. brown	53	7.2	25	56	1,400	180	1,900	8.9	–0.02
PFM000009	2003-10-30	8088	10,000	–1		–1	6.6	No smell	Traces. black	160	7.4		65	1,300	860	5,600	13	–0.02
PFM000009	2004-10-19	8692		17	6,100	–1	7.7	No smell	Traces. opal.	37	7.0	25	840	130	150	56	6.7	–0.02
PFM000010	2004-09-23	8641		950	10,000	8		No smell	Traces. opal.	97	7.0	25	240	560	180	1,500	14	–0.02
PFM000039	2003-10-30	8084	–100,000	1		–1	6.2	Musty	No	160	7.2		160	1,000	710	3,900	13	–0.02
PFM000039	2004-10-19	8691		2	–100	–1		No smell	–	81	7.0	25	170	990	530	3,400	15	–0.02

Explanations:

Hbact	Number of heterotrophic bacteria
Kbact	Number of coliform bacteria
Ecoli	Number of escherichia coli bacteria at 35 °C
Sediment	Ocular inspection of sediment
EC_L	Electric conductivity
Fe_a_af	Fe concentration after airing and filtering

Cont. Table A4-2. Drinking water quality.

Id code	Date	Sample no	F (mg/L)	Fe (mg/L)	Fe_a_af (mg/L)	Hardness_German (dH)	K (mg/L)	Mg (mg/L)	Mn (mg/L)	Na (mg/L)	NH_4_N (mg/L)	NH_4 (mg/L)	NO_3_N (mg/L)	NO_3 (mg/L)	NO_2_N (mg/L)	NO_2 (mg/L)	PO_4_P (mg/L)	PO_4 (mg/L)	SO_4 (mg/L)
PFM000001	2003-10-30	8086	0.4	0.71	–0.02	29.1		35	0.44		3.8				0.008		–0.005		122
PFM000001	2005-10-19	8689	0.5	0.17		41.0	26	61	0.15	630	0.36	0.05	–0.1	–0.4	–0.002	–0.01	–0.005	–0.02	240
PFM000007	2003-10-30	8087	0.6	32	0.083	29.5		6.7	0.61		3.4			–0.4	0.004		0.021		270
PFM000007	2004-10-19	8688	0.8	0.69	–0.02	23.0	8.1	6.6	0.40	4.9	0.86	1.1	–0.1	–0.4	0.016	0.05	0.013	0.04	57
PFM000008	2003-10-30	8085	1.1	3.6	–0.02	150.0	27	170	1.1	1,700	1.4	1.8	–0.1	–0.4	–0.002	–0.01	–0.005	–0.02	270
PFM000008	2004-10-19	8690	0.4	0.46	–0.02	45.7		89	0.12		0.12				0.004		–0.005		280
PFM000009	2003-10-30	8088	0.9	3.1	–0.02	164.1		190	1.0		1.6				–0.002		–0.005		300
PFM000009	2004-10-19	8692	0.7	0.59	–0.02	28.0	42	31	0.27	44	3.8	4.9	0.1	0.44	–0.002	–0.01	–0.005	–0.02	110
PFM000010	2004-09-23	8641	0.6	1.0	0.170	39.0	23	60	0.24	660	0.25	0.32	–0.1	–0.4	–0.002	–0.01	0.014	0.04	250
PFM000039	2003-10-30	8084	0.5	2.3	–0.02	136.2		160	1.2		1.7				0.002		–0.005		280
PFM000039	2004-10-19	8691	0.6	2.0	–0.02	106.0	27	140	1.1	1,200	1.4	1.8	–0.1	–0.4	–0.002	–0.01	–0.005	–0.02	270

Explanations:

Hbact	Number of heterotrophic bacteria
Kbact	Number of coliform bacteria
Ecoli	Number of escherichia coli bacteria at 35 °C
Sediment	Ocular inspection of sediment
EC_L	Electric conductivity
Fe_a_af	Fe concentration after airing and filtering

Table A4-3. Surface water suplements.

Id code	Secup m	Seclow m	Date	Sample no	NH_4-N (mg/l)	NO_2-N (mg/l)	NO_3-N+NO_2-N (mg/l)	NO_3-N (mg/l)	N-tot (mg/l)	P-tot (mg/l)	PO_4-P (mg/l)	SiO_4-Si (mg/l)	TOC (mg/l)	DOC (mg/l)	DIC (mg/l)	O_2 (mg/l)
PFM000001			2003-11-03	8073	1.99	0.0076	0.636				0.0006	6.97	7.0	6.4	90.6	
PFM000001			2004-04-27	8434	1.62	0.0039	0.395		2.54	0.0052	0.0006	6.73	6.9	6.6	101	
PFM000001			2004-10-19	8687	3.90	0.0036	0.113		4.44	0.0073	0.0012	7.53	7.7	7.7	125	
PFM000007			2003-11-03	8046	0.540	0.0003	0.0006				0.0023	6.66	11.1	11.0	75.0	
PFM000007			2004-04-23	8435	0.261	0.0004	0.0017		0.684	0.0724	0.0094	5.92	11.6	11.6	92.4	
PFM000007			2004-10-12	8680	0.781	0.0003	–0.0002		1.20	0.0552	0.0091	7.05	11.4	11.2	109	
PFM000008			2003-11-03	8050	0.011	0.0002	0.0002				0.0022	4.14	5.3	5.5	25.7	
PFM000008			2004-04-27	8437	0.006	0.0004	0.967		1.27	0.0034	0.0025	4.55	5.7	5.6	76.6	
PFM000008			2004-10-19	8682	0.026	0.0007	0.0027		0.369	0.0131	0.0030	4.07	6.5	6.6	63.9	
PFM000009			2003-11-03	8078	1.56	0.0001	0.0009				0.0003	5.86	1.4	2.2	11.5	
PFM000009			2004-04-27	8439	1.32	0.0002	0.0011		1.46	0.0014	–0.0005	4.91	1.5	1.2	7.3	
PFM000009			2004-10-18	8685	1.58	0.0002	0.0013		1.57	0.0041	–0.0005	5.79	1.1	1.2	13.5	
PFM000039			2003-09-04	4987	0.366	0.0025	0.0038		0.839	0.0039	–0.0005	6.11	11.7	12.5	41.4	
PFM000039			2003-11-03	8076	1.68	0.0001	0.0017				–0.0005	7.56	4.7	4.9	24.8	
PFM000039			2004-05-04	8438	2.35	0.0010	0.0232		2.46	0.0037	–0.0005	7.78	3.3	3.3	18.9	
PFM000039			2004-10-19	8686	1.38	–0.0001	–0.0002		1.62	0.0059	–0.0005	7.24	6.4	6.5	33.6	
PFM002942			2003-11-04	8092	5.07	0.0169	0.143				0.218	3.39	10.7	11.0	37.6	
PFM002942			2004-04-26	8430	0.234	0.0004	0.0013		0.692	0.0415	0.0225	3.46	8.9	8.7	51.2	
PFM002942			2004-10-19	8684	8.690	0.0010	0.0043		10.4	1.10	0.736	6.05	30.2	29.4	94.0	
PFM004179			2004-10-18	8683	0.020	0.0040	0.376		0.752	0.0154	0.0066	5.42	5.5	5.8	75.5	
PFM004504			2004-10-13	8662	0.050	0.0008	0.0141		0.960	0.0085	0.0026	5.19	25.4	25.0	51.2	
PFM004778			2003-11-03	8077	0.133	0.0015	0.123				0.0784	3.49	10.1	9.4	40.4	
PFM004778			2004-04-23	8436	0.145	0.0006	0.0046		0.666	0.0642	0.0413	3.51	8.4	7.9	57.8	
PFM004778			2004-10-18	8670	0.344	0.0008	0.0344		0.941	0.0945	0.0693	4.62	8.0	8.4	90.5	
SFM0001	3.95	4.95	2002-07-18	4219	0.170		0.0511		1.18	0.0484	0.0174	4.75	22.3	17.0	45.2	–0.1
SFM0001	3.95	4.95	2002-09-20	4316	0.215		0.0114		1.07	0.0411	0.0246	4.02	21.6	17.2		–0.1

Id code	Secup m	Seclow m	Date	Sample no	NH_4-N (mg/l)	NO_2-N (mg/l)	NO_3-N+NO_2-N (mg/l)	NO_3-N (mg/l)	N-tot (mg/l)	P-tot (mg/l)	PO_4-P (mg/l)	SiO_4-Si (mg/l)	TOC (mg/l)	DOC (mg/l)	DIC (mg/l)	O_2 (mg/l)
SFM0001	3.95	4.95	2002-12-12	4403	0.174	0.0028	0.0686		1.25	0.04645	0.01536	4.75	27.3	25.2	69.6	–0.2
SFM0001	3.95	4.95	2003-06-05	4808	0.213		0.0067		1.24	0.0323	0.0219	6.62	27.6	26.4	79.8	
SFM0001	3.95	4.95	2003-07-10	4900	0.266	0.0003	0.0004	–0.0002	0.999	0.0432	0.0269	6.32	21.5	21.5	80.0	
SFM0001	3.95	4.95	2003-10-28	8069	0.317	0.0016	0.0006				0.0301	7.93	21.1	21.6	96.9	
SFM0001	3.95	4.95	2004-01-20	8242	0.162	0.0009	0.0007		1.50	0.037	0.0246	5.77	36.4	36.7	62.2	
SFM0001	3.95	4.95	2004-04-19	8418	0.137	0.0004	0.0011		1.15	0.0306	0.0228	6.32	27.8	28.2	58.8	
SFM0001	3.95	4.95	2004-07-06	8583	0.209	0.0001	0.0003		1.05	0.040	0.0359	6.62	24.6	24.1	78.5	
SFM0001	3.95	4.95	2004-10-12	8661	0.302	0.0014	0.0003		1.03	0.053	0.0464	7.78	20.8	21.0	107	
SFM0001	3.95	4.95	2005-01-24	8775	0.281	0.0007	0.0004		1.28	0.0443	0.0322	7.80	28.0	28.6	102	
SFM0001	3.95	4.95	2005-04-11	8853	0.248	0.0001	0.0002	–0.0002	1.47	0.0421	0.0328	7.44	33.9	33.2	78.1	–0.2
SFM0002	4.21	5.21	2002-07-18	4220	0.260				0.557	0.118	0.0044	1.93	15.1	15.8	45.3	0.9
SFM0002	4.21	5.21	2002-09-20	4318	0.091		0.0262		0.511	0.200	0.0017	3.45	15.3	17.3		3.7
SFM0002	4.21	5.21	2002-12-12	4405	0.090	0.0011	0.0077		0.509	0.18775	0.00249	4.24	12.3	12.2	50.8	0.6
SFM0002	4.21	5.21	2003-06-04	4806	0.080		0.0024		0.514	0.0262	0.0018	5.32	13.7	13.4	55.7	0.3
SFM0002	4.21	5.21	2003-07-09	4898	0.081	0.0003	0.0015	0.0015	0.491	0.0293	0.0039	5.49	14.3	14.4	43.9	
SFM0002	4.21	5.21	2003-10-28	8067	0.086	0.0025	0.0013				0.0034	6.05	16.2	15.1	55.6	
SFM0002	4.21	5.21	2004-01-14	8238	0.074	0.0003	0.0006		0.529	0.011	0.0062	5.48	15.1	14.9	53.8	
SFM0002	4.21	5.21	2004-04-19	8414	0.061	0.0003	0.0008		0.483	0.0091	0.0055	5.18	14.6	14.1	57.8	
SFM0002	4.21	5.21	2004-07-06	8586	0.065	0.0001	0.0002		0.478	0.0083	0.0064	5.29	13.9	13.4	62.8	
SFM0002	4.21	5.21	2004-10-12	8659	0.074	0.0016	0.0002		0.500	0.0135	0.0064	5.91	15.3	15.3	68.8	
SFM0002	4.21	5.21	2005-01-20	8767	0.057	0.0025	0.0025		0.484	0.010	0.0053	5.48	14.9	14.7	65.2	
SFM0002	4.21	5.21	2005-04-11	8858	0.054	0.0003	0.0004	–0.0002	0.460	0.0093	0.0057	5.28	15.0	15.2	54.6	–0.2
SFM0003	8.98	10.98	2002-07-18	4221	0.222				0.711	3.04	0.0180	7.23	11.1	13.8	66.6	0.3
SFM0003	8.98	10.98	2002-09-20	4317	0.200		0.0280		0.568	0.0631	0.0109	3.62	11.0	12.0		1.1
SFM0003	8.98	10.98	2002-12-12	4404	0.146	0.0020	0.0070		0.554	0.05387	0.01142	7.82	9.6	11.2	69.8	0.3
SFM0003	8.98	10.98	2003-06-04	4807	0.217		0.0033		0.561	0.0454	0.0154	9.74	10.5	10.6	79.9	0.4
SFM0003	8.98	10.98	2003-07-09	4902	0.215	–0.0001	0.0004	0.0004	0.558	0.0358	0.0143	9.56	10.4	10.7	71.2	

Id code	Secup m	Seclow m	Date	Sample no	NH_4-N (mg/l)	NO_2-N (mg/l)	NO_3-N+NO_2-N (mg/l)	NO_3-N (mg/l)	N-tot (mg/l)	P-tot (mg/l)	PO_4-P (mg/l)	SiO_4-Si (mg/l)	TOC (mg/l)	DOC (mg/l)	DIC (mg/l)	O_2 (mg/l)
SFM0003	8.98	10.98	2003-10-28	8065	0.222	0.0032	0.0008				0.0386	9.78	6.5	11.1	57.3	
SFM0003	8.98	10.98	2004-01-19	8240	0.217	0.0009	0.0008		0.622	0.0441	0.0249	9.80	10.9	10.6	78.7	
SFM0003	8.98	10.98	2004-04-19	8415	0.205	0.0008	0.0063		0.559	0.042	0.0380	9.85	10.9	10.4	71.9	
SFM0003	8.98	10.98	2004-07-06	8585	0.213	–0.0001	–0.0002		0.562	0.038	0.0427	9.69	10.4	10.0	74.1	
SFM0003	8.98	10.98	2004-10-12	8660	0.208	0.0008	0.0039		0.562	0.030	0.0075	10.6	10.9	10.4	82.7	
SFM0003	8.98	10.98	2005-01-24	8778	0.210	0.0051	0.0052		0.558	0.050	0.0406	9.95	11.1	11.1	67.9	
SFM0003	8.98	10.98	2005-04-06	8851	0.210	0.0003	0.0013	0.0010	0.572	0.0447	0.0317	10.0	10.7	11.1	61.8	–0.2
SFM0005	2.21	3.21	2002-12-16	4432	0.013	0.0017	0.0394				0.00516	2.81	12.0			5.2
SFM0005	2.21	3.21	2003-06-03	4805	0.026		0.264		0.632	0.010	0.0037	4.19	8.6	8.6	55.9	0.9
SFM0005	2.21	3.21	2004-01-12	8232	0.003	0.0005	0.0767		0.512	0.009	0.0049	4.48	12.2	12.7	59.3	
SFM0005	2.21	3.21	2004-04-20	8426	0.001	0.0014	0.212		0.572	0.008	0.0040	4.32	8.9	9.7	65.7	
SFM0005	2.21	3.21	2004-07-13	8598	0.002	0.0005	0.0538		0.522	0.0133	0.0042	4.54	10.8	11.3	56.8	
SFM0005	2.21	3.21	2005-01-24	8771	0.006	0.0009	0.0344		0.477	0.0114	0.0052	4.67	13.3	13.0	70.0	
SFM0005	2.21	3.21	2005-04-08	8854	0.003	0.0004	0.197	0.197	0.637	0.010	0.0034	3.72	11.3	10.9	48.5	5.9
SFM0006	3.21	4.21	2003-05-07	4764	0.033	0.0199	0.850		1.82	0.0166	0.0022	5.35	14.4	14.3	57.1	8.7
SFM0006	3.21	4.21	2003-06-03	4810	0.020		0.617		1.51	0.0153	0.0036	5.90	12.9	12.7	64.3	6.2
SFM0006	3.21	4.21	2004-01-15	8234	0.005	0.0014	0.458		1.47	0.0173	0.0043	5.72	13.8	13.9	73.8	
SFM0006	3.21	4.21	2004-04-21	8413	0.005	0.0005	0.169		1.03	0.0171	0.0085	6.04	12.8	12.9	69.2	
SFM0006	3.21	4.21	2005-01-19	8763	0.003	0.0007	0.746		1.83	0.0189	0.0074	5.30	15.6	16.4	57.1	
SFM0006	3.21	4.21	2005-04-08	8855	0.003	0.0003	0.124	0.124	1.04	0.040	0.0360	5.19	15.1	14.7	45.7	8.7
SFM0008	5.14	6.14	2003-06-02	4812	0.049		0.0035		0.265	0.0145	0.0014	5.44	4.4	4.3	71.0	0.3
SFM0008	5.14	6.14	2003-07-07	4895	0.044	0.0001	0.0005	0.0005	0.257	0.010	0.0019	5.35	4.7	4.6	56.3	
SFM0008	5.14	6.14	2003-10-29	8070	0.064	0.0006	–0.0002				0.0021	5.12	7.4	7.7	60.5	
SFM0008	5.14	6.14	2004-01-13	8236	0.016	0.0013	0.0101		0.336	0.009	0.0017	4.55	5.9	6.3	38.6	
SFM0008	5.14	6.14	2004-04-20	8416	0.017	0.0008	0.0094		0.292	0.0047	0.0028	4.42	6.0	6.3	56.2	
SFM0008	5.14	6.14	2004-07-05	8584	0.032	0.0001	–0.0002		0.287	0.0041	0.0031	4.57	6.5	6.7	67.5	
SFM0008	5.14	6.14	2004-10-15	8672	0.048	0.0002	0.0002		0.374	0.0058	0.0028	4.51	8.4	8.5	72.6	

Id code	Secup m	Seclow m	Date	Sample no	NH_4-N (mg/l)	NO_2-N (mg/l)	NO_3-N+NO_2-N (mg/l)	NO_3-N (mg/l)	N-tot (mg/l)	P-tot (mg/l)	PO_4-P (mg/l)	SiO_4-Si (mg/l)	TOC (mg/l)	DOC (mg/l)	DIC (mg/l)	O_2 (mg/l)
SFM0008	5.14	6.14	2005-01-25	8779	0.018	0.0037	0.0114		0.326	0.010	0.0039	4.72	6.8	6.8	54.6	
SFM0008	5.14	6.14	2005-04-07	8845	0.018	–0.0001	0.0162	0.0162	0.366	0.0084	0.0021	4.52	7.4	7.1	50.2	1.7
SFM0009	2.00	3.00	2003-07-08	4897	0.004	0.0006	0.0423	0.0423	0.688	0.0487	0.0013	3.82	15.9	15.2	31.2	
SFM0009	2.00	3.00	2003-10-29	8066	0.020	0.0003	0.0077				0.0024	4.88	15.9	15.5	54.6	
SFM0009	2.00	3.00	2004-01-12	8233	–0.001	0.0001	0.140		0.855	0.0042	0.0008	4.05	19.2	18.5	39.3	
SFM0009	2.00	3.00	2004-04-20	8427	0.001	0.0002	0.206		0.700	0.0168	0.0010	3.83	14.0	13.9	51.5	
SFM0009	2.00	3.00	2004-07-13	8596	0.012	0.0003	–0.0002		0.512	0.010	0.0019	4.06	13.6	13.1	53.3	
SFM0009	2.00	3.00	2004-10-13	8666	0.025	0.0002	0.0002		0.598	0.0076	0.0025	4.71	17.5	17.2	65.2	
SFM0009	2.00	3.00	2005-01-24	8777	0.004	0.0012	0.484		1.13	0.013	0.0016	3.69	17.3	17.5	40.8	
SFM0009	2.00	3.00	2005-04-07	8846	0.002	0.0002	0.481	0.481	0.985	0.0055	0.0014	3.67	14.5	14.8	44.5	3.7
SFM0012	5.35	6.35	2003-06-04	4809	3.59		0.0003		3.66	0.028	0.0020	7.00	3.3	3.4	63.2	0.3
SFM0012	5.35	6.35	2003-07-14	4921	3.12	–0.0001	–0.0002	–0.0002	3.43	0.0127	0.0005	6.65	3.0	3.1	41.4	
SFM0012	5.35	6.35	2003-11-05	8080	3.41	–0.0001	–0.0002				–0.0005	8.38	3.3	3.6	35.4	
SFM0012	5.35	6.35	2004-01-19	8249	3.57	–0.0001	–0.0002		3.72	0.170	–0.0005	5.89	4.8	4.5	33.5	
SFM0012	5.35	6.35	2004-04-26	8424	3.45	0.0002	0.0005		3.56	0.0677	0.0013	7.25	3.3	3.3	40.6	
SFM0012	5.35	6.35	2004-07-08	8593	3.20	0.0004	–0.0002		3.45	0.012	0.0009	8.06	3.1	3.1	44.9	
SFM0012	5.35	6.35	2004-10-14	8676	3.37	0.0151	0.0272		3.54	0.0034	0.0086	7.09	3.4	3.7	56.6	
SFM0012	5.35	6.35	2005-01-19	8768	3.34	0.0014	0.0013		3.73		0.0008	6.96	3.8	3.7	41.8	
SFM0012	5.35	6.35	2005-04-05	8864	3.47	0.0001	0.0004	0.0002	3.56	0.221	–0.0005	7.14	3.2	3.6	33.6	0.4
SFM0015	6.34	7.34	2003-06-04	4811	6.26		0.0026		6.41	0.112	0.0008	7.82	9.4	9.3	133	0.9
SFM0015	6.34	7.34	2003-07-14	4922	6.87	0.0001	0.0003	0.0002	6.94	0.586	0.0110	7.37	8.6	8.6	137	
SFM0015	6.34	7.34	2003-11-05	8079	7.16	–0.0001	–0.0002				0.0232	8.63	8.9	8.8	122	
SFM0015	6.34	7.34	2004-01-15	8251	7.15	0.0079	0.0089		7.75	0.455	0.214	7.89	8.7	8.5	151	
SFM0015	6.34	7.34	2004-07-13	8591	8.14	0.0016	–0.0002		8.44	0.626	0.0414	8.39	8.0	7.9	145	
SFM0015	6.34	7.34	2004-10-15	8677	8.56	0.0005	–0.0002		8.71	0.199	0.0941	8.82	8.2	8.2	143	
SFM0015	6.34	7.34	2005-01-18	8762	7.74	0.0025	0.0026		8.50	0.746	0.199	8.67	8.5	8.7	136	
SFM0015	6.34	7.34	2005-04-05	8863	7.34	0.0006	0.0027	0.0021	7.66	0.431		8.56	8.7	9.1	138	0.3

Id code	Secup m	Seclow m	Date	Sample no	NH_4-N (mg/l)	NO_2-N (mg/l)	NO_3-N+NO_2-N (mg/l)	NO_3-N (mg/l)	N-tot (mg/l)	P-tot (mg/l)	PO_4-P (mg/l)	SiO_4-Si (mg/l)	TOC (mg/l)	DOC (mg/l)	DIC (mg/l)	O_2 (mg/l)
SFM0022	5.30	5.80	2004-07-13	8594	2.13	0.0017	0.0013		2.59	0.0117	0.0009	8.47	4.9	5.4	59.8	
SFM0022	5.30	5.80	2004-10-15	8675	2.21	0.0001	–0.0002		2.28	0.0034	–0.0005	8.46	4.9	5.6	62.2	
SFM0022	5.30	5.80	2005-01-18	8761	1.91	0.0032	0.0020		2.17		0.0010	7.73	4.4	4.6	45.6	
SFM0023	4.42	5.42	2003-07-16	4920	2.73	–0.0001	–0.0002	–0.0002	2.91	0.0038	–0.0005	1.21	2.8	2.7	8.1	
SFM0023	4.42	5.42	2003-11-06	8083	2.78	0.0001	0.0006				0.0005	4.58	2.6	2.5	18.2	
SFM0023	4.42	5.42	2004-01-16	8252	2.78	–0.0001	0.0008		2.87	0.0119	–0.0005	3.41	2.8	2.9	18.7	
SFM0023	4.42	5.42	2004-04-28	8440	2.71	0.0013	0.0019		2.84	0.0065	0.0023	4.40	2.6	2.7	19.8	
SFM0023	4.42	5.42	2004-07-08	8545	2.74	0.0013	0.0007		2.85	0.0051	0.0051	5.54	3.0	3.3	16.6	
SFM0023	4.42	5.42	2004-10-18	8678	2.80	–0.0001	0.0002		2.96	0.0039	0.0006	3.33	5.8	5.8	9.3	
SFM0023	4.42	5.42	2005-01-24	8774	2.60	0.0006	0.0010		2.99	0.0052	0.0027	1.83	4.7	6.7	12.7	
SFM0023	4.42	5.42	2005-04-11	8861	2.72	–0.0001	0.0006	0.0006	2.91	0.0032	0.0007	0.41	3.8	6.3	16.4	–0.2
SFM0024	2.71	3.21	2003-07-14	4918	0.266	0.0003	0.0004	–0.0002	0.999	0.0432	0.0269	5.80	6.6	9.1	54.7	
SFM0024	2.71	3.21	2003-11-06	8082	0.408	–0.0001	0.0002				0.0014	6.93	8.9	8.9	37.3	
SFM0025	6.06	7.06	2003-07-09	4901	1.27	0.0006	0.0091	0.0091	1.33	0.0127	0.0078	8.42	2.2	2.5	32.8	
SFM0025	6.06	7.06	2003-11-04	8081	1.24	–0.0001	–0.0002				0.0010	10.7	1.6	2.3	14.0	
SFM0025	6.06	7.06	2004-01-14	8248	1.28		0.0161		1.39	0.0185	0.0199	8.90	2.1	2.3	22.4	
SFM0025	6.06	7.06	2004-04-26	8425	1.24	0.0001	0.0003		1.33	0.0144	0.0029	8.30	2.0	2.4	24.2	
SFM0025	6.06	7.06	2004-07-09	8592	1.20	0.0007	0.0005		1.34	0.0145	0.0019	9.60	2.1	2.1	29.4	
SFM0025	6.06	7.06	2004-10-14	8674	1.30	0.0001	–0.0002		1.37	0.0044	–0.0005	9.34	2.4	2.4	37.7	
SFM0025	6.06	7.06	2005-01-20	8770	1.24	0.0025	0.0025		1.37	0.0169	0.0021	8.34	2.0	2.2	31.2	
SFM0025	6.06	7.06	2005-04-13	8862	1.22	–0.0001	–0.0002	–0.0002	1.32	0.0163	–0.0005	8.45	1.9	2.0	32.0	–0.2
SFM0027	7.00	8.00	2003-07-09	4896	0.492	0.0001	0.0003	0.0003	0.723	0.0688	0.0388	7.86	5.3	5.4	65.5	
SFM0027	7.00	8.00	2003-10-30	8071	0.476	0.0007	0.0013				0.0361	8.14	5.8	5.7	66.9	
SFM0027	7.00	8.00	2004-01-15	8241	0.532	0.0072	0.0142		0.824	0.070	0.0297	8.13	5.7	5.4	71.1	
SFM0027	7.00	8.00	2004-04-21	8422	0.300	0.0036	0.0085		0.879	0.070	0.0234	6.37	5.5	7.7	65.7	
SFM0027	7.00	8.00	2004-07-07	8588	0.469	0.0167	0.0631		0.807	0.0621	0.0429	8.37	5.6	6.5	70.4	
SFM0027	7.00	8.00	2004-10-18	8664	0.581	0.0038	0.0129		0.812	0.0634	0.0702	9.12	6.2	5.6	79.4	

Id code	Secup m	Seclow m	Date	Sample no	NH_4-N (mg/l)	NO_2-N (mg/l)	NO_3-N+NO_2-N (mg/l)	NO_3-N (mg/l)	N-tot (mg/l)	P-tot (mg/l)	PO_4-P (mg/l)	SiO_4-Si (mg/l)	TOC (mg/l)	DOC (mg/l)	DIC (mg/l)	O_2 (mg/l)
SFM0027	7.00	8.00	2005-01-19	8764	0.523	0.0104	0.0166		0.923	0.0682	0.0586	8.89	5.4	5.4	68.7	
SFM0027	7.00	8.00	2005-04-06	8848	0.569	0.0057	0.0146	0.0090	0.826	0.0671	0.0628	8.97	5.6	6.3	64.1	0.9
SFM0029	7.00	8.00	2003-07-08	4893	0.049	–0.0001	0.0022	0.0022	0.299	0.0183	0.0088	5.39	6.8	6.8	51.3	
SFM0029	7.00	8.00	2003-10-28	8068	0.149	0.0032	0.0008				0.0162	6.21	7.8	8.8	61.3	
SFM0029	7.00	8.00	2004-01-20	8237	0.067	0.0005	0.0009		0.353	0.0173	0.0052	5.77	7.3	7.2	70.1	
SFM0029	7.00	8.00	2004-04-20	8419	0.052	0.0008	0.0009		0.327	0.0121	0.0126	5.88	7.4	7.8	73.0	
SFM0029	7.00	8.00	2004-10-13	8668	0.073	0.0023	–0.0002		0.360	0.0194	0.0085	6.13	7.9	8.0	84.1	
SFM0029	7.00	8.00	2005-01-21	8773	0.070	0.0066	0.0066		0.322	0.0221	0.0084	6.01	7.8	7.8	76.3	
SFM0029	7.00	8.00	2005-04-07	8852	0.056	0.0007	0.0015	0.0008	0.331	0.0165	0.0019	5.98	7.6	7.8	60.0	–0.2
SFM0031	3.50	4.50	2003-07-09	4899	0.085	–0.0001	0.0007	0.0007	0.346	0.0326	0.0008	7.78	7.4	7.4	59.3	
SFM0031	3.50	4.50	2003-10-30	8072	0.080	0.0025	0.0036				0.0008	8.28	7.7	7.8	62.2	
SFM0031	3.50	4.50	2004-01-20	8245	0.078	0.0014	0.0040		0.468	0.0537	0.0005	7.61	8.3	13.0	75.5	
SFM0031	3.50	4.50	2004-04-22	8421	0.093	0.0012	0.0028		0.357	0.0066	0.0005	7.71	7.5	7.5	82.0	
SFM0031	3.50	4.50	2004-07-07	8589	0.100	0.0025	0.0135		0.368	0.004	0.0015	8.27	7.7	7.7	74.9	
SFM0031	3.50	4.50	2004-10-14	8667	0.072	0.0053	0.0380		0.373	0.0039	0.0006	8.80	8.1	10.8	83.0	
SFM0031	3.50	4.50	2005-01-20	8769	0.074	0.0028	0.0054		0.368	0.0045	0.0006	7.94	8.0	9.8	76.5	
SFM0031	3.50	4.50	2005-04-06	8847	0.109	0.0003	0.0008	0.0005	0.389	0.0092	–0.0005	7.91	7.8	7.8	40.9	0.5
SFM0032	3.00	4.00	2003-07-08	4894	0.039	0.0002	0.0020	0.0020	0.721	0.0125	0.0064	7.06	19.4	20.1	50.7	
SFM0032	3.00	4.00	2003-10-30	8074	0.072	0.0022	0.0097				0.0069	7.12	15.4	15.9	59.0	
SFM0032	3.00	4.00	2004-01-13	8235	0.076	0.0007	0.0010		0.643	0.0116	0.0082	6.32	16.7	16.6	57.9	
SFM0032	3.00	4.00	2004-04-21	8423	0.077	0.0004	0.0004		0.606	0.0124	0.0080	5.91	16.3	16.5	63.4	
SFM0032	3.00	4.00	2004-07-08	8587	0.083	–0.0001	–0.0002		0.634	0.0129	0.0105	6.93	16.4	16.3	64.6	
SFM0032	3.00	4.00	2004-10-14	8669	0.070	0.0006	0.0114		0.743	0.0138	0.0025	7.74	20.5	20.2	72.1	
SFM0032	3.00	4.00	2005-01-19	8766	0.083	0.0025	0.0023		0.636	0.0134	0.0084	6.29	17.0	17.2	66.9	
SFM0032	3.00	4.00	2005-04-12	8856	0.080	0.0004	0.0004	–0.0002	0.631	0.0144	0.0087	6.00	17.4	17.8	54.1	–0.2
SFM0037	2.00	3.00	2003-07-10	4919	0.009	0.0002	0.0003	–0.0002	0.818	0.260	0.0021	5.77	19.9	20.4	101	
SFM0037	2.00	3.00	2003-10-31	8075	0.014	0.0025	0.0011				0.0056	6.33	21.1	21.2	70.9	

Id code	Secup m	Seclow m	Date	Sample no	NH_4-N (mg/l)	NO_2-N (mg/l)	NO_3-N+NO_2-N (mg/l)	NO_3-N (mg/l)	N-tot (mg/l)	P-tot (mg/l)	PO_4-P (mg/l)	SiO_4-Si (mg/l)	TOC (mg/l)	DOC (mg/l)	DIC (mg/l)	O_2 (mg/l)
SFM0037	2.00	3.00	2004-01-19	8239	0.031	0.0013	0.0015		0.980	0.0031	0.0055	5.08	29.5	31.3	72.8	
SFM0037	2.00	3.00	2004-04-22	8420	0.023	0.0007	0.0004		0.879	0.0325	0.0014	5.13	26.0	25.6	72.2	
SFM0037	2.00	3.00	2004-07-07	8581	0.029	0.0003	0.0024		0.839	0.0357	0.0026	6.68	20.8	20.7	77.5	
SFM0037	2.00	3.00	2004-10-14	8673	0.012	0.0024	0.0004		0.717	0.0213	0.0102	7.73	16.3	16.0	106	
SFM0037	2.00	3.00	2005-01-20	8765	0.031	0.0030	0.0027		0.997		0.0075	5.85	26.1	27.0	71.4	
SFM0037	2.00	3.00	2005-04-06	8850	0.009	0.0003	0.0004	–0.0002	0.917	0.040	0.0047	5.09	27.3	27.4	57.3	0.4
SFM0049	4.00	5.00	2004-07-12	8597	0.101	0.0012	–0.0002		0.750	0.0134	0.0086	4.35	18.9	19.1	38.5	
SFM0049	4.00	5.00	2004-10-12	8665	0.133	0.0011	0.0002		0.710	0.015	0.0121	3.93	18.2	17.8	45.7	
SFM0049	4.00	5.00	2005-01-25	8776	0.061	0.0011	0.0011		0.595	0.0122	0.0068	5.02	17.6	17.5	37.6	
SFM0049	4.00	5.00	2005-04-12	8859	0.066	0.0003	0.0005	–0.0002	0.664	0.0176	0.0071	4.80	16.9	16.6	35.7	–0.2
SFM0057	3.45	4.45	2003-11-04	8091	0.021	0.0007	0.0017				0.0064	3.61	19.3	19.3	32.1	
SFM0057	3.45	4.45	2004-01-20	8243	–0.001	0.0058	0.0280		0.592	0.010	0.0024	2.97	15.0	15.1	37.2	
SFM0057	3.45	4.45	2004-04-20	8412	0.014	0.0200	0.123		0.592	0.0084	0.0026	3.16	11.2	11.4	42.8	
SFM0057	3.45	4.45	2004-07-06	8582	0.015	0.0001	0.0009		0.380	0.005	0.0028	3.65	10.4	10.3	53.8	
SFM0057	3.45	4.45	2004-10-13	8663	0.037	0.0003	0.0002		0.435	0.0071	0.0050	4.19	12.6	12.7	60.1	
SFM0057	3.45	4.45	2005-01-21	8772	0.032	0.0421	0.429		1.05	0.0132	0.0042	3.22	19.9	19.8	42.8	
SFM0057	3.45	4.55	2005-04-08	8857	0.002	0.0010	0.143	0.142	0.661	0.0132	0.0028	3.15	15.1	14.8	35.3	0.5
SFM0060	6.60	7.60	2004-01-21	8244	–0.001	0.0006	0.283		0.609	0.007	0.00091	3.35	6.5	7.2	61.6	
SFM0060	6.60	7.60	2004-07-07	8590	–0.001	–0.0001	0.0961		0.318	0.0029	0.0017	3.34	6.2	6.2	64.0	
SFM0060	6.60	7.60	2004-10-14	8671	0.001	0.0001	0.0708		0.275	0.0034	0.0017	3.42	4.7	4.7	60.2	
SFM0060	6.60	7.60	2005-01-25	8780	0.001	0.0004	0.540		0.741	0.0045	0.0020	3.28	6.1	6.7	51.7	
SFM0060	6.60	7.60	2005-04-07	8849	0.001	0.0002	0.204	0.203	0.482	0.0048	0.0016	3.09	7.1	7.0	46.3	4.1

Table A4-4. Isotopes I.

Id code	Secup m	Seclow m	Date	Sample no	pmC	$\partial^{13}C$ (‰ PDB)	$\partial^{34}S$ (‰ CDT)	$^{10}B/^{11}B$	$\partial^{37}Cl$ (‰ SMOC)	$^{87}Sr/^{86}Sr$	∂ D (‰ SMOW)	Tritium (TU)	$\partial^{18}O$ (‰ SMOW)
PFM000001			2003-11-03	8073				0.2389			–82.2	6.0	–12.0
PFM000001			2004-04-27	8434				0.2415			–84.4	12.3	–12.0
PFM000001			2004-10-19	8687				0.2424			–80.7	13.6	–11.6
PFM000007			2003-11-03	8046				0.2379			–87.8	11.8	–12.8
PFM000007			2004-04-23	8435				0.2418			–88.0	11.9	–12.6
PFM000007			2004-10-12	8680				0.2440			–85.5	10.2	–12.4
PFM000008			2003-11-03	8050				0.2377			–77.6	13.2	–10.9
PFM000008			2004-04-27	8437				0.2409			–85.7	11.1	–12.4
PFM000008			2004-10-19	8682				0.2430			–73.8	12.7	–9.9
PFM000009			2003-11-03	8078				0.2349			–85.1	3.9	–11.6
PFM000009			2004-04-27	8439				0.2366			–95.2	1.5	–12.7
PFM000009			2004-10-18	8685				0.2385			–81.2	–0.8	–10.9
PFM000039			2003-09-04	4987							–78.6	9.4	–10.3
PFM000039			2003-11-03	8076				0.2376			–75.9	12.1	–10.4
PFM000039			2004-05-04	8438				0.2367			–74.2	3.1	–10.1
PFM000039			2004-10-19	8686				0.2408			–73.4	6.0	–10.2
PFM002942			2003-11-04	8092				0.2410			–81.4	6.4	–11.9
PFM002942			2004-04-26	8430			24.3	0.2415			–83.5	11.1	–12.1
PFM002942			2004-10-19	8684				0.2428			–79.4	8.9	–11.5
PFM004179			2004-04-23	8432				0.2426			–85.6	12.8	–12.4
PFM004179			2004-10-18	8683				0.2432			–84.6	10.9	–11.9
PFM004504			2004-10-13	8662	84.52	–10.66	–6.4	0.2452	0.41	0.721625	–74.9	11.0	–11.1
PFM004778			2003-11-03	8077				0.2419			–87.8	1.8	–12.8
PFM004778			2004-04-23	8436				0.2412			–89.4	11.5	–13.0
PFM004778			2004-10-18	8670				0.2461			–87.2	11.0	–12.7

Id code	Secup m	Seclow m	Date	Sample no	pmC	∂^{13}C (‰ PDB)	∂^{34}S (‰ CDT)	^{10}B/^{11}B	∂^{37}Cl (‰ SMOC)	^{87}Sr/^{86}Sr	∂ D (‰ SMOW)	Tritium (TU)	∂^{18}O (‰ SMOW)
SFM0001	3.95	4.95	2002-07-18	4219	90.20	–15.60			–0.10		–90.6	15.3	–10.9
SFM0001	3.95	4.95	2002-09-20	4316			10.4	0.1900	0.25	0.721181	–76.3	–6.0	–10.8
SFM0001	3.95	4.95	2002-12-12	4403	98.81	–14.70		0.2402	0.25		–80.3	13.3	–11.1
SFM0001	3.95	4.95	2003-06-05	4808	91.55	–14.40	7.0	0.2363	0.43		–84.0	12.5	–11.1
SFM0001	3.95	4.95	2003-07-10	4900	88.43	–13.68	8.3	0.2368	0.23	0.721015	–82.7	11.9	–10.7
SFM0001	3.95	4.95	2003-10-28	8069	91.05	–13.97	0.4	0.2382	0.28	0.721011	–76.2	12.3	–10.7
SFM0001	3.95	4.95	2004-01-20	8242		–14.64	2.2	0.2411	–0.22	0.721046	–83.7	11.8	–11.9
SFM0001	3.95	4.95	2004-04-19	8418			1.9	0.2380	–0.56	0.721228	–86.1	12.1	–12.3
SFM0001	3.95	4.95	2004-07-06	8583	89.20	–12.60	6.7	0.2356	0.26	0.720935	–82.5	12.5	–11.1
SFM0001	3.95	4.95	2004-10-12	8661	89.45	–12.56	1.8	0.2408	0.51	0.720902	–73.1	11.6	–10.7
SFM0001	3.95	4.95	2005-01-24	8775			6.1	0.2408	0.34	0.721024	–77.1	11.0	–10.3
SFM0001	3.95	4.95	2005-04-11	8853			2.8	0.2410	0.51	0.721128	–75.5	11.8	–11.0
SFM0002	4.21	5.21	2002-07-18	4220	85.30	–15.80			–0.48		–95.2	13.7	–11.8
SFM0002	4.21	5.21	2002-09-20	4318			6.1	0.1900	–0.07	0.724237	–83.5	13.0	–11.9
SFM0002	4.21	5.21	2002-12-12	4405				0.2427	0.06		–84.0	11.7	–11.9
SFM0002	4.21	5.21	2003-06-04	4806	87.98	–14.81	4.7	0.2347	0.04		–88.5	10.1	–12.1
SFM0002	4.21	5.21	2003-07-09	4898	85.29	–14.53	8.0	0.2396	–0.38	0.722456	–88.2	11.4	–12.0
SFM0002	4.21	5.21	2003-10-28	8067	86.72	–15.23	12.0	0.2420	–0.29	0.722201	–84.7	9.6	–12.2
SFM0002	4.21	5.21	2004-01-14	8238		–15.29	9.4	0.2423	–0.29	0.721742	–85.9	12.5	–12.0
SFM0002	4.21	5.21	2004-04-19	8414			7.1	0.2396	–0.35	0.722164	–88.4	12.8	–12.5
SFM0002	4.21	5.21	2004-07-06	8586	87.03	–13.22	7.1	0.2418	–0.49	0.722218	–89.5	10.8	–12.3
SFM0002	4.21	5.21	2004-10-12	8659	86.90	–12.88	5.6	0.2457	–0.28	0.722307	–81.6	10.9	–12.2
SFM0002	4.21	5.21	2005-01-20	8767			2.7	0.2432	–0.32	0.722235	–83.5	11.6	–12.0
SFM0002	4.21	5.21	2005-04-11	8858			2.4	0.2441	–0.17	0.722252	–80.9	12.0	–12.5
SFM0003	8.98	10.98	2002-07-18	4221	69.10	–11.40			0.26		–82.3	24.9	–9.0
SFM0003	8.98	10.98	2002-09-20	4317			–2.4	0.1900	0.26	0.724103	–76.3	–6.0	–9.7
SFM0003	8.98	10.98	2002-12-12	4404	87.96	–14.20		0.2431	0.20		–74.9	17.9	–9.9

Id code	Secup m	Seclow m	Date	Sample no	pmC	$\partial^{13}C$ (‰ PDB)	$\partial^{34}S$ (‰ CDT)	$^{10}B/^{11}B$	$\partial^{37}Cl$ (‰ SMOC)	$^{87}Sr/^{86}Sr$	∂ D (‰ SMOW)	Tritium (TU)	$\partial^{18}O$ (‰ SMOW)
SFM0003	8.98	10.98	2003-06-04	4807	90.92	–13.68	0.8	0.2415	0.31		–81.9	14.3	–9.6
SFM0003	8.98	10.98	2003-07-09	4902	91.07	–9.95	0.6	0.2388		0.724681	–79.1	15.6	–9.7
SFM0003	8.98	10.98	2003-10-28	8065			1.0	0.2390	0.58	0.724690	–71.3	14.8	–10.0
SFM0003	8.98	10.98	2004-01-19	8240		–13.83	0.7	0.2439	0.06	0.724736	–75.5	14.3	–9.8
SFM0003	8.98	10.98	2004-04-19	8415			1.9	0.2385	–0.23	0.724756	–75.3	15.0	–10.1
SFM0003	8.98	10.98	2004-07-06	8585	90.70	–12.44	0.4	0.2430	0.04	0.724728	–76.8	12.9	–9.8
SFM0003	8.98	10.98	2004-10-12	8660	89.60	–12.02	–7.4	0.2438	0.12	0.724747	–71.8	13.9	–9.7
SFM0003	8.98	10.98	2005-01-24	8778			–0.3	0.2455	0.98	0.724686	–72.9	13.7	–9.7
SFM0003	8.98	10.98	2005-04-06	8851			–1.9	0.2446	0.20	0.724760	–72.8	13.5	–10.3
SFM0005	2.21	3.21	2002-12-16	4432				0.2431	0.01		–84.3	11.0	–12.0
SFM0005	2.21	3.21	2003-06-03	4805	95.38	–14.54	–1.0	0.2283	0.08		–93.8	11.2	–12.7
SFM0005	2.21	3.21	2004-01-12	8232		–15.42	1.3	0.2444	–0.19	0.723603	–86.3	11.7	–12.3
SFM0005	2.21	3.21	2004-04-20	8426			1.1	0.2436	–0.11	0.722751	–92.5	11.3	–13.1
SFM0005	2.21	3.21	2004-07-13	8598	94.56	–12.69	–0.1	0.2463	–0.46	0.723130	–89.4	11.8	–11.9
SFM0005	2.21	3.21	2005-01-24	8771			–0.8	0.2452	0.27	0.722942	–82.6	11.2	–11.4
SFM0005	2.21	3.21	2005-04-08	8854			–1.6	0.2444	0.45	0.723077	–85.7	10.5	–12.7
SFM0006	3.21	4.21	2003-05-07	4764	105.14	–15.24	–7.5	0.2466	–0.14		–92.5	7.8	–12.7
SFM0006	3.21	4.21	2003-06-03	4810	102.67	–14.63	–5.6	0.2315	0.19		–92.4	11.3	–12.7
SFM0006	3.21	4.21	2004-01-15	8234		–15.45	–5.1	0.2470	–0.22	0.722593	–89.1	9.6	–12.6
SFM0006	3.21	4.21	2004-04-21	8413			–1.8	0.2442	–0.57	0.722258	–91.6	12.0	–13.0
SFM0006	3.21	4.21	2005-01-19	8763			–3.9	0.2426	–0.23	0.722977	–96.7	10.3	–12.4
SFM0006	3.21	4.21	2005-04-08	8855			–7.4	0.2459	0.11	0.722386	–86.3	9.9	–12.9
SFM0008	5.14	6.14	2003-06-02	4812	99.55	–14.60	–12.7	0.2386	0.33		–90.6	10.4	–12.3
SFM0008	5.14	6.14	2003-07-07	4895			–13.0	0.2381	0.08	0.728649	–90.1	12.2	–12.2
SFM0008	5.14	6.14	2003-10-29	8070			0.8	0.2397	0.20	0.727078	–82.1	8.1	–12.3
SFM0008	5.14	6.14	2004-01-13	8236		–14.91	–3.3	0.2423	–0.37	0.726872	–87.3	10.1	–12.2
SFM0008	5.14	6.14	2004-04-20	8416			–4.5	0.2410	–0.40	0.727173	–87.7	11.0	–12.4

Id code	Secup m	Seclow m	Date	Sample no	pmC	$\partial^{13}C$ (‰ PDB)	$\partial^{34}S$ (‰ CDT)	$^{10}B/^{11}B$	$\partial^{37}Cl$ (‰ SMOC)	$^{87}Sr/^{86}Sr$	∂ D (‰ SMOW)	Tritium (TU)	$\partial^{18}O$ (‰ SMOW)
SFM0008	5.14	6.14	2004-07-05	8584	96.30	–12.51	–9.1	0.2395	0.08	0.727366	–89.7	10.7	–12.3
SFM0008	5.14	6.14	2004-10-15	8672	95.21	–12.95	–5.1	0.2434	–0.11	0.727022	–83.2	10.3	–12.1
SFM0008	5.14	6.14	2005-01-25	8779			–6.6	0.2442	0.12	0.727172	–84.7	11.5	–11.8
SFM0008	5.14	6.14	2005-04-07	8845			–9.8	0.2434	0.16	0.727071	–88.1	10.5	–12.5
SFM0009	2	3	2003-03-31	4674							–86.8	11.7	–11.9
SFM0009	2	3	2003-07-08	4897	90.98	–13.95	–5.0	0.2401	–0.07	0.727906	–87.9	11.7	–11.8
SFM0009	2	3	2003-10-29	8066			–12.1	0.2442	–0.05	0.725217	–81.3	11.0	–11.9
SFM0009	2	3	2004-01-12	8233			–0.6	0.2377	–0.42	0.724165	–85.1	12.6	–12.0
SFM0009	2	3	2004-04-20	8427			0.3	0.2460	0.00	0.724094	–86.6	11.4	–12.3
SFM0009	2	3	2004-07-13	8596	95.30	–12.64	–1.4	0.2449	–0.37	0.724374	–87.0	12.5	–12.0
SFM0009	2	3	2004-10-13	8666	95.11	–13.02	–10.8	0.2485	0.03	0.724588	–81.7	10.6	–11.9
SFM0009	2	3	2005-01-24	8777			–5.2	0.2462	0.48	0.724527	–81.0	12.6	–11.5
SFM0009	2	3	2005-04-07	8846			–5.6	0.2473	0.01	0.724252	–85.4	12.1	–12.2
SFM0010	1	2	2003-04-03	4672							–86.9	–0.8	–12.3
SFM0011	3.5	4.5	2003-03-31	4668							–73.5	2.0	–9.5
SFM0012	5.35	6.35	2003-04-24	4730							–78.5	12.4	–9.7
SFM0012	5.35	6.35	2003-06-04	4809	47.91	–6.52	30.3	0.2346	0.57		–77.3	0.9	–9.5
SFM0012	5.35	6.35	2003-07-14	4921	67.80	3.13	30.1	0.2371	0.17	0.722176	–78.2	1.2	–9.6
SFM0012	5.35	6.35	2003-11-05	8080	51.12	–6.53	15.7	0.2368		0.722193	–74.8	7.0	–10.0
SFM0012	5.35	6.35	2004-01-19	8249		–6.81	28.7	0.2373	0.17	0.722158	–75.1	1.4	–9.6
SFM0012	5.35	6.35	2004-04-26	8424			29.5	0.2359	–0.18	0.722086	–74.5	–0.8	–9.6
SFM0012	5.35	6.35	2004-07-08	8593	48.57	–4.80	29.3		0.08	0.722129	–76.3	–0.8	–9.6
SFM0012	5.35	6.35	2004-10-14	8676	49.81	–4.35	28.2	0.2389	0.17	0.722155	–71.4	–0.8	–9.6
SFM0012	5.35	6.35	2005-01-19	8768			27.4	0.2397	0.24	0.722205	–81.3	1.0	–9.5
SFM0012	5.35	6.35	2005-04-05	8864			28.9	0.2369	0.52	0.722241	–72.9	–0.8	–9.8
SFM0013	4.48	5.48	2003-03-31	4671							–81.0	7.0	–10.8
SFM0014	2	3	2003-02-18	4513							–87.5	13.5	–12.1

Id code	Secup m	Seclow m	Date	Sample no	pmC	$\partial^{13}C$ (‰ PDB)	$\partial^{34}S$ (‰ CDT)	$^{10}B/^{11}B$	$\partial^{37}Cl$ (‰ SMOC)	$^{87}Sr/^{86}Sr$	∂ D (‰ SMOW)	Tritium (TU)	$\partial^{18}O$ (‰ SMOW)
SFM0015	6.34	7.34	2003-02-26	4517							–67.5	8.0	–7.6
SFM0015	6.34	7.34	2003-06-04	4811	83.79	6.77		0.2354	1.56		–67.4	3.3	–7.6
SFM0015	6.34	7.34	2003-07-14	4922	82.86	7.64		0.2379	0.68	0.712996	–68.0	4.3	–7.6
SFM0015	6.34	7.34	2003-11-05	8079	84.42	6.83		0.2406		0.712719	–65.7	–0.8	–8.0
SFM0015	6.34	7.34	2004-01-15	8251		8.10		0.2369	1.16	0.712770	–65.6	5.0	–7.6
SFM0015	6.34	7.34	2004-07-13	8591	81.98	8.25		0.2408	1.22	0.712096	–68.0	4.2	–7.7
SFM0015	6.34	7.34	2004-10-15	8677	82.32	7.41		0.2345	1.32	0.712062	–62.5	4.1	–7.7
SFM0015	6.34	7.34	2005-01-18	8762				0.2414	1.48	0.712381	–66.3	4.3	–7.7
SFM0015	6.34	7.34	2005-04-05	8863				0.2401	1.44	0.712779	–64.4	4.3	–8.0
SFM0016	7.5	8.5	2003-02-27	4512							–78.5	13.8	–10.1
SFM0017	4	5	2003-02-25	4515							–84.9	7.8	–11.5
SFM0018	4.5	5.5	2003-02-27	4519							–86.3	7.1	–11.9
SFM0019	4.5	5.5	2003-03-25	4667							–86.0	12.7	–11.9
SFM0020	3	4	2003-03-19	4631							–86.0	10.1	–11.9
SFM0021	2	3	2003-04-08	4725							–86.8	12.0	–11.8
SFM0022	5.3	5.8	2004-07-13	8594	66.75	–8.40	19.9	0.2394	–0.67	0.717306	–77.5	1.5	–10.0
SFM0022	5.3	5.8	2004-10-15	8675	66.65	–7.74	17.0	0.2422	–0.31	0.717287	–72.5	1.0	–10.0
SFM0022	5.3	5.8	2005-01-18	8761			18.9	0.2398	–0.37	0.717328	–77.2	–0.8	–10.0
SFM0023	4.42	5.42	2003-03-04	4516							–69.0	2.4	–8.9
SFM0023	4.42	5.42	2003-07-16	4920			9.3	0.2373	–0.14	0.724992	–72.9	2.5	–8.9
SFM0023	4.42	5.42	2003-11-06	8083	42.08	–6.48	29.2	0.2379		0.724998	–68.9	12.8	–9.2
SFM0023	4.42	5.42	2004-01-16	8252		–7.60	27.5	0.2369	0.21	0.725010	–69.8	2.4	–8.8
SFM0023	4.42	5.42	2004-04-28	8440			28.0		–0.01	0.725030	–67.1	3.7	–8.9
SFM0023	4.42	5.42	2004-07-08	8545	46.63	–0.76	40.9		0.20	0.725030	–70.9	2.7	–9.1
SFM0023	4.42	5.42	2004-10-18	8678	62.17	–4.35	23.9	0.2402	0.10	0.725035	–65.7	3.0	–8.9
SFM0023	4.42	5.42	2005-01-24	8774			29.1	0.2393	0.27	0.725077	–66.8	3.2	–8.8
SFM0023	4.42	5.42	2005-04-11	8861			27.7	0.2373	0.44	0.725117	–67.6	3.5	–9.1

Id code	Secup m	Seclow m	Date	Sample no	pmC	$\partial^{13}C$ (‰ PDB)	$\partial^{34}S$ (‰ CDT)	$^{10}B/^{11}B$	$\partial^{37}Cl$ (‰ SMOC)	$^{87}Sr/^{86}Sr$	∂ D (‰ SMOW)	Tritium (TU)	$\partial^{18}O$ (‰ SMOW)
SFM0024	2.71	3.21	2003-03-26	4670							–75.5	12.2	–9.7
SFM0024	2.71	3.21	2003-07-14	4918	87.93	–12.36	15.1	0.2389	0.04	0.713966	–77.8	13.5	–9.8
SFM0024	2.71	3.21	2003-11-06	8082	89.79	–12.39	17.6	0.2390		0.713763	–73.2	4.8	–10.1
SFM0025	6.06	7.06	2003-03-20	4634							–85.6	9.7	–11.4
SFM0025	6.06	7.06	2003-07-09	4901			16.9	0.2388	–0.41	0.718611	–89.9	7.9	–11.7
SFM0025	6.06	7.06	2003-11-04	8081	47.73	–11.28	16.8	0.2383		0.718538	–87.5	14.5	–12.2
SFM0025	6.06	7.06	2004-01-14	8248		–11.21	16.5	0.2385	–0.27	0.718577	–87.9	8.0	–11.8
SFM0025	6.06	7.06	2004-04-26	8425			17.2	0.2376	–0.26	0.718585	–87.2	6.8	–11.9
SFM0025	6.06	7.06	2004-07-09	8592	47.64	–8.74	15.7		–0.36	0.718574	–88.2	6.2	–11.7
SFM0025	6.06	7.06	2004-10-14	8674	48.20	–8.70	9.2	0.2401	–0.20	0.718566	–86.6	5.0	–11.7
SFM0025	6.06	7.06	2005-01-20	8770			14.1	0.2411	–0.30	0.718576	–84.9	6.4	–11.7
SFM0025	6.06	7.06	2005-04-13	8862			15.4	0.2380	0.06	0.718640	–85.0	6.4	–12.0
SFM0026	16	17	2003-03-24	4633							–87.0	15.7	–12.0
SFM0027	7	8	2003-04-25	4729							–89.4	12.0	–11.9
SFM0027	7	8	2003-07-09	4896	78.34	–14.07	2.1	0.2386	–0.64	0.738072	–89.6	9.6	–11.9
SFM0027	7	8	2003-10-30	8071			3.5	0.2404	–0.72	0.737813	–86.2	12.3	–12.3
SFM0027	7	8	2004-01-15	8241		–14.15	2.0	0.2414	–0.32	0.736793	–86.5	10.0	–11.9
SFM0027	7	8	2004-04-21	8422			1.7	0.2390	–0.40	0.737582	–85.7	11.3	–12.1
SFM0027	7	8	2004-07-07	8588	81.32	–13.33	2.6	0.2402	–0.54	0.737512	–88.0	10.2	–11.9
SFM0027	7	8	2004-10-18	8664	79.18	–13.28	–2.0	0.2407	–0.16	0.737409	–83.5	8.9	–12.0
SFM0027	7	8	2005-01-19	8764			1.7	0.2443	–0.28	0.737262	–85.7	8.8	–11.9
SFM0027	7	8	2005-04-06	8848			0.3	0.2420	0.02	0.737152	–82.6	11.3	–12.2
SFM0028	7	8	2003-03-17	4636							–86.1	15.5	–11.9
SFM0029	7	8	2003-07-08	4893			–6.8	0.2396	0.03	0.724891	–88.3	13.4	–11.9
SFM0029	7	8	2003-10-28	8068			–4.6	0.2389	–0.14	0.724732	–84.4	10.7	–12.2
SFM0029	7	8	2004-01-20	8237		–14.08	–5.9	0.2418	–0.07	0.724900	–85.2	13.7	–11.9
SFM0029	7	8	2004-04-20	8419			–5.6	0.2382	–0.26	0.724866	–84.9	12.4	–12.0

Id code	Secup m	Seclow m	Date	Sample no	pmC	$\partial^{13}C$ (‰ PDB)	$\partial^{34}S$ (‰ CDT)	$^{10}B/^{11}B$	$\partial^{37}Cl$ (‰ SMOC)	$^{87}Sr/^{86}Sr$	∂ D (‰ SMOW)	Tritium (TU)	$\partial^{18}O$ (‰ SMOW)
SFM0029	7	8	2004-07-13	8595	93.36	–12.08	–6.7	0.2430	–0.59	0.724925	–87.4	11.1	–12.0
SFM0029	7	8	2004-10-13	8668	93.29	–11.73	–7.6	0.2437	0.04	0.724995	–84.9	10.9	–11.9
SFM0029	7	8	2005-01-21	8773			–6.7	0.2434	–0.09	0.724912	–87.0	11.7	–12.0
SFM0029	7	8	2005-04-07	8852			–8.8	0.2434	0.31	0.724923	–82.3	11.2	–12.6
SFM0030	4	5	2003-03-11	4616							–80.8	11.8	–10.2
SFM0031	3.5	4.5	2003-07-09	4899	94.50	–16.51	–10.2	0.2388	–0.07	0.727320	–76.0	12.1	–10.0
SFM0031	3.5	4.5	2003-10-30	8072			–11.8	0.2430	–0.55	0.727411	–72.1	10.8	–10.5
SFM0031	3.5	4.5	2004-01-20	8245		–15.23	–10.0	0.2444	–0.36	0.727083	–72.3	13.0	–10.1
SFM0031	3.5	4.5	2004-04-22	8421			–9.7	0.2402	–0.04	0.726921	–72.4	12.4	–10.2
SFM0031	3.5	4.5	2004-07-07	8589	96.47	–13.21	–9.7	0.2412	0.18	0.726976	–74.5	12.2	–10.1
SFM0031	3.5	4.5	2004-10-14	8667	94.61	–12.95	–17.4	0.2437	0.18	0.727205	–68.8	13.4	–10.2
SFM0031	3.5	4.5	2005-01-20	8769			–11.2	0.2450	0.24	0.727033	–73.3	14.2	–10.4
SFM0031	3.5	4.5	2005-04-06	8847			–13.7	0.2436	0.18	0.726944	–71.4		–11.2
SFM0032	3	4	2003-03-04	4514							–85.1	15.6	–11.8
SFM0032	3	4	2003-07-08	4894	94.69	–14.56	0.4	0.2398	0.19	0.726273	–83.7	13.0	–11.1
SFM0032	3	4	2003-10-30	8074	105.10	–0.54	1.1	0.2401	–0.41	0.726278	–83.3	10.5	–12.0
SFM0032	3	4	2004-01-13	8235		–14.64	–0.5	0.2413	–0.29	0.726775	–86.2	12.4	–11.8
SFM0032	3	4	2004-04-21	8423		–7.78	–0.5	0.2399	–0.18	0.727025	–86.2	5.6	–11.9
SFM0032	3	4	2004-05-11	8469				0.2540			–85.0	9.8	–11.8
SFM0032	3	4	2004-07-08	8587	90.58	–12.75	2.2	0.2400	–0.22	0.726807	–85.1	12.3	–11.4
SFM0032	3	4	2004-10-14	8669	91.97	–12.68	1.1	0.2436	0.20	0.726290	–76.0	12.3	–10.9
SFM0032	3	4	2005-01-19	8766			–0.8	0.2432	0.17	0.726904	–92.0	12.2	–11.9
SFM0032	3	4	2005-04-12	8856			–2.1	0.2412	0.17	0.727243	–81.3	11.0	–12.5
SFM0034	2	3	2003-03-11	4617							–81.1	12.9	–10.8
SFM0036	1.99	2.99	2003-03-12	4632							–80.7	11.5	–11.0
SFM0037	2	3	2003-07-10	4919	105.44	–16.26	9.3	0.2364	0.29	0.718472	–78.6	13.2	–10.5
SFM0037	2	3	2003-10-31	8075			–3.2	0.2410	0.12	0.718512	–73.8	13.1	–10.8

Id code	Secup m	Seclow m	Date	Sample no	pmC	$\partial^{13}C$ (‰ PDB)	$\partial^{34}S$ (‰ CDT)	$^{10}B/^{11}B$	$\partial^{37}Cl$ (‰ SMOC)	$^{87}Sr/^{86}Sr$	∂ D (‰ SMOW)	Tritium (TU)	$\partial^{18}O$ (‰ SMOW)
SFM0037	2	3	2004-01-19	8239		–15.52	–2.1	0.2421	0.00	0.718951	–82.3	13.6	–11.8
SFM0037	2	3	2004-04-22	8420			–2.2	0.2388	0.12	0.719466	–84.0	11.7	–12.0
SFM0037	2	3	2004-07-07	8581	101.03	–13.77	–4.6	0.2405	0.23	0.718671	–76.6	12.5	–10.6
SFM0037	2	3	2004-10-14	8673	105.10	–13.66	1.1	0.2408	0.32	0.718356	–67.1	11.2	–9.8
SFM0037	2	3	2005-01-20	8765			–3.9	0.2443	0.29	0.719033	–72.4	12.7	–10.3
SFM0037	2	3	2005-04-06	8850			–6.4	0.2434	0.33	0.719110	–76.1	10.9	–11.5
SFM0049	4	5	2003-04-01	4673							–76.2	12.9	–10.1
SFM0049	4	5	2004-05-27	8497							–79.8	9.6	–11.0
SFM0049	4	5	2004-07-12	8597	113.57	–10.19		0.2400	–0.48	0.723034	–75.4	13.3	–9.5
SFM0049	4	5	2004-10-12	8665	110.40	–9.76	22.3	0.2432	–0.02	0.722860	–68.8	13.2	–9.3
SFM0049	4	5	2005-01-25	8776				0.2427	0.16	0.723331	–78.5	10.0	–10.9
SFM0049	4	5	2005-04-12	8859				0.2375	0.06	0.723163	–76.8	12.2	–10.9
SFM0051	5.02	5.18	2003-06-25	4855	86.32	–13.59			0.50	0.723818	–89.2	11.0	–12.0
SFM0051	5.02	5.18	2003-10-22	8062	87.47	–14.84		0.2440	0.35	0.723703	–85.8	7.3	–12.5
SFM0051	5.02	5.18	2004-01-27	8254		–14.13		0.2450		0.723580	–85.2	10.4	–12.1
SFM0051	5.02	5.18	2004-05-11	8473		–13.46			–0.40	0.723510	–86.1	10.2	–12.3
SFM0051	5.02	5.18	2004-08-03	8599	88.17	–12.90		0.2452	–0.41	0.723360	–87.7	11.5	–12.3
SFM0051	5.02	5.18	2004-11-02	8714	88.35	–12.16		0.2427	–0.12	0.723118	–84.6	11.6	–12.1
SFM0051	5.02	5.18	2005-02-03	8788				0.2439	2.24	0.723446	–85.1	10.2	–11.8
SFM0051	5.02	5.18	2005-05-11	8889				0.2411	0.06			10.3	
SFM0053	6.01	6.17	2003-06-26	4856	89.88	–13.02				0.725140	–88.6	11.8	–11.9
SFM0053	6.01	6.17	2003-10-22	8061	98.09	–4.98		0.2485	0.24	0.724816	–84.8	9.4	–12.3
SFM0053	6.01	6.17	2004-01-28	8256		–13.30		0.2448	0.06	0.724732	–86.5	1.2	–11.9
SFM0053	6.01	6.17	2004-05-11	8472		–12.47			0.18	0.724688	–86.1	10.2	–12.3
SFM0053	6.01	6.17	2004-08-03	8600	93.94	–11.87		0.2437	0.31	0.724735	–86.8	11.2	–12.1
SFM0053	6.01	6.17	2004-11-03	8715	93.85	–12.18		0.2441	–0.16	0.724608	–83.5	11.0	–12.0
SFM0053	6.01	6.17	2005-02-10	8789				0.2385	0.26	0.724700	–82.3	9.7	–11.5

Id code	Secup m	Seclow m	Date	Sample no	pmC	$\partial^{13}C$ (‰ PDB)	$\partial^{34}S$ (‰ CDT)	$^{10}B/^{11}B$	$\partial^{37}Cl$ (‰ SMOC)	$^{87}Sr/^{86}Sr$	∂ D (‰ SMOW)	Tritium (TU)	$\partial^{18}O$ (‰ SMOW)
SFM0053	6.01	6.17	2005-05-11	8890				0.2409	0.16			10.6	
SFM0056	6.01	6.17	2003-06-25	4857							–83.9	–0.8	–11.2
SFM0056	6.01	6.17	2003-06-22	8063				0.2466			–81.1	–0.8	–11.6
SFM0056	6.01	6.17	2004-01-27	8255				0.2417	0.33		–85.2	–0.8	–11.9
SFM0056	6.01	6.17	2004-05-10	8474							–81.7	–0.8	–11.5
SFM0056	6.01	6.17	2004-08-02	8601				0.2411			–83.7	–0.8	–11.3
SFM0056	6.01	6.17	2004-11-01	8713				0.2364			–79.9	2.6	–11.1
SFM0056	6.01	6.17	2005-02-01	8787				0.2391			–80.1	–0.8	–10.7
SFM0056	6.01	6.17	2005-05-11	8891				0.2405				–0.8	
SFM0057	3.45	4.45	2003-11-04	8091	92.08	–15.16	18.8	0.2395		0.718964	–80.9	12.5	–12.2
SFM0057	3.45	4.45	2004-01-20	8243		–12.68	20.3	0.2411	–0.28	0.718853	–90.7	9.7	–12.8
SFM0057	3.45	4.45	2004-04-20	8412			20.0	0.2424	–0.28	0.720443	–93.5	8.6	–13.1
SFM0057	3.45	4.45	2004-07-06	8582	96.67	–12.99	18.4	0.2388	–0.57	0.719763	–89.7	10.6	–12.5
SFM0057	3.45	4.45	2004-10-13	8663	94.15	–12.67	14.5	0.2408	–0.19	0.719411	–82.9	9.8	–12.1
SFM0057	3.45	4.45	2005-01-21	8772			9.8	0.2408	0.00	0.719296	–87.2	11.1	–12.4
SFM0057	3.45	4.55	2005-04-08	8857			8.2	0.2397	0.05	0.719401	–89.3	10.7	–13.4
SFM0059	4.88	5.88	2003-12-02	8165				0.2395			–82.0	9.0	–11.1
SFM0060	6.6	7.6	2004-01-21	8244		–13.09	–4.9	0.2452	–0.19	0.726455	–85.9	10.0	–12.3
SFM0060	6.6	7.6	2004-07-07	8590	88.86	–11.03	–7.8	0.2407	–0.03	0.726727	–90.7	10.8	–12.5
SFM0060	6.6	7.6	2004-10-14	8671	87.68	–10.80	–4.5	0.2447	0.19	0.726922	–88.7	9.9	–12.5
SFM0060	6.6	7.6	2005-01-25	8780			–4.0	0.2440	0.26	0.726081	–85.9	10.1	–12.2
SFM0060	6.6	7.6	2005-04-07	8849			–8.2	0.2427	0.02	0.726199	–83.9		–12.6
SFM0061	6.03	8.06	2003-12-04	8166				0.2426				10.9	
SFM0061	6.03	8.06	2003-12-02	8167				0.2437			–88.2	9.9	–12.2
SFM0061	6.03	8.06	2003-12-03	8168				0.2405			–90.2	11.6	–12.5
SFM0062	3.25	3.65	2004-02-18	8264							–83.5		–12.0
SFM0062	3.25	3.65	2004-05-11	8468				0.2503			–83.1	10.0	–11.8

Id code	Secup m	Seclow m	Date	Sample no	pmC	$\partial^{13}C$ (‰ PDB)	$\partial^{34}S$ (‰ CDT)	$^{10}B/^{11}B$	$\partial^{37}Cl$ (‰ SMOC)	$^{87}Sr/^{86}Sr$	∂ D (‰ SMOW)	Tritium (TU)	$\partial^{18}O$ (‰ SMOW)
SFM0062	3.25	3.65	2004-05-28	8498				0.2497			–84.5	9.8	–11.8
SFM0063	3.22	3.72	2004-02-18	8261							–80.5		–11.5
SFM0063	3.22	3.72	2004-05-11	8466				0.2446			–81.2	9.0	–11.1
SFM0065	4.45	4.85	2004-02-18	8262							–77.4		–11.2
SFM0074	2	4.7	2004-05-18	8461				0.2500			–82.1	10.8	–11.5
SFM0074	2	4.7	2004-05-14	8462				0.2474			–85.8	10.3	–11.9
SFM0074	2	4.7	2004-05-17	8463				0.2469			–82.7	10.8	–11.5
SFM0074	2	4.7	2004-05-13	8464				0.2495			–85.8	11.1	–12.0
SFM0074	2	4.7	2004-05-16	8465				0.2474			–81.6	9.1	–11.8
SFM0074	2	4.7	2004-05-11	8467				0.2548			–86.3	11.8	–12.3
SFM0074	2	4.7	2004-05-12	8470				0.2516			–84.5	11.1	–12.2
SFM0074	2	4.7	2004-05-11	8471				0.2481			–85.3	11.4	–12.3
SFM0074	2	4.7	2004-05-19	8494				0.2485			–82.7	9.0	–11.4
SFM0074	2	4.7	2004-05-21	8495				0.2475			–82.7	8.7	–11.3
SFM0074	2	4.7	2004-05-24	8496				0.2476			–81.7	9.0	–11.3

Table A4-5. Trace metals I.

Id code	Secup m	Seclow m	Date	Sample no	Al ug/L	As ug/L	Cd ug/L	Cr ug/L	Cu ug/L	Co ug/L	Hg ug/L	Ni ug/L	Zn ug/L	Pb ug/L	V ug/L	Mo ug/L	Ba ug/L
PFM004179			2004-10-18	8683	29.7	0.312	0.013	0.097	1.91	0.205	–0.002	1.49	0.891	0.062	0.278	1.02	64.9
PFM004504			2004-10-13	8662	38.8	1.53	0.062	0.294	13.2	0.543	0.0028	2.54	0.815	3.52	1.20	1.88	57.9
SFM0001	3.95	4.95	2002-07-18	4219		1.61	0.006		0.72		–0.002		3.16		3.02		54.0
SFM0001	3.95	4.95	2002-07-18	4219	473			4.78		0.950		9.86	4.65			2.00	59.7
SFM0001	3.95	4.95	2002-09-20	4316	59.8	–0.01	0.004	0.707	0.392	0.254	–0.002		1.59	0.243	1.96	2.97	61.5
SFM0001	3.95	4.95	2002-12-12	4403	30.3		–0.002	0.451	0.765	0.229	–0.002			0.193	1.38	1.58	52.2
SFM0001	3.95	4.95	2003-10-28	8069	69.5		0.008	0.246	0.331	0.375	–0.002	0.664	1.31	0.123	1.84	2.26	84.8
SFM0001	3.95	4.95	2004-01-20	8242	49.4		0.040	0.511	0.985	0.497	–0.002	1.81	2.98	0.273	2.08	3.30	32.0
SFM0001	3.95	4.95	2004-04-19	8418	36.3		0.006	0.372	0.435	0.247	–0.002	1.19	0.741	0.089	1.58	1.01	33.0
SFM0001	3.95	4.95	2004-07-06	8583	26.8		0.004	0.230	0.199	0.227	–0.002	0.779	0.575	0.069	1.92	1.72	49.5
SFM0001	3.95	4.95	2004-10-12	8661	32.7	1.50	0.012	0.268	–0.5	0.306	0.0033	0.513	–1	0.285	1.86	2.52	68.7
SFM0001	3.95	4.95	2005-04-11	8853	31.4	–4	0.002	0.351	0.234	0.243	–0.002	0.905	0.849	0.0839	1.87	0.986	62.2
SFM0002	4.21	5.21	2002-07-18	4220		1.10					–0.002				3.73		105
SFM0002	4.21	5.21	2002-09-20	4318	31.8	0.888	0.004		0.345	0.752	–0.002			0.136	2.84	2.29	101
SFM0002	4.21	5.21	2002-12-12	4405	18.5		–0.002	0.560		0.626	–0.002			0.228	1.63	2.38	78.9
SFM0002	4.21	5.21	2003-10-28	8067	102		0.004	0.327	0.504	0.276	–0.002	3.75	3.70	0.128	2.20	2.10	117
SFM0002	4.21	5.21	2004-01-14	8238	22.9		0.005	0.253	0.533	0.309	–0.002	4.51	2.48	0.054	1.85	1.24	86.6
SFM0002	4.21	5.21	2004-04-19	8414	23.8		0.005	0.230	0.231	0.256	–0.002	2.34	1.53	0.059	1.92	1.53	80.8
SFM0002	4.21	5.21	2004-07-06	8586	25.1		0.004	0.319	0.130	0.209	–0.002	2.44	1.05	0.079	1.69	1.75	85.7
SFM0002	4.21	5.21	2004-10-12	8659	43.3	1.03	0.007	0.317	0.157	0.176	–0.002	1.47	0.793	0.125	2.42	1.66	93.3
SFM0002	4.21	5.21	2005-04-11	8858	23.7	–1	0.003	0.253	0.192	0.153	–0.002	1.05	0.630	0.0717	1.77	1.64	90.5
SFM0003	8.98	10.98	2002-07-18	4221		8.07					–0.002						63.2
SFM0003	8.98	10.98	2002-09-20	4317	31.0	7.55	0.003	0.124	0.419	0.215	–0.002	0.595	2.62	0.096	0.297	0.924	33.5
SFM0003	8.98	10.98	2002-12-12	4404	1.75		0.006	0.149	0.179	0.129	–0.002	1.28	1.14	0.075	0.275	0.915	33.3
SFM0003	8.98	10.98	2003-10-28	8065	20.6		0.004	0.050	0.127	0.143	–0.002	0.355	0.668	0.058	0.326	0.794	39.8
SFM0003	8.98	10.98	2004-01-19	8240	0.99		0.003	0.055	0.104	0.125	–0.002	0.354	0.486	0.031	0.361	0.707	38.5
SFM0003	8.98	10.98	2004-04-19	8415	2.71		0.007	0.083	0.126	0.139	–0.002	0.421	0.960	0.164	0.307	0.870	40.3

Id code	Secup m	Seclow m	Date	Sample no	Al ug/L	As ug/L	Cd ug/L	Cr ug/L	Cu ug/L	Co ug/L	Hg ug/L	Ni ug/L	Zn ug/L	Pb ug/L	V ug/L	Mo ug/L	Ba ug/L
SFM0003	8.98	10.98	2004-07-06	8585	7.71		0.003	0.040	–0.1	0.139	–0.002	0.400	0.573	0.045	0.295	0.962	39.2
SFM0003	8.98	10.98	2004-10-12	8660	34.5	8.98	–0.010	0.060	–0.5	0.154	–0.002	0.383	–1	0.134	0.374	0.884	39.9
SFM0003	8.98	10.98	2005-04-06	8851	1.72	8.06	0.012	0.106	–0.1	0.127	–0.002	0.434	1.49	0.159	0.327	0.940	39.9
SFM0005	2.21	3.21	2002-12-16	4432	39.1		0.019	0.427	3.47	0.191	–0.002	1.79	1.42	0.133	0.313	0.743	65.1
SFM0005	2.21	3.21	2004-01-12	8232	47.0		0.020	0.183	2.80	0.159	0.0028	0.889	0.8	0.224	0.347	0.349	47.3
SFM0005	2.21	3.21	2004-04-20	8426	30.3		0.024	0.214	2.40	0.138	–0.002	0.770	0.738	0.088	0.34	0.460	64.1
SFM0005	2.21	3.21	2004-07-13	8598	53.3		0.017	0.284	3.29	0.138	–0.002	1.01	0.457	0.160	0.646	0.502	64.9
SFM0005	2.21	3.21	2005-04-08	8854	43.5	–0.5	0.018	0.207	2.76	0.168	0.0034	0.837	0.521	0.188	0.419	0.392	44.4
SFM0006	3.21	4.21	2003-05-07	4764	10.5	0.391	0.027	0.155	7.90	0.962	–0.002	5.80	4.21	0.369	0.699	2.99	176
SFM0006	3.21	4.21	2004-01-15	8234	5.39		0.018	0.078	6.68	0.248	–0.002	3.10	1.14	0.153	0.326	2.26	190
SFM0006	3.21	4.21	2004-04-21	8413	9.89		0.019	0.089	6.52	0.184	–0.002	3.19	1.12	0.058	0.283	2.21	174
SFM0006	3.21	4.21	2005-04-08	8855	6.07	–1	0.010	0.069	7.41	0.117	–0.002	2.51	0.433	0.020	0.397	2.65	111
SFM0008	5.14	6.14	2003-10-29	8070	19.8		0.022	0.132	0.692	0.421	–0.002	1.08	0.612	0.055	0.362	1.12	105
SFM0008	5.14	6.14	2004-01-13	8236	2.08		0.009	0.058	1.19	0.268	–0.002	1.31	0.385	0.022	0.089	0.807	93.8
SFM0008	5.14	6.14	2004-04-20	8416	3.09		0.015	0.063	1.60	0.265	–0.002	1.50	0.312	0.012	0.095	0.681	79.9
SFM0008	5.14	6.14	2004-07-05	8584	12.0		0.012	0.075	1.52	0.267	–0.002	1.41	0.632	0.027	0.143	0.724	66.6
SFM0008	5.14	6.14	2004-10-15	8672	8.38	0.52	0.014	0.104	1.35	0.315	–0.002	1.45	0.237	0.059	0.167	0.776	61.7
SFM0008	5.14	6.14	2005-04-07	8845	4.28	–3	0.006	0.058	1.91	0.147	–0.002	1.08	–0.2	–0.01	0.141	0.636	74
SFM0009	2	3	2003-10-29	8066	55.0		0.018	0.191	3.04	0.266	–0.002	1.43	1.25	0.285	0.398	1.02	43.6
SFM0009	2	3	2004-01-12	8233	13.0		0.011	0.201	3.11	0.078	0.0025	0.912	0.914	0.103	0.222	0.609	27.3
SFM0009	2	3	2004-04-20	8427	10.6		0.011	0.137	3.06	0.099	–0.002	1.00	1.12	0.058	0.259	0.804	29.3
SFM0009	2	3	2004-07-13	8596	36.8		0.019	0.134	3.64	0.174	–0.002	1.32	0.949	0.0954	0.302	0.990	32.4
SFM0009	2	3	2004-10-13	8666	19.9	0.486	0.023	0.211	3.44	0.265	0.0034	1.57	0.707	0.208	0.434	1.10	35.9
SFM0009	2	3	2005-04-07	8846	25.9	–0.8	0.011	0.124	3.14	0.068	–0.002	0.885	0.514	0.0937	0.319	1.09	28.3
SFM0027	7	8	2003-10-30	8071	9.64		0.012	0.045	0.214	0.102	–0.002	0.354	0.634	0.053	0.472	11.5	35.4
SFM0027	7	8	2004-01-15	8241	3.45		0.025	0.038	0.195	0.109	–0.002	0.310	0.372	0.029	0.667	31.1	27.6
SFM0027	7	8	2004-04-21	8422	6.56		0.014	0.058	–0.1	0.048	–0.002	0.191	0.353	0.017	0.433	4.24	42.1
SFM0027	7	8	2004-07-07	8588	1.22		0.011	0.023	–0.1	0.021	–0.002	0.154	1.17	0.030	0.327	3.93	40.8

Id code	Secup m	Seclow m	Date	Sample no	Al ug/L	As ug/L	Cd ug/L	Cr ug/L	Cu ug/L	Co ug/L	Hg ug/L	Ni ug/L	Zn ug/L	Pb ug/L	V ug/L	Mo ug/L	Ba ug/L
SFM0027	7	8	2004-10-18	8664	5.49	0.35	0.007	0.041	0.118	0.053	–0.002	0.251	0.803	0.077	0.402	3.87	37.0
SFM0027	7	8	2005-04-06	8848	29.5	–2	0.003	0.051	0.121	0.030	–0.002	0.146	0.335	0.0351	0.378	3.12	46.4
SFM0029	7	8	2003-10-28	8068	7.32		0.003	0.058	0.138	0.148	–0.002	0.395	0.330	0.021	0.605	1.44	77.8
SFM0029	7	8	2004-01-20	8237	3.32		0.010	0.095	0.188	0.348	–0.002	0.394	0.621	0.019	0.497	1.37	68.4
SFM0029	7	8	2004-04-20	8419	3.82		0.006	0.088	0.120	0.199	–0.002	0.380	0.440	0.037	0.515	1.28	71.6
SFM0029	7	8	2004-07-13	8595	27.5		0.009	0.079	0.314	0.197	–0.002	0.639	0.554	0.148	0.478	1.35	79.3
SFM0029	7	8	2004-10-13	8668	3.41	1.97	0.007	0.082	0.242	0.294	–0.002	0.844	0.536	0.060	0.412	1.96	80.0
SFM0029	7	8	2005-04-07	8852	5.56	1.78	0.011	0.083	0.183	0.273	–0.002	0.454	1.73	0.0471	0.507	1.93	74.5
SFM0031	3.5	4.5	2003-10-30	8072	5.27		0.014	0.035	1.16	0.436	–0.002	0.827	0.747	0.020	0.292	1.87	55.2
SFM0031	3.5	4.5	2004-01-20	8245	1.74		0.014	0.044	0.977	0.314	–0.002	0.806	1.66	0.019	0.256	1.36	43.8
SFM0031	3.5	4.5	2004-04-22	8421	2.11		0.029	0.046	0.993	0.428	–0.002	0.932	1.08	–0.01	0.273	1.58	51.4
SFM0031	3.5	4.5	2004-07-07	8589	2.17		0.014	0.032	0.907	0.244	–0.002	0.856	0.824	–0.01	0.234	1.88	51.8
SFM0031	3.5	4.5	2004-10-14	8667	2.39	1.19	0.053	0.059	1.44	0.291	–0.002	0.827	1.31	0.078	0.238	2.30	48.2
SFM0031	3.5	4.5	2005-04-06	8847	10.2	2.89	0.015	0.027	0.535	0.245	–0.002	0.663	0.816	0.0345	0.262	1.83	44.6
SFM0032	3	4	2003-10-30	8074	14.3		0.004	0.297	0.28	0.197	–0.002	0.995	2.95	0.032	1.43	2.61	53.0
SFM0032	3	4	2004-01-13	8235	11.9		–0.002	0.185	0.196	0.109	–0.002	0.395	0.298	0.036	1.42	1.79	45.8
SFM0032	3	4	2004-04-21	8423	14.2		0.005	0.202	0.225	0.106	–0.002	0.496	0.207	0.028	1.62	1.85	47.3
SFM0032	3	4	2004-07-08	8587	12.8		0.003	0.228	–0.1	0.100	–0.002	0.321	0.299	0.036	1.70	2.03	52.7
SFM0032	3	4	2004-10-14	8669	20.0	1.33	0.006	0.337	–0.1	0.141	–0.002	0.501	0.837	0.100	2.26	1.83	51.6
SFM0032	3	4	2005-04-12	8856	14.5	1.35	0.006	0.197	0.159	0.088	–0.002	0.462	0.221	0.0484	1.58	1.62	53.8
SFM0037	2	3	2004-01-19	8239	555		0.003	0.532	0.517	0.177	–0.002	0.951	0.872	0.051	2.73	0.929	58.8
SFM0037	2	3	2004-04-22	8420	39.7		0.003	0.439	0.409	0.102	–0.002	0.881	0.516	0.021	2.48	0.774	71.8
SFM0037	2	3	2004-07-07	8581	23.2		0.009	0.440	0.653	0.265	–0.002	1.60	1.36	0.048	2.18	3.63	96.4
SFM0037	2	3	2004-10-14	8673	14.9	1.47	0.007	0.395	0.397	0.108	–0.002	0.756	0.212	0.064	1.97	2.31	93.0
SFM0037	2	3	2005-04-06	8850	27.5	–2	–0.002	0.455	0.532	0.068	–0.002	0.851	–0.2	0.0637	1.83	1.58	85.9
SFM0049	4	5	2004-05-27	8497	104		–0.002	0.330	0.330	0.120	–0.002	0.530	0.570	0.294	1.63	0.100	23.1
SFM0049	4	5	2004-07-12	8597	41.1		–0.002	0.203	–0.1	0.052	–0.002	0.293	–0.2	0.0789	0.970	–0.05	23.3
SFM0049	4	5	2004-10-12	8665	34.3	0.472	0.003	0.245	0.121	0.061	–0.002	0.162	0.403	0.081	0.910	–0.05	21.9

Id code	Secup m	Seclow m	Date	Sample no	Al ug/L	As ug/L	Cd ug/L	Cr ug/L	Cu ug/L	Co ug/L	Hg ug/L	Ni ug/L	Zn ug/L	Pb ug/L	V ug/L	Mo ug/L	Ba ug/L
SFM0049	4	5	2005-04-12	8859	49.4	1.11	0.002	0.189	0.223	0.077	–0.002	0.239	0.710	0.321	1.08	0.063	24.0
SFM0051	5.02	5.18	2004-01-27	8254	302		0.007	0.738	1.00	0.222	–0.002	0.745	5.26	0.968	1.55	0.853	75.3
SFM0051	5.02	5.18	2004-05-11	8473	253		0.010	1.64	3.19	0.430	–0.002	1.25	6.55	1.35	5.35	1.75	91.0
SFM0051	5.02	5.18	2004-08-03	8599	136	0.53	0.006	1.00	0.713	0.159	–0.002	1.96	19.5	0.427	1.96	0.935	83.7
SFM0051	5.02	5.18	2004-11-02	8714	393	1.2	–0.004	1.05	0.840	0.270	–0.002	0.770	3.53	0.600	2.85	1.22	86.9
SFM0051	5.02	5.18	2005-02-03	8788	109	0.35	–0.002	0.203	0.556	0.055	–0.002	0.422	1.20	0.0942	0.383	1.24	74.1
SFM0051	5.02	5.18	2005-05-11	8889	723	1.05	0.004	1.36	0.719	0.356	–0.002	0.964	4.04	0.621	2.83	1.05	89.4
SFM0053	6.01	6.17	2004-01-28	8256	497		0.005	1.22	0.960	0.276	–0.002	1.25	2.87	0.562	1.52	0.897	62.0
SFM0053	6.01	6.17	2004-05-11	8472	96.0		–0.002	0.500	0.630	0.150	–0.002	1.08	3.41	0.184	1.18	1.75	67.0
SFM0053	6.01	6.17	2004-08-03	8600	273	0.77	0.004	1.05	0.521	0.166	–0.002	1.36	2.47	0.232	1.21	1.10	77.4
SFM0053	6.01	6.17	2004-11-03	8715	238	1.2	–0.004	0.590	2.31	0.280	–0.002	1.80	5.59	0.470	1.19	1.13	72.8
SFM0053	6.01	6.17	2005-02-10	8789	63.6	0.35	–0.002	0.123	0.417	0.025	–0.002	0.577	1.79	0.0429	0.203	1.07	68.7
SFM0053	6.01	6.17	2005-05-11	8890	246	0.999	0.006	0.748	3.29	0.213	–0.002	2.320	6.450	0.308	1.150	1.100	84.0
SFM0056	6.01	6.17	2004-01-27	8255	372		0.004	0.708	0.731	0.263	–0.002	0.712	2.81	0.623	1.26	0.955	63.3
SFM0056	6.01	6.17	2004-05-10	8474	24.0		–0.002	0.150	0.430	0.110	–0.002	0.450	12.7	0.077	0.310	2.62	13.6
SFM0056	6.01	6.17	2004-08-02	8601	23.7	0.8	0.009	0.172	1.46	0.128	–0.002	1.99	5.06	0.191	0.289	2.14	13.9
SFM0056	6.01	6.17	2004-11-01	8713	24.1	1.3	–0.004	0.270	0.280	0.130	–0.002	1.07	7.86	0.080	0.24	2.17	12.3
SFM0056	6.01	6.17	2005-02-01	8787	82.1	0.96	–0.004	0.084	0.156	0.083	–0.002	0.287	1.26	0.0665	0.246	2.21	12.3
SFM0056	6.01	6.17	2005-05-11	8891	10.1	–2	0.010	0.156	0.209	0.128	–0.002	0.323	0.859	0.037	0.238	2.090	12.7
SFM0057	3.45	4.45	2003-11-04	8091	112		0.035	0.474	3.26	0.262	0.0057	0.706	0.999	0.435	1.13	0.497	78.7
SFM0057	3.45	4.45	2004-01-20	8243	59.4		0.067	0.271	2.20	0.282	0.0036	0.738	2.11	0.243	0.621	0.657	118
SFM0057	3.45	4.45	2004-04-20	8412	33.2		0.033	0.221	4.21	0.354	0.0024	1.13	0.608	0.095	0.583	0.401	98.9
SFM0057	3.45	4.45	2004-07-06	8582	41.9		0.045	0.212	3.41	0.365	–0.002	1.29	0.568	0.083	0.588	0.511	135
SFM0057	3.45	4.45	2004-10-13	8663	63.0	0.71	0.050	0.300	1.49	0.443	0.003	1.11	0.439	0.337	0.979	0.399	133
SFM0057	3.45	4.55	2005-04-08	8857	103	–2	0.018	0.410	8.23	0.173	0.0066	0.756	0.439	0.307	0.723	0.306	43.6
SFM0060	6.6	7.6	2004-01-21	8244	4.50		0.028	0.076	4.96	0.223	–0.002	1.87	2.11	0.031	0.182	2.35	82.5
SFM0060	6.6	7.6	2004-07-07	8590	5.68		0.031	0.136	5.46	0.049	–0.002	1.54	1.57	0.036	0.125	2.40	63.6
SFM0060	6.6	7.6	2004-10-14	8671	6.36	0.26	0.046	0.076	4.61	0.074	–0.002	3.12	1.30	0.112	0.161	3.11	77.8
SFM0060	6.6	7.6	2005-04-07	8849	37.6	–0.6	0.030	0.080	5.90	0.065	–0.002	2.31	2.97	0.100	0.187	2.55	68.1

Table A4-6. Trace metals II.

Id code	Secup m	Seclow m	Date	Sample no	U (ug/l)	Th (ug/l)	Sc (ug/l)	Rb (ug/l)	Y (ug/l)	Zr (ug/l)	In (ug/l)	Sb (ug/l)	Cs (ug/l)	La (ug/l)	Hf (ug/l)	Tl (ug/l)	Ce (ug/l)
PFM004179			2004-10-18	8683	17.2	–0.02	–0.05	1.45	0.125	0.460	–0.05	0.071	–0.03	0.081	0.008	0.040	0.137
PFM004504			2004-10-13	8662	35.3	0.100	0.118	3.14	1.80	3.14	–0.05	0.354	–0.03	0.736	0.071	0.097	1.16
SFM0001	3.95	4.95	2002-09-20	4316	6.09	0.252	0.103	5.54	2.98	8.48		0.103	0.031	2.45	0.179	0.005	2.53
SFM0001	3.95	4.95	2003-10-28	8069	5.02	0.087	–0.1	4.69	2.58	7.02		0.070	–0.05	2.18	0.135	–0.05	3.89
SFM0001	3.95	4.95	2004-01-20	8242	3.59	0.302	0.172	2.37	5.63	4.83		0.087	–0.03	7.09	0.144	–0.03	10.4
SFM0001	3.95	4.95	2004-04-19	8418	3.03	0.208	0.156	2.27	3.17	3.58		0.079	–0.03	3.57	0.108	–0.03	6.07
SFM0001	3.95	4.95	2004-07-06	8583	3.78	0.05	0.058	3.90	2.25	4.68		0.077	0.031	2.84	0.127	–0.03	4.93
SFM0001	3.95	4.95	2004-10-12	8661	4.39	–0.1	–0.3	4.64	1.74	6.46	–0.3	0.051	–0.1	1.79	0.088	0.822	3.45
SFM0001	3.95	4.95	2005-04-11	8853	3.44	0.199	0.119	3.71	3.15	5.02	–0.05	0.065	–0.03	3.69	0.0966	–0.03	7.05
SFM0002	4.21	5.21	2002-09-20	4318	4.59	0.251	0.155	2.47	5.00	11.3		0.203	0.009	5.11	0.294	0.006	5.61
SFM0002	4.21	5.21	2003-10-28	8067	4.47	0.085	0.116	2.30	3.81	8.71		0.041	–0.03	2.23	0.218	–0.03	4.33
SFM0002	4.21	5.21	2004-01-14	8238	5.52	0.127	0.125	1.79	3.41	6.34		0.038	–0.03	2.57	0.210	–0.03	3.81
SFM0002	4.21	5.21	2004-04-19	8414	6.96	0.122	0.114	1.51	2.85	5.22		0.044	–0.03	2.28	0.190	–0.03	3.84
SFM0002	4.21	5.21	2004-07-06	8586	5.62	0.067	0.088	1.94	2.82	4.48		0.049	–0.03	2.55	0.215	–0.03	4.56
SFM0002	4.21	5.21	2004-10-12	8659	5.27	0.187	0.104	2.08	2.80	9.01	–0.05	0.029	–0.03	1.66	0.188	0.076	3.28
SFM0002	4.21	5.21	2005-04-11	8858	7.27	0.150	0.123	1.57	2.56	6.10	–0.05	0.040	–0.03	1.45	0.132	–0.03	2.35
SFM0003	8.98	10.98	2002-09-20	4317	0.550	0.0235	0.020	1.54	0.401	0.443		0.055	0.010	0.506	0.0079	0.012	0.289
SFM0003	8.98	10.98	2003-10-28	8065	0.483	–0.02	–0.05	1.52	0.263	0.404		0.024	–0.03	0.173	0.0063	–0.03	0.201
SFM0003	8.98	10.98	2004-01-19	8240	0.500	–0.02	–0.05	1.36	0.157	0.419		0.021	–0.03	0.166	0.0078	–0.03	0.134
SFM0003	8.98	10.98	2004-04-19	8415	0.450	–0.02	–0.05	1.47	0.193	0.313		0.036	–0.03	0.216	0.006	–0.03	0.194
SFM0003	8.98	10.98	2004-07-06	8585	0.478	–0.02	–0.05	1.62	0.216	0.309		0.036	–0.03	0.276	0.007	–0.03	0.252
SFM0003	8.98	10.98	2004-10-12	8660	0.415	–0.1	–0.3	1.51	0.171	0.367	–0.3	–0.05	–0.1	0.167	–0.02	–0.1	0.176
SFM0003	8.98	10.98	2005-04-06	8851	0.422	–0.02	–0.05	1.52	0.152	0.305	–0.05	0.024	–0.03	0.148	–0.005	–0.03	0.155
SFM0005	2.21	3.21	2004-01-12	8232	5.06	0.0389	0.110	1.68	3.38	0.958		0.086	–0.03	4.12	0.0371	–0.03	2.66
SFM0005	2.21	3.21	2004-04-20	8426	6.27	0.033	0.077	1.57	2.34	0.782		0.097	–0.03	2.96	0.031	–0.03	1.85
SFM0005	2.21	3.21	2004-07-13	8598	3.72	0.061	0.102	1.73	3.22	0.911		0.101	–0.03	4.04	0.036	–0.03	2.27

Cont. Table A4-6. Trace metals II.

Id code	Secup m	Seclow m	Date	Sample no	Pr (ug/l)	Nd (ug/l)	Sm (ug/l)	Eu (ug/l)	Gd (ug/l)	Tb (ug/l)	Dy (ug/l)	Ho (ug/l)	Er (ug/l)	Tm (ug/l)	Yb (ug/l)	Lu (ug/l)
PFM004179			2004-10-18	8683	0.018	0.080	0.013	–0.005	0.016	–0.005	0.0129	–0.005	0.009	–0.005	0.0107	–0.005
PFM004504			2004-10-13	8662	0.176	0.743	0.161	0.0244	0.233	0.033	0.235	0.0575	0.157	0.025	0.153	0.0249
SFM0001	3.95	4.95	2002-09-20	4316	0.485	2.03	0.352	0.0488	0.451	0.0547	0.365	0.0815	0.213	0.035	0.220	0.0358
SFM0001	3.95	4.95	2003-10-28	8069	0.567	2.21	0.368	0.0469	0.380	–0.1	0.321	0.0677	0.190	0.026	0.167	0.0268
SFM0001	3.95	4.95	2004-01-20	8242	1.40	5.57	0.951	0.121	0.938	0.124	0.705	0.146	0.410	0.057	0.366	0.061
SFM0001	3.95	4.95	2004-04-19	8418	0.722	2.83	0.488	0.062	0.533	0.071	0.418	0.087	0.251	0.036	0.229	0.039
SFM0001	3.95	4.95	2004-07-06	8583	0.572	1.99	0.346	0.060	0.405	0.072	0.307	0.072	0.208	0.031	0.181	0.031
SFM0001	3.95	4.95	2004-10-12	8661	0.372	1.52	0.246	0.0329	0.295	0.035	0.225	0.0512	0.132	–0.02	0.132	–0.02
SFM0001	3.95	4.95	2005-04-11	8853	0.748	3.00	0.515	0.0717	0.529	0.0725	0.432	0.0948	0.286	0.041	0.251	0.0438
SFM0002	4.21	5.21	2002-09-20	4318	0.893	3.86	0.560	0.080	0.754	0.0848	0.550	0.125	0.361	0.059	0.398	0.066
SFM0002	4.21	5.21	2003-10-28	8067	0.580	2.32	0.416	0.0528	0.456	0.070	0.433	0.102	0.312	0.047	0.314	0.0544
SFM0002	4.21	5.21	2004-01-14	8238	0.513	2.04	0.362	0.0451	0.403	0.056	0.352	0.0824	0.259	0.039	0.269	0.0487
SFM0002	4.21	5.21	2004-04-19	8414	0.463	1.84	0.320	0.041	0.375	0.050	0.318	0.073	0.233	0.035	0.244	0.044
SFM0002	4.21	5.21	2004-07-06	8586	0.523	1.95	0.337	0.066	0.426	0.073	0.367	0.094	0.291	0.050	0.298	0.058
SFM0002	4.21	5.21	2004-10-12	8659	0.356	1.50	0.274	0.0358	0.351	0.048	0.339	0.0864	0.251	0.043	0.286	0.0529
SFM0002	4.21	5.21	2005-04-11	8858	0.308	1.23	0.222	0.0407	0.309	–0.05	0.287	0.0735	0.240	0.036	0.250	0.050
SFM0003	8.98	10.98	2002-09-20	4317	0.084	0.347	0.049	0.0078	0.058	0.0056	0.0368	0.008	0.022	0.003	0.0176	0.0032
SFM0003	8.98	10.98	2003-10-28	8065	0.045	0.186	0.030	–0.005	0.033	–0.05	0.0237	0.0052	0.015	–0.005	0.0124	–0.005
SFM0003	8.98	10.98	2004-01-19	8240	0.027	0.115	0.016	–0.005	0.020	–0.005	0.0138	–0.005	0.009	–0.005	0.0086	–0.005
SFM0003	8.98	10.98	2004-04-19	8415	0.038	0.160	0.024	–0.005	0.028	–0.005	0.018	–0.005	0.012	–0.005	0.010	–0.005
SFM0003	8.98	10.98	2004-07-06	8585	0.047	0.185	0.029	0.014	0.036	0.0052	0.022	–0.005	0.016	–0.005	0.012	–0.005
SFM0003	8.98	10.98	2004-10-12	8660	0.030	0.130	–0.02	–0.02	–0.02	–0.02	–0.02	–0.02	–0.02	–0.02	–0.02	–0.02
SFM0003	8.98	10.98	2005-04-06	8851	0.027	0.119	0.018	0.0075	0.024	–0.05	0.015	–0.005	0.011	–0.005	0.010	–0.005
SFM0005	2.21	3.21	2004-01-12	8232	0.644	2.60	0.424	0.0575	0.471	0.0613	0.350	0.073	0.202	0.027	0.159	0.0247
SFM0005	2.21	3.21	2004-04-20	8426	0.482	1.92	0.309	0.042	0.365	0.044	0.258	0.054	0.150	0.019	0.120	0.019
SFM0005	2.21	3.21	2004-07-13	8598	0.645	2.46	0.393	0.055	0.413	0.055	0.312	0.064	0.181	0.022	0.134	0.021

Id code	Secup m	Seclow m	Date	Sample no	U (ug/l)	Th (ug/l)	Sc (ug/l)	Rb (ug/l)	Y (ug/l)	Zr (ug/l)	In (ug/l)	Sb (ug/l)	Cs (ug/l)	La (ug/l)	Hf (ug/l)	Tl (ug/l)	Ce (ug/l)
SFM0005	2.21	3.21	2005-04-08	8854	2.86	0.0528	0.080	1.60	2.46	0.796	–0.05	0.080	–0.03	3.20	0.0224	–0.03	1.70
SFM0006	3.21	4.21	2003-05-07	4764	23.7	–0.02	0.031	1.49	7.56	1.31		0.189	0.007		0.159	0.025	2.37
SFM0006	3.21	4.21	2004-01-15	8234	19.8	–0.02	0.051	0.859	6.11	0.713		0.158	–0.03	6.88	0.020	–0.03	1.94
SFM0006	3.21	4.21	2004-04-21	8413	19.5	–0.02	–0.05	0.770	5.34	0.586		0.181	–0.03	5.58	0.017	–0.03	1.66
SFM0006	3.21	4.21	2005-04-08	8855	15.5	–0.02	–0.05	0.737	3.79	0.586	–0.05	0.156	–0.03	4.49	0.010	–0.03	1.18
SFM0008	5.14	6.14	2003-10-29	8070	12.1	–0.02	0.056	3.97	1.58	1.34		0.042	–0.03	0.634	0.0273	–0.03	0.694
SFM0008	5.14	6.14	2004-01-13	8236	13.6	–0.02	–0.05	1.91	0.684	0.426		0.053	–0.03	0.551	0.010	–0.03	0.284
SFM0008	5.14	6.14	2004-04-20	8416	11.3	–0.02	–0.05	1.94	0.454	0.265		0.081	–0.03	0.390	0.007	–0.03	0.221
SFM0008	5.14	6.14	2004-07-05	8584	11.0	–0.02	0.057	2.22	0.546	0.599		0.067	–0.03	0.455	0.021	–0.03	0.278
SFM0008	5.14	6.14	2004-10-15	8672	9.59	–0.02	–0.05	2.37	0.882	1.27	0.125	0.059	–0.03	0.678	0.022	0.095	0.504
SFM0008	5.14	6.14	2005-04-07	8845	8.80	–0.02	–0.05	1.66	0.482	0.348	–0.05	0.058	–0.03	0.405	0.0075	–0.03	0.176
SFM0009	2	3	2003-10-29	8066	7.65	0.028	–0.05	4.32	2.08	1.57		0.097	–0.03	2.51	0.0411	–0.03	1.55
SFM0009	2	3	2004-01-12	8233	7.38	0.026	–0.05	2.30	0.983	0.719		0.074	–0.03	1.58	0.0219	–0.03	0.576
SFM0009	2	3	2004-04-20	8427	10.3	0.030	–0.05	2.54	0.864	0.611		0.091	–0.03	1.43	0.023	–0.03	0.518
SFM0009	2	3	2004-07-13	8596	7.66	0.029	–0.05	3.52	1.18	0.997		0.084	–0.03	1.67	0.029	–0.03	0.926
SFM0009	2	3	2004-10-13	8666	7.69	0.042	0.056	4.30	1.40	1.54	–0.05	0.088	–0.03	1.92	0.031	0.080	1.22
SFM0009	2	3	2005-04-07	8846	8.02	–0.02	–0.05	2.31	0.613	0.743	–0.05	0.079	–0.03	0.760	0.016	–0.03	0.346
SFM0012	5.35	6.35	2004-01-19	8249	20.0	–0.2	–0.5	4.87	0.0554	–0.3		–0.1	–0.3	–0.05	–0.05	–0.3	–0.05
SFM0015	6.34	7.34	2004-01-15	8251	0.041	–0.02	–0.05	5.28	0.0268	0.629		0.012	–0.03	0.010	0.0074	–0.03	0.0058
SFM0023	4.42	5.42	2004-01-16	8252	0.110	–0.2	–0.5	17.1	–0.05	–0.3		–0.1	–0.3	–0.05	–0.05	–0.3	–0.05
SFM0025	6.06	7.06	2004-01-14	8248	3.88	–0.2	–0.5	6.20	–0.05	–0.3		–0.1	–0.3	–0.05	–0.05	–0.3	–0.05
SFM0027	7	8	2003-10-30	8071	1.58	–0.02	–0.05	2.49	0.363	0.814		0.066	0.042	0.049	0.0069	–0.03	0.0532
SFM0027	7	8	2004-01-15	8241	1.57	–0.02	–0.05	1.77	0.737	0.538		0.073	0.034	0.121	0.0065	–0.03	0.111
SFM0027	7	8	2004-04-21	8422	0.709	–0.02	–0.05	2.96	0.386	0.841		0.021	0.079	0.031	0.009	–0.03	0.030
SFM0027	7	8	2004-07-07	8588	0.810	–0.02	–0.05	3.02	0.307	0.772		0.024	0.075	0.052	0.012	–0.03	0.027
SFM0027	7	8	2004-10-18	8664	0.725	–0.02	–0.05	3.14	0.394	1.11	–0.05	0.021	0.085	0.029	0.006	0.072	0.0241
SFM0027	7	8	2005-04-06	8848	0.608	–0.02	–0.05	3.33	0.474	1.05	–0.05	0.012	0.101	0.033	0.007	–0.03	0.0389

Id code	Secup m	Seclow m	Date	Sample no	Pr (ug/l)	Nd (ug/l)	Sm (ug/l)	Eu (ug/l)	Gd (ug/l)	Tb (ug/l)	Dy (ug/l)	Ho (ug/l)	Er (ug/l)	Tm (ug/l)	Yb (ug/l)	Lu (ug/l)
SFM0005	2.21	3.21	2005-04-08	8854	0.515	2.14	0.344	0.0565	0.410	–0.05	0.294	0.0644	0.177	0.024	0.130	0.0224
SFM0006	3.21	4.21	2003-05-07	4764	1.47	6.06	0.809	0.139	0.964	0.126	0.597	0.145	0.426	0.057	0.265	0.0436
SFM0006	3.21	4.21	2004-01-15	8234	1.02	4.37	0.635	0.0948	0.722	0.0805	0.458	0.103	0.289	0.036	0.203	0.0336
SFM0006	3.21	4.21	2004-04-21	8413	0.850	3.66	0.522	0.083	0.638	0.070	0.402	0.094	0.261	0.033	0.186	0.031
SFM0006	3.21	4.21	2005-04-08	8855	0.708	3.00	0.411	0.0848	0.526	0.0548	0.323	0.0766	0.211	0.025	0.138	0.023
SFM0008	5.14	6.14	2003-10-29	8070	0.165	0.687	0.108	0.0186	0.140	–0.05	0.118	0.0282	0.083	0.011	0.0677	0.0117
SFM0008	5.14	6.14	2004-01-13	8236	0.071	0.289	0.039	0.0059	0.054	0.0124	0.0391	0.010	0.029	–0.005	0.0236	–0.005
SFM0008	5.14	6.14	2004-04-20	8416	0.055	0.226	0.033	–0.005	0.044	–0.005	0.032	0.007	0.022	–0.005	0.018	–0.005
SFM0008	5.14	6.14	2004-07-05	8584	0.068	0.254	0.042	0.024	0.058	0.010	0.051	0.013	0.037	0.006	0.031	–0.005
SFM0008	5.14	6.14	2004-10-15	8672	0.100	0.431	0.067	0.010	0.100	0.011	0.0809	0.0192	0.053	0.008	0.050	0.0084
SFM0008	5.14	6.14	2005-04-07	8845	0.062	0.255	0.040	0.0151	0.052	–0.05	0.0389	0.0093	0.029	–0.005	0.0224	–0.005
SFM0009	2	3	2003-10-29	8066	0.653	2.54	0.382	0.0513	0.361	–0.05	0.249	0.049	0.132	0.016	0.100	0.0161
SFM0009	2	3	2004-01-12	8233	0.289	1.10	0.174	0.0235	0.171	0.0261	0.109	0.022	0.061	0.008	0.0483	0.008
SFM0009	2	3	2004-04-20	8427	0.276	1.06	0.161	0.022	0.165	0.020	0.106	0.022	0.060	0.007	0.049	0.008
SFM0009	2	3	2004-07-13	8596	0.338	1.28	0.195	0.025	0.187	0.024	0.133	0.027	0.071	0.010	0.059	0.010
SFM0009	2	3	2004-10-13	8666	0.378	1.54	0.239	0.0338	0.267	0.029	0.175	0.0386	0.093	0.014	0.086	0.0128
SFM0009	2	3	2005-04-07	8846	0.151	0.589	0.101	0.0171	0.102	–0.05	0.070	0.015	0.045	0.006	0.0354	0.0063
SFM0012	5.35	6.35	2004-01-19	8249	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05
SFM0015	6.34	7.34	2004-01-15	8251	–0.005	0.0071	–0.005	–0.005	–0.005	–0.005	–0.005	–0.005	–0.005	–0.005	–0.005	–0.005
SFM0023	4.42	5.42	2004-01-16	8252	–0.05	–0.05	–0.05	–0.05	–0.05	–0.5	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05
SFM0025	6.06	7.06	2004-01-14	8248	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05	–0.05
SFM0027	7	8	2003-10-30	8071	0.013	0.0556	0.011	–0.005	0.014	–0.05	0.0178	0.0053	0.018	–0.005	0.0179	–0.005
SFM0027	7	8	2004-01-15	8241	0.027	0.131	0.027	–0.005	0.037	0.0118	0.0376	0.0106	0.038	0.005	0.0332	0.0063
SFM0027	7	8	2004-04-21	8422	0.007	0.034	0.008	–0.005	0.013	–0.005	0.018	0.006	0.023	–0.005	0.023	–0.005
SFM0027	7	8	2004-07-07	8588	0.011	0.042	0.007	0.010	0.010	–0.005	0.015	–0.005	0.021	–0.005	0.021	–0.005
SFM0027	7	8	2004-10-18	8664	0.006	0.0293	0.007	–0.005	0.014	–0.005	0.019	0.0065	0.022	–0.005	0.0249	–0.005
SFM0027	7	8	2005-04-06	8848	0.0074	0.0316	0.008	0.0073	0.017	–0.05	0.0223	0.0074	0.031	–0.005	0.030	0.0069

Id code	Secup m	Seclow m	Date	Sample no	U (ug/l)	Th (ug/l)	Sc (ug/l)	Rb (ug/l)	Y (ug/l)	Zr (ug/l)	In (ug/l)	Sb (ug/l)	Cs (ug/l)	La (ug/l)	Hf (ug/l)	Tl (ug/l)	Ce (ug/l)
SFM0029	7	8	2003-10-28	8068	3.37	–0.02	–0.05	1.76	1.67	1.44		0.021	–0.03	1.81	0.0234	–0.03	0.986
SFM0029	7	8	2004-01-20	8237	3.13	–0.02	–0.05	1.49	2.32	0.979		0.022	–0.03	3.14	0.0212	–0.03	1.42
SFM0029	7	8	2004-04-20	8419	3.15	0.021	–0.05	1.48	1.72	0.941		0.027	–0.03	2.45	0.021	–0.03	1.19
SFM0029	7	8	2004-07-13	8595	5.70	–0.02	–0.05	1.71	1.54	1.11		0.033	–0.03	2.16	0.021	–0.03	1.18
SFM0029	7	8	2004-10-13	8668	6.65	–0.02	–0.05	2.24	1.64	1.37	–0.05	0.03	–0.03	2.28	0.016	0.073	1.25
SFM0029	7	8	2005-04-07	8852	3.62	–0.02	–0.05	1.67	1.59	0.993	–0.05	0.024	–0.03	1.88	0.0152	–0.03	1.01
SFM0031	3.5	4.5	2003-10-30	8072	7.95	–0.02	0.054	1.45	5.22	0.331		0.066	–0.03	2.41	0.0073	–0.03	0.860
SFM0031	3.5	4.5	2004-01-20	8245	8.25	–0.02	0.052	1.36	2.51	0.281		0.042	–0.03	1.53	0.0056	–0.03	0.450
SFM0031	3.5	4.5	2004-04-22	8421	8.37	–0.02	0.094	1.11	4.04	0.262		0.051	–0.03	1.87	0.007	–0.03	0.519
SFM0031	3.5	4.5	2004-07-07	8589	7.30	–0.02	0.067	1.41	3.83	0.243		0.050	–0.03	2.79	0.009	–0.03	0.819
SFM0031	3.5	4.5	2004-10-14	8667	8.68	–0.02	0.052	1.51	2.83	0.280	–0.05	0.049	–0.03	1.47	–0.005	0.049	0.412
SFM0031	3.5	4.5	2005-04-06	8847	6.13	–0.02	–0.05	1.48	1.79	0.238	–0.05	0.028	–0.03	1.13	–0.005	–0.03	0.328
SFM0032	3	4	2003-10-30	8074	7.91	0.032	–0.05	2.46	1.98	3.81		0.064	–0.03	1.11	0.0873	–0.03	1.05
SFM0032	3	4	2004-01-13	8235	5.93	0.0493	0.055	1.74	2.46	3.58		0.029	–0.03	2.20	0.103	–0.03	1.40
SFM0032	3	4	2004-04-21	8423	6.40	0.068	0.066	1.80	2.04	3.62		0.038	–0.03	1.61	0.114	–0.03	1.22
SFM0032	3	4	2004-07-08	8587	5.17	0.094	0.076	2.38	1.86	3.05		0.044	–0.03	1.89	0.105	–0.03	1.81
SFM0032	3	4	2004-10-14	8669	4.13	0.131	0.077	2.41	2.47	4.94	–0.05	0.071	–0.03	1.90	0.085	0.072	2.09
SFM0032	3	4	2005-04-12	8856	6.26	0.0686	0.069	1.71	1.95	3.84	–0.05	0.034	–0.03	1.86	0.0734	–0.03	1.40
SFM0037	2	3	2004-01-19	8239	8.60	0.195	0.184	2.28	5.40	4.45		0.072	–0.03	4.56	0.162	–0.03	6.73
SFM0037	2	3	2004-04-22	8420	10.0	0.240	0.221	2.15	4.73	3.79		0.091	–0.03	3.85	0.167	–0.03	6.24
SFM0037	2	3	2004-07-07	8581	11.2	0.048	0.071	3.87	2.67	2.95		0.194	–0.03	2.34	0.130	–0.03	3.97
SFM0037	2	3	2004-10-14	8673	9.25	0.105	0.076	3.89	1.89	4.64	–0.05	0.082	–0.03	1.49	0.088	0.076	2.64
SFM0037	2	3	2005-04-06	8850	6.59	0.194	0.145	2.29	3.57	3.46	–0.05	0.081	–0.03	2.17	0.090	–0.03	3.43
SFM0049	4	5	2004-05-27	8497	0.301	0.203	0.135	5.70	2.06	1.01		0.070	–0.03	3.06	0.038	–0.03	5.63
SFM0049	4	5	2004-07-12	8597	0.195	0.137	0.082	3.86	1.12	0.347		0.036	–0.03	1.70	0.020	–0.03	3.28
SFM0049	4	5	2004-10-12	8665	0.172	0.122	0.082	3.01	1.05	0.449	–0.05	0.025	–0.03	1.55	0.017	0.045	2.87
SFM0049	4	5	2005-04-12	8859	0.222	0.0847	–0.050	2.53	1.09	0.288	–0.05	0.039	–0.03	1.77	0.010	–0.03	3.11

Id code	Secup m	Seclow m	Date	Sample no	Pr (ug/l)	Nd (ug/l)	Sm (ug/l)	Eu (ug/l)	Gd (ug/l)	Tb (ug/l)	Dy (ug/l)	Ho (ug/l)	Er (ug/l)	Tm (ug/l)	Yb (ug/l)	Lu (ug/l)
SFM0029	7	8	2003-10-28	8068	0.471	1.86	0.288	0.0374	0.276	–0.05	0.171	0.0359	0.087	0.011	0.0622	0.010
SFM0029	7	8	2004-01-20	8237	0.573	2.32	0.340	0.0445	0.353	0.0446	0.194	0.0409	0.112	0.013	0.0777	0.0135
SFM0029	7	8	2004-04-20	8419	0.464	1.89	0.272	0.035	0.290	0.029	0.160	0.033	0.087	0.011	0.062	0.011
SFM0029	7	8	2004-07-13	8595	0.409	1.48	0.218	0.025	0.219	0.023	0.124	0.025	0.064	0.008	0.046	0.008
SFM0029	7	8	2004-10-13	8668	0.415	1.73	0.241	0.0307	0.279	0.028	0.157	0.0334	0.080	0.011	0.0631	0.010
SFM0029	7	8	2005-04-07	8852	0.359	1.43	0.215	0.0384	0.236	–0.05	0.140	0.0318	0.087	0.011	0.0616	0.0109
SFM0031	3.5	4.5	2003-10-30	8072	0.625	2.56	0.361	0.0485	0.381	0.0553	0.333	0.0781	0.218	0.028	0.152	0.0243
SFM0031	3.5	4.5	2004-01-20	8245	0.280	1.14	0.161	0.0225	0.193	0.0279	0.146	0.035	0.100	0.013	0.0765	0.0125
SFM0031	3.5	4.5	2004-04-22	8421	0.351	1.46	0.200	0.029	0.266	0.033	0.222	0.055	0.163	0.021	0.130	0.022
SFM0031	3.5	4.5	2004-07-07	8589	0.518	1.91	0.268	0.053	0.350	0.056	0.256	0.067	0.197	0.026	0.144	0.026
SFM0031	3.5	4.5	2004-10-14	8667	0.258	1.11	0.150	0.0205	0.207	0.023	0.160	0.0408	0.108	0.015	0.0889	0.0142
SFM0031	3.5	4.5	2005-04-06	8847	0.208	0.84	0.117	0.0224	0.148	–0.05	0.109	0.0266	0.080	0.010	0.0619	0.010
SFM0032	3	4	2003-10-30	8074	0.289	1.19	0.203	0.0245	0.209	–0.05	0.201	0.0463	0.138	0.020	0.132	0.0227
SFM0032	3	4	2004-01-13	8235	0.420	1.70	0.273	0.0337	0.300	0.0351	0.229	0.052	0.157	0.022	0.148	0.0261
SFM0032	3	4	2004-04-21	8423	0.319	1.31	0.216	0.028	0.259	0.035	0.213	0.049	0.150	0.022	0.150	0.027
SFM0032	3	4	2004-07-08	8587	0.387	1.44	0.237	0.047	0.285	0.0482	0.237	0.060	0.181	0.028	0.164	0.031
SFM0032	3	4	2004-10-14	8669	0.393	1.75	0.285	0.0368	0.344	0.042	0.287	0.0679	0.189	0.031	0.194	0.032
SFM0032	3	4	2005-04-12	8856	0.369	1.41	0.227	0.0425	0.278	–0.05	0.215	0.0509	0.162	0.023	0.154	0.0287
SFM0037	2	3	2004-01-19	8239	0.966	3.94	0.706	0.0917	0.762	0.104	0.614	0.135	0.405	0.058	0.372	0.0629
SFM0037	2	3	2004-04-22	8420	0.860	3.46	0.634	0.079	0.723	0.097	0.601	0.133	0.400	0.058	0.382	0.064
SFM0037	2	3	2004-07-07	8581	0.514	1.93	0.352	0.078	0.438	0.076	0.367	0.085	0.254	0.042	0.240	0.041
SFM0037	2	3	2004-10-14	8673	0.321	1.35	0.235	0.0289	0.291	0.036	0.239	0.0564	0.153	0.025	0.153	0.0252
SFM0037	2	3	2005-04-06	8850	0.51	2.13	0.390	0.0646	0.470	0.068	0.443	0.105	0.323	0.049	0.309	0.0541
SFM0049	4	5	2004-05-27	8497	0.693	2.57	0.441	0.054	0.386	0.053	0.297	0.059	0.157	0.022	0.140	0.021
SFM0049	4	5	2004-07-12	8597	0.395	1.46	0.246	0.030	0.234	0.031	0.169	0.032	0.085	0.012	0.074	0.012
SFM0049	4	5	2004-10-12	8665	0.333	1.34	0.235	0.031	0.241	0.027	0.172	0.0363	0.091	0.015	0.0862	0.0133
SFM0049	4	5	2005-04-12	8859	0.399	1.44	0.253	0.0365	0.244	–0.05	0.177	0.0355	0.103	0.014	0.0866	0.0144

Id code	Secup m	Seclow m	Date	Sample no	U (ug/l)	Th (ug/l)	Sc (ug/l)	Rb (ug/l)	Y (ug/l)	Zr (ug/l)	In (ug/l)	Sb (ug/l)	Cs (ug/l)	La (ug/l)	Hf (ug/l)	Tl (ug/l)	Ce (ug/l)
SFM0051	5.02	5.18	2004-01-27	8254	1.33	0.481	0.211	2.17	1.63	3.42		0.024	0.072	1.93	0.117	–0.03	3.85
SFM0051	5.02	5.18	2004-05-11	8473	1.98	0.804	0.320	4.02	2.40	7.58		0.050	0.12	2.37	0.218	–0.03	4.97
SFM0051	5.02	5.18	2004-08-03	8599	1.24	0.301	0.139	1.98	0.998	4.06	–0.05	0.026	0.05	0.848	0.110	–0.03	1.70
SFM0051	5.02	5.18	2004-11-02	8714	1.15	0.634	0.216	2.54	1.53	6.22	–0.05	0.028	0.107	1.64	0.161	–0.02	3.34
SFM0051	4.32	4.48	2005-02-03	8788	0.964	0.0316	–0.05	1.20	0.319	3.00	–0.05	0.022	–0.03	0.074	0.0407	–0.03	0.149
SFM0051	4.32	4.48	2005-05-11	8889	1.26	0.489	0.22	3.52	1.29	5.64	–0.05	0.024	0.14	1.33	0.281	–0.03	2.94
SFM0053	6.01	6.17	2004-01-28	8256	0.305	0.272	0.163	2.35	0.739	2.13		0.017	0.103	0.982	0.0679	–0.03	1.94
SFM0053	6.01	6.17	2004-05-11	8472	0.316	0.084	0.091	2.32	0.290	1.74		0.030	0.05	0.311	0.050	–0.03	0.638
SFM0053	6.01	6.17	2004-08-03	8600	0.206	0.140	0.120	2.38	0.316	1.77	–0.05	0.018	0.077	0.437	0.057	–0.03	0.798
SFM0053	6.01	6.17	2004-11-03	8715	0.258	0.260	0.091	1.98	0.460	1.92	–0.05	–0.02	0.075	0.646	0.0576	–0.02	1.37
SFM0053	4.72	4.88	2005-02-10	8789	0.134	–0.02	–0.050	1.01	0.0529	0.967	–0.05	0.013	–0.03	0.020	0.010	–0.03	0.0377
SFM0053	4.72	4.88	2005-05-11	8890	0.196	0.133	0.074	1.68	0.261	1.85	–0.05	0.014	0.054	0.324	0.085	–0.03	0.715
SFM0056	6.01	6.17	2004-01-27	8255	0.248	0.194	0.117	2.03	0.490	1.82		0.017	0.074	0.664	0.0549	–0.03	1.3
SFM0056	6.01	6.17	2004-05-10	8474	0.143	–0.02	–0.050	2.70	0.040	0.230		0.040	0.05	0.045	0.006	–0.03	0.117
SFM0056	6.01	6.17	2004-08-02	8601	0.123	0.023	–0.050	2.32	0.052	0.282	–0.05	0.030	–0.03	0.052	0.006	–0.03	0.166
SFM0056	6.01	6.17	2004-11-01	8713	0.104	–0.04	–0.080	2.16	0.030	0.190	–0.05	0.028	0.05	0.028	–0.004	–0.02	0.059
SFM0056	6.01	6.17	2005-02-01	8787	0.109	–0.02	–0.050	2.09	0.0384	0.311	–0.05	0.017	0.033	0.023	–0.005	–0.03	0.050
SFM0056	6.01	6.17	2005-05-11	8891	0.098	–0.02	–0.050	1.96	0.018	0.288	–0.05	0.052	–0.03	0.015	0.059	–0.03	0.052
SFM0057	3.45	4.45	2003-11-04	8091	2.75	0.264	0.271	3.78	6.43	1.83		0.157	–0.03	5.99	0.0621	–0.03	7.96
SFM0057	3.45	4.45	2004-01-20	8243	4.44	0.147	0.181	3.50	4.16	1.22		0.102	–0.03	5.91	0.0492	–0.03	5.66
SFM0057	3.45	4.45	2004-04-20	8412	7.35	0.062	0.121	3.27	3.16	1.25		0.129	–0.03	4.31	0.049	–0.03	3.32
SFM0057	3.45	4.45	2004-07-06	8582	7.16	0.059	0.102	4.98	3.41	1.26		0.130	–0.03	5.15	0.057	–0.03	4.47
SFM0057	3.45	4.45	2004-10-13	8663	7.22	0.152	0.193	5.51	4.74	2.19	–0.05	0.082	–0.03	5.91	0.053	0.130	5.41
SFM0057	3.45	4.55	2005-04-08	8857	3.82	0.165	0.169	2.13	3.28	1.05	–0.05	0.142	–0.03	4.03	0.030	–0.03	3.73
SFM0060	6.6	7.6	2004-01-21	8244	35.9	–0.02	–0.05	4.27	1.17	0.609		0.216	–0.03	1.08	0.0182	0.040	0.329
SFM0060	6.6	7.6	2004-07-07	8590	29.8	–0.02	0.051	4.55	1.04	0.539		0.104	–0.03	1.12	0.022	0.048	0.303
SFM0060	6.6	7.6	2004-10-14	8671	33.7	–0.02	–0.05	5.75	0.882	0.700	–0.05	0.091	–0.03	0.821	0.013	0.148	0.224
SFM0060	6.6	7.6	2005-04-07	8849	31.0	–0.02	–0.05	4.02	1.05	0.662	–0.05	0.083	–0.03	0.949	0.0132	0.041	0.217

Id code	Secup m	Seclow m	Date	Sample no	Pr (ug/l)	Nd (ug/l)	Sm (ug/l)	Eu (ug/l)	Gd (ug/l)	Tb (ug/l)	Dy (ug/l)	Ho (ug/l)	Er (ug/l)	Tm (ug/l)	Yb (ug/l)	Lu (ug/l)
SFM0051	5.02	5.18	2004-01-27	8254	0.443	1.68	0.338	0.0393	0.324	–0.05	0.269	0.0518	0.151	0.021	0.151	0.0237
SFM0051	5.02	5.18	2004-05-11	8473	0.591	2.13	0.417	0.050	0.399	0.060	0.355	0.073	0.219	0.032	0.218	0.038
SFM0051	5.02	5.18	2004-08-03	8599	0.192	0.727	0.146	0.016	0.160	0.023	0.133	0.029	0.089	0.014	0.091	0.017
SFM0051	5.02	5.18	2004-11-02	8714	0.422	1.42	0.284	0.0336	0.317	0.0441	0.255	0.0519	0.157	0.023	0.158	0.0273
SFM0051	4.32	4.48	2005-02-03	8788	0.021	0.089	0.020	0.0078	0.029	–0.05	0.035	0.009	0.034	0.006	0.0425	0.0082
SFM0051	4.32	4.48	2005-05-11	8889	0.355	1.29	0.252	0.043	0.222	–0.050	0.203	0.044	0.137	0.021	0.143	0.023
SFM0053	6.01	6.17	2004-01-28	8256	0.235	0.855	0.168	0.0242	0.164	–0.05	0.125	0.0243	0.066	0.009	0.0626	0.0088
SFM0053	6.01	6.17	2004-05-11	8472	0.078	0.302	0.056	0.007	0.056	0.008	0.044	0.009	0.024	–0.005	0.023	–0.005
SFM0053	6.01	6.17	2004-08-03	8600	0.106	0.355	0.066	0.008	0.060	0.009	0.051	0.011	0.026	–0.005	0.026	–0.005
SFM0053	6.01	6.17	2004-11-03	8715	0.164	0.589	0.122	0.0139	0.110	0.0161	0.0877	0.0165	0.045	0.006	0.0414	0.0057
SFM0053	4.72	4.88	2005-02-10	8789	0.005	0.020	–0.005	0.0055	–0.005	–0.05	–0.005	–0.005	–0.005	–0.005	–0.005	–0.005
SFM0053	4.72	4.88	2005-05-11	8890	0.084	0.324	0.061	0.018	0.056	–0.05	0.054	0.010	0.028	–0.005	0.025	–0.005
SFM0056	6.01	6.17	2004-01-27	8255	0.168	0.559	0.111	0.0147	0.099	–0.05	0.0829	0.021	0.043	0.007	0.0391	0.0059
SFM0056	6.01	6.17	2004-05-10	8474	0.011	0.038	–0.005	–0.005	0.007	–0.005	0.007	–0.005	–0.005	–0.005	–0.005	–0.005
SFM0056	6.01	6.17	2004-08-02	8601	0.012	0.047	0.009	–0.005	0.009	–0.005	0.008	–0.005	–0.005	–0.005	–0.005	–0.005
SFM0056	6.01	6.17	2004-11-01	8713	0.007	0.0249	0.008	–0.004	0.005	–0.004	0.0049	–0.004	–0.004	–0.004	–0.004	–0.004
SFM0056	6.01	6.17	2005-02-01	8787	0.006	0.0182	–0.005	–0.005	–0.005	–0.05	–0.005	–0.005	–0.005	–0.005	–0.005	–0.005
SFM0056	6.01	6.17	2005-05-11	8891	–0.005	0.013	–0.005	–0.005	–0.005	–0.05	–0.005	–0.005	–0.005	–0.005	–0.005	–0.005
SFM0057	3.45	4.45	2003-11-04	8091	1.55	6.19	1.04	0.150	1.04	0.153	0.842	0.168	0.455	0.060	0.349	0.0537
SFM0057	3.45	4.45	2004-01-20	8243	0.959	3.74	0.605	0.0915	0.639	0.0824	0.457	0.0942	0.262	0.035	0.210	0.0343
SFM0057	3.45	4.45	2004-04-20	8412	0.697	2.78	0.418	0.063	0.480	0.058	0.341	0.071	0.193	0.026	0.159	0.026
SFM0057	3.45	4.45	2004-07-06	8582	0.882	3.12	0.475	0.117	0.623	0.102	0.407	0.094	0.262	0.038	0.210	0.034
SFM0057	3.45	4.45	2004-10-13	8663	0.990	4.16	0.638	0.0992	0.811	0.090	0.557	0.122	0.313	0.046	0.261	0.0416
SFM0057	3.45	4.55	2005-04-08	8857	0.747	2.89	0.490	0.0805	0.541	0.070	0.433	0.0924	0.265	0.037	0.230	0.0358
SFM0060	6.6	7.6	2004-01-21	8244	0.150	0.674	0.098	0.0146	0.124	0.0209	0.0862	0.0208	0.059	0.007	0.0459	0.0077
SFM0060	6.6	7.6	2004-07-07	8590	0.169	0.656	0.099	0.032	0.134	0.0211	0.099	0.025	0.070	0.010	0.055	0.009
SFM0060	6.6	7.6	2004-10-14	8671	0.121	0.525	0.073	0.0117	0.105	0.012	0.0746	0.019	0.048	0.007	0.0425	0.007
SFM0060	6.6	7.6	2005-04-07	8849	0.152	0.599	0.100	0.0247	0.123	–0.05	0.0877	0.0211	0.062	0.008	0.0506	0.0088

Table A4-6. Isotopes II.

Id code	Secup m	Seclow m	Date	Sample no	Ra-226 (Bq/l)	Rn-222 (Bq/l)	U-238 (mBq/kg)	U-235 (mBq/kg)	U-234 (mBq/kg)	Th-232 (mBq/kg)	Th-230 (mBq/kg)
PFM004504			2004-10-13	8662	0.20	35.7					
SFM0001	3.95	4.95	2002-09-20	4316	0.10	28.0	100	–30	100	–50	–50
SFM0001	3.95	4.95	2003-06-05	4808	0.50	25.8	70	–50	70	–50	–50
SFM0001	3.95	4.95	2003-10-28	8069	0.50	33.0					
SFM0001	3.95	4.95	2004-10-12	8661	0.10	24.4	63		81		0.9
SFM0002	4.21	5.21	2002-09-20	4318	0.50	47.0	400	–30	400	–50	–50
SFM0002	4.21	5.21	2003-06-04	4806	0.80	58.7	70	–50	70	–50	–50
SFM0002	4.21	5.21	2003-10-28	8067	0.60	78.3					
SFM0002	4.21	5.21	2004-10-12	8659	0.20	25.0	72		85		25
SFM0003	8.98	10.98	2002-09-20	4317	–0.10	26.0	100	–30	100	–50	–50
SFM0003	8.98	10.98	2003-06-04	4807	–0.10	16.0	–50	–50	–50	–50	–50
SFM0003	8.98	10.98	2003-10-28	8065	–0.10	21.5					
SFM0003	8.98	10.98	2004-10-12	8660	0.10	9.8	5.7		7.4		–0.3
SFM0005	2.21	3.21	2003-06-03	4805	0.10	74.9	60	–50	60	–50	–50
SFM0006	3.21	4.21	2003-06-03	4810	–0.10	7.7	150	–50	150	–50	–50
SFM0008	5.14	6.14	2003-06-02	4812	0.10	20.1	110	–50	110	–50	–50
SFM0008	5.14	6.14	2003-10-29	8070	0.30	40.4					
SFM0008	5.14	6.14	2004-10-15	8672	0.10	29.7	118		137		–0.4
SFM0009	2	3	2003-10-29	8066	0.70	46.2					
SFM0009	2	3	2004-10-13	8666	0.10	33.7	112		126		7.3
SFM0012	5.35	6.35	2003-06-04	4809	0.50	64.6	180	–50	180	–50	–50
SFM0015	6.34	7.34	2003-06-04	4811	0.60	74.7	–50	–50	–50	–50	–50
SFM0027	7	8	2003-10-30	8071	0.20	177.0					
SFM0027	7	8	2004-10-18	8664	0.20	149.0	12		26		–0.3
SFM0029	7	8	2003-10-28	8068	0.20	14.6					
SFM0029	7	8	2004-10-13	8668	0.10	9.6	75		90		–0.4
SFM0031	3.5	4.5	2003-10-30	8072	0.50	28.5					
SFM0031	3.5	4.5	2004-10-14	8667	0.10	149.0	103		132		1.6
SFM0032	3	4	2003-10-30	8074	0.30	48.4					
SFM0032	3	4	2004-10-14	8669	0.10	18.6	60		82		1.4
SFM0037	2	3	2003-10-31	8075	0.20	29.3					
SFM0037	2	3	2004-10-14	8673	–0.10	32.6	123		138		1.2
SFM0049	4	5	2004-10-12	8665	0.30	18.7	2.4		2.8		0.9
SFM0057	3.45	4.45	2003-11-04	8091	0.90	35.4					
SFM0057	3.45	4.45	2004-10-13	8663	0.20	22.7	88		94		1.5
SFM0060	6.6	7.6	2004-10-14	8671	–0.10	36.3	418		445		–0.4