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# Hydrochemical monitoring of near surface groundwater and surface waters

## Results from the sampling period January–December 2017

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*Keywords:* AP SFK-17-001, Water sampling, Chemical analyses, Field measurements, Sea, Lake, Stream, Near surface groundwater.

# Abstract

This report presents the hydrochemical monitoring of near surface groundwaters and surface waters in Forsmark during the sampling period January to December 2017.

Near surface groundwaters were sampled and analysed four times during this period. The samples were collected from shallow soil monitoring wells.

Sampling of surface waters (sea, streams and lakes) was performed once per month (except July) in the four streams and in the outlet of Lake Biotestsjön and once per season (four times) in the sea location PFM000062 and lakes included in the monitoring programme. The sea sampling locations PFM000083, PFM000084 and PFM007783 were sampled at seven occasions (not February, March, July, November or December) and PFM007910, PFM007911 and PFM007912 west of Lake Biotestsjön were sampled in August.

The results from the near surface groundwater and surface water monitoring 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, trace metals and isotopes. For surface waters, the field measurements also include depth and turbidity.

Generally, the new data confirm the knowledge and conclusions from the earlier investigation periods. The characters of the near surface groundwaters in the monitoring programme generally remain unchanged also this year.

Surface waters in the lakes and streams in the Forsmark area are well buffered with high alkalinity, high pH and high calcium concentrations. The proportions of the major ions in the sampled freshwaters and the shallow sea bay were similar to previous years, showing no major changes. Also, the concentrations of total nitrogen and total phosphorus were similar to previous years. However, a slightly elevated concentration of $Na^+$ and $Cl^-$ indicate salt water inflow into Bolundsfjärden. Previous data indicates periodic tritium contamination from the adjacent nuclear power plant in water samples from near the cooling water outlet. In 2017, elevated tritium concentration was measured in September and October.

# Sammanfattning

Rapporten dokumenterar den hydrokemiska övervakningen av ytnära grundvatten och ytvatten i Forsmarksområdet under provtagningsperioden januari till december 2017.

Provtagning och analyser av ytnära grundvatten utfördes vid fyra tillfällen under 2017. Vid dessa tillfällen provtogs vatten från sju jordborrhål.

Ytvatten provtogs en gång per månad (utom i juli) i fyra bäckar och i utloppet av Biotestsjön samt fyra gånger per år (en gång per årstid) i sjöar och havspunkten PFM000062. Havspunkterna PFM000083, PFM000084 och PFM007783 provtogs vid sju tillfällen (ej februari, mars, juli, november eller december) och provpunkterna PFM007910, PFM007911 och PFM007912 väster om Biotestsjön provtogs i augusti.

De erhållna resultaten från ytnära grundvatten och ytvatten omfattar fältmätningar av ORP (redox-potential), pH, löst syre, elektrisk konduktivitet och vattentemperatur samt kemiska analyser av huvudkomponenter, närsalter, kolföreningar, spårelement och isotoper. För ytvatten mäts även djup och turbiditet.

Årets data bekräftar generellt slutsatser från tidigare undersökningsperioder. Ytvattnet i sjöar och bäckar i Forsmarksområdet är väl buffrade med hög alkalinitet, högt pH och höga kalciumkoncentrationer. Koncentrationen av de vanligaste jonerna i de provtagna sötvattnen och havet liknade föregående år. Något förhöjda koncentrationer av natrium- och kloridjoner indikerar dock saltvattensinflöde i Bolundsfjärden. Förhöjda halter av tritium uppmättes i proverna nära kylvattenutsläppet från kärnkraftverket (Biotestsjön) vid provtagningarna i september och oktober.

# Contents

# 1 Introduction

The site investigations in Forsmark were finished in June 2007 (SKB 2001, 2005) and a less intensive phase commenced when a prolonged monitoring programme was established (SKB 2007). This document reports the performance and results for near surface groundwater and surface waters during the period January to December 2017. The monitoring has been ongoing, in one form or another, since 2001 and is today governed by the monitoring programme (SKB 2007, Berglund and Lindborg 2017).

The sampling objects for near surface groundwater in soil include shallow monitoring wells. The different sampling objects are presented in Table 2-1 and a map showing their location is presented in Figure 2-1. The surface water sampling sites include lakes, streams and the sea in the Forsmark area. The sampling locations are presented in Figure 2-1 and Table 3-1.

The monitoring activities include sampling and chemical analyses as well as field measurements. The controlling documents for the activities are listed in Table 1-1. The activity plans and method descriptions are SKB's internal controlling documents. Original data from the reported activities are stored in the primary database Sicada. Data are traceable in Sicada by the activity plan numbers (AP SFK-17-001). Only data in the database are accepted for further interpretation and modelling. The results presented in this report are regarded as copies of the original data. Data in the database may be revised, if needed. However, such revision of the database will not necessarily result in a revision of this report.

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

| **Activity plans** | **Number** | **Version** |
|---|---|---|
| Hydrokemisk monitering av ytvatten, ytnära grundvatten och gölar 2017. | AP SFK-17-001 | 1.0 |
| **Method descriptions** | **Number** | **Version** |
| Metodbeskrivning för ytvattenprovtagningar vid platsundersökningar. | SKB MB 900.004 | 2.0 |
| Provtagning och Provhantering | SKB MD 452.001 | 11.0 |

***Figure 1-1.*** *Sampling at Norra bassängen (PFM000097) in December 2017.*

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

# 2 Near surface groundwaters

## 2.1 Objectives and scope

An extensive, two-year-long sampling campaign designed to characterise near surface groundwaters in different types of environments within the candidate area (SKB 2001) was followed by a reduced monitoring programme in July 2005 (SKB 2005). The site investigation of the candidate area was concluded in June 2007 but the monitoring programme (SKB 2007, Berglund and Lindborg 2017) will continue until the construction of the repository for spent nuclear fuel starts and during the construction and operation phase. This in order to monitor the water composition and obtain long time-series of data, first to create a base-line describing the natural variations and second to follow changes caused by the construction and operation of the repository.

During the reported period, January–December 2017, the sampling locations (stand pipes) within the monitoring programme were sampled at four occasions, in January, April, August and October. The sampling was conducted from shallow soil monitoring wells. The different sampling objects are presented in Table 2-1 and a map showing their location is presented in Figure 2-1.

The activity includes water sampling for chemical analysis as well as direct measurements in the field of parameters such as ORP (redox potential), pH, dissolved oxygen, electrical conductivity (EC) and water temperature. The analytical protocol includes major constituents, nutrient salts, silica, carbon species as well as isotopes and trace metals, see Tables 2-2 and 2-3.

## 2.2 Sampling objects

The monitoring programme for near surface groundwater includes stand pipes. The wells/pipes are of the following types:

- Single stand pipes made of HDPE located close to drill sites.
- Double and single stand pipes made of HDPE. Double pipes mean that one of the pipes is equipped with a permanently installed sensor for logging the groundwater pressure and the other pipe is intended for hydrochemical sampling.

For both pipe types the positions of the filter/screen part correspond to the upper and lower section limits (Secup and Seclow) in the Sicada database. The section limits refer to the top of the stand pipe (Top Of Casing/TOC).

The sampled monitoring wells and their stand pipe types are listed in Table 2-1. The locations of the different sampling objects are displayed in Figure 2-1.

**Table 2-1. List of sampling objects.**

| Idcode | Comments on sampled object | Pipe type |
|---|---|---|
| SFM0001 | Stand pipe connected to drill site | Plastic |
| SFM0032 | Double-pipe for chemistry | Plastic |
| SFM0037 | Double-pipe for chemistry | Plastic |
| SFM0049 | Double-pipe for chemistry | Plastic |
| SFM0002 | Double-pipe for chemistry | Plastic |
| SFM0011 | Double-pipe for chemistry | Plastic |
| SFM0057 | Double-pipe for chemistry | Plastic |

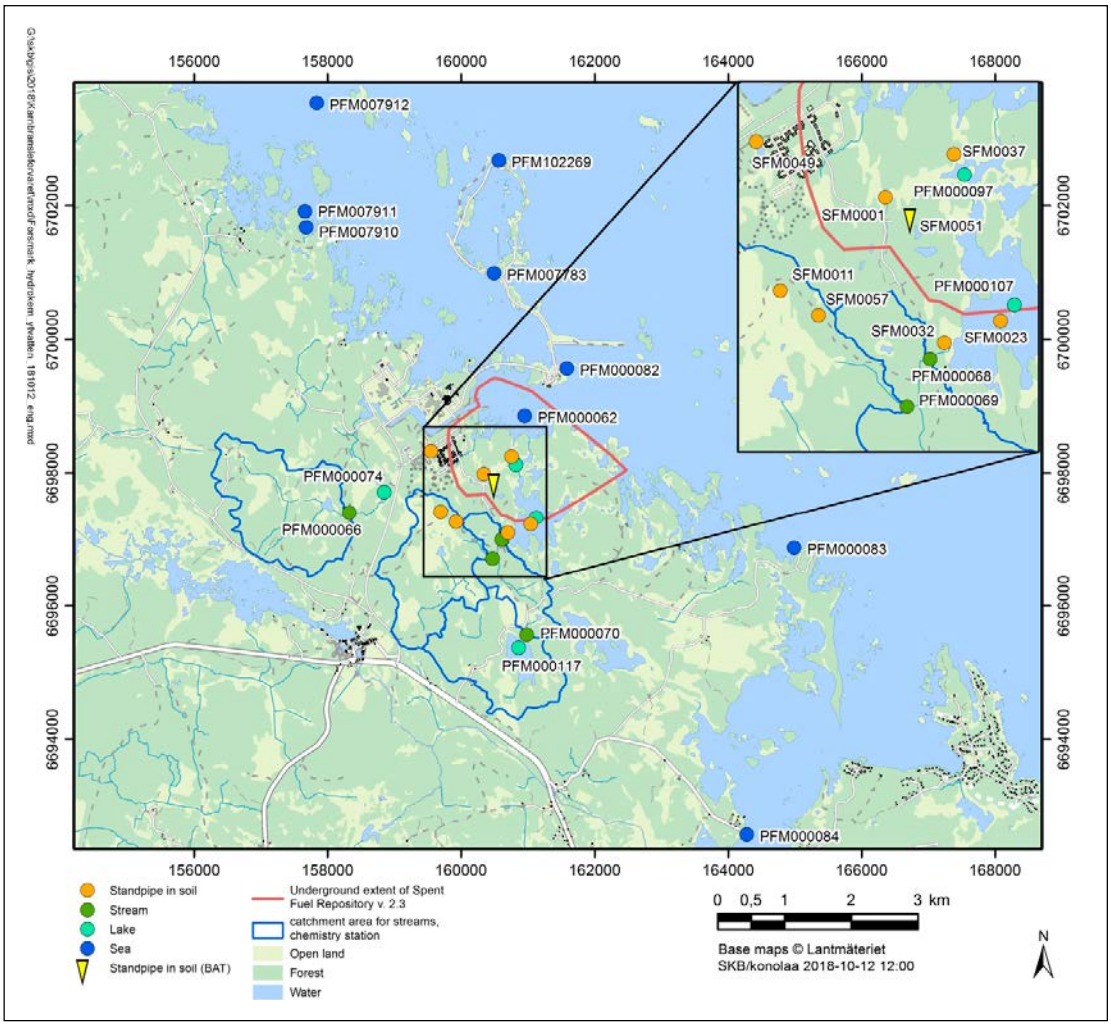


***Figure 2-1.*** *Sampling locations within the monitoring programme for surface and near surface waters in Forsmark during 2017. One location (PFM000082) constitutes an alternative for a regular sampling position (see Table 3-1).*

## 2.3 Equipment

### 2.3.1 Sampling equipment

Groundwater samples from the shallow monitoring stand pipes in soil were collected using pump setups, each one consisting of a submersible electrical pump (12V, Awimex) connected to a 5–10 m long polyamide-tube (Tecalan) of 8 mm diameter. Manually operated electrical regulators were used to adjust the water flow to a maximum of 0.5 litre/minute. Disposable filters (0.45 µm, ∅=22 mm) were used for filtration of some sample portions. The filters were fitted to 60 ml syringes.

### 2.3.2 Multi-parameter sondes

Field measurements were conducted with a multi-parameter sonde, InSitu TROLL9500 (Figure 2-2). A hand-held PC is connected to the sonde through a cable for logging and initial field control of data.

The measured parameters in near surface groundwaters included pH, water temperature, oxygen, ORP (redox potential) as well as electrical conductivity. Measurements were conducted in a flow-through cell, Figure 2-2.

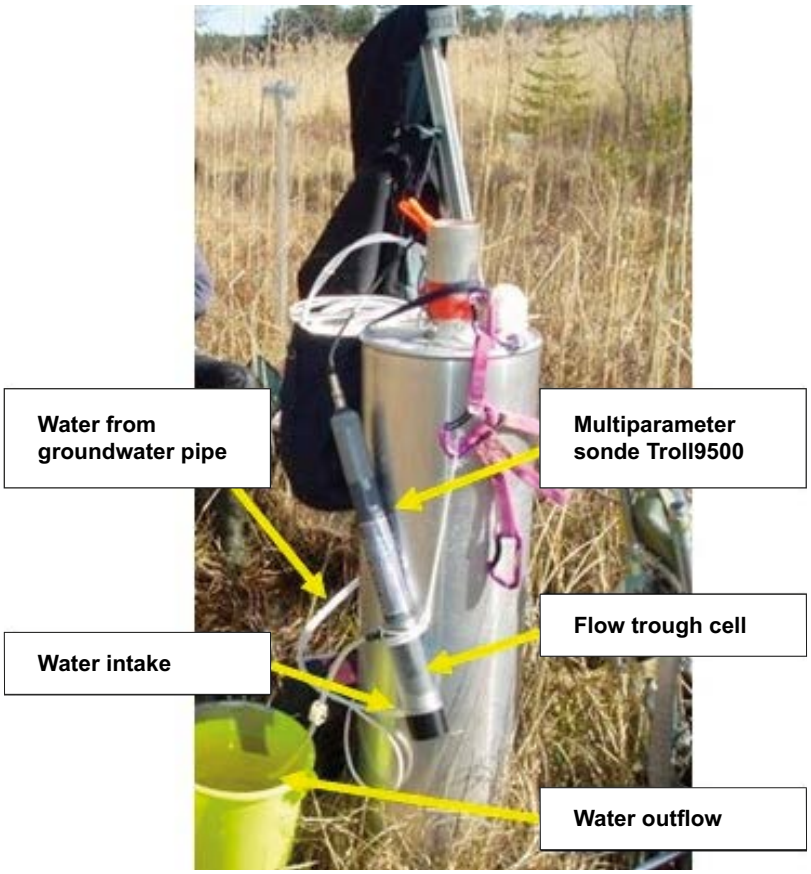


***Figure 2-2.*** *The multi parameter sonde used in 2017, TROLL9500.*

## 2.4 Performance

### 2.4.1 Sampling programme

#### *Sampling schedule*

The sampling schedule for the sampling programme is given in Table 2-2. Bottles were filled and the analyses performed according to the different SKB chemical classes (class 3 and class 5, respectively) as summarised in Table 2-3.

#### *Presampling preparations*

Prior to the sampling campaigns, sample bottles were labelled and packed in insulated boxes/bags. Acid additions were made in advance to bottles intended for trace metal and iron analyses as well as acidified archive samples. Bottles with nitric acid added were put in a separate plastic bag and kept outside the box away from the other sample bottles in order to avoid contamination. The pump 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. Calibration of the sonde was performed according to the measurement system description (the operator's manual for TROLL9500, Rev. 007, 2009).

**Table 2-2. Sampling schedule January–December 2017.**

| Year | Month | Week | Sampling objects | Sampling and analysis class |
|---|---|---|---|---|
| 2017 | January | 3 | Shallow monitoring wells | SKB class 5 |
| 2017 | April | 17 | Shallow monitoring wells | SKB class 3 |
| 2017 | August | 31 | Shallow monitoring wells | SKB class 5 |
| 2017 | October | 41 | Shallow monitoring wells | SKB class 3 |

### *Sampling and measurements*

The groundwater sampling procedure described below was generally applied in the groundwater pipes and wells. First, the groundwater level in the pipe was established by sounding and the water volume of the pipe was calculated. The pump with its connected tube was lowered carefully in order to prevent dirt from entering the pipe. The water inlet of the submersible pump was lowered to the filter/screen section of the pipe or just above. Pumping was then performed at a maximum flow rate of 0.5 litre per minute. The pumped water was disposed of at least 10 m away from the sampling object where it filtrated 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.
- Field measurement: A flow-through cell was connected to the pump setup and measurements were performed with the multi parameter sonde. 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 and logged on the hand-held PC.
- Sampling: All sample bottles, except the ones with added acid, were rinsed three times with sample water before they were filled. Disposable filters were used for filtration of water portions for major components, trace metals, Fe, nutrients and DOC/DIC. Each filter was rinsed with sample water (approx. 20 mL) before the sample portion/filtrate was collected. Bottles containing acid were the last ones to be filled in order to prevent acid contamination in the other sample portions. Disposable plastic gloves were used during the sampling. The samples were transported back from the field in insulated boxes/bags.

**Table 2-3. Sample portions/bottles and preparation procedures for class 3 and class 5.**

| Bottle volume (mL) | Number of bottles | Components | Preparation |
|---|---|---|---|
| 100 | 1 | Br, I | |
| 100 | 1 | Deuterium $^{2}H$, $^{18}O$ | – |
| 250 | 2 | Anions (Br, $SO_4$, Cl, F), Alkalinity, pH, Electric conductivity | – |
| 500 | 1 | Tritium, $^{3}H$ | – |
| 100 | 1 | Tot-N, Tot-P | – |
| 100 | 1 | TOC | – |
| 250 | 2 | Archive samples | – |
| 25 | 4 | Ammonia, NOx, Silicate, Phosphate | Filtering with syringe/0.4 µm filter |
| 100 | 2 | DOC, DIC | Filtering with syringe/0.4 µm filter |
| 100 | 1 | Major constituents; cations[1a] and S, Si. Environmental metals[1b], trace metals[1c] | Acid addition (1 mL conc. $HNO_3$) Filtering with syringe/0.4 µm, |
| 100 | 3 | Archive samples | Acid addition (1 mL conc. $HNO_3$) Filtering with syringe0.4 µm, |
| 250 | 1 | Fe(II)/Fetot | Acid addition (2.5 mL conc. HCl) Filtering with 0.4 µm filter, |
| Winkler bottles 125 | 2 | HS* | 0.5 ml ZnAc + 0.5 ml NaOH and mix |

Class 3 and 5
Class 5

[1a] Na, K, Ca, Mg, Si, Fe, Mn, Li, Sr.

[1b] Al, As, Ba, B, Cd, Co, Cr, Cu, Hg, Mo, Ni, P, Pb, V, Zn (only class 5 samples).

[1c] 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 (only class 5 samples).

* Only class 5 samples.

### 2.4.2 Sample handling and analyses

Table 2-4 lists the collected samples during the reported period. 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 laboratory. An overview of sample treatments and analytical routines for major constituents, minor anions, trace metals and isotopes is given in Appendix 1. The routines are applicable independent of sampling method or type of sampling object.

**Table 2-4. List of collected samples during the period January to December 2017 (X = collected sample).**

| | Week/ Year | | | | |
|---|---|---|---|---|---|
| **Id code** | **3/17** | **17/17** | **31/17** | **41/17** | **Sum (X)** |
| **Soil wells** | | | | | |
| SFM 0001 | X | X | X | X | **4** |
| SFM 0002 | X | X | X | X | **4** |
| SFM 0011 | X | X | X | X | **4** |
| SFM 0032 | X | X | X | X | **4** |
| SFM 0037 | X | X | X | X | **4** |
| SFM 0049 | X | X | X | X | **4** |
| SFM 0057 | X | X | X | X | **4** |
| **Sum (X)** | **7** | **7** | **7** | **7** | **28** |

### 2.4.3 Nonconformities

During the august sampling the handheld PC was not working correctly and therefore the measured values were written on the paper protocol. Also, during this sampling a remarkably low conductivity was measured in pipe SFM0001. This field measurement was 0,2 mS/m while the corresponding laboratory value was 232.0 mS/m (see figure 2-4 below), indicating sonde error at that occasion.

## 2.5 Results

### 2.5.1 Field measurements

The pH, electrical conductivity, dissolved oxygen, oxygen saturation, water temperature and redox potential (ORP) results from the field measurements are presented in Appendix 2.

#### *pH-measurement*

Field measurements of pH are plotted against the corresponding laboratory values in Figure 2-3. The data show good agreement between field and laboratory measurements although some deviation is expected due to different water temperatures and the time delay between field and laboratory measurements.

#### *Electrical conductivity*

Electrical conductivity values from the field are plotted versus corresponding laboratory values in Figure 2-4. The values generally show good agreement between field and laboratory measurements. The only exception is the extremely low field measurement at SFM0001 in august (see nonconformities above).

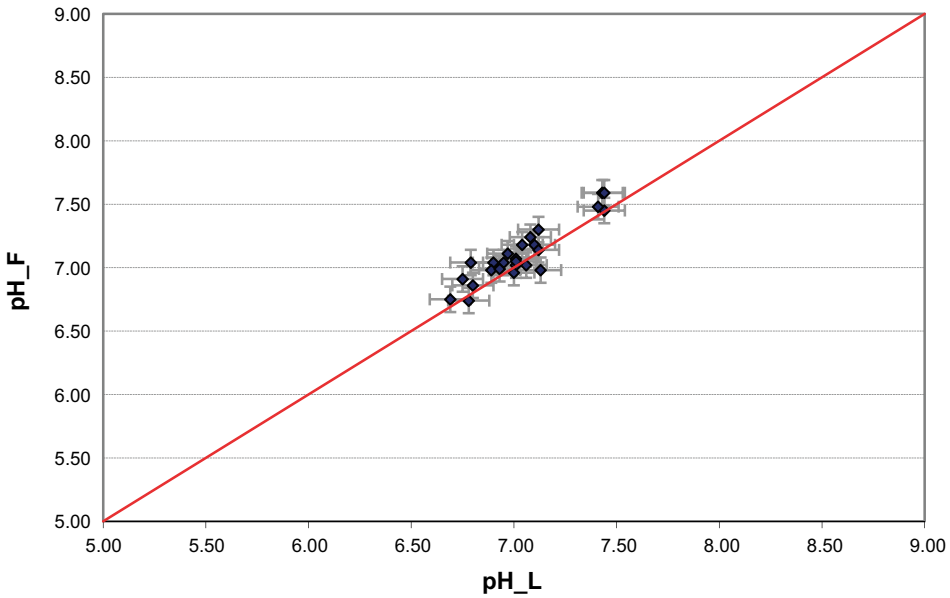


***Figure 2-3.*** *Field-pH (pH_F) values versus laboratory-pH (pH_L) values. Field-pH and laboratory-pH values are measured at prevailing water temperature and at 25° C respectively. The measurement uncertainty (Appendix 1) is shown as error bars.*

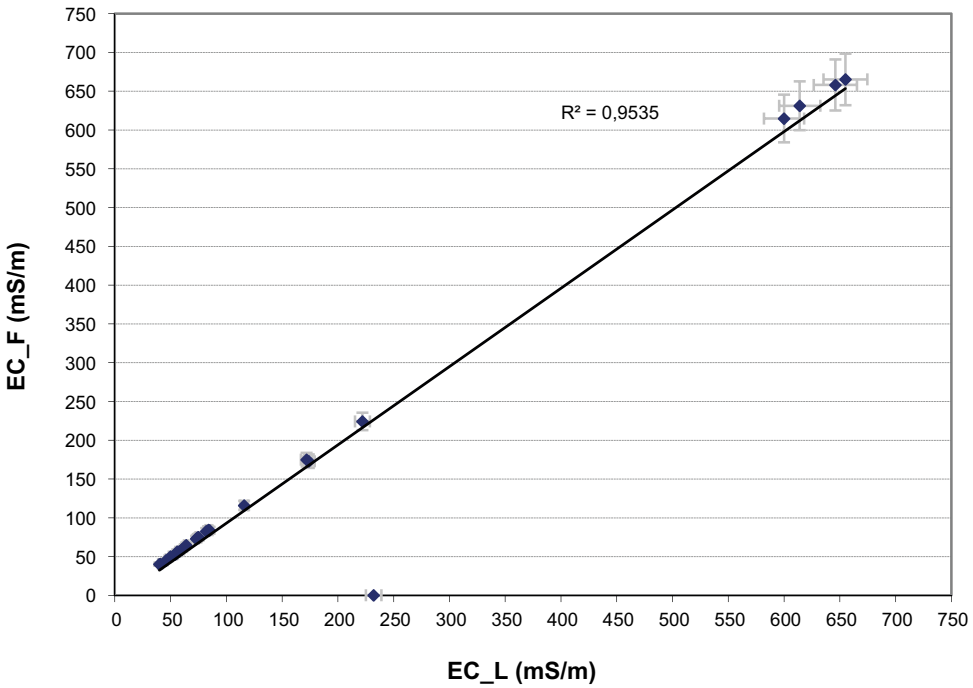


***Figure 2-4.*** *Electrical conductivity (25° C). Field measurements (EC_F) versus laboratory values (EC_L). The measurement uncertainty (Appendix 1) is shown as error bars.*

#### *Dissolved oxygen*

The field measurements of dissolved oxygen were checked in April 2005 by comparison to results from laboratory analyses (Nilsson and Borgiel 2005) This control showed that, generally, the field measurement values were somewhat higher, especially at oxygen concentrations below 4 mg/L. Field measurements of dissolved oxygen are presented in Appendix 2.

#### *ORP-measurements and redox conditions*

ORP-measurements (Oxidation Reduction Potential) have been conducted using the multipurpose measurement sonde. The recorded ORP-values should be used with great caution and merely considered as an indication of the redox conditions in the waters. Measured ORP-values are presented in Appendix 2.

### 2.5.2 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 2. The charge balance error provides an indication of the quality and uncertainty of the analyses of major constituents and the charge balance error was calculated for all samples according to the formula below.

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

Relative errors within 5 % are considered acceptable. All samples collected in 2017 showed acceptable errors., Appendix 2 Table A2-2.

Differences in flow rate may result in different water characteristics in the duplicate samples which may result in a large charge balance error. Duplicate analyses by a second laboratory or another method are conducted regularly for some of the analysed constituents as a further check of the reliability of the analyses.

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 for most samples.

#### *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 and DIC. The analytical data are compiled in Appendix 2. 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 may show seasonal variation depending on decomposition processes and varying redox conditions also in shallow groundwater, however, this variation is more pronounced in surface waters. The graphs in Figure 2-6 show the variations of total nitrogen, ammonium and phosphate in the sampled groundwater from the soil-pipes included in the long-term monitoring programme. The results from 2017 show concentrations within reasonable variations (compared to previous measurements) for each sampling location. In 2017 three new pipes were included in the monitoring programme. Of these new pipes, SFM0011, stands out with overall higher ammonium concentrations.

***Figure 2-5.*** *Winter sampling of near surface groundwater at the sampling well SFM0032.*

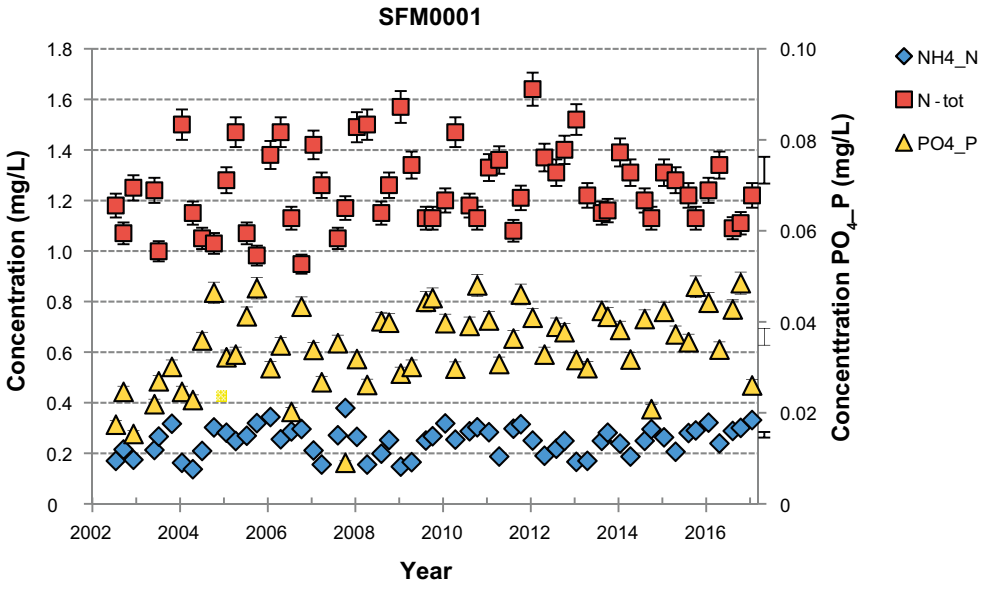


***Figure 2-6.*** *Ammonium, total nitrogen and phosphate concentrations plotted versus sampling date for the sampling wells SFM0001, SFM0032, SFM0037, SFM0049, SFM0002, SFM0011 and SFM0057. The figure continues on the next two pages.*

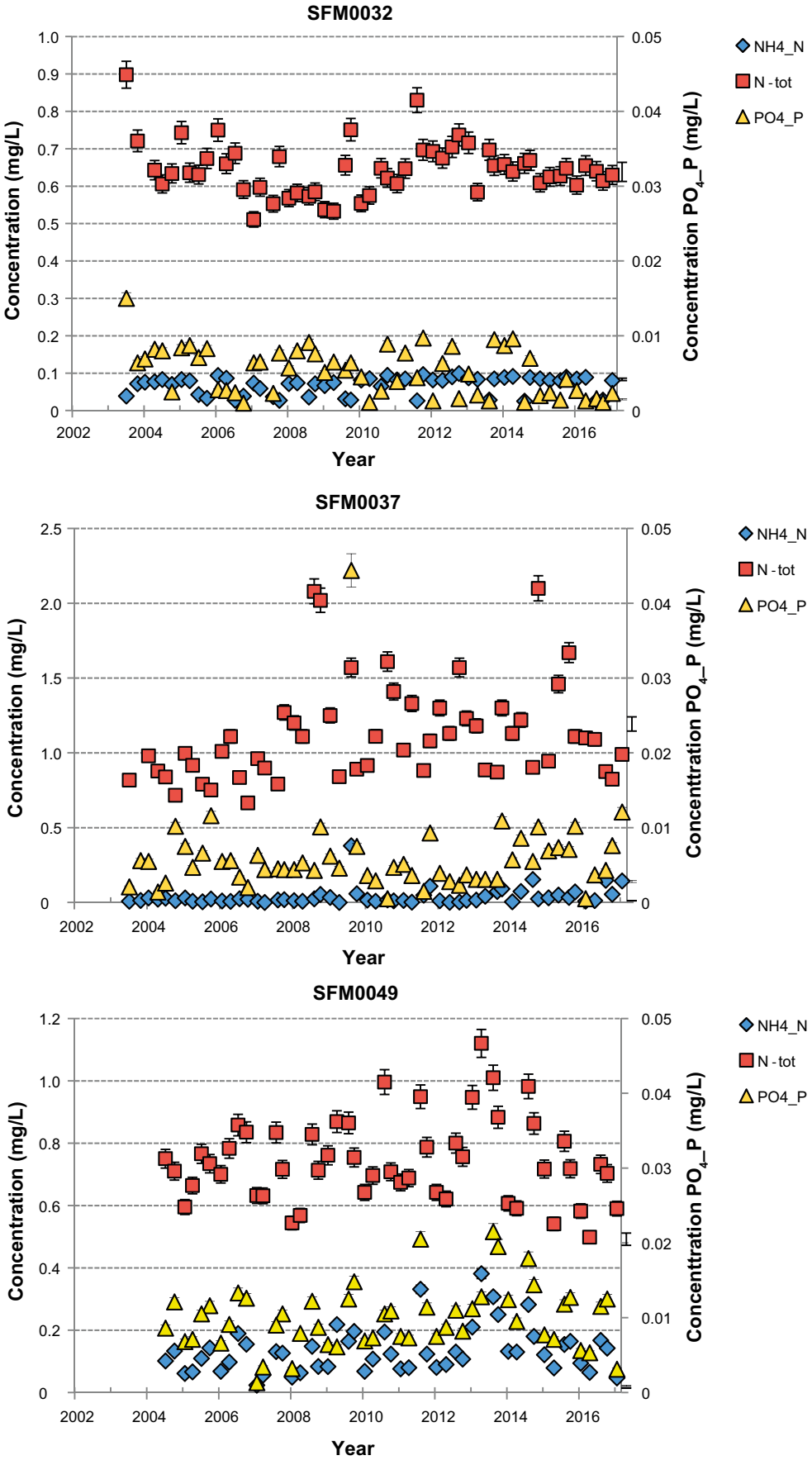


***Figure 2-6.*** *Continued from previous page.*

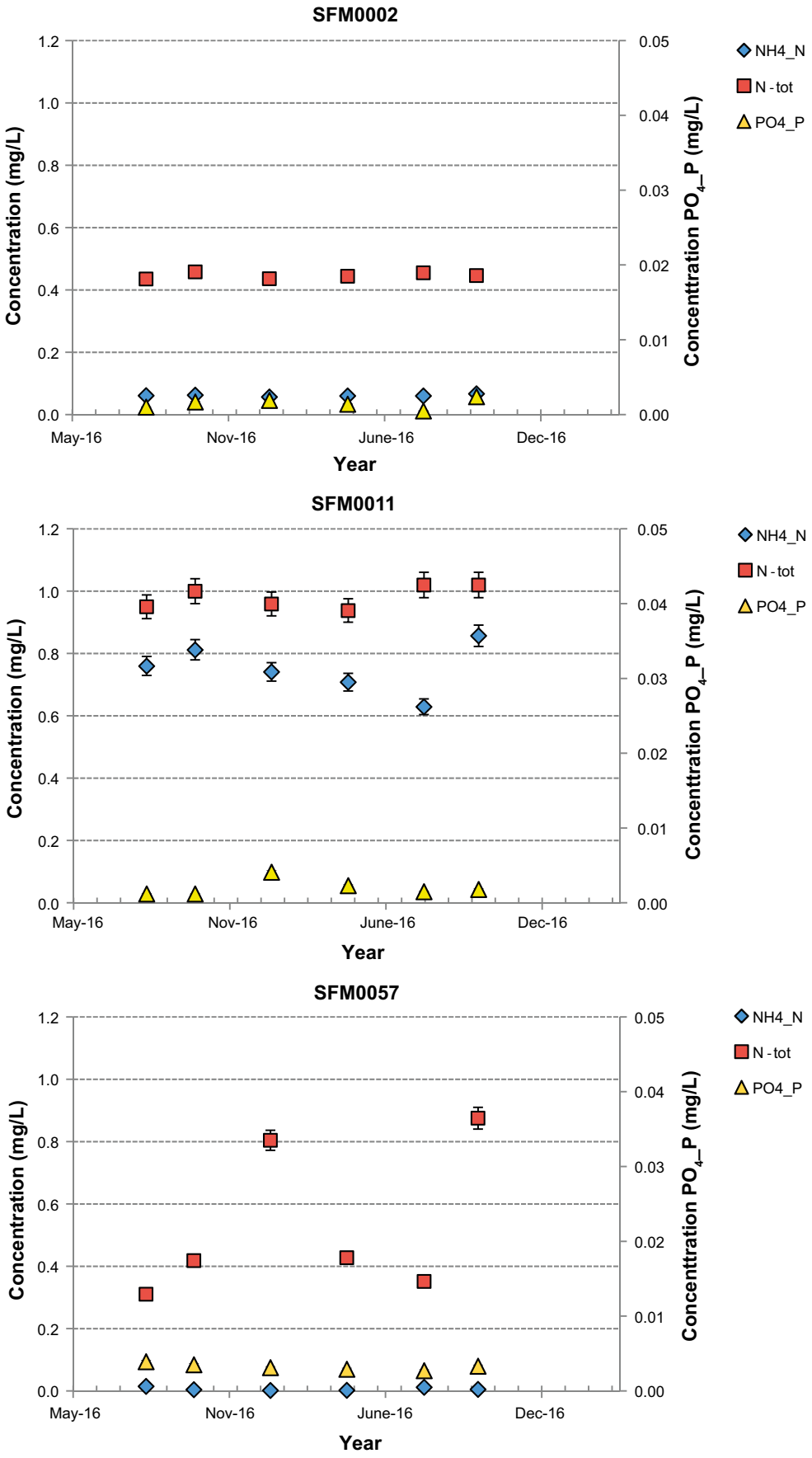


***Figure 2-6.*** *Continued from previous page.*

#### *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, Se and Lu. The trace element data are compiled in Appendix 2.

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.

#### *Isotopes*

Isotope determinations including the stable isotopes δD, and $\delta^{18}O$ as well as the radioactive isotope $^{3}H$ (TU) are compiled in Appendix 2.

## 2.6 Summary and discussion

The characters of the near surface groundwater in the monitoring programme generally remain unchanged. The chemical investigation routines for near surface groundwater are well established after several years of field work, reporting and data administration and this year of the long-term monitoring programme has passed without any major nonconformities or surprises.

# 3 Surface waters

## 3.1 Objectives and scope

Sampling and analyses of surface waters in the Forsmark area began in 2002 during the site investigation phase. After the site investigations, the surface water monitoring programme continued and focused on sampling locations in the prioritised north-western part of the Forsmark candidate area (SKB 2007). The monitoring programme was reviewed and modified in 2010. The modifications of the programme have resulted in reduced sampling frequency in the lakes and sea and fewer isotope determinations but also extended sampling in the streams adding environmental metals to the analytical programme at every sampling occasion.

The main objectives are to obtain long time-series of data to create a base-line, describing the natural variations. This in order to allow identification of eventual perturbation effects from SKB activities during the future construction and operation of the repository for nuclear waste.

The programme includes sampling of water for chemical analysis as well as direct field measurements of physical and chemical parameters such as ORP (Oxidation Reduction Potential), pH, dissolved oxygen, EC, measurement depth, turbidity and water temperature.

Analyses of major constituents, surface water supplements (nutrient salts etc) and trace elements were conducted frequently (once a month) while extended analyses, including also isotopes were performed once per season, i.e. in January, April, August and October.

## 3.2 Sampling locations and sampling schedule

The monitoring programme included four lakes, eight shallow sea bay location and four streams. The extent of the sampling varied at different occasions. The streams and one of the sea sampling locations (Biotestsjön) were sampled at eleven occasions (once per month, except for July). At these occasions measurements were also conducted at Norra bassängen (PFM000097). The remaining lakes and the sea sampling location PFM000062 were sampled at four occasions (once per season) during the reported time period. The sea sampling locations PFM000083, PFM000084 and PFM007783 were sampled at seven occasions (not February, March, July, November or December) and PFM007910, PFM007911 and PFM007912 were sampled in August.

The sampling locations are presented in Figure 2-1 and listed in Table 3-1. The sampling schedule for 2017 is given in Table 3-2.

***Figure 3-1.*** *Field sampling at PFM000068 in December 2017.*

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

| Sampling locations | Coordinates (RT90 RHB70) | Name | Comments |
|---|---|---|---|
| **Lakes** | | | |
| PFM000074 | 16 29 854, 66 99 393 | Labboträsket | |
| PFM000097* | 16 31 814, 66 99 868 | Norra bassängen | * Only field measurements |
| PFM000107 | 16 32 065, 66 99 031 | Bolundsfjärden | |
| PFM000117 | 16 31 946, 66 97 118 | Eckarfjärden | |
| **Shallow sea bays and sea location** | | | |
| PFM000062 | 16 31 921, 67 00 605 | SV Forslingens grund | |
| PFM000082 | 16 32 528, 67 01 336 | | Alternative to PFM00062 |
| PFM102269 | 16 31 405, 67 04 412 | Cooling water outlet, Lake Biotestsjön | Check of tritium contamination. Normal sampling starting in August 2016. |
| PFM000083 | 16 36 023, 66 98 757 | Kallrigafjärden | Included from August 2016. First sampled in October 2016. |
| PFM000084 | 16 35 455, 66 94 442 | Olandsån | Included from August 2016. First sampled in October 2016. |
| PFM007783 | 16 31 390, 67 02 724 | Uppströms böjen, Lake Biotestsjön | Included from August 2016. First sampled in August 2016. |
| PFM007910 | 16 28 553, 67 03 318 | Skaten-Rångsen | Only sampled in August 2017. |
| PFM007911 | 16 28 528, 67 03 554 | Skaten-Rångsen | Only sampled in August 2017. |
| PFM007912 | 16 28 649, 67 05 182 | Skaten-Rångsen | Only sampled in August 2017. |
| **Streams** | | | |
| PFM000066 | 16 29 343, 66 99 064 | Öster Gunnarsboträsket | |
| PFM000068 | 16 31 641, 66 98 735 | Kungsträsket | |
| PFM000069 | 16 31 510, 66 98 440 | Bolundsskogen | |
| PFM000070 | 16 32 061, 66 97 319 | Norr Eckarfjärden | |


***Figure 3-2.*** *Field sampling at PFM000069 in April 2017.*

**Table 3-2. Surface water sampling schedule from January to December 2017.**

| Year | Month | Week | Programme type* | Sampling comment |
|---|---|---|---|---|
| 2017 | January | 3 | E | All sampling points, except PFM007910, 7911 and 7912. |
| 2017 | February | 8 | M | Streams and Lake Biotestsjön |
| 2017 | March | 12 | M | Streams and Lake Biotestsjön |
| 2017 | April | 17 | E | All sampling points, except PFM007910, 7911 and 7912. |
| 2017 | May | 20 | M | Streams, Lake Biotestsjön, PFM000083, 84 and 7783. |
| 2017 | June | 24 | M | Streams, Lake Biotestsjön, PFM000083, 84 and 7783. |
| 2017 | August | 31 | E | All sampling points |
| 2017 | September | 37 | M | Streams, Lake Biotestsjön, PFM000083, 84 and 7783. |
| 2017 | October | 41 | E | All sampling points, except PFM007910, 7911 and 7912. |
| 2017 | November | 45 | M | Streams and Lake Biotestsjön |
| 2017 | December | 49 | M | Streams and Lake Biotestsjön |

* M = main programme (SKB class 3 including surface water supplements), E=extended programme (SKB class 5 including surface water supplements).

## 3.3 Equipment

### 3.3.1 Sampling equipment

Water samples were collected using a pump setup consisting of an electrical peristaltic pump system, Solinst, model 410, connected to 4-8 m long Teflon-tubes (FEP 140) of 5 mm inner diameter. The sampling equipment is presented in Figure 3-3.

### 3.3.2 Multi-parameter sondes

Field measurements were conducted with a multi-parameter sonde, InSitu TROLL9500. The parameters measured in field that are summarised in Table 3-3. A hand-held PC is connected to the sonde through a cable for logging and initial field control of data.


***Figure 3-3.*** *Winter sampling of surface water using the peristaltic pump system (PPS). A schematic presentation of the PPS is shown below the photo. Photo from the sampling at PFM00062.*

**Table 3-3. Parameters measured by the sonde TROLL9500.**

| Parameter | TROLL9500 |
|---|---|
| Date/time | Yes |
| Temperature (°C) | Yes |
| pH | Yes |
| Dissolved oxygen (mg/L, %) | Yes |
| ORP (Redox potential, mV) | Yes |
| Electrical conductivity (mS/cm) | Yes |
| Depth (m) | Yes |
| Turbidity (NTU) | Yes |

### 3.3.3 General field equipment

- Ruttner samplers were used as back up if the portable pump system should fail.
- The exact locations of the sampling location positions were determined using a GPS.
- Water depth in the lakes and sea was measured using an echo sounder (Plastimo, Echotest, LCD digital sounder) with an accuracy of ± 0.05 m.
- Water transparency was estimated using a Secchi disc and an aqua scope.
- Disposable filters (Millipore, 0.40 mm, ∅ = 22 mm) were used together with 60 mL syringes to filter specific sample portions of the sampled water in the field.
- Stopwatch, a water-filled plastic bottle (50 mL) and measuring-tape were used for flow/runoff estimates in stream waters.

## 3.4 Performance

### 3.4.1 Pre-sampling preparations

Prior to sampling, the sample bottles were labelled and packed in insulated boxes/bags. Acid additions were made in advance to bottles intended for iron and trace metal analyses as well as acidified archive samples. The bottles with added acid were placed in separate plastic bags outside the box/bag to avoid contamination. The peristaltic pump system, including the Teflon tubes, was washed using acid (0.5 M HCl) and rinsed with deionised water before use. The equipment was kept well protected in plastic bags or in tight containers. Calibration of the sonde was performed according to the measurement system description (the operator's manual for TROLL9500 Rev.007, 2009).

### 3.4.2 Water sampling

Water samples were collected using the peristaltic pump system. Lake and sea water samples were collected close to the surface at 0.5 m depth. When the lake and sea sampling locations were covered with ice, water was also collected from approximately 0.5 m above the lake or sea bottom, in order to sample water both above and below the stratification. Stream water samples were collected at approximately 0.1 m depth. The peristaltic pump and sample bottles were rinsed with water from the sampling locations prior to collecting samples, except for bottles with acid additions. The disposable filters were rinsed with sample water before filtering and sampling commenced. The field crew wore rubber gloves to avoid contamination and great care was taken not to contaminate bottles or equipment. Bottles and samples with added acid were handled and stored separately to avoid contaminating other sample portions.

Each sample consists of several sample portions labelled with the same sample number. The preparation of the sample portions in the field differs depending on their use. Details on collected sample portions, components to be analysed and sample preparations are summarised in Table 3-4.


***Figure 3-4.*** *Field sampling at PFM000066 in June 2017.*

**Table 3-4. Sample volumes, components and preparation of samples.**

| Bottle volume (mL) | Number of bottles | Analyses | Comments | Preparation in field |
|---|---|---|---|---|
| 250 | 1 | pH, EC, Alkalinity, colour determination | | |
| 250 | 1 | Cl, $SO_4$, Br, F | | |
| 100 | 1 | Br | | |
| 100 | 1 | Major cations, SO4_S, Si , Environmental metals | Acid washed | Filtering with syringe/0.4 µm filter |
| 2000 | 1 | PON, POP, POC, Chlorophyll a, c and pheophytin | Filtrated in laboratory | |
| 100 | 1 | Tot-N, tot-P | | |
| 100 | 2 | DIC, DOC | | Filtering with syringe/0.4 µm filter |
| 100 | 1 | TOC | | |
| 25 | 2 | Nutrients: NH4, NO2, NO3, PO4 | | Filtering with syringe/0.4 µm filter |
| 100 | 3 | Archives | Acid washed | Filtering with syringe/0.4 µm filter |
| 250 | 2 | Archives | | |
| 1000 | 1 | Suspended matter | | |
| 100 | 1 | I | The same bottle as for Br above. | |
| 125 | 1 | Trace metals | Acid washed, the same bottle as for major cations above. | |
| 25 | 3 | Nutrients: NH4, NO2, NO3, PO4 | | Filtering with syringe/0.4 µm filter |
| 100 | 1 | Deuterium, $^{18}O$ | | |
| 500 | 1 | Tritium, $^{3}H$ | | |

Main programme, eleven times per year in streams, four times per year in lakes and sea.
Extended programme four times per year.

### 3.4.3 Field measurements

The multi parameter sonde was used for measurements of pH, water temperature, ORP, turbidity, electrical conductivity and dissolved oxygen. Light penetration was measured at lake and sea sampling locations with a Secchi disc according to the Swedish standard BIN SR 111. Photo documentation of stream waters was performed to facilitate evaluation of the investigation data. Photos were taken at each stream water sampling location. At the lakes and sea sampling location field measurements were taken in a depth profile, with measurements logged at every metre from the surface to the bottom, see Table 3-5.

**Table 3-5. Logging depths at sampling locations in lakes and sea locations.**

| Sampling locations | Name | Logging depth (m) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 | 4 | 4.5 | 5 | 6 | 7 | 8 |
| **Lakes** | | | | | | | | | | | | | |
| PFM000074 | Labboträsket | X | | | | | | | | | | | |
| PFM000097 | Norra bassängen | X | | | | | | | | | | | |
| PFM000107 | Bolundsfjärden | X | X | | | | | | | | | | |
| PFM000117 | Eckarfjärden | X | X | X | | | | | | | | | |
| **Shallow sea bays and sea locations** | | | | | | | | | | | | | |
| PFM000062 | SV Forslingens grund | X | X | | X | | X | | | | | | |
| PFM007910 | Skaten-Rångsen | X | X | | X | | X | X | | X | X | X | X |
| PFM007911 | Skaten-Rångsen | X | X | | X | | X | X | X | | | | |
| PFM007912 | Skaten-Rångsen | X | X | X | X | | | | | | | | |
| PFM102269 | Cooling water outlet, Lake Biotestsjön | X | | | | | | | | | | | |
| PFM000083 | Kallrigafjärden | X | | | | | | | | | | | |
| PFM000084 | Olandsån | X | | | | | | | | | | | |
| PFM007783 | Uppströms böjen, Lake Biotestsjön | X | | | | | | | | | | | |

A simple "floating bottle" method (Johansson 2005) was used to measure water flow/runoff in the streams as a complement to the regular method using discharge weirs and gauges. The cross-section mean area of the stream was estimated, forming a rectangle, see Figure 3-5. The time for the bottle (close to neutral in weight in water) to float the distance (L) from point A to B was measured with a stopwatch. This procedure was repeated three times in each stream. The average water velocity (m/s) multiplied with the average area ($m^2$) resulted in a rough water runoff estimate ($m^3/s$).

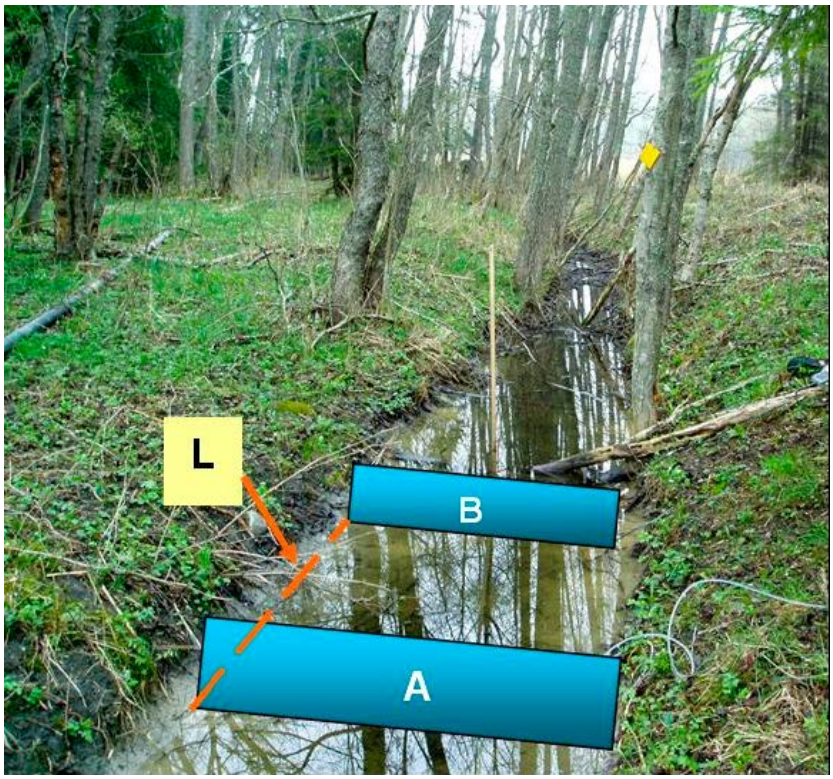


***Figure 3-5.*** *Schematic presentation for estimating water runoff in natural stream waters (see text for explanation).*

### 3.4.4 Sample treatment and chemical analyses

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

### 3.4.5 Data handling/post processing

A field protocol established during sampling/measuring contains metadata (idcode, date, time, sample no., field crew etc.), a few measured data and weather observations as well as other comments on field conditions that may influence the analytical results. The field protocols supply the basic information for creating activities and activity comments in the Sicada database and also information that describes the sampling conditions for further storage in database tables. Furthermore, eventual deviations from the sampling programme or from the normal routines are also documented in special reports/comment files. The comment files are stored in the Sicada file archive (Table 3-6).

#### *Field measurement data*

The logged data from field measurements are exported digitally from the hand-held PC to the specified Sicada data table. The original data file, as well as photographs and comments on sampling and measurements, are stored in the Sicada file archive (Table 3-6).

**Table 3-6. File types stored in the Sicada file archive.**

| Type of file | Example of file name | No. per sampling session |
|---|---|---|
| Data file | YTv41_17_data.xls | 1 |
| Comments | Noterat V41-17.doc | 1 |
| Photography | PFM66.jpg | 1–4 |

***Figure 3-6.*** *Sampling in the cooling water outlet (PFM102269).*

***Other relevant information and data***

Information about weather conditions and related parameters describing the sampling conditions are compiled in a separate Table in Sicada called “Weather_data” which contains the following columns below. These data are not presented in this report but are good information when evaluating data together with information from measurements of other activities within the monitoring programme.

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

### 3.4.6 Nonconformities

Some nonconformities have been reported during this sampling period, January-December 2017. The flow measurements in the streams were not always performed due to the ice, dry conditions or too much water vegetation. Collected samples and some comments on sampling and measurements are compiled in Tables 3-7 and 3-8.

During 2017 there were problems with the sondes, both ordinary and backup Troll sondes. The problems were mainly connected to the $O_2$ probes. The ordinary sonde was only used during the measurement in week 8. During the rest of the sampling year it was either awaiting service or at service due to problem with the $O_2$ probes. During the sampling in week 8 the sonde showed unreliable $O_2$ values.

A backup sonde (InSitu TROLL9500 but with no turbidity probe) was used during the sampling the weeks 3, 12, 17, 20, 37 and half of week 41. During the measurements in week 20 the sonde showed an error message which resulted in cancelled sonde measurement that week. During the measurements week 24 a smaller Troll sonde, usually used in near ground water sampling, was used. This sonde does not contain a turbidity probe. Starting at the mid of week 41 and the weeks 45 and 49 a replacement sonde (AquaTroll) was used. This sonde measured all the parameters as the ordinary sonde. Also, this sonde was calibrated by the service facility before delivery and was therefore calibrated the first time in the week 45. During the weeks 45 and 49 it was noted that the replacement sonde showed unreliable turbidity values. This could not be fixed despite repeated calibrations.

**Table 3-7. Collected samples and conducted measurements.**

| | Year<br>Week | 17<br>3 | 17<br>8 | 17<br>12 | 17<br>17 | 17<br>20 | 17<br>24 | 17<br>31 | 17<br>37 | 17<br>41 | 17<br>45 | 17<br>49 | Sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sea** | **Name** | | | | | | | | | | | | |
| PFM000062 | SV-Forslingen | X | | | X | | | X | | X | | | **4** |
| PFM102269 | Utlopp Biotesten | X | X | X | X | Y | X | X | X | X | X | X | **11** |
| PFM000083 | Kallrigafjärden | X | | | X | Y | X | X | X | X | | | **7** |
| PFM000084 | Olandsån | X | | | X | Y | X | X | X | X | | | **7** |
| PFM007783 | Böjen Biotestsjön | X | | | X | Y | X | X | X | X | | | **7** |
| PFM007910 | Skaten-Rångsen | | | | | | | X | | | | | **1** |
| PFM007911 | Skaten-Rångsen | | | | | | | X | | | | | **1** |
| PFM007912 | Skaten-Rångsen | | | | | | | X | | | | | **1** |
| **Stream** | | | | | | | | | | | | | |
| PFM000066 | Ö-Gunnarsbo | X | X | X | X | Y | X | G | X | X | X | X | **10** |
| PFM000068 | Kungsträsket | X | X | X | X | Y | X | G | X | X | X | X | **10** |
| PFM000069 | Bolundsskogen | X | X | X | X | Y | X | G | X | X | X | X | **10** |
| PFM000070 | N-Eckarfjärden | X | X | X | X | Y | X | G | X | X | X | X | **10** |
| **Lakes** | | | | | | | | | | | | | |
| PFM000074 | Labbotträsket | X | | | X | | | X | | X | | | **4** |
| PFM000097 | N. bassängen | B | B | C | B | | B | B | B | B | B | B | |
| PFM00107 | Bolundsfjärden | XX | | | X | | | X | | X | | | **5** |
| PFM00117 | Eckarfjärden | XX | | | X | | | X | | X | | | **5** |
| | **Sum water samples** | **14** | **5** | **5** | **12** | **8** | **8** | **11** | **8** | **12** | **5** | **5** | **93** |

Y: Sample taken, no field measurements.

X: Sample and fieldmeasurments taken.

B: No sample, only field measurements with sonde.

C: No measurement due to weak ice.

G: Dry conditions, no measurements or samples.

**Table 3-8. Some comments on measurements/water sampling.**

| | Year<br>Week | 17<br>3 | 17<br>8 | 17<br>12 | 17<br>17 | 17<br>20 | 17<br>24 | 17<br>31 | 17<br>37 | 17<br>41 | 17<br>45 | 17<br>49 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Stream** | | | | | | | | | | | | |
| PFM000066 | Ö-Gunnarsbo | C | C | | | | F | G | F | | | |
| PFM000068 | Kungsträsket | C | C | | F | F | F | G | B | | | |
| PFM000069 | Bolundsskogen | C | C | | | | | G | | | | |
| PFM000070 | N-Eckarfjärden | C | F | | B | B | F | G | B | B | | |
| **Lakes** | | | | | | | | | | | | |
| PFM00107 | Bolundsfjärden | A | | | | | | | | | | |
| PFM00117 | Eckarfjärden | A | | | | | | | | | | |

Explanations to codes/abbreviations:

A: Two samples collected. Surface and bottom water sampled separetely due to winter stagnation in lake.

C: Frozen water, no flow measurement.

F: Flow rate to low, no flow measurement.

G: Dry conditions, no measurements or samples.

B: Too much water vegetation, no flow measurement.

## 3.5 Results

### 3.5.1 General

The surface water investigation period from January to December 2017 includes 93 water samples and 132 field loggings of measurements from the regular sampling locations in streams, lakes and sea. Furthermore, the accompanying field documentation is quite extensive. The data are compiled in the attached Appendices and stored in the Sicada database where they are traceable by the activity plan number.

Fresh waters in the Forsmark area are well buffered with high alkalinity, high pH and high calcium concentrations. In addition, waters affected or recently affected by brackish sea water still show high sodium chloride concentrations. The relationship between the position of the coastline and the salinity of the water samples collected at the sampling locations in the area has been demonstrated in Nilsson et al. 2003. Furthermore, a detailed evaluation of surface water data from March 2002 to March 2004 was presented in Sonesten (2005). A summary of the results from the surface water monitoring during 2005-2009 is available in Nilsson et al. (2010).

The results presented and compiled in this section are restricted to field work performed between January and December 2017.

### 3.5.2 Water analyses

#### *Major components*

The basic water analyses include the major constituents Na, K, Ca, Mg, Sr, S, $SO_4^{2-}$, $Cl^-$, Si and alkalinity as well as the minor constituents Fe, Li, Mn, Br, $F^-$, and I. Furthermore, batch measurements of pH and EC are included. The basic water analysis data are compiled together with field measurements of pH and water temperature in Appendix 3.

The charge balance errors, see section 2.5.2 for calculation formula, give an indication of the quality and uncertainty of the analyses of major constituents. For surface water the acceptable error is maximum ± 10 %. All samples were within the acceptable limit except for one that was just above at 12 %, Appendix 3 Table A3-3.

#### *Surface water supplements*

The surface water supplements include $NH_4$-N, $NO_2$-N, $NO_3$-N+$NO_2$-N, $NO_3$-N, tot-N, tot-P, $PO_4$-P, TOC, DOC and DIC. The analytical data are compiled in Appendix 3. The DIC values should be used with care and bicarbonate values, by alkalinity titration, are considered more reliable.

#### *Isotopes*

The isotope data including the stable isotopes δD, $\delta^{18}O$, as well as the radioactive isotope tritium ($^3H$) are compiled in Appendix 3.

#### *Tritium*

It is suspected that the adjacent nuclear power plant may have increased the natural content of tritium and $^{14}C$ isotopes (Nilsson et al. 2003). Very high tritium concentrations, above 100 TU, have previously been recorded in samples from the cooling water outlet PFM102269 in July 2005, January and May 2008, October 2010 and April 2011. Slightly elevated values have also been noted in 2006, 2007, 2009, 2011, 2013, 2015 and 2016. In 2017, elevated tritium concentration was measured in September and October, Figure 3-7.

Tritium content in the water from near the cooling water outlet (PFM102269) ranged from 5.08–60.28 TU compared to the other sampling points ranging from 5.49–9.67 TU.

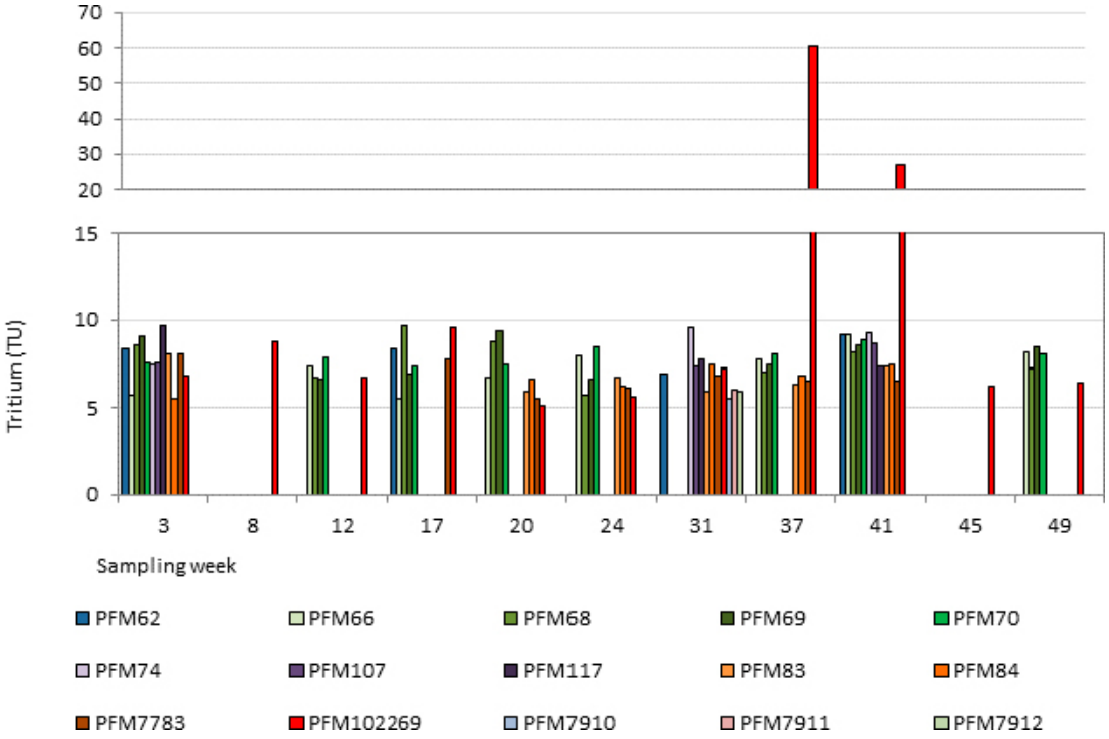


***Figure 3-7.*** *Results from tritium analyses sampled during 2017. The red bars represent the sampling location near the cooling water outlet, PFM102269. Note the broken y-axis.*

#### *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, Se and Lu. The trace element data are compiled in Appendix 3.

These elements are generally present at low concentrations in the water and the risk for contamination is high. Especially data on common metals like Al, Cr, Cu, Co, Ni and Zn must be used with caution.

### 3.5.3 Field measurements

The field measurement data including redox potential, pH, dissolved oxygen, electrical conductivity, measurement depth, turbidity and water temperature are compiled in Appendix 3. The water flow rate estimations by the float method (Johansson 2005) are of low accuracy compared to measurements using discharge weirs and gauges. They were performed in order to allow comparison between early data obtained when there was no other available method and new data from installed measurement stations.

### 3.5.4 Water composition

The major cations in freshwater and sea water are generally calcium, magnesium, sodium and potassium. Sulphate and chloride are the major anions in sea water and in freshwater also bicarbonate gives a large contribution. The relative proportions between these major constituents differ between sea water and freshwater and also between different freshwater bodies, Figures 3-8 and 3-9.

Comparisons of the mean concentrations of these ions at the different sampling locations during year 2008–2017 generally show some variation, Figure 3-10 and 3-11. The largest variation in these major constituents is seen in Lake Bolundsfjärden, PFM000107, especially for the ions $Na^+$ and $Cl^-$. Lake Bolundsfjärden is characterised by irregular inflow of saltwater, which explains the larger variations in these two ions. The concentrations of ions $Na^+$ and $Cl^-$ were comparatively high in 2008 indicating a recent influx of saltwater. Also, in 2012, 2015-2017 the concentrations were higher indicating saltwater inflow.

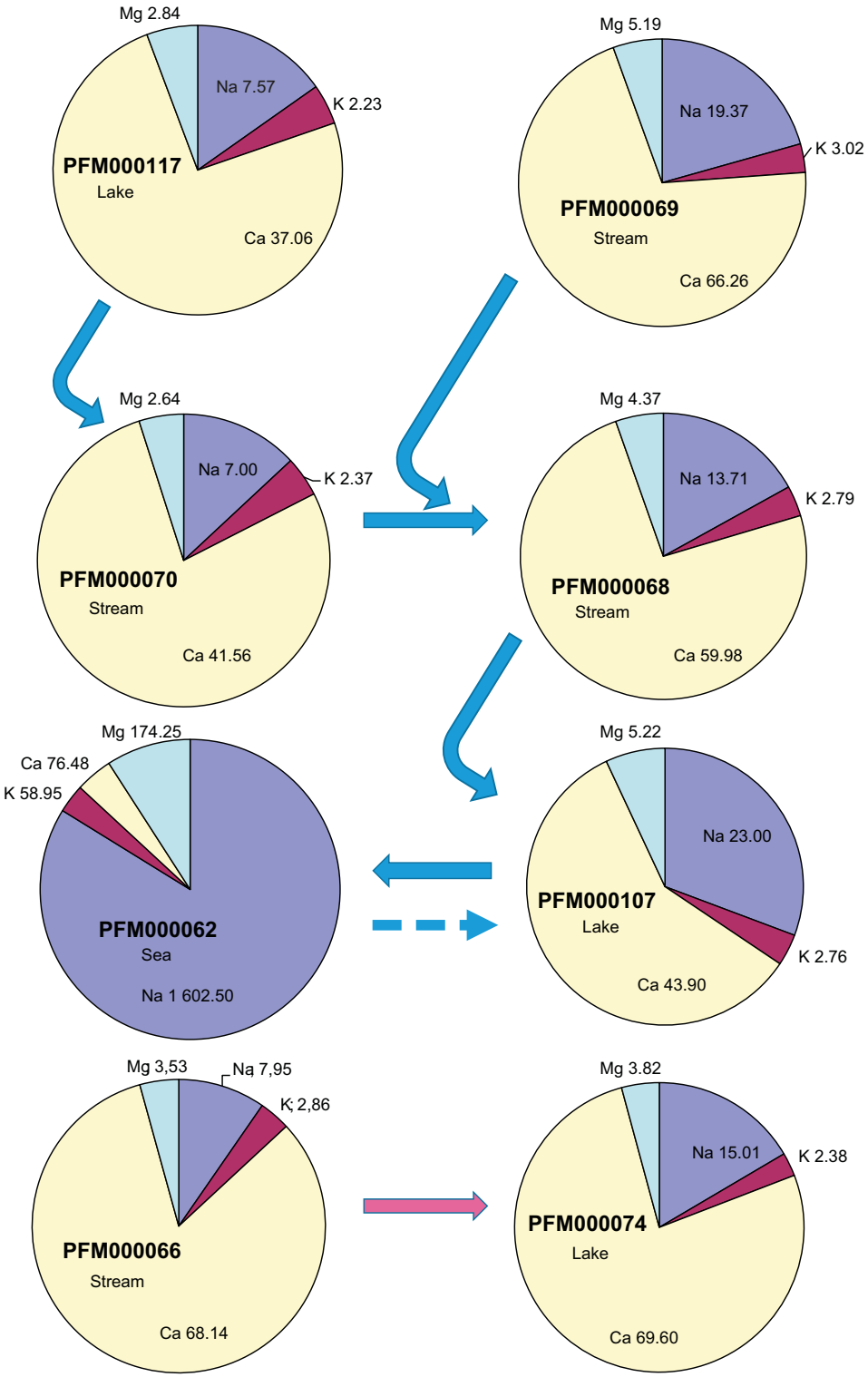


***Figure 3-8.*** *Relative proportions of the cations $Na^+$, $K^+$, $Ca^{2+}$, $Mg^{2+}$ based on average values during the sampling period 2017. The average values (mg/L) are displayed behind each cation in the diagrams. The arrows show the path of the surface water between the lakes and streams. Occasional inflow of sea water into Lake Bolundsfjärden (PFM 000107) is indicated by a dashed arrow. The Lake Labboträsket (PFM000074) and the stream PFM000066 belong to a different catchment area.*

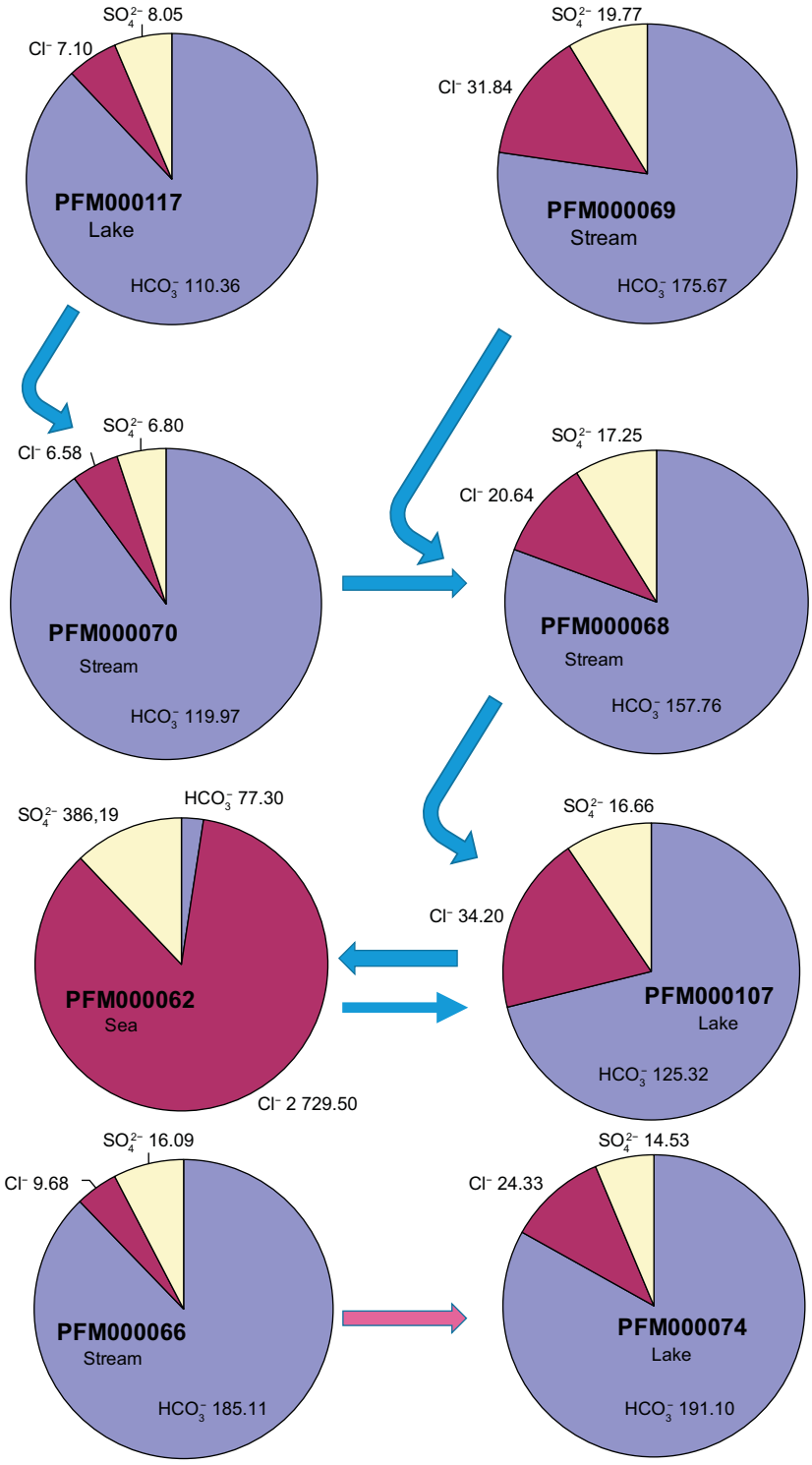


***Figure 3-9.*** *Relative proportions of the anions $Cl^-$, $HCO^{3-}$ and $SO_4^{2-}$ based on the average values (given in the diagrams in mg/L) during the sampling period 2017. The arrows show the path of the surface water between the lakes and streams. Occasional inflow of sea water into Lake Bolundsfjärden (PFM 000107) is indicated by a dotted arrow. The Lake Labboträsket (PFM000074) and the stream PFM000066 belong to a different catchment area.*

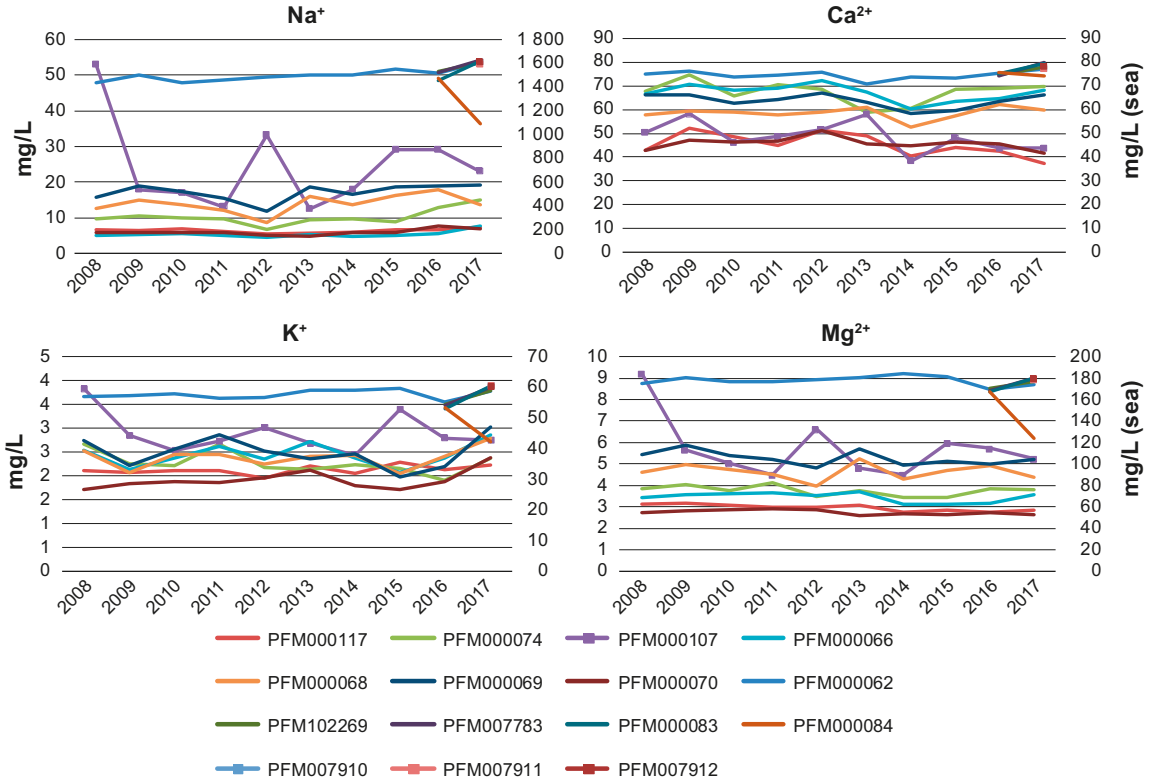


***Figure 3-10.*** *Mean concentrations of the cations $Na^+$, $K^+$, $Ca^{2+}$, $Mg^{2+}$ during the years 2008–2017 at the sampling locations in the three lakes (PFM000074, PFM000107 and PFM000117) the four streams (PFM000066, PFM000068, PFM000069 and PFM000070) and the sea (PFM000062, PFM102269, PFM007783, PFM000083, PFM000084, PFM007910, PFM007911 and PFM007912). Note that the four sea locations PFM102269, PFM007783, PFM000083 and PFM000084 only have data from 2016 and 2017 and the three locations PFM007910, PFM007911 and PFM007912 only have data from 2017.*

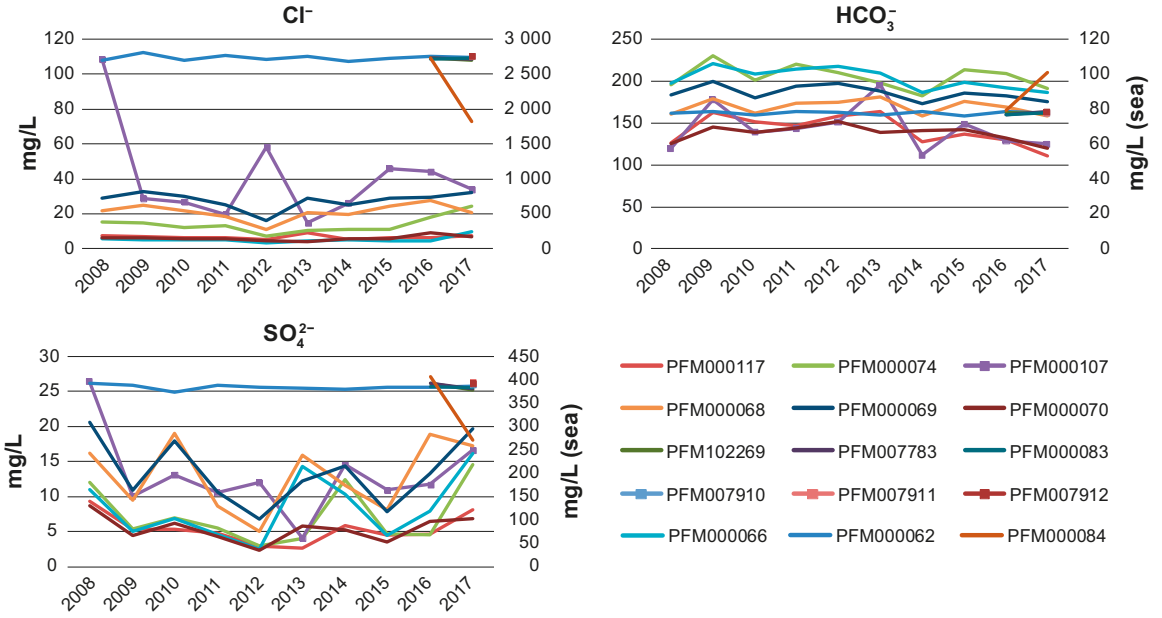


***Figure 3-11.*** *Mean concentrations of the anions $Cl^-$, $HCO^{3-}$ and $SO_4^{2-}$ during the years 2008–2017 at the sampling locations in the three lakes (PFM000074, PFM000107 and PFM000117) the four streams (PFM000066, PFM000068, PFM000069 and PFM000070) and the sea (PFM000062, PFM102269, PFM007783, PFM000083, PFM000084, PFM007910, PFM007911 and PFM007912). Note that the four sea locations PFM102269, PFM007783, PFM000083 and PFM000084 only have data from 2016 and 2017 and the three locations PFM007910, PFM007911 and PFM007912 only have data from 2017.*


***Figure 3-12.*** *No water at site PFM000070 during the week 31 sampling.*

### 3.5.5 The NP-ratio in the surface water

The nutrients, nitrogen and phosphorus, are often the limiting factors for the primary production. Primary producers, such as plants and phytoplankton, use nitrogen and phosphorus in a ratio of about 16 mol nitrogen to 1 mol phosphorous, also known as the Redfield ratio, or 7:1 in terms of mass. A ratio deviating from 16 (or 7) indicates that the primary production is limited by either nitrogen or phosphorus. When nitrogen is present in excess the ratio will be higher than 16, indicating that lack of phosphorus is limiting the growth. Whereas lower ratios indicate nitrogen limitations, which may favour growth of blue green algae able to use nitrogen from the air. In fresh water, phosphorus is usually the limiting nutrient whereas in the oceans it is usually nitrogen.

Figure 3-13 shows the relationship between nitrogen and phosphorous in the surface water of the investigated streams, lakes and coastal bays in the Forsmark area. The lakes and streams are phosphorus limited with a relatively high concentrations of nitrogen. The coastal locations in the Baltic Sea, PFM000062, PFM000083, PFM000084, PFM007783, PFM007910, PFM007911 and PFM007912 are also phosphorous limited although the ratio is much lower.

Comparisons of the mean concentrations of total nitrogen and total phosphorus during years 2008–2017 generally show little variation between years, Figure 3-14. The largest variation is seen for phosphorus in Lake Eckarfjärden, PFM000117, but there is no increasing or decreasing trend over the years.

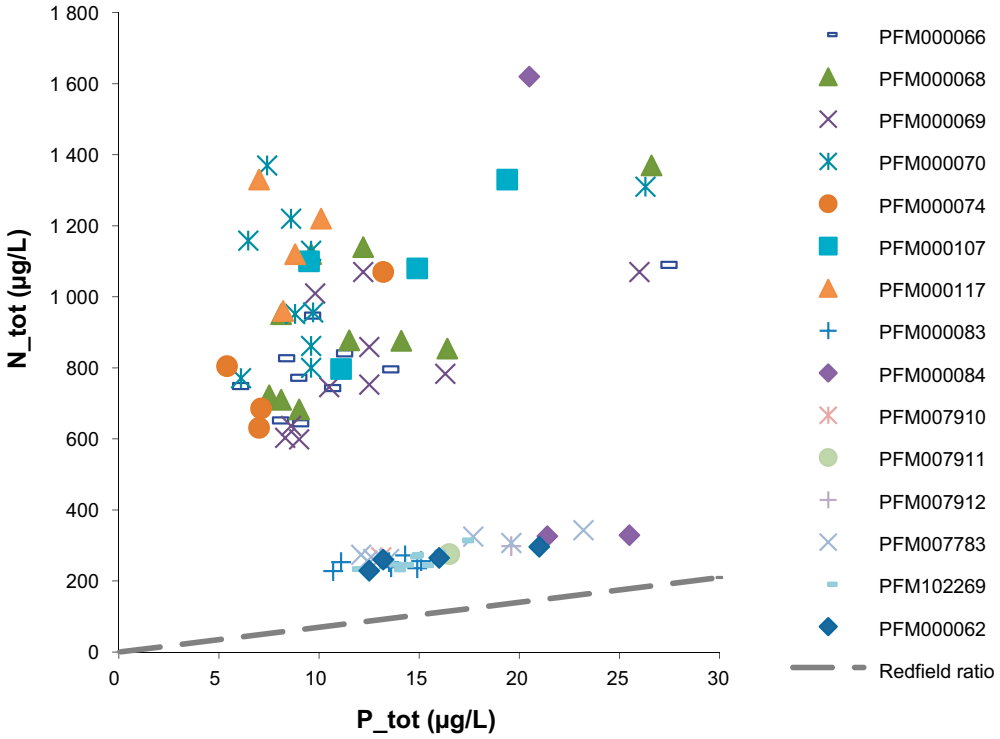


***Figure 3-13.*** *The relationship between nitrogen and phosphorus in the surface water of the investigated streams, lakes and coastal locations in the Forsmark area during 2017. The Redfield ratio (7:1) is indicated. Values above and below the line indicate phosphorus limitation and nitrogen limitation, respectively.*

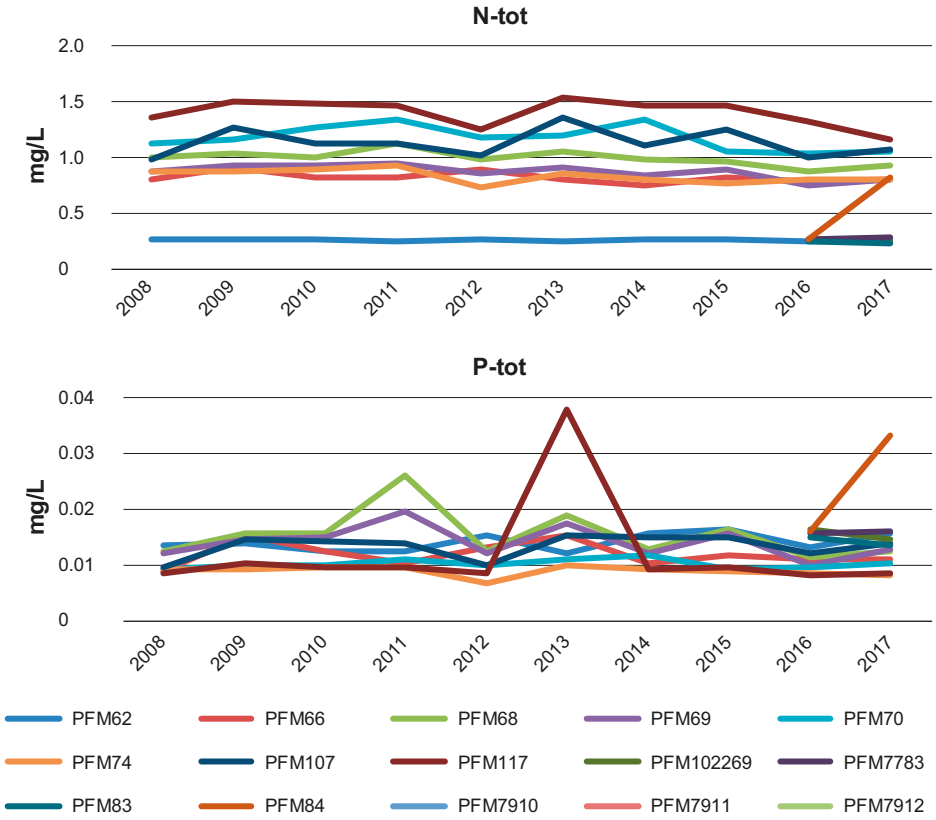


***Figure 3-14.*** *Mean concentrations of total nitrogen (N-tot) and total phosphorus (P-tot) during the years 2008–2017 at the sampling locations in the four streams (PFM000066, PFM000068, PFM000069 and PFM000070), three lakes (PFM000074, PFM000107 and PFM000117) and the sea (PFM000062, PFM102269, PFM007783, PFM000083, PFM000084, PFM007910, PFM007911 and PFM007912). Note that the four sea locations PFM102269, PFM007783, PFM000083 and PFM000084 only have data from 2016 and 2017 and the three locations PFM007910, PFM007911 and PFM007912 only have data from 2017.*

## 3.6 Summary and discussion

The chemical investigation routines for surface waters are well established and this period of the long-term surface water monitoring programme has passed without any major nonconformities or surprises.

The main experiences and conclusions from surface water sampling and analyses during the sampling period January to December 2017 are summarised below:

- Previous data indicates periodic tritium contamination from the adjacent nuclear power plant in water samples from near the cooling water outlet. In 2017, elevated tritium concentration was measured in September and October.
- The proportions of the major ions in the sampled freshwaters and the shallow sea bay were similar to previous years. However, in 2015, 2016 and 2017 the concentration of $Na^+$ and $Cl^-$ in Lake Bolundsfjärden, PFM000107, were higher compared to 2013 and 2014, indicating saltwater inflows.
- The concentrations of total nitrogen and total phosphorus in the sampled freshwaters and shallow sea locations were similar to previous years.

# References



**Berglund S, Lindborg T (eds), 2017.** Monitoring Forsmark – evaluation and recommendations for programme update. SKB TR-15-01, Svensk Kärnbränslehantering AB.

**Johansson P-O, 2005.** Forsmark site investigation. Manual discharge measurements in brooks, April 2002 – April 2005. SKB P-05-153, Svensk Kärnbränslehantering AB

**Nilsson A-C, Borgiel M, 2005.** Forsmark site investigation. Sampling and analyses of surface waters. Results from sampling in the Forsmark area, March 2004 to June 2005. SKB P-05-274, Svensk Kärnbränslehantering AB.

**Nilsson A-C, Karlsson S, Borgiel M, 2003.** Forsmark site investigation. Sampling and analyses of surface waters. Results from sampling in the Forsmark area, March 2002 to March 2003. SKB P-03-27, Svensk Kärnbränslehantering AB.

**Nilsson A-C (ed), Berg C, Harrström J, Jönsson S, Thur P, Borgiel M, Qvarfordt S 2010.** Forsmark site investigation. Hydrochemical monitoring of groundwaters and surface waters. Results from water sampling in the Forsmark area, January–December 2009. SKB P-10-40, Svensk Kärnbränslehantering AB.

**SKB, 2001.** Site investigations. Investigation methods and general execution programme. SKB TR-01-29, Svensk Kärnbränslehantering AB.

**SKB, 2005.** Forsmark site investigation. Programme for further investigations of geosphere and biosphere. SKB R-05-14, Svensk Kärnbränslehantering AB.

**SKB, 2007.** Programme for long-term observations of geosphere and biosphere after completed site investigations. SKB R-07-34, Svensk Kärnbränslehantering AB

**Sonesten L, 2005.** Chemical characteristics of surface waters in the Forsmark area. Evaluation of data from lakes, streams, and coastal sites. SKB R-05-41, Svensk Kärnbränslehantering AB.

# Appendix 1

## Methods, reporting limits and measurement uncertainties

**Table A1-1. Methods, reporting limits and measurement uncertainties.**

| Component | Method[1] | Reporting limits (RL), detection limits (DL) or range[2] | Unit | Measurement uncertainty[3] |
|---|---|---|---|---|
| pH | Potentiometric | 3–10 | pH unit | ± 0.1 |
| EC | Electrical Conductivity meas. | 2–150<br>150–10 000 | mS/m | 5 %<br>3 % |
| $HCO_3$ | Alkalinity titration | 2 | mg/L | 4 % |
| $Cl^-$<br>$Cl^-$ | Mohr- titration<br>IC | ≥ 70<br>0.5–70 | mg/L | 5 %<br>8 % |
| $SO_4$ | IC | 0.5 | mg/L | 12 % |
| $Br^-$ | IC | DL 0.2, RL 0.5 | mg/L | 15 % |
| Br | ICP SFMS | 0.001, 0.004, 0.010[4] | mg/L | 25 %[5] |
| $F^-$<br>$F^-$ | IC<br>Potentiometric | DL 0.2, RL 0.5<br>DL 0.1, RL 0.2 | mg/L | 13 %<br>12 % |
| $I^-$ | ICP SFMS | 0.001, 0.004, 0.010[4] | mg/L | 25 %[5] |
| Na | ICP AES | 0.1 | mg/L | 13 % |
| K | ICP AES | 0.4 | mg/L | 12 % |
| Ca | ICP AES | 0.1 | mg/L | 12 % |
| Mg | ICP AES | 0.09 | mg/L | 12 % |
| S(tot) | ICP AES | 0.16 | mg/L | 12 % |
| Si(tot) | ICP AES | 0.03 | mg/L | 14 % |
| Sr | ICP AES | 0.002 | mg/L | 12 % |
| Li | ICP AES | 0.004 | mg/L | 12.2 % |
| Fe | ICP AES | 0.02 | mg/L | 13.3 %[6] |
| Fe | ICP SFMS | 0.0004, 0.002, 0.004[4] | mg/L | 20 %[6] |
| Mn | ICP AES | 0.003 | mg/L | 12.1 %[5] |
| Mn | ICP SFMS | 0.00003, 0.00004, 0.0001[4] | mg/L | 53 %[6] |
| Fe(II), Fe(tot) | Spectrophotometry | DL 0.006, RL 0.02 | mg/L | 0.005 (0.02–0.05 mg/L)<br>9 % (0.05-1 mg/L)<br>7 % (1–3 mg/L) |
| $HS^-$ | Spectrophotometry, SKB | SKB DL 0.006, RL 0.02 | mg/L | 25 % |
| $HS^-$ | Spectrophotometry, external laboratory | 0.01 | mg/L | 0.02 (0.01–0.2 mg/L)<br>12 % (> 0.2 mg/L) |
| $NO_2$ as N | Spectrophotometry | 0.1 | µg/L | 2 % |
| $NO_3$ as N | Spectrophotometry | 0.2 | µg/L | 5 % |

| Component | Method[1] | Reporting limits (RL), detection limits (DL) or range[2] | Unit | Measurement uncertainty[3] |
|---|---|---|---|---|
| $NO_2$+$NO_3$ as N | Spectrophotometry | 0.2 | µg/L | 0.2 (0.2–20 µg/L)<br>2 % (>20 µg/L) |
| $NH_4$ as N | Spectrophotometry, SKB | 11 | µg/L | 30 % (11–20 µg/L)<br>25 % (20–50 µg/L)<br>12 % (50–1200 µg/L) |
| $NH_4$ as N | Spectrophotometry external laboratory | 0.8 | µg/L | 0.8 (0.8–20 µg/L)<br>5 % (>20 µg/L) |
| $PO_4$ as P | Spectrophotometry | 0.7 | µg/L | 0.7 (0.7–20 µg/L)<br>3 % (>20 µg/L) |
| $SiO_4$ | Spectrophotometry | 1 | µg/L | 2.5 % (>100 µg/L) |
| $O_2$ | Iodometric titration | 0.2–20 | mg/L | 5 % |
| Chlorophyll a, c pheopigment[7] | Spectrophotometry/ Fluorometry | 0.5 | µg/L | 5 % |
| Component | Method[1] | Reporting limits (RL), detection limits (DL) or range[2] | Unit | Measurement uncertainty[3] |
| PON[7] | Elementar analysator | 0.5 | µg/L | 5 % |
| POP[7] | Own method 990121 | 0.1 | µg/L | 5 % |
| POC[7] | Elementar analysator | 1 | µg/L | 4 % |
| Tot-N[7] | Spectrophotometry | 10 | µg/L | 4 % |
| Tot-P[7] | Spectrophotometry | 0.5 | µg/L | 6 % |
| Al, | ICP SFMS | 0.2, 0.3, 0.7[4] | µg/L | 17.6 %[6] |
| Zn | ICP SFMS | 0.2, 0.8, 2[4] | µg/L | 15.5, 17.7, 25.5 %[6] |
| Ba, Cr, Mo, | ICP SFMS | 0.01, 0.04, 0.1[4] | µg/L | Ba 15 %[4], Cr 22 %[5] Mo 39 %[6] |
| Pb | ICP SFMS | 0.01, 0.1, 0.3[4] | µg/L | 15 %[6] |
| Cd | ICP SFMS | 0.002, 0.02, 0.5[4] | µg/L | 15.5 %[6] |
| Hg | ICP AFS | 0.002 | µg/L | 10.7 %[6] |
| Co | ICP SFMS | 0.005, 0.02, 0.05[4] | µg/L | 25.9 %[6] |
| V | ICP SFMS | 0.005, 0.03, 0.05[4] | µg/L | 18.1 %[6] |
| Cu | ICP SFMS | 0.1, 0.2, 0.5[4] | µg/L | 14.4 %[6] |
| Ni | ICP SFMS | 0.05, 0.2, 0.5[4] | µg/L | 15.8 %[6] |
| P | ICP SFMS | 1, 5, 40[4] | µg/L | 16.3 %[6] |
| As | ICP SFMS | 0.01 (520 mS/m) | µg/L | 59.2 %[6] |
| La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu | ICP SFMS | 0.005, 0.02, 0.05[4] | µg/L | 20 %, 20 %, 25 %[6] |
| Sc, In, Th | ICP SFMS | 0.05, 0.2, 0.5[4] | µg/L | 25 %[6] |
| Rb, Zr, Sb, Cs | ICP SFMS | 0.025, 0.1, 0.25[4] | µg/L | 15 %, 20 %, 20 %[5]<br>25 %[6] |
| Tl | ICP SFMS | 0.025, 0.1, 0.25[4] | µg/L | 14.3 %[5 and 6] |
| Y, Hf | ICP SFMS | 0.005, 0.02, 0.05[4] | µg/L | 15 %, 20 %, 20 %[5]<br>25 %[6] |

| Component | Method[1] | Reporting limits (RL), detection limits (DL) or range[2] | Unit | Measurement uncertainty[3] |
|---|---|---|---|---|
| U | ICP SFMS | 0.001, 0.005, 0.01[4] | µg/L | 13.5 %, 14.3 %, 15.9 %[5]<br>19.1 %, 17.9 %, 20.9 %[6] |
| DOC | UV oxidation, IR<br>Carbon analysator | 0.5 | mg/L | 8 % |
| TOC | UV oxidation, IR<br>Carbon analysator | 0.5 | mg/L | 10 % |
| $\delta^{2}H$ | MS | 2 | ‰ SMOW[8] | 0.9 (one standard deviation) |
| $\delta^{18}O$ | MS | 0.1 | ‰ SMOW[8] | 0.1 (one standard dev.) |
| $^{3}H$ | LSC | 0.8 | TU[9] | 0.8 |
| $\delta^{37}Cl$ | A (MS) | 0.2 | ‰ SMOC[10] | 0.2[17] |
| $\delta^{13}C$ | A (MS) | – | ‰ PDB[11] | 0.3[17] |
| $^{14}C$ pmc | A (MS) | – | PMC[12] | 0.4[17] |
| $\delta^{34}S$ | MS | 0.2 | ‰ CDT[13] | 0.4 (one standard dev.) |
| $^{87}Sr/^{86}Sr$ | TIMS | – | No unit (ratio)[14] | 0.00002 |
| $^{10}B/^{11}B$ | ICP SFMS | – | No unit (ratio)[14] | – |
| $^{234}U$, $^{235}U$, $^{238}U$, $^{232}Th$, $^{30}Th$ | Alfa spectr. | 0.0001 | Bq/L[15] | ≤ 5 % (Counting statistics uncertainty) |
| $^{222}Rn$, $^{226}Ra$ | LSS | 0.015 | Bq/L | ≤ 5 % (Count. stat. uncert.) |

1. Many elements may be determined by more than one ICP technique depending on concentration range. The most relevant technique and measurement uncertainty for the concentrations normally encountered in groundwater are presented. In cases where two techniques were frequently used, both are displayed.
2. Reporting limits (RL), generally 10×standard deviation, if nothing else is stated. Measured values below RL or DL are stored as negative values in Sicada (i.e. –RL value and –DL value).
3. Measurement uncertainty reported by the laboratory, generally as ± percent of measured value in question at 95% confidence interval.
4. Reporting limits at electrical cond. 520 mS/m, 1 440 mS/m and 3 810 mS/m respectively.
5. Measurement uncertainty at concentrations 100×RL.
6. Measurement uncertainty at concentrations 10×RL.
7. Determined only in surface waters. PON, POP and POC refers to Particulate Organic Nitrogen, Phosphorous and Carbon, respectively.
8. Per mille deviation[16] from SMOW (Standard Mean Oceanic Water).
9. TU=Tritium Units, where one TU corresponds to a tritium/hydrogen ratio of $10^{-18}$ (1 Bq/L Tritium = 8.45 TU).
10. Per mille deviation[16] from SMOC (Standard Mean Oceanic Chloride).
11. Per mille deviation[16] from PDB (the standard PeeDee Belemnite).
12. The following relation is valid between pmC (percent modern carbon) and Carbon-14 age: $pmC = 100 \times e^{((1950\text{-}y\text{-}1.03t)/8274)}$ where y = the year of the C-14 measurement and t = C-14 age.
13. Per mille deviation[16] from CDT (the standard Canyon Diablo Troilite).
14. Isotope ratio without unit.
15. 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.
16. Isotopes are often reported as per mill deviation from a standard. The deviation is calculated as: $\delta^{y}I = 1\,000 \times (K_{sample}\text{-}K_{standard})/K_{standard}$, where K= the isotope ratio and $^{y}I = {}^{2}H$, $^{18}O$, $^{37}Cl$, $^{13}C$ or $^{34}S$ etc.
17. SKB estimation from duplicate analyses by the contracted laboratory.

# Appendix 2

## Near surface groundwater

**Table A2-1. Field measurements.**

| Idcode | Measuring date yyyy-mm-dd hh:mm | Sample no | Water temp. (°C) | pH | EC (mS/m) | ORP (mV) | $O_2$ diss. (mg/L) | Oxygen (%) |
|---|---|---|---|---|---|---|---|---|
| SFM0001 | 2017-01-17 10:42 | 30976 | 6.42 | 7.18 | 224.2 | −170 | −0.01 | −0.1 |
| SFM0001 | 2017-04-28 10:24 | 31016 | 5.03 | 7.30 | 174.9 | −170 | 0.00 | 0.0 |
| SFM0001 | 2017-08-03 16:02 | 31123 | 12.52 | 6.98 | 0.2 | −103 | 3.29 | 32.4 |
| SFM0001 | 2017-10-09 10:15 | 31171 | 8.53 | 7.14 | 172.9 | −180 | −0.06 | −0.5 |
| SFM0002 | 2017-01-17 12:02 | 30977 | 6.46 | 7.07 | 73.0 | −60 | 0.52 | 4.3 |
| SFM0002 | 2017-04-27 16:22 | 31020 | 6.08 | 7.18 | 74.1 | −120 | 0.25 | 2.1 |
| SFM0002 | 2017-08-02 15:04 | 31126 | 11.34 | 7.04 | 74.8 | −120 | 0.02 | 0.2 |
| SFM0002 | 2017-10-09 15:08 | 31175 | 9.29 | 7.02 | 74.9 | −110 | 0.01 | 0.1 |
| SFM0011 | 2017-01-18 12:02 | 30979 | 2.54 | 7.59 | 631.2 | −70 | 0.22 | 1.7 |
| SFM0011 | 2017-04-26 15:50 | 31018 | 5.95 | 7.59 | 614.8 | −80 | 0.09 | 0.8 |
| SFM0011 | 2017-08-01 15:42 | 31125 | 10.32 | 7.45 | 665.2 | −80 | 0.17 | 1.6 |
| SFM0011 | 2017-10-10 15:38 | 31176 | 8.28 | 7.48 | 658.1 | −100 | 0.20 | 1.8 |
| SFM0032 | 2017-01-16 16:02 | 30975 | 4.43 | 7.11 | 84.3 | −130 | 0.15 | 1.2 |
| SFM0032 | 2017-04-26 09:58 | 31017 | 3.75 | 7.24 | 82.7 | −150 | −0.01 | −0.1 |
| SFM0032 | 2017-08-03 10:00 | 31127 | 11.54 | 6.98 | 74.9 | −130 | −0.02 | −0.2 |
| SFM0032 | 2017-10-11 15:10 | 31174 | 9.38 | 7.05 | 83.9 | −130 | −0.04 | −0.3 |
| SFM0037 | 2017-01-19 10:25 | 30980 | 2.32 | 7.04 | 64.8 | −90 | 1.74 | 13.1 |
| SFM0037 | 2017-04-27 10:39 | 31019 | 3.95 | 7.04 | 56.2 | −10 | 1.06 | 8.5 |
| SFM0037 | 2017-08-01 10:00 | 31124 | 11.27 | 6.96 | 116.0 | −110 | 0.07 | 0.7 |
| SFM0037 | 2017-10-11 10:59 | 31177 | 9.19 | 6.99 | 62.8 | −40 | 0.45 | 4.1 |
| SFM0049 | 2017-01-20 09:42 | 30981 | 2.89 | 6.86 | 40.2 | −40 | 0.53 | 4.0 |
| SFM0049 | 2017-04-25 15:34 | 31015 | 3.29 | 6.91 | 40.4 | −50 | 0.72 | 5.6 |
| SFM0049 | 2017-07-31 15:22 | 31121 | 11.34 | 6.75 | 50.1 | −200 | −0.01 | −0.1 |
| SFM0049 | 2017-10-12 10:16 | 31173 | 10.39 | 6.74 | 45.2 | −110 | −0.06 | −0.6 |
| SFM0057 | 2017-01-17 16:01 | 30978 | 5.59 | 7.02 | 57.0 | 130 | 0.09 | 0.8 |
| SFM0057 | 2017-04-25 10:33 | 31014 | 4.31 | 7.15 | 53.7 | 90 | 0.01 | 0.1 |
| SFM0057 | 2017-08-02 09:28 | 31122 | 8.61 | 6.96 | 58.9 | −10 | −0.04 | −0.3 |
| SFM0057 | 2017-10-10 10:42 | 31172 | 8.83 | 6.83 | 52.8 | 90 | −0.05 | −0.4 |

## A2.1 Compilation of water analysis data

**Table A2-2. Water composition – major components.**

| Idcode | Secup m | Seclow m | Date yyyy-mm-dd | Sample No. | RCB % | 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 | Mn mg/L | Li mg/L | Sr mg/L | pH (lab) | EC (lab) mS/m | $HS^-$ mg/L | $I^-$ mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SFM0032 | 3.00 | 4.00 | 2017-01-16 | 30975 | 3.3 | 34.1 | 6.21 | 137.0 | 10.40 | 363.5 | 57.9 | 57.40 | 19.10 | 0.391 | 0.65 | 6.39 | 2.180 | 0.209 | 0.008 | 0.238 | 6.97 | 84.0 | 0.030 | 0.0047 |
| SFM0001 | 3.95 | 4.95 | 2017-01-17 | 30976 | 1.2 | 306.0 | 20.70 | 115.0 | 46.50 | 557.6 | 348.0 | 198.00 | 63.90 | 1.310 | 0.66 | 7.76 | 3.960 | 0.265 | 0.022 | 0.475 | 7.10 | 222.0 | 0.074 | 0.0119 |
| SFM0002 | 4.21 | 5.21 | 2017-01-17 | 30977 | 0.5 | 11.9 | 4.09 | 125.0 | 9.11 | 353.6 | 54.8 | 12.50 | 4.24 | 0.242 | 0.49 | 5.57 | 2.820 | 0.148 | < 0.004 | 0.172 | 7.01 | 73.0 | <0.019 | 0.0066 |
| SFM0057 | 3.55 | 4.55 | 2017-01-17 | 30978 | 0.9 | 7.3 | 3.33 | 108.0 | 5.75 | 336.7 | 8.2 | 18.70 | 6.31 | 0.052 | 0.22 | 4.09 | 0.032 | 0.015 | < 0.004 | 0.170 | 7.06 | 58.0 | <0.019 | 0.0032 |
| SFM0011 | 3.50 | 4.50 | 2017-01-18 | 30979 | 0.9 | 1050.0 | 25.60 | 145.0 | 66.10 | 327.7 | 1755.0 | 242.90 | 82.90 | 6.690 | 0.91 | 6.16 | 0.647 | 0.184 | 0.030 | 1.070 | 7.43 | 614.0 | <0.019 | <0.09 |
| SFM0037 | 2.00 | 3.00 | 2017-01-19 | 30980 | 1.8 | 32.0 | 4.74 | 89.9 | 10.30 | 252.1 | 29.8 | 77.50 | 26.00 | 0.143 | 0.43 | 4.89 | 0.203 | 0.126 | 0.006 | 0.166 | 6.95 | 64.0 | <0.019 | 0.0019 |
| SFM0049 | 4.00 | 5.00 | 2017-01-20 | 30981 | 1.8 | 19.8 | 3.07 | 55.9 | 4.24 | 172.1 | 29.8 | 10.60 | 4.22 | 0.069 | 0.32 | 4.75 | 0.243 | 0.061 | 0.002 | 0.075 | 6.80 | 40.0 | 0.055 | 0.0022 |
| SFM0057 | 3.55 | 4.55 | 2017-04-25 | 31014 | 3.1 | 6.9 | 3.05 | 106.0 | 5.58 | 317.9 | 9.0 | 13.30 | 4.61 | 0.043 | 0.24 | 4.18 | 0.036 | 0.018 | 0.001 | 0.161 | 7.02 | 55.0 | <0.019 | 0.0035 |
| SFM0049 | 4.00 | 5.00 | 2017-04-25 | 31015 | 4.2 | 20.0 | 4.36 | 58.7 | 4.89 | 158.6 | 34.4 | 16.90 | 6.11 | 0.060 | 0.34 | 4.75 | 0.120 | 0.039 | 0.002 | 0.077 | 6.75 | 41.0 | 0.029 | 0.0020 |
| SFM0001 | 3.95 | 4.95 | 2017-04-28 | 31016 | 2.2 | 220.0 | 16.90 | 106.0 | 38.10 | 479.8 | 239.0 | 145.20 | 50.20 | 0.891 | 0.62 | 7.57 | 3.780 | 0.230 | 0.016 | 0.386 | 7.12 | 172.0 | 0.071 | 0.0099 |
| SFM0032 | 3.00 | 4.00 | 2017-04-26 | 31017 | 5.0 | 31.8 | 6.01 | 142.0 | 10.80 | 368.0 | 53.3 | 50.00 | 18.00 | 0.338 | 0.66 | 6.45 | 2.510 | 0.212 | 0.007 | 0.236 | 7.08 | 82.0 | 0.032 | 0.0036 |
| SFM0011 | 3.50 | 4.50 | 2017-04-26 | 31018 | 0.6 | 1050.0 | 25.10 | 153.0 | 68.80 | 343.4 | 1698.0 | 231.70 | 85.20 | 6.260 | 0.89 | 6.44 | 0.848 | 0.197 | 0.030 | 1.090 | 7.44 | 600.0 | <0.019 | 0.0182 |
| SFM0037 | 2.00 | 3.00 | 2017-04-27 | 31019 | 5.4 | 23.9 | 4.81 | 89.8 | 10.00 | 242.7 | 24.7 | 47.20 | 18.10 | 0.117 | 0.49 | 6.41 | 0.713 | 0.151 | 0.005 | 0.163 | 6.79 | 56.0 | 0.049 | 0.0033 |
| SFM0002 | 4.21 | 5.21 | 2017-04-27 | 31020 | 4.2 | 12.9 | 4.00 | 135.0 | 9.93 | 353.1 | 55.6 | 12.80 | 4.56 | 0.240 | 0.49 | 5.73 | 3.370 | 0.164 | 0.004 | 0.180 | 7.04 | 74.0 | 0.022 | 0.0055 |
| SFM0049 | 4.00 | 5.00 | 2017-07-31 | 31121 | 4.3 | 25.0 | 4.58 | 75.8 | 5.76 | 235.3 | 38.0 | 3.10 | 1.51 | 0.100 | 0.38 | 4.14 | 0.720 | 0.098 | 0.003 | 0.099 | 6.69 | 50.0 | 0.371 | 0.0051 |
| SFM0057 | 3.55 | 4.55 | 2017-08-02 | 31122 | 3.7 | 7.8 | 3.73 | 119.0 | 6.29 | 358.1 | 8.2 | 12.80 | 4.71 | 0.066 | 0.21 | 4.86 | 0.042 | 0.033 | 0.001 | 0.174 | 6.90 | 60.0 | <0.019 | 0.0049 |
| SFM0001 | 3.95 | 4.95 | 2017-08-03 | 31123 | 2.2 | 333.0 | 21.80 | 124.0 | 51.10 | 576.7 | 368.0 | 198.90 | 73.80 | 1.560 | 0.73 | 8.41 | 4.360 | 0.279 | 0.024 | 0.471 | 7.13 | 232.0 | 0.073 | 0.0136 |
| SFM0037 | 2.00 | 3.00 | 2017-08-01 | 31124 | 1.7 | 86.4 | 9.61 | 151.0 | 27.10 | 517.5 | 62.0 | 130.30 | 49.70 | 0.275 | 0.71 | 7.79 | 1.670 | 0.248 | 0.015 | 0.368 | 7.00 | 116.0 | <0.019 | 0.0035 |
| SFM0011 | 3.50 | 4.50 | 2017-08-01 | 31125 | 0.0 | 1110.0 | 28.70 | 175.0 | 78.10 | 316.6 | 1874.0 | 254.10 | 97.10 | 7.520 | 0.88 | 6.70 | 1.100 | 0.231 | 0.035 | 1.200 | 7.44 | 655.0 | <0.019 | 0.0233 |
| SFM0002 | 4.21 | 5.21 | 2017-08-02 | 31126 | 4.2 | 13.2 | 4.52 | 136.0 | 10.00 | 355.8 | 56.3 | 13.20 | 4.87 | 0.299 | 0.48 | 6.09 | 3.380 | 0.162 | 0.005 | 0.176 | 6.90 | 75.0 | 0.027 | 0.0060 |
| SFM0032 | 3.00 | 4.00 | 2017-08-03 | 31127 | 4.0 | 26.0 | 6.17 | 130.0 | 9.10 | 325.1 | 41.6 | 62.50 | 23.10 | 0.254 | 0.66 | 7.53 | 3.090 | 0.232 | 0.010 | 0.210 | 6.89 | 75.0 | 0.094 | 0.0050 |
| SFM0001 | 3.95 | 4.95 | 2017-10-09 | 31171 | 1.5 | 226.0 | 19.90 | 105.0 | 38.70 | 509.6 | 240.4 | 139.00 | 51.00 | 0.893 | 0.76 | 8.54 | 3.780 | 0.230 | 0.020 | 0.383 | 7.12 | 174.0 | 0.082 | 0.0122 |
| SFM0057 | 3.55 | 4.55 | 2017-10-10 | 31172 | 3.6 | 7.1 | 4.21 | 107.0 | 5.42 | 322.1 | 8.7 | 9.96 | 3.83 | 0.099 | 0.20 | 5.36 | 0.094 | 0.017 | 0.001 | 0.163 | 6.83 | 54.0 | <0.019 | 0.0056 |
| SFM0049 | 4.00 | 5.00 | 2017-10-12 | 31173 | 4.4 | 24.5 | 3.91 | 66.1 | 4.99 | 172.6 | 41.1 | 17.50 | 7.69 | 0.078 | 0.39 | 4.75 | 0.581 | 0.077 | 0.002 | 0.087 | 6.78 | 46.0 | 0.136 | 0.0036 |
| SFM0032 | 3.00 | 4.00 | 2017-10-11 | 31174 | 3.0 | 33.8 | 7.18 | 137.0 | 10.40 | 371.2 | 58.6 | 50.80 | 18.10 | 0.326 | 0.70 | 7.19 | 2.730 | 0.220 | 0.009 | 0.230 | 7.01 | 85.0 | 0.061 | 0.0047 |
| SFM0002 | 4.21 | 5.21 | 2017-10-09 | 31175 | 2.6 | 13.2 | 4.76 | 133.0 | 9.55 | 357.0 | 57.9 | 13.40 | 4.96 | 0.264 | 0.49 | 5.99 | 3.230 | 0.158 | 0.004 | 0.173 | 7.01 | 75.0 | 0.027 | 0.0058 |
| SFM0011 | 3.50 | 4.50 | 2017-10-10 | 31176 | −0.7 | 1080.0 | 30.30 | 174.0 | 74.80 | 320.6 | 1853.0 | 253.30 | 95.10 | 7.180 | 0.87 | 6.77 | 1.100 | 0.223 | 0.037 | 1.210 | 7.41 | 646.0 | 0.000 | 0.0185 |
| SFM0037 | 2.00 | 3.00 | 2017-10-11 | 31177 | 4.5 | 25.7 | 6.73 | 103.0 | 11.70 | 283.7 | 19.4 | 66.10 | 24.90 | 0.138 | 0.54 | 5.66 | 0.684 | 0.149 | 0.007 | 0.185 | 6.93 | 63.0 | 0.039 | 0.0046 |

**Table A2-3. Biochemical components.**

| Idcode | Secup m | Seclow m | Date yyyy-mm-dd | 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 | $SiO_2$-Si mg/L | TOC mg/L | DOC mg/L | DIC mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SFM0001 | 3.95 | 4.95 | 2017-01-17 | 30976 | 0.331 | 0.0004 | 0.0006 | 0.0002 | 1.220 | 0.0493 | 0.0260 | 8.16 | 28.3 | 28.4 | 102.4 |
| SFM0001 | 3.95 | 4.95 | 2017-04-28 | 31016 | 0.273 | 0.0006 | 0.0005 | <0.0003 | 1.320 | 0.0462 | 0.0367 | 7.62 | 33.0 | 32.5 | 89.3 |
| SFM0001 | 3.95 | 4.95 | 2017-08-03 | 31123 | 0.270 | <0.0002 | <0.0003 | <0.0003 | 1.190 | 0.0492 | 0.0039 | b | 26.5 | 26.3 | 87.5 |
| SFM0001 | 3.95 | 4.95 | 2017-10-09 | 31171 | 0.301 | 0.0007 | 0.0008 | <0.0003 | 1.390 | 0.0487 | 0.0431 | 8.39 | 35.9 | 35.7 | 82.5 |
| SFM0002 | 4.21 | 5.21 | 2017-01-17 | 30977 | 0.057 | <0.0002 | 0.0033 | 0.0032 | 0.436 | 0.0073 | 0.0019 | 5.86 | 15.5 | 15.8 | 67.5 |
| SFM0002 | 4.21 | 5.21 | 2017-04-27 | 31020 | 0.060 | <0.0002 | <0.0003 | <0.0003 | 0.444 | 0.0064 | 0.0014 | 5.60 | 15.1 | 15.3 | 52.1 |
| SFM0002 | 4.21 | 5.21 | 2017-08-02 | 31126 | 0.060 | <0.0002 | <0.0003 | <0.0003 | 0.455 | 0.0078 | 0.0005 | b | 14.4 | 14.6 | 47.4 |
| SFM0002 | 4.21 | 5.21 | 2017-10-09 | 31175 | 0.067 | 0.0007 | 0.0014 | 0.0007 | 0.446 | 0.0079 | 0.0024 | 6.02 | 14.9 | 14.7 | 52.4 |
| SFM0011 | 3.50 | 4.50 | 2017-01-18 | 30979 | 0.741 | 0.0011 | 0.0287 | 0.0276 | 0.959 | 0.0091 | 0.0041 | 6.53 | 6.1 | 6.3 | 54.3 |
| SFM0011 | 3.50 | 4.50 | 2017-04-26 | 31018 | 0.708 | 0.0003 | 0.0613 | 0.0610 | 0.938 | 0.0377 | 0.0023 | 6.30 | 6.6 | 6.8 | 36.1 |
| SFM0011 | 3.50 | 4.50 | 2017-08-01 | 31125 | 0.629 | 0.0007 | 0.0008 | <0.0003 | 1.020 | 0.0106 | 0.0015 | b | 5.1 | 6.0 | 27.2 |
| SFM0011 | 3.50 | 4.50 | 2017-10-10 | 31176 | 0.857 | <0.0002 | 0.0003 | <0.0003 | 1.020 | 0.0156 | 0.0018 | 6.60 | 5.7 | 6.0 | 31.7 |
| SFM0032 | 3.00 | 4.00 | 2017-01-16 | 30975 | 0.081 | <0.0002 | 0.0021 | 0.0020 | 0.630 | 0.0106 | 0.0023 | 6.49 | 18.2 | 18.4 | 64.0 |
| SFM0032 | 3.00 | 4.00 | 2017-04-26 | 31017 | 0.083 | <0.0002 | <0.0003 | <0.0003 | 0.638 | 0.0102 | 0.0015 | 6.19 | 17.6 | 17.9 | 53.5 |
| SFM0032 | 3.00 | 4.00 | 2017-08-03 | 31127 | 0.025 | <0.0002 | <0.0003 | <0.0003 | 0.880 | 0.0119 | 0.0006 | b | 25.2 | 24.6 | 48.5 |
| SFM0032 | 3.00 | 4.00 | 2017-10-11 | 31174 | 0.085 | 0.0004 | 0.0004 | <0.0003 | 0.647 | 0.0120 | 0.0032 | 7.20 | 18.3 | 18.4 | 52.9 |
| SFM0037 | 2.00 | 3.00 | 2017-01-19 | 30980 | 0.144 | 0.0003 | 0.0009 | 0.0006 | 0.990 | 0.0271 | 0.0121 | 5.25 | 24.1 | 23.9 | 50.9 |
| SFM0037 | 2.00 | 3.00 | 2017-04-27 | 31019 | 0.012 | 0.0008 | 0.0009 | <0.0003 | 1.193 | 0.0418 | 0.0028 | 6.36 | 30.3 | 29.7 | 49.0 |
| SFM0037 | 2.00 | 3.00 | 2017-08-01 | 31124 | 0.105 | 0.0023 | 0.0023 | <0.0003 | 0.829 | 0.1770 | 0.0072 | b | 20.8 | 18.7 | 74.2 |
| SFM0037 | 2.00 | 3.00 | 2017-10-11 | 31177 | 0.016 | 0.0008 | 0.0049 | 0.0041 | 1.770 | 0.0516 | 0.0041 | 5.66 | 50.2 | 49.0 | 49.6 |
| SFM0049 | 4.00 | 5.00 | 2017-01-20 | 30981 | 0.047 | 0.0005 | 0.0259 | 0.0254 | 0.590 | 0.0085 | 0.0031 | 5.11 | 16.0 | 15.7 | 36.9 |
| SFM0049 | 4.00 | 5.00 | 2017-04-25 | 31015 | 0.015 | 0.0003 | 0.0238 | 0.0234 | 0.492 | 0.0054 | 0.0009 | 4.83 | 14.5 | 14.4 | 33.1 |
| SFM0049 | 4.00 | 5.00 | 2017-07-31 | 31121 | 0.147 | <0.0002 | <0.0003 | <0.0003 | 0.748 | 0.0158 | 0.0075 | b | 18.8 | 18.5 | 34.5 |
| SFM0049 | 4.00 | 5.00 | 2017-10-12 | 31173 | 0.082 | 0.0003 | 0.0005 | <0.0003 | 0.865 | 0.0155 | 0.0076 | 4.78 | 24.4 | 24.2 | 28.9 |
| SFM0057 | 3.55 | 4.55 | 2017-01-17 | 30978 | 0.001 | 0.0912 | 0.3981 | 0.3070 | 0.804 | 0.0069 | 0.0031 | 4.37 | 13.0 | 12.9 | 60.2 |
| SFM0057 | 3.55 | 4.55 | 2017-04-25 | 31014 | 0.002 | 0.0402 | 0.0575 | 0.0173 | 0.427 | 0.0060 | 0.0029 | 4.27 | 11.9 | 11.7 | 52.5 |
| SFM0057 | 3.55 | 4.55 | 2017-08-02 | 31122 | 0.011 | <0.0002 | 0.0006 | 0.0005 | 0.351 | 0.0069 | 0.0027 | b | 10.5 | 10.4 | 44.9 |
| SFM0057 | 3.55 | 4.55 | 2017-10-10 | 31172 | 0.005 | 0.0029 | 0.0056 | 0.0027 | 0.875 | 0.0248 | 0.0033 | 5.47 | 26.0 | 25.4 | 45.5 |

b = no results, samples frozen at arrival at external laboratory.

**Table A2-4. Isotopes.**

| Idcode | Secup m | Seclow m | Date yyyy-mm-dd | Sample No. | ∂ D (‰ SMOW) | Tritium (TU) | ∂18O (‰ SMOW) |
|---|---|---|---|---|---|---|---|
| SFM0001 | 3.95 | 4.95 | 2017-01-17 | 30976 | −75.0 | 7.21 | −10.43 |
| SFM0001 | 3.95 | 4.95 | 2017-04-28 | 31016 | −77.8 | 6.77 | −10.97 |
| SFM0001 | 3.95 | 4.95 | 2017-08-03 | 31123 | −72.6 | 6.80 | −10.34 |
| SFM0001 | 3.95 | 4.95 | 2017-10-09 | 31171 | −77.8 | 6.34 | −11.16 |
| SFM0002 | 4.21 | 5.21 | 2017-01-17 | 30977 | −81.9 | 6.44 | −11.56 |
| SFM0002 | 4.21 | 5.21 | 2017-04-27 | 31020 | −81.5 | 8.53 | −11.64 |
| SFM0002 | 4.21 | 5.21 | 2017-08-02 | 31126 | −80.9 | 8.55 | −11.43 |
| SFM0002 | 4.21 | 5.21 | 2017-10-09 | 31175 | −84.4 | 7.45 | −11.73 |
| SFM0011 | 3.50 | 4.50 | 2017-01-18 | 30979 | −70.8 | 1.15 | −9.78 |
| SFM0011 | 3.50 | 4.50 | 2017-04-26 | 31018 | −71.0 | 1.47 | −9.83 |
| SFM0011 | 3.50 | 4.50 | 2017-08-01 | 31125 | −67.8 | 1.02 | −9.42 |
| SFM0011 | 3.50 | 4.50 | 2017-10-10 | 31176 | −71.3 | 1.47 | −9.74 |
| SFM0032 | 3.00 | 4.00 | 2017-01-16 | 30975 | −81.1 | 7.83 | −11.39 |
| SFM0032 | 3.00 | 4.00 | 2017-04-26 | 31017 | −81.5 | 8.39 | −11.65 |
| SFM0032 | 3.00 | 4.00 | 2017-08-03 | 31127 | −73.5 | 8.35 | −10.75 |
| SFM0032 | 3.00 | 4.00 | 2017-10-11 | 31174 | −80.6 | 8.45 | −11.37 |
| SFM0037 | 2.00 | 3.00 | 2017-01-19 | 30980 | −80.2 | 7.19 | −11.69 |
| SFM0037 | 2.00 | 3.00 | 2017-04-27 | 31019 | −76.5 | 8.25 | −10.93 |
| SFM0037 | 2.00 | 3.00 | 2017-08-01 | 31124 | −70.6 | 7.52 | −10.06 |
| SFM0037 | 2.00 | 3.00 | 2017-10-11 | 31177 | −77.0 | 9.05 | −10.60 |
| SFM0049 | 4.00 | 5.00 | 2017-01-20 | 30981 | −71.9 | 7.55 | −9.75 |
| SFM0049 | 4.00 | 5.00 | 2017-04-25 | 31015 | −74.6 | 7.42 | −10.38 |
| SFM0049 | 4.00 | 5.00 | 2017-07-31 | 31121 | −69.0 | 7.35 | −8.80 |
| SFM0049 | 4.00 | 5.00 | 2017-10-12 | 31173 | −67.7 | 9.82 | −9.03 |
| SFM0057 | 3.55 | 4.55 | 2017-01-17 | 30978 | −80.3 | 8.47 | −11.60 |
| SFM0057 | 3.55 | 4.55 | 2017-04-25 | 31014 | −87.8 | 6.62 | −12.40 |
| SFM0057 | 3.55 | 4.55 | 2017-08-02 | 31122 | −81.8 | 6.50 | −11.65 |
| SFM0057 | 3.55 | 4.55 | 2017-10-10 | 31172 | −73.7 | 9.18 | −10.64 |

**Table A2-5. Trace elements 1.**

| Idcode | Secup m | Seclow m | Date yyyy-mm-dd | Sample No. | Al µg/L | Cd µg/L | Cr µg/L | Cu µg/L | Co µg/L | Hg µg/L | Ni µg/L | Zn µg/L | Pb µg/L | V µg/L | Mo µg/L | Ba µg/L | Se µg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SFM0001 | 3.95 | 4.95 | 2017-01-17 | 30976 | 18.4 | 0.002 | 0.328 | 0.166 | 0.109 | <0.002 | 0.432 | 1.120 | 0.0282 | 1.580 | 0.948 | 69.3 | <0.5 |
| SFM0001 | 3.95 | 4.95 | 2017-04-28 | 31016 | 24.9 | <0.002 | 0.368 | 0.234 | 0.107 | <0.002 | 0.726 | 3.540 | 0.0341 | 2.090 | 0.967 | 52.5 | <0.5 |
| SFM0001 | 3.95 | 4.95 | 2017-08-03 | 31123 | 17.8 | <0.002 | 0.200 | <0.1 | 0.129 | <0.002 | 0.502 | 0.324 | 0.0395 | 2.060 | 1.380 | 73.4 | <0.5 |
| SFM0001 | 3.95 | 4.95 | 2017-10-09 | 31171 | 33.4 | 0.007 | 0.391 | 0.393 | 0.107 | <0.002 | 0.770 | 1.290 | 0.0653 | 2.550 | 1.000 | 57.0 | <0.5 |
| SFM0002 | 4.21 | 5.21 | 2017-01-17 | 30977 | 21.6 | 0.009 | 0.325 | 0.324 | 0.060 | <0.002 | 0.464 | 1.780 | 0.0179 | 2.230 | 1.080 | 98.3 | <0.5 |
| SFM0002 | 4.21 | 5.21 | 2017-04-27 | 31020 | 21.2 | 0.003 | 0.303 | 0.171 | 0.075 | <0.002 | 0.378 | 2.380 | 0.0266 | 2.280 | 1.160 | 101.0 | <0.5 |
| SFM0002 | 4.21 | 5.21 | 2017-08-02 | 31126 | 24.2 | 0.003 | 0.336 | <0.1 | 0.071 | <0.002 | 0.446 | 1.680 | 0.0363 | 2.730 | 1.230 | 108.0 | <0.5 |
| SFM0002 | 4.21 | 5.21 | 2017-10-09 | 31175 | 22.5 | 0.023 | 0.324 | 0.512 | 0.084 | <0.002 | 0.943 | 3.710 | 0.0363 | 2.690 | 1.260 | 108.0 | <0.5 |
| SFM0011 | 3.50 | 4.50 | 2017-01-18 | 30979 | 1.3 | 0.022 | <0.04 | 0.469 | 0.145 | <0.002 | 0.273 | 3.110 | <0.1 | 0.369 | 8.210 | 47.5 | <3 |
| SFM0011 | 3.50 | 4.50 | 2017-04-26 | 31018 | 1.2 | 0.012 | 0.028 | 0.177 | 0.152 | <0.002 | 0.252 | 4.840 | 0.0227 | 0.359 | 8.560 | 47.8 | 1.28 |
| SFM0011 | 3.50 | 4.50 | 2017-08-01 | 31125 | 1.5 | <0.02 | <0.04 | <0.02 | 0.114 | <0.002 | <0.2 | 2.590 | <0.1 | 0.375 | 8.820 | 54.8 | <3 |
| SFM0011 | 3.50 | 4.50 | 2017-10-10 | 31176 | 3.2 | <0.02 | <0.04 | <0.2 | 0.157 | <0.002 | 0.322 | 1.780 | <0.1 | 0.585 | 8.480 | 57.0 | <3 |
| SFM0032 | 3.00 | 4.00 | 2017-01-16 | 30975 | 12.1 | 0.004 | 0.204 | 0.219 | 0.075 | <0.002 | 0.476 | 0.604 | 0.0232 | 1.120 | 1.820 | 67.1 | <0.5 |
| SFM0032 | 3.00 | 4.00 | 2017-04-26 | 31017 | 12.2 | <0.002 | 0.195 | 0.239 | 0.076 | <0.002 | 0.513 | 4.020 | 0.0198 | 1.320 | 1.980 | 65.6 | <0.5 |
| SFM0032 | 3.00 | 4.00 | 2017-08-03 | 31127 | 22.5 | 0.005 | 0.441 | 0.184 | 0.076 | <0.002 | 0.678 | 1.270 | 0.0612 | 2.300 | 3.130 | 63.0 | <0.5 |
| SFM0032 | 3.00 | 4.00 | 2017-10-11 | 31174 | 14.0 | 0.008 | 0.210 | 0.175 | 0.075 | <0.002 | 0.600 | 1.280 | 0.0349 | 1.680 | 2.030 | 68.7 | <0.5 |
| SFM0037 | 2.00 | 3.00 | 2017-01-19 | 30980 | 27.0 | 0.029 | 0.270 | 1.560 | 0.356 | 0.002 | 1.620 | 4.580 | 0.5760 | 1.700 | 1.790 | 51.6 | <0.5 |
| SFM0037 | 2.00 | 3.00 | 2017-04-27 | 31019 | 37.8 | 0.030 | 0.234 | 1.110 | 0.416 | <0.002 | 2.200 | 5.740 | 0.6490 | 1.870 | 1.010 | 49.0 | <0.5 |
| SFM0037 | 2.00 | 3.00 | 2017-08-01 | 31124 | 22.9 | 0.023 | 0.398 | 0.630 | 0.270 | <0.002 | 1.280 | 2.670 | 0.3470 | 2.580 | 1.410 | 114.0 | <0.5 |
| SFM0037 | 2.00 | 3.00 | 2017-10-11 | 31177 | 61.1 | 0.035 | 0.470 | 3.410 | 0.315 | 0.004 | 2.020 | 7.830 | 0.7670 | 2.720 | 1.650 | 59.4 | <0.5 |
| SFM0049 | 4.00 | 5.00 | 2017-01-20 | 30981 | 18.0 | 0.008 | 0.103 | 1.000 | 0.232 | <0.002 | 0.411 | 1.440 | 0.4500 | 0.511 | 0.317 | 33.8 | <0.5 |
| SFM0049 | 4.00 | 5.00 | 2017-04-25 | 31015 | 19.4 | 0.017 | 0.093 | 1.230 | 0.271 | <0.002 | 0.477 | 5.310 | 0.3880 | 0.424 | 0.287 | 41.7 | <0.5 |
| SFM0049 | 4.00 | 5.00 | 2017-07-31 | 31121 | 28.0 | <0.002 | 0.195 | 0.151 | 0.107 | <0.002 | 0.256 | 1.310 | 0.1160 | 1.290 | 0.075 | 42.5 | <0.5 |
| SFM0049 | 4.00 | 5.00 | 2017-10-12 | 31173 | 40.9 | 0.006 | 0.222 | 0.730 | 0.168 | <0.002 | 0.537 | 1.620 | 0.4050 | 1.220 | 0.184 | 38.0 | <0.5 |
| SFM0057 | 3.55 | 4.55 | 2017-01-17 | 30978 | 28.5 | 0.014 | 0.188 | 8.410 | 0.170 | 0.003 | 0.729 | 1.680 | 0.0649 | 0.504 | 0.598 | 57.9 | <0.5 |
| SFM0057 | 3.55 | 4.55 | 2017-04-25 | 31014 | 28.2 | 0.017 | 0.185 | 6.310 | 0.140 | 0.002 | 0.670 | 4.680 | 0.0668 | 0.470 | 0.582 | 51.8 | <0.5 |
| SFM0057 | 3.55 | 4.55 | 2017-08-02 | 31122 | 30.3 | 0.019 | 0.191 | 3.870 | 0.163 | <0.002 | 0.739 | 0.748 | 0.0857 | 0.543 | 0.613 | 60.1 | <0.5 |
| SFM0057 | 3.55 | 4.55 | 2017-10-10 | 31172 | 106.0 | 0.027 | 0.328 | 10.400 | 0.188 | 0.007 | 1.030 | 1.620 | 0.1990 | 1.050 | 0.514 | 56.0 | <0.5 |

**Table A2-6. Trace elements 2. Continues on next page.**

| Idcode | Secup m | Seclow m | Date yyyy-mm-dd | Sample No. | U µg/L | Th µg/L | Sc µg/L | Rb µg/L | Y µg/L | Zr µg/L | Sb µg/L | Cs µg/L | La µg/L | Hf µg/L | Tl µg/L | Ce µg/L | Pr µg/L | Nd µg/L | Sm µg/L | Eu µg/L | Gd µg/L | Tb µg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SFM0001 | 3.95 | 4.95 | 2017-01-17 | 30976 | 3.570 | 0.240 | 0.123 | 3.720 | 2.680 | 6.320 | 0.053 | <0.03 | 1.460 | 0.103 | <0.01 | 3.470 | 0.351 | 1.500 | 0.311 | 0.043 | 0.287 | 0.045 |
| SFM0001 | 3.95 | 4.95 | 2017-04-28 | 31016 | 3.260 | 0.209 | 0.137 | 3.580 | 2.680 | 6.430 | 0.049 | <0.03 | 1.610 | 0.105 | <0.01 | 3.910 | 0.397 | 1.680 | 0.356 | 0.037 | 0.356 | 0.050 |
| SFM0001 | 3.95 | 4.95 | 2017-08-03 | 31123 | 4.690 | 0.185 | 0.117 | 4.420 | 2.190 | 6.570 | 0.050 | 0.099 | 1.260 | 0.104 | <0.01 | 3.010 | 0.304 | 1.230 | 0.251 | 0.028 | 0.298 | 0.046 |
| SFM0001 | 3.95 | 4.95 | 2017-10-09 | 31171 | 2.600 | 0.359 | 0.144 | 3.970 | 3.660 | 6.860 | 0.051 | <0.03 | 2.240 | 0.135 | <0.01 | 5.120 | 0.566 | 2.280 | 0.473 | 0.050 | 0.534 | 0.086 |
| SFM0002 | 4.21 | 5.21 | 2017-01-17 | 30977 | 3.000 | 0.217 | 0.147 | 1.620 | 2.730 | 7.860 | 0.028 | <0.03 | 0.944 | 0.169 | <0.01 | 2.620 | 0.228 | 0.996 | 0.215 | 0.033 | 0.239 | 0.039 |
| SFM0002 | 4.21 | 5.21 | 2017-04-27 | 31020 | 3.440 | 0.177 | 0.123 | 1.660 | 2.380 | 8.340 | 0.025 | <0.03 | 0.805 | 0.173 | <0.01 | 2.230 | 0.201 | 0.899 | 0.199 | 0.014 | 0.236 | 0.036 |
| SFM0002 | 4.21 | 5.21 | 2017-08-02 | 31126 | 3.710 | 0.227 | 0.115 | 1.840 | 2.640 | 7.930 | 0.031 | <0.03 | 0.875 | 0.179 | <0.01 | 2.300 | 0.216 | 0.948 | 0.208 | 0.021 | 0.273 | 0.044 |
| SFM0002 | 4.21 | 5.21 | 2017-10-09 | 31175 | 2.380 | 0.213 | 0.119 | 1.790 | 2.460 | 7.600 | 0.032 | <0.03 | 0.760 | 0.189 | <0.01 | 2.040 | 0.194 | 0.853 | 0.201 | 0.020 | 0.261 | 0.044 |
| SFM0011 | 3.50 | 4.50 | 2017-01-18 | 30979 | 9.590 | 0.149 | 0.166 | 2.790 | 1.700 | 1.350 | 0.163 | <0.03 | 1.310 | 0.030 | 0.023 | 2.060 | 0.293 | 1.190 | 0.225 | 0.038 | 0.206 | 0.032 |
| SFM0011 | 3.50 | 4.50 | 2017-04-26 | 31018 | 10.000 | <0.04 | <0.08 | 5.470 | 0.600 | 0.286 | <0.02 | 0.076 | 0.236 | <0.004 | <0.01 | 0.294 | 0.045 | 0.203 | 0.037 | <0.004 | 0.046 | 0.006 |
| SFM0011 | 3.50 | 4.50 | 2017-08-01 | 31125 | 11.700 | <0.2 | <0.4 | 6.300 | 0.596 | 0.222 | <0.1 | <0.1 | 0.242 | <0.02 | <0.05 | 0.297 | 0.046 | 0.219 | 0.037 | <0.02 | 0.049 | <0.02 |
| SFM0011 | 3.50 | 4.50 | 2017-10-10 | 31176 | 8.330 | <0.2 | <0.4 | 6.380 | 0.626 | 0.218 | <0.1 | <0.1 | 0.299 | <0.02 | <0.05 | 0.361 | 0.057 | 0.265 | 0.041 | <0.02 | 0.066 | <0.02 |
| SFM0032 | 3.00 | 4.00 | 2017-01-16 | 30975 | 6.420 | 0.065 | 0.100 | 1.900 | 1.620 | 3.960 | 0.030 | <0.03 | 0.677 | 0.061 | <0.01 | 1.240 | 0.152 | 0.692 | 0.136 | 0.023 | 0.128 | 0.021 |
| SFM0032 | 3.00 | 4.00 | 2017-04-26 | 31017 | 8.410 | 0.058 | 0.073 | 1.910 | 1.370 | 3.870 | 0.030 | <0.03 | 0.638 | 0.068 | <0.01 | 1.190 | 0.148 | 0.625 | 0.130 | 0.009 | 0.140 | 0.020 |
| SFM0032 | 3.00 | 4.00 | 2017-08-03 | 31127 | 5.090 | 0.226 | 0.101 | 1.990 | 2.570 | 4.200 | 0.065 | <0.03 | 1.110 | 0.078 | <0.01 | 2.120 | 0.277 | 1.160 | 0.257 | 0.028 | 0.304 | 0.052 |
| SFM0032 | 3.00 | 4.00 | 2017-10-11 | 31174 | 5.550 | 0.107 | 0.059 | 2.440 | 1.860 | 4.380 | 0.032 | <0.03 | 0.799 | 0.082 | <0.01 | 1.490 | 0.191 | 0.763 | 0.158 | 0.018 | 0.198 | 0.032 |
| SFM0037 | 2.00 | 3.00 | 2017-01-19 | 30980 | 24.000 | 0.142 | 0.086 | 4.790 | 1.970 | 1.840 | 0.083 | <0.03 | 1.550 | 0.046 | 0.024 | 2.680 | 0.338 | 1.320 | 0.253 | 0.033 | 0.230 | 0.037 |
| SFM0037 | 2.00 | 3.00 | 2017-04-27 | 31019 | 10.900 | 0.145 | 0.092 | 4.760 | 2.210 | 1.750 | 0.066 | <0.03 | 1.700 | 0.042 | 0.018 | 3.050 | 0.376 | 1.540 | 0.307 | 0.030 | 0.300 | 0.042 |
| SFM0037 | 2.00 | 3.00 | 2017-08-01 | 31124 | 15.000 | 0.206 | 0.127 | 7.130 | 2.500 | 4.190 | 0.080 | 0.039 | 1.560 | 0.090 | 0.031 | 2.690 | 0.362 | 1.370 | 0.287 | 0.031 | 0.317 | 0.053 |
| SFM0037 | 2.00 | 3.00 | 2017-10-11 | 31177 | 11.000 | 0.392 | 0.182 | 6.810 | 4.820 | 3.430 | 0.112 | <0.03 | 3.360 | 0.096 | 0.024 | 5.700 | 0.773 | 2.940 | 0.628 | 0.071 | 0.695 | 0.113 |
| SFM0049 | 4.00 | 5.00 | 2017-01-20 | 30981 | 0.663 | 0.073 | 0.064 | 3.450 | 0.627 | 0.278 | 0.085 | <0.03 | 0.792 | 0.008 | 0.015 | 1.430 | 0.179 | 0.680 | 0.130 | 0.019 | 0.101 | 0.015 |
| SFM0049 | 4.00 | 5.00 | 2017-04-25 | 31015 | 0.649 | 0.055 | <0.05 | 4.620 | 0.457 | 0.163 | 0.067 | <0.03 | 0.621 | <0.005 | 0.023 | 1.050 | 0.141 | 0.556 | 0.110 | 0.008 | 0.087 | 0.012 |
| SFM0049 | 4.00 | 5.00 | 2017-07-31 | 31121 | 0.454 | 0.129 | 0.079 | 5.800 | 0.931 | 0.406 | 0.028 | <0.03 | 1.160 | 0.013 | <0.01 | 2.220 | 0.262 | 1.020 | 0.192 | 0.022 | 0.188 | 0.027 |
| SFM0049 | 4.00 | 5.00 | 2017-10-12 | 31173 | 0.426 | 0.168 | 0.061 | 4.500 | 1.100 | 0.394 | 0.049 | <0.03 | 1.670 | 0.013 | <0.01 | 3.250 | 0.384 | 1.430 | 0.273 | 0.031 | 0.257 | 0.038 |
| SFM0057 | 3.55 | 4.55 | 2017-01-17 | 30978 | 9.310 | <0.2 | <0.4 | 5.420 | 0.593 | 0.248 | <0.1 | <0.1 | 0.217 | <0.02 | <0.05 | 0.256 | 0.042 | 0.181 | 0.031 | <0.02 | 0.043 | <0.02 |
| SFM0057 | 3.55 | 4.55 | 2017-04-25 | 31014 | 8.160 | 0.102 | 0.154 | 2.380 | 1.440 | 1.120 | 0.113 | <0.03 | 1.110 | 0.024 | 0.020 | 1.850 | 0.250 | 1.040 | 0.207 | 0.023 | 0.201 | 0.027 |
| SFM0057 | 3.55 | 4.55 | 2017-08-02 | 31122 | 10.100 | 0.118 | 0.149 | 3.350 | 1.750 | 1.360 | 0.114 | <0.03 | 1.270 | 0.031 | 0.027 | 2.160 | 0.285 | 1.140 | 0.220 | 0.031 | 0.241 | 0.037 |
| SFM0057 | 3.55 | 4.55 | 2017-10-10 | 31172 | 4.050 | 0.291 | 0.251 | 2.810 | 3.040 | 1.590 | 0.179 | <0.03 | 2.550 | 0.040 | 0.026 | 3.650 | 0.588 | 2.220 | 0.453 | 0.060 | 0.479 | 0.074 |

**Table A2-6. Continued.**

| Idcode | Secup m | Seclow m | Date yyyy-mm-dd | Sample No. | Dy µg/L | Ho µg/L | Er µg/L | Tm µg/L | Yb µg/L | Lu µg/L |
|---|---|---|---|---|---|---|---|---|---|---|
| SFM0001 | 3.95 | 4.95 | 2017-01-17 | 30976 | 0.334 | 0.084 | 0.227 | 0.035 | 0.213 | 0.037 |
| SFM0001 | 3.95 | 4.95 | 2017-04-28 | 31016 | 0.355 | 0.076 | 0.242 | 0.033 | 0.235 | 0.037 |
| SFM0001 | 3.95 | 4.95 | 2017-08-03 | 31123 | 0.273 | 0.062 | 0.180 | 0.028 | 0.171 | 0.031 |
| SFM0001 | 3.95 | 4.95 | 2017-10-09 | 31171 | 0.499 | 0.119 | 0.335 | 0.052 | 0.323 | 0.054 |
| SFM0002 | 4.21 | 5.21 | 2017-01-17 | 30977 | 0.291 | 0.083 | 0.262 | 0.042 | 0.282 | 0.055 |
| SFM0002 | 4.21 | 5.21 | 2017-04-27 | 31020 | 0.272 | 0.066 | 0.240 | 0.035 | 0.266 | 0.047 |
| SFM0002 | 4.21 | 5.21 | 2017-08-02 | 31126 | 0.293 | 0.076 | 0.247 | 0.040 | 0.286 | 0.054 |
| SFM0002 | 4.21 | 5.21 | 2017-10-09 | 31175 | 0.284 | 0.076 | 0.248 | 0.041 | 0.282 | 0.053 |
| SFM0011 | 3.50 | 4.50 | 2017-01-18 | 30979 | 0.212 | 0.052 | 0.140 | 0.021 | 0.128 | 0.021 |
| SFM0011 | 3.50 | 4.50 | 2017-04-26 | 31018 | 0.043 | 0.010 | 0.032 | 0.004 | 0.028 | 0.005 |
| SFM0011 | 3.50 | 4.50 | 2017-08-01 | 31125 | 0.043 | <0.02 | 0.032 | <0.02 | 0.025 | <0.02 |
| SFM0011 | 3.50 | 4.50 | 2017-10-10 | 31176 | 0.040 | <0.02 | 0.034 | <0.02 | 0.035 | <0.02 |
| SFM0032 | 3.00 | 4.00 | 2017-01-16 | 30975 | 0.156 | 0.044 | 0.131 | 0.020 | 0.127 | 0.024 |
| SFM0032 | 3.00 | 4.00 | 2017-04-26 | 31017 | 0.149 | 0.035 | 0.118 | 0.017 | 0.125 | 0.021 |
| SFM0032 | 3.00 | 4.00 | 2017-08-03 | 31127 | 0.311 | 0.076 | 0.228 | 0.036 | 0.231 | 0.041 |
| SFM0032 | 3.00 | 4.00 | 2017-10-11 | 31174 | 0.209 | 0.054 | 0.164 | 0.026 | 0.168 | 0.030 |
| SFM0037 | 2.00 | 3.00 | 2017-01-19 | 30980 | 0.256 | 0.060 | 0.175 | 0.027 | 0.167 | 0.028 |
| SFM0037 | 2.00 | 3.00 | 2017-04-27 | 31019 | 0.286 | 0.061 | 0.193 | 0.027 | 0.190 | 0.028 |
| SFM0037 | 2.00 | 3.00 | 2017-08-01 | 31124 | 0.309 | 0.073 | 0.215 | 0.033 | 0.220 | 0.037 |
| SFM0037 | 2.00 | 3.00 | 2017-10-11 | 31177 | 0.670 | 0.156 | 0.441 | 0.068 | 0.430 | 0.069 |
| SFM0049 | 4.00 | 5.00 | 2017-01-20 | 30981 | 0.102 | 0.021 | 0.059 | 0.009 | 0.053 | 0.009 |
| SFM0049 | 4.00 | 5.00 | 2017-04-25 | 31015 | 0.075 | 0.015 | 0.042 | 0.005 | 0.038 | 0.006 |
| SFM0049 | 4.00 | 5.00 | 2017-07-31 | 31121 | 0.142 | 0.030 | 0.081 | 0.013 | 0.076 | 0.012 |
| SFM0049 | 4.00 | 5.00 | 2017-10-12 | 31173 | 0.196 | 0.040 | 0.100 | 0.015 | 0.098 | 0.014 |
| SFM0057 | 3.55 | 4.55 | 2017-01-17 | 30978 | 0.043 | <0.02 | 0.033 | <0.02 | 0.030 | <0.02 |
| SFM0057 | 3.55 | 4.55 | 2017-04-25 | 31014 | 0.185 | 0.039 | 0.116 | 0.016 | 0.113 | 0.017 |
| SFM0057 | 3.55 | 4.55 | 2017-08-02 | 31122 | 0.216 | 0.047 | 0.135 | 0.020 | 0.125 | 0.021 |
| SFM0057 | 3.55 | 4.55 | 2017-10-10 | 31172 | 0.414 | 0.094 | 0.256 | 0.039 | 0.241 | 0.038 |

# Appendix 3

## Surface waters

**Table A3-1. Field measurements.**

| Idcode | Measuring date yyyy-mm-dd hh:mm | Depth (m) | Water depth (m) | Sno | Temp. (º C) | pH | EC (mS/m) | Turb (NTU) | O2 diss. (mg/l) | O2 sat. (%) | ORP (mV) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PFM000062 | 2017-01-16 13:45 | 0.5 | 4.40 | 30990 | 0.69 | 7.29 | 896.0 | | 13.77 | 97.5 | 210 |
| PFM000062 | 2017-01-16 14:02 | 1.0 | 4.40 | | 0.69 | 7.38 | 895.3 | | 13.77 | 97.5 | 210 |
| PFM000062 | 2017-01-16 14:05 | 2.0 | 4.40 | | 0.70 | 7.44 | 897.1 | | 13.77 | 97.5 | 200 |
| PFM000062 | 2017-01-16 14:09 | 3.0 | 4.40 | | 0.69 | 7.53 | 900.8 | | 13.74 | 97.3 | 200 |
| PFM000062 | 2017-04-24 10:00 | 0.5 | 4.00 | 31027 | 5.78 | 7.83 | 886.9 | | 12.99 | 105.3 | 170 |
| PFM000062 | 2017-04-24 10:20 | 1.0 | 4.00 | | 5.79 | 7.91 | 887.0 | | 12.93 | 104.9 | 150 |
| PFM000062 | 2017-04-24 10:23 | 2.0 | 4.00 | | 5.81 | 8.01 | 888.5 | | 12.92 | 104.9 | 140 |
| PFM000062 | 2017-04-24 10:31 | 3.0 | 4.00 | | 5.85 | 8.07 | 890.2 | | 12.99 | 105.5 | 140 |
| PFM000062 | 2017-08-01 09:25 | 0.5 | 4.00 | 31137 | 16.46 | 8.05 | 888.1 | | 8.88 | 92.1 | 130 |
| PFM000062 | 2017-08-01 09:33 | 1.0 | 4.00 | | 16.46 | 7.98 | 889.6 | | 8.87 | 92.0 | 130 |
| PFM000062 | 2017-08-01 09:36 | 2.0 | 4.00 | | 16.45 | 7.96 | 891.8 | | 8.90 | 92.3 | 130 |
| PFM000062 | 2017-08-01 09:39 | 3.0 | 4.00 | | 16.45 | 7.94 | 893.3 | | 8.91 | 92.4 | 130 |
| PFM000062 | 2017-10-11 13:55 | 0.5 | 4.00 | 31187 | 10.43 | 8.32 | 878.9 | 8.8 | 10.10 | 94.0 | 180 |
| PFM000062 | 2017-10-11 14:10 | 1.0 | 4.00 | | 10.48 | 8.32 | 879.7 | 8.2 | 10.10 | 94.1 | 180 |
| PFM000062 | 2017-10-11 14:13 | 2.0 | 4.00 | | 10.49 | 8.33 | 880.9 | 7.9 | 10.10 | 94.2 | 179 |
| PFM000062 | 2017-10-11 14:16 | 3.0 | 4.00 | | 10.49 | 8.33 | 881.5 | 7.7 | 10.10 | 94.2 | 179 |
| PFM000066 | 2017-01-18 09:30 | 0.1 | 0.32 | 30998 | 0.03 | 7.40 | 37.5 | | 3.90 | 26.3 | 290 |
| PFM000066 | 2017-02-21 11:20 | 0.1 | 0.27 | 31006 | 0.21 | 6.97 | 41.4 | 1.4 | | | 190 |
| PFM000066 | 2017-03-21 11:30 | 0.1 | 0.38 | 31013 | 1.69 | 7.65 | 33.3 | | 5.73 | 40.4 | 110 |
| PFM000066 | 2017-04-26 09:30 | 0.1 | 0.34 | 31039 | 3.94 | 8.20 | 33.0 | | 8.90 | 66.8 | 190 |
| PFM000066 | 2017-05-15 13:20 | 0.1 | 0.19 | 31098 | | | | | | | |
| PFM000066 | 2017-06-12 11:55 | 0.1 | 0.27 | 31114 | 15.77 | 7.41 | 31.5 | | 5.07 | 53.8 | 80 |
| PFM000066 | 2017-09-11 11:05 | 0.1 | 0.18 | 31161 | 12.44 | 7.06 | 29.6 | | 5.81 | 53.6 | 130 |
| PFM000066 | 2017-10-09 09:35 | 0.1 | 0.30 | 31191 | 8.85 | 7.29 | 33.1 | | 6.05 | 51.3 | 90 |
| PFM000066 | 2017-11-06 12:40 | 0.1 | 0.58 | 31202 | 4.86 | 7.80 | 32.0 | 26.1 | 5.75 | 45.2 | 207 |
| PFM000066 | 2017-12-06 12:30 | 0.1 | 0.47 | 31206 | 0.29 | 7.31 | 33.6 | 6.0 | 5.12 | 35.6 | 121 |
| PFM000068 | 2017-01-18 11:00 | 0.1 | 0.61 | 31000 | 0.02 | 7.24 | 39.1 | | 3.11 | 21.0 | 140 |
| PFM000068 | 2017-02-21 10:50 | 0.1 | 0.66 | 31005 | 0.06 | 6.81 | 42.0 | 1.4 | | | 130 |
| PFM000068 | 2017-03-21 09:30 | 0.1 | 0.67 | 31010 | 0.44 | 7.89 | 34.6 | | 8.57 | 58.4 | 90 |
| PFM000068 | 2017-04-25 14:35 | 0.1 | 0.65 | 31036 | 3.07 | 8.07 | 35.3 | | 9.19 | 67.3 | 140 |
| PFM000068 | 2017-05-15 10:30 | 0.1 | 0.59 | 31095 | | | | | | | |
| PFM000068 | 2017-06-12 10:45 | 0.1 | 0.53 | 31113 | 14.23 | 7.37 | 43.9 | | 6.09 | 62.5 | 80 |
| PFM000068 | 2017-09-11 09:30 | 0.1 | 0.46 | 31158 | 11.56 | 6.86 | 49.5 | | 6.01 | 54.4 | 160 |
| PFM000068 | 2017-10-09 07:40 | 0.1 | 0.62 | 31188 | 8.74 | 7.07 | 37.5 | | 6.62 | 56.1 | 110 |
| PFM000068 | 2017-11-06 10:10 | 0.1 | 0.78 | 31199 | 5.43 | 7.48 | 29.8 | 19.4 | 6.05 | 48.3 | 195 |
| PFM000068 | 2017-12-06 10:00 | 0.1 | 0.86 | 31203 | 0.41 | 6.82 | 32.6 | 4.3 | 6.58 | 45.9 | 144 |
| PFM000069 | 2017-01-17 15:20 | 0.1 | 0.23 | 30996 | 0.01 | 7.42 | 48.2 | | 1.24 | 8.3 | 100 |
| PFM000069 | 2017-02-21 13:40 | 0.1 | 0.21 | 31008 | 0.05 | 7.07 | 51.1 | 4.1 | | | 40 |
| PFM000069 | 2017-03-21 09:55 | 0.1 | 0.25 | 31011 | 0.05 | 7.86 | 44.7 | | 5.35 | 36.1 | 70 |
| PFM000069 | 2017-04-25 15:00 | 0.1 | 0.18 | 31037 | 3.03 | 8.27 | 38.7 | | 7.99 | 58.5 | 190 |
| PFM000069 | 2017-05-15 11:05 | 0.1 | 0.17 | 31096 | | | | | | | |
| PFM000069 | 2017-06-12 15:40 | 0.1 | 0.15 | 31118 | 14.55 | 7.44 | 42.7 | | 6.04 | 62.4 | 90 |
| PFM000069 | 2017-09-11 09:50 | 0.1 | 0.10 | 31159 | 11.30 | 6.98 | 48.0 | | 7.62 | 68.6 | 160 |
| PFM000069 | 2017-10-09 08:10 | 0.1 | 0.27 | 31189 | 8.61 | 7.28 | 40.5 | | 6.65 | 56.1 | 110 |
| PFM000069 | 2017-11-06 10:40 | 0.1 | 0.47 | 31200 | 5.17 | 7.65 | 37.5 | 22.8 | 4.43 | 35.2 | 182 |
| PFM000069 | 2017-12-06 10:30 | 0.1 | 0.55 | 31204 | 0.61 | 6.98 | 39.0 | 9.1 | 3.84 | 26.9 | 114 |
| PFM000070 | 2017-01-17 16:10 | 0.1 | 0.21 | 30997 | 0.06 | 7.83 | 26.4 | | 12.59 | 84.9 | 120 |
| PFM000070 | 2017-02-21 12:50 | 0.1 | 0.16 | 31007 | 1.04 | 7.62 | 23.6 | 0.4 | | | 220 |
| PFM000070 | 2017-03-21 10:50 | 0.1 | 0.25 | 31012 | 2.89 | 8.04 | 20.5 | | 11.08 | 80.8 | 90 |
| PFM000070 | 2017-04-26 08:45 | 0.1 | 0.18 | 31038 | 5.10 | 8.22 | 24.7 | | 10.29 | 79.5 | 200 |

| Idcode | Measuring date yyyy-mm-dd | hh:mm | Depth (m) | Water depth (m) | Sno | Temp. (º C) | pH | EC (mS/m) | Turb (NTU) | O2 diss. (mg/l) | O2 sat. (%) | ORP (mV) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PFM000070 | 2017-05-15 | 11:50 | 0.1 | 0.10 | 31097 | | | | | | | |
| PFM000070 | 2017-06-12 | 15:10 | 0.1 | 0.05 | 31117 | 16.39 | 7.25 | 25.5 | | 5.46 | 58.6 | 100 |
| PFM000070 | 2017-09-11 | 10:30 | 0.1 | 0.06 | 31160 | 12.90 | 6.84 | 23.7 | | 0.26 | 2.4 | 60 |
| PFM000070 | 2017-10-09 | 08:50 | 0.1 | 0.15 | 31190 | 8.82 | 7.55 | 15.4 | | 8.34 | 70.7 | 100 |
| PFM000070 | 2017-11-06 | 11:10 | 0.1 | 0.38 | 31201 | 4.96 | 8.15 | 19.8 | 26.5 | 10.34 | 81.6 | 217 |
| PFM000070 | 2017-12-06 | 11:15 | 0.1 | 0.39 | 31205 | 0.15 | 7.77 | 24.4 | 9.8 | 12.04 | 83.4 | 169 |
| PFM000074 | 2017-01-18 | 10:20 | 0.5 | 0.85 | 30999 | 0.48 | 7.46 | 39.8 | | 2.11 | 14.4 | 210 |
| PFM000074 | 2017-04-24 | 14:30 | 0.5 | 0.99 | 31029 | 8.27 | 8.08 | 39.1 | | 10.28 | 86.0 | 220 |
| PFM000074 | 2017-07-31 | 14:40 | 0.5 | 1.00 | 31135 | 21.81 | 7.90 | 39.6 | | 10.96 | 122.9 | 140 |
| PFM000074 | 2017-10-09 | 12:25 | 0.5 | 0.90 | 31184 | 8.93 | 7.45 | 47.9 | | 8.32 | 70.7 | 140 |
| PFM000083 | 2017-01-17 | 09:50 | 0.5 | | 30993 | 0.14 | 7.80 | 894.1 | | 13.93 | 97.1 | 310 |
| PFM000083 | 2017-04-25 | 09:15 | 0.5 | | 31032 | 5.69 | 8.37 | 885.9 | | 12.62 | 102.1 | 190 |
| PFM000083 | 2017-06-12 | 13:25 | 0.5 | | 31115 | 12.00 | 8.09 | 907.7 | | 11.61 | 116.8 | 120 |
| PFM000083 | 2017-08-02 | 09:30 | 0.5 | | 31144 | 17.06 | 8.23 | 897.4 | | 9.37 | 98.5 | 200 |
| PFM000083 | 2017-09-11 | 13:50 | 0.5 | | 31163 | 10.46 | 7.75 | 938.3 | | 9.97 | 90.8 | 140 |
| PFM000083 | 2017-10-12 | 09:00 | 0.5 | | 31194 | 10.53 | 8.37 | 858.3 | 31.1 | 10.26 | 92.7 | 161 |
| PFM000084 | 2017-01-17 | 11:00 | 0.5 | | 30994 | 0.11 | 7.86 | 166.8 | | 11.07 | 75.1 | 280 |
| PFM000084 | 2017-04-25 | 10:05 | 0.5 | | 31033 | 6.04 | 8.37 | 582.6 | | 12.43 | 100.4 | 210 |
| PFM000084 | 2017-06-12 | 14:15 | 0.5 | | 31116 | 11.99 | 8.10 | 853.1 | | 11.19 | 112.3 | 140 |
| PFM000084 | 2017-08-02 | 10:20 | 0.5 | | 31145 | 17.66 | 7.89 | 864.4 | | 8.48 | 90.0 | 180 |
| PFM000084 | 2017-09-11 | 13:10 | 0.5 | | 31162 | 14.48 | 7.68 | 782.6 | | 9.47 | 93.8 | 160 |
| PFM000084 | 2017-10-12 | 09:45 | 0.5 | | 31195 | 8.52 | 8.12 | 440.0 | 43.8 | 9.98 | 86.0 | 188 |
| PFM000097 | 2017-01-19 | 09:15 | 0.5 | 1.00 | | 2.35 | 7.81 | 526.0 | | 0.42 | 3.1 | -160 |
| PFM000097 | 2017-02-21 | 15:40 | 0.5 | 0.85 | | 4.59 | 7.70 | 257.4 | 0.5 | | | 160 |
| PFM000097 | 2017-04-26 | 07:40 | 0.5 | 0.95 | | 4.89 | 8.65 | 38.6 | | 11.94 | 91.8 | 210 |
| PFM000097 | 2017-06-13 | 07:25 | 0.5 | 0.55 | | 16.40 | 8.31 | 31.2 | | 6.87 | 73.8 | 60 |
| PFM000097 | 2017-08-02 | 08:35 | 0.5 | 0.70 | | 19.48 | 9.30 | 60.4 | | 8.91 | 95.5 | 170 |
| PFM000097 | 2017-09-11 | 18:05 | 0.5 | 0.82 | | 16.66 | 9.05 | 62.2 | | 14.00 | 141.7 | 160 |
| PFM000097 | 2017-10-10 | 07:55 | 0.5 | 0.97 | | 8.57 | 8.42 | 44.4 | | 10.54 | 88.8 | 170 |
| PFM000097 | 2017-11-07 | 09:20 | 0.5 | 1.04 | | 3.47 | 7.55 | 32.3 | 4.7 | 10.88 | 82.3 | 210 |
| PFM000097 | 2017-12-07 | 09:45 | 0.5 | 1.00 | | 3.23 | 7.67 | 33.1 | 19.3 | 8.13 | 61.9 | 60 |
| PFM000107 | 2017-01-16 | 11:10 | 0.5 | 1.80 | 30988 | 1.49 | 6.90 | 41.6 | | 10.19 | 71.5 | 240 |
| PFM000107 | 2017-01-16 | 11:31 | 1.0 | 1.80 | 30989 | 3.57 | 6.94 | 43.5 | | 5.34 | 39.7 | 240 |
| PFM000107 | 2017-04-25 | 07:50 | 0.5 | 1.80 | 31031 | 6.73 | 8.73 | 34.1 | | 11.93 | 96.1 | 190 |
| PFM000107 | 2017-04-25 | 08:07 | 1.0 | 1.80 | | 6.72 | 8.64 | 34.1 | | 11.99 | 96.6 | 180 |
| PFM000107 | 2017-07-31 | 15:50 | 0.5 | 1.60 | 31138 | 21.69 | 9.48 | 27.8 | | 11.18 | 125.1 | 110 |
| PFM000107 | 2017-07-31 | 15:58 | 1.0 | 1.60 | | 21.70 | 9.50 | 27.8 | | 11.18 | 125.1 | 110 |
| PFM000107 | 2017-10-11 | 08:55 | 0.5 | 1.70 | 31193 | 8.13 | 8.68 | 27.8 | 1.1 | 10.58 | 90.5 | 161 |
| PFM000107 | 2017-10-11 | 09:04 | 1.0 | 1.70 | | 7.97 | 8.67 | 28.0 | 1.9 | 10.62 | 90.5 | 172 |
| PFM000117 | 2017-01-16 | 15:10 | 0.5 | 1.80 | 30991 | 0.64 | 7.99 | 25.7 | | 14.76 | 101.2 | 200 |
| PFM000117 | 2017-01-16 | 15:33 | 1.0 | 1.80 | | 2.33 | 7.79 | 25.2 | | 13.25 | 95.2 | 200 |
| PFM000117 | 2017-01-16 | 15:43 | 1.5 | 1.80 | 30992 | 3.46 | 7.60 | 27.7 | | 8.12 | 60.1 | 210 |
| PFM000117 | 2017-04-24 | 13:00 | 0.5 | 2.00 | 31028 | 7.65 | 8.37 | 25.0 | | 12.98 | 107.0 | 200 |
| PFM000117 | 2017-04-24 | 13:10 | 1.0 | 2.00 | | 7.66 | 8.40 | 25.0 | | 13.11 | 108.0 | 200 |
| PFM000117 | 2017-04-24 | 13:13 | 1.5 | 2.00 | | 7.66 | 8.44 | 25.0 | | 13.15 | 108.4 | 200 |
| PFM000117 | 2017-07-31 | 11:40 | 0.5 | 2.20 | 31134 | 21.33 | 7.77 | 16.6 | | 10.52 | 116.8 | 150 |
| PFM000117 | 2017-07-31 | 11:51 | 1.5 | 2.20 | | 21.33 | 8.89 | 16.6 | | 10.61 | 117.8 | 140 |
| PFM000117 | 2017-07-31 | 11:56 | 1.0 | 2.20 | | 21.34 | 8.60 | 16.6 | | 10.55 | 117.2 | 140 |
| PFM000117 | 2017-10-09 | 13:55 | 0.5 | 2.10 | 31185 | 9.44 | 8.39 | 17.2 | | 11.14 | 95.8 | 160 |
| PFM000117 | 2017-10-09 | 14:05 | 1.0 | 2.10 | | 9.42 | 8.38 | 17.3 | | 11.12 | 95.6 | 160 |
| PFM000117 | 2017-10-09 | 14:08 | 1.5 | 2.10 | | 9.43 | 8.40 | 17.3 | | 11.12 | 95.7 | 160 |
| PFM007783 | 2017-01-17 | 11:55 | 0.5 | | 30995 | 0.09 | 7.72 | 901.8 | | 13.71 | 95.5 | 240 |
| PFM007783 | 2017-04-25 | 12:30 | 0.5 | | 31034 | 5.12 | 8.23 | 883.5 | | 12.30 | 98.0 | 170 |
| PFM007783 | 2017-06-12 | 18:20 | 0.5 | | 31120 | 16.82 | 8.43 | 887.6 | | 10.70 | 119.5 | 170 |
| PFM007783 | 2017-08-01 | 14:10 | 0.5 | | 31142 | 19.44 | 8.25 | 900.7 | | 9.65 | 106.4 | 110 |

| Idcode | Measuring date yyyy-mm-dd hh:mm | Depth (m) | Water depth (m) | Sno | Temp. (º C) | pH | EC (mS/m) | Turb (NTU) | O2 diss. (mg/l) | O2 sat. (%) | ORP (mV) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PFM007783 | 2017-09-11 14:40 | 0.5 | | 31164 | 15.18 | 8.00 | 909.3 | | 10.69 | 108.0 | 130 |
| PFM007783 | 2017-10-12 13:30 | 0.5 | | 31196 | 9.49 | 8.39 | 854.7 | 28.3 | 10.70 | 94.5 | 194 |
| PFM007910 | 2017-08-01 10:30 | 0.5 | 8.20 | 31139 | 18.10 | 8.12 | 895.2 | | 9.37 | 100.6 | 130 |
| PFM007910 | 2017-08-01 10:37 | 1.0 | 8.20 | | 18.11 | 8.15 | 895.2 | | 9.38 | 100.7 | 120 |
| PFM007910 | 2017-08-01 10:40 | 2.0 | 8.20 | | 18.10 | 8.16 | 895.8 | | 9.41 | 101.0 | 120 |
| PFM007910 | 2017-08-01 10:41 | 3.0 | 8.20 | | 18.09 | 8.16 | 895.8 | | 9.40 | 100.9 | 120 |
| PFM007910 | 2017-08-01 10:43 | 4.0 | 8.20 | | 18.03 | 8.16 | 896.4 | | 9.44 | 101.2 | 120 |
| PFM007910 | 2017-08-01 10:45 | 5.0 | 8.20 | | 17.99 | 8.16 | 897.0 | | 9.38 | 100.5 | 120 |
| PFM007910 | 2017-08-01 10:46 | 6.0 | 8.20 | | 18.01 | 8.16 | 897.8 | | 9.45 | 101.2 | 130 |
| PFM007910 | 2017-08-01 10:48 | 7.0 | 8.20 | | 17.68 | 8.16 | 897.3 | | 9.43 | 100.4 | 130 |
| PFM007910 | 2017-08-01 10:50 | 8.0 | 8.20 | | 17.66 | 8.16 | 897.8 | | 9.42 | 100.1 | 130 |
| PFM007911 | 2017-08-01 11:10 | 0.5 | 4.90 | 31140 | 18.28 | 8.12 | 897.1 | | 9.28 | 100.0 | 120 |
| PFM007911 | 2017-08-01 11:19 | 1.0 | 4.90 | | 18.29 | 8.12 | 897.3 | | 9.30 | 100.2 | 120 |
| PFM007911 | 2017-08-01 11:22 | 2.0 | 4.90 | | 18.25 | 8.12 | 897.7 | | 9.28 | 99.8 | 120 |
| PFM007911 | 2017-08-01 11:24 | 3.0 | 4.90 | | 18.17 | 8.12 | 897.3 | | 9.35 | 100.5 | 120 |
| PFM007911 | 2017-08-01 11:25 | 4.0 | 4.90 | | 18.13 | 8.12 | 897.3 | | 9.36 | 100.5 | 120 |
| PFM007911 | 2017-08-01 11:27 | 4.5 | 4.90 | | 17.82 | 8.10 | 896.6 | | 9.19 | 98.0 | 120 |
| PFM007912 | 2017-08-01 11:40 | 0.5 | 2.10 | 31141 | 18.47 | 8.12 | 897.9 | | 9.38 | 101.5 | 100 |
| PFM007912 | 2017-08-01 11:48 | 1.0 | 2.10 | | 18.46 | 8.12 | 898.1 | | 9.40 | 101.6 | 100 |
| PFM007912 | 2017-08-01 11:50 | 1.5 | 2.10 | | 18.47 | 8.13 | 898.0 | | 9.41 | 101.8 | 100 |
| PFM007912 | 2017-08-01 11:51 | 2.0 | 2.10 | | 18.41 | 8.14 | 898.3 | | 9.55 | 103.1 | 90 |
| PFM102269 | 2017-01-18 12:00 | 0.5 | | 31001 | 11.60 | 7.57 | 869.5 | | 13.26 | 123.6 | 150 |
| PFM102269 | 2017-02-21 14:40 | 0.5 | | 31004 | 11.87 | 7.42 | 864.8 | 1.1 | | | 120 |
| PFM102269 | 2017-03-21 13:10 | 0.5 | | 31009 | 12.68 | 8.12 | 877.1 | | 13.96 | 133.3 | 90 |
| PFM102269 | 2017-04-25 13:15 | 0.5 | | 31035 | 15.96 | 8.06 | 876.9 | | 12.09 | 124.1 | 140 |
| PFM102269 | 2017-06-12 16:20 | 0.5 | | 31119 | 21.18 | 7.96 | 911.1 | | 11.25 | 137.2 | 110 |
| PFM102269 | 2017-08-01 14:45 | 0.5 | | 31143 | 27.56 | 7.94 | 910.9 | | 9.24 | 118.6 | 120 |
| PFM102269 | 2017-09-11 15:00 | 0.5 | | 31165 | 23.08 | 7.64 | 935.6 | | 9.37 | 111.0 | 140 |
| PFM102269 | 2017-10-12 14:00 | 0.5 | | 31197 | 15.29 | 8.28 | 863.5 | 29.2 | 9.91 | 99.7 | 196 |
| PFM102269 | 2017-11-06 13:30 | 0.5 | | 31198 | 16.58 | 8.21 | 880.6 | 24.1 | 11.08 | 114.6 | 185 |
| PFM102269 | 2017-12-06 13:15 | 0.5 | | 31207 | 12.48 | 7.80 | 913.3 | 23.2 | 12.28 | 116.0 | 144 |

Sno = Corresponding water sample no.

EC = Electrical conductivity.

NTU = Nephelometric Turbidiy Unit.

ORP = Oxidising Reducing Potential.

**Table A3-2. Water flow measurements.**

| Idcode | Start date | Stop date | Simple flow rate ($m^3/s$) | Code / Comment |
|---|---|---|---|---|
| PFM000066 | 2017-01-18 09:30 | 2017-01-18 09:50 | | C |
| PFM000066 | 2017-02-21 11:20 | 2017-02-21 11:40 | | C |
| PFM000066 | 2017-03-21 11:30 | 2017-03-21 11:50 | 0.068 | L |
| PFM000066 | 2017-04-26 09:30 | 2017-04-26 09:50 | 0.043 | L |
| PFM000066 | 2017-05-15 13:20 | 2017-05-15 13:40 | 0.022 | L |
| PFM000066 | 2017-06-12 11:55 | 2017-06-12 12:15 | | F |
| PFM000066 | 2017-07-31 13:40 | 2017-07-31 13:41 | | G |
| PFM000066 | 2017-09-11 11:05 | 2017-09-11 11:20 | | F |
| PFM000066 | 2017-10-09 09:35 | 2017-10-09 09:55 | 0.019 | L |
| PFM000066 | 2017-11-06 12:40 | 2017-11-06 13:00 | 0.168 | L |
| PFM000066 | 2017-12-06 12:30 | 2017-12-06 12:50 | 0.150 | L |
| PFM000068 | 2017-01-18 11:00 | 2017-01-18 11:20 | | C |
| PFM000068 | 2017-02-21 10:50 | 2017-02-21 11:10 | | C |
| PFM000068 | 2017-03-21 09:30 | 2017-03-21 09:50 | 0.237 | L |
| PFM000068 | 2017-04-25 14:35 | 2017-04-25 14:55 | | F |
| PFM000068 | 2017-05-15 10:30 | 2017-05-15 10:50 | | F |
| PFM000068 | 2017-06-12 10:45 | 2017-06-12 11:05 | | F |
| PFM000068 | 2017-07-31 16:20 | 2017-07-31 16:21 | | G |
| PFM000068 | 2017-09-11 09:30 | 2017-09-11 09:45 | | B |
| PFM000068 | 2017-10-09 07:40 | 2017-10-09 08:00 | 0.158 | L |
| PFM000068 | 2017-11-06 10:10 | 2017-11-06 10:30 | 0.400 | L |
| PFM000068 | 2017-12-06 10:00 | 2017-12-06 10:20 | 0.462 | L |
| PFM000069 | 2017-01-17 15:20 | 2017-01-17 15:40 | | C |
| PFM000069 | 2017-02-21 13:40 | 2017-02-21 14:00 | | C |
| PFM000069 | 2017-03-21 09:55 | 2017-03-21 10:15 | 0.047 | L |
| PFM000069 | 2017-04-25 15:00 | 2017-04-25 15:20 | 0.039 | L |
| PFM000069 | 2017-05-15 11:05 | 2017-05-15 11:25 | 0.034 | L |
| PFM000069 | 2017-06-12 15:40 | 2017-06-12 16:00 | 0.017 | L |
| PFM000069 | 2017-07-31 16:45 | 2017-07-31 16:46 | | G |
| PFM000069 | 2017-09-11 09:50 | 2017-09-11 10:05 | 0.007 | L |
| PFM000069 | 2017-10-09 08:10 | 2017-10-09 08:30 | 0.041 | L |
| PFM000069 | 2017-11-06 10:40 | 2017-11-06 11:00 | 0.116 | L |
| PFM000069 | 2017-12-06 10:30 | 2017-12-06 10:50 | 0.240 | L |
| PFM000070 | 2017-01-17 16:10 | 2017-01-17 16:30 | | C |
| PFM000070 | 2017-02-21 12:50 | 2017-02-21 13:10 | | F |
| PFM000070 | 2017-03-21 10:50 | 2017-03-21 11:10 | 0.052 | L |
| PFM000070 | 2017-04-26 08:45 | 2017-04-26 09:05 | | B |
| PFM000070 | 2017-05-15 11:50 | 2017-05-15 12:10 | | B |
| PFM000070 | 2017-06-12 15:10 | 2017-06-12 15:30 | | F |
| PFM000070 | 2017-07-31 10:54 | 2017-07-31 10:55 | | G |
| PFM000070 | 2017-09-11 10:30 | 2017-09-11 10:45 | | B |
| PFM000070 | 2017-10-09 08:50 | 2017-10-09 09:10 | | B |
| PFM000070 | 2017-11-06 11:10 | 2017-11-06 11:30 | 0.079 | L |
| PFM000070 | 2017-12-06 11:15 | 2017-12-06 11:35 | 0.107 | L |

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

## A3.1 Compilation of hydrochemical data from water analyses

**Table A3-3. Major components.**

| Idcode | Sample no. | Depth (m) | Sampling date (yyyy-mm-dd) | RCB (%) | Na (mg/L) | K (mg/L) | Ca (mg/L) | Mg (mg/L) | $HCO_3^-$ (mg/L) | $Cl^-$ (mg/L) | $SO_4^{2-}$ (mg/L) | $SO_4$-S (mg/L) | Br (mg/L) | $F^-$ (mg/L) | Si (mg/L) | Fe (mg/L) | Mn (mg/L) | Li (mg/L) | Sr (mg/L) | $I^-$ (mg/L) | pH_L | pH_F | Temp_F (º C) | EC_L (mS/m) | EC_F (mS/m) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PFM000062 | 30990 | 0.50 | 2017-01-16 | 1.6 | 1570 | 54.9 | 73.1 | 164 | 76.6 | 2651 | 378.7 | 127 | 9.40 | 0.33 | 0.66 | 0.0035 | 0.0014 | 0.0282 | 1.060 | <0.09 | 7.75 | 7.29 | 0.69 | 867 | 896.0 |
| PFM000062 | 31027 | 0.50 | 2017-04-24 | 2.1 | 1600 | 54.5 | 74.3 | 167 | 75.9 | 2682 | 369.8 | 124 | 9.57 | 0.31 | 0.20 | <0.1 | 0.0024 | 0.0272 | 1.080 | 0.01000 | 8.03 | 7.83 | 5.78 | 869 | 886.9 |
| PFM000062 | 31137 | 0.50 | 2017-08-01 | 1.7 | 1620 | 61.3 | 78.4 | 182 | 77.5 | 2755 | 390.0 | 142 | 9.68 | 0.31 | 0.39 | 0.0043 | 0.0042 | 0.0290 | 1.100 | 0.01180 | 7.92 | 8.05 | 16.46 | 896 | 888.1 |
| PFM000062 | 31187 | 0.50 | 2017-10-11 | 0.5 | 1620 | 65.1 | 80.1 | 184 | 79.2 | 2830 | 406.2 | 146 | 10.40 | 0.31 | 0.61 | 0.0061 | 0.0062 | 0.0317 | 1.140 | 0.06200 | 7.85 | 8.32 | 10.43 | 916 | 878.9 |
| PFM000066 | 30998 | 0.10 | 2017-01-18 | 2.8 | 6.4 | 2.41 | 67.1 | 3.23 | 179.5 | 6.8 | 29.60 | 9.85 | 0.043 | <0.2 | 4.95 | 0.0403 | 0.0068 | <0.004 | 0.070 | 0.00342 | 6.96 | 7.40 | 0.03 | 38 | 37.5 |
| PFM000066 | 31006 | 0.10 | 2017-02-21 | 4.3 | 6.7 | 2.62 | 80.7 | 3.81 | 216.7 | 6.8 | 26.00 | 8.98 | 0.052 | 0.22 | 5.66 | 0.0945 | 0.0574 | <0.004 | 0.081 | 0.00556 | 7.10 | 6.97 | 0.21 | 42 | 41.4 |
| PFM000066 | 31013 | 0.10 | 2017-03-21 | 5.6 | 5.7 | 2.36 | 64.7 | 3.14 | 172.8 | 5.6 | 17.20 | 6.33 | 0.035 | 0.21 | 4.75 | 0.0422 | 0.0134 | 0.0017 | 0.066 | 0.00361 | 7.09 | 7.65 | 1.69 | 33 | 33.3 |
| PFM000066 | 31039 | 0.10 | 2017-04-26 | 5.5 | 5.4 | 2.25 | 65.1 | 2.93 | 178.0 | 5.1 | 13.70 | 5.12 | 0.037 | 0.22 | 3.82 | 0.0469 | 0.0096 | 0.0016 | 0.063 | 0.00403 | 7.47 | 8.20 | 3.94 | 33 | 33.0 |
| PFM000066 | 31098 | 0.10 | 2017-05-15 | 7.0 | 6.2 | 2.46 | 70.6 | 3.32 | 189.2 | 5.7 | 13.10 | 5.08 | 0.040 | 0.24 | 3.35 | 0.0530 | 0.0313 | 0.0017 | 0.073 | 0.00453 | 7.56 | | | 35 | |
| PFM000066 | 31114 | 0.10 | 2017-06-12 | 4.1 | 24.7 | 2.60 | 61.7 | 5.48 | 173.6 | 40.7 | 13.00 | 4.94 | 0.166 | 0.31 | 4.76 | 0.3620 | 0.0447 | 0.0029 | 0.106 | 0.00884 | 7.44 | 7.41 | 15.77 | 44 | 31.5 |
| PFM000066 | 31161 | 0.10 | 2017-09-11 | 6.2 | 6.21 | 2.31 | 58 | 3.1 | 166.4 | 5.92 | 6.3 | 2.73 | 0.0485 | 0.21 | 5.12 | 0.0795 | 0.0182 | 0.00168 | 0.0688 | 0.00518 | 7.41 | 7.06 | 12.44 | 30 | 29.6 |
| PFM000066 | 31191 | 0.10 | 2017-10-09 | 7.3 | 5.7 | 4.83 | 67.5 | 3.38 | 175.2 | 6.2 | 16.00 | 6.76 | 0.055 | 0.21 | 5.09 | 0.2840 | 0.0348 | 0.0023 | 0.071 | 0.00609 | 7.18 | 7.29 | 8.85 | 34 | 33.1 |
| PFM000066 | 31202 | 0.10 | 2017-11-06 | 7.9 | 5.7 | 3.38 | 69.4 | 3.26 | 188.5 | 5.5 | 9.78 | 3.89 | 0.054 | <0.2 | 6.18 | 0.0892 | 0.0083 | 0.0017 | 0.068 | 0.00828 | 7.31 | 7.80 | 4.86 | 34 | 32.0 |
| PFM000066 | 31206 | 0.10 | 2017-12-06 | 6.0 | 5.1 | 2.80 | 66.5 | 3.24 | 192.5 | 4.9 | 6.43 | 2.56 | 0.033 | <0.2 | 5.94 | 0.0997 | 0.0114 | 0.0014 | 0.067 | 0.00769 | 7.17 | 7.31 | 0.29 | 34 | 33.6 |
| PFM000068 | 31000 | 0.10 | 2017-01-18 | 3.2 | 14.8 | 2.78 | 59.2 | 4.36 | 161.7 | 22.2 | 23.40 | 7.94 | 0.092 | 0.24 | 4.60 | 0.1380 | 0.0912 | <0.004 | 0.088 | 0.00623 | 6.83 | 7.24 | 0.02 | 39 | 39.1 |
| PFM000068 | 31005 | 0.10 | 2017-02-21 | 3.9 | 15.6 | 2.59 | 67.6 | 5.05 | 183.9 | 24.5 | 22.70 | 7.79 | 0.116 | 0.27 | 5.02 | 0.2640 | 0.0465 | <0.004 | 0.102 | 0.00694 | 6.94 | 6.81 | 0.06 | 43 | 42.0 |
| PFM000068 | 31010 | 0.10 | 2017-03-21 | 5.6 | 12.6 | 2.15 | 57.3 | 4.13 | 150.0 | 18.8 | 17.40 | 6.43 | 0.083 | 0.26 | 4.03 | 0.0867 | 0.0130 | 0.0020 | 0.081 | 0.00452 | 7.13 | 7.89 | 0.44 | 35 | 34.6 |
| PFM000068 | 31036 | 0.10 | 2017-04-25 | 4.8 | 14.5 | 2.29 | 55.4 | 4.17 | 147.6 | 22.7 | 16.50 | 6.05 | 0.094 | 0.27 | 3.48 | 0.0925 | 0.0085 | 0.0021 | 0.082 | 0.00463 | 7.33 | 8.07 | 3.07 | 35 | 35.3 |
| PFM000068 | 31095 | 0.10 | 2017-05-15 | 6.6 | 21.3 | 2.66 | 66.0 | 5.33 | 171.9 | 32.5 | 16.20 | 6.29 | 0.144 | 0.30 | 4.23 | 0.1410 | 0.0282 | 0.0026 | 0.104 | 0.00570 | 7.43 | | | 42 | |
| PFM000068 | 31113 | 0.10 | 2017-06-12 | 5.4 | 6.2 | 2.15 | 60.5 | 3.11 | 174.9 | 5.2 | 8.61 | 3.35 | 0.045 | 0.23 | 3.08 | 0.1320 | 0.0551 | 0.0016 | 0.069 | 0.00736 | 7.47 | 7.37 | 14.23 | 32 | 43.9 |
| PFM000068 | 31158 | 0.10 | 2017-09-11 | 4.6 | 32 | 2.38 | 68.7 | 6.76 | 188.6 | 52.8 | 14.5 | 5.98 | 0.21 | 0.3 | 5.33 | 0.383 | 0.0164 | 0.00437 | 0.122 | 0.00839 | 7.44 | 6.86 | 11.56 | 50 | 49.5 |
| PFM000068 | 31188 | 0.10 | 2017-10-09 | 8.0 | 17.6 | 4.61 | 60.3 | 5.26 | 129.8 | 31.6 | 25.80 | 10.60 | 0.149 | 0.27 | 4.72 | 0.3490 | 0.0180 | 0.0029 | 0.100 | 0.00506 | 7.13 | 7.07 | 8.74 | 38 | 37.5 |
| PFM000068 | 31199 | 0.10 | 2017-11-06 | 7.3 | 10.6 | 3.04 | 55.4 | 3.96 | 143.3 | 15.4 | 14.10 | 5.55 | 0.089 | 0.24 | 5.01 | 0.1860 | 0.0066 | 0.0019 | 0.073 | 0.00811 | 7.22 | 7.48 | 5.43 | 32 | 29.8 |
| PFM000068 | 31203 | 0.10 | 2017-12-06 | 7.6 | 10.2 | 2.82 | 58.1 | 3.97 | 156.7 | 12.9 | 10.50 | 4.38 | 0.064 | 0.25 | 5.13 | 0.2030 | 0.0108 | 0.0017 | 0.074 | 0.00889 | 7.17 | 6.82 | 0.41 | 32 | 32.6 |
| PFM000069 | 30996 | 0.10 | 2017-01-17 | 2.5 | 20.3 | 3.22 | 71.4 | 5.38 | 194.5 | 33.8 | 28.00 | 9.52 | 0.141 | 0.25 | 6.12 | 0.2280 | 0.2860 | <0.004 | 0.106 | 0.00805 | 6.77 | 7.42 | 0.01 | 48 | 48.2 |
| PFM000069 | 31008 | 0.10 | 2017-02-21 | 3.3 | 20.9 | 3.02 | 79.9 | 6.09 | 219.2 | 35.2 | 25.50 | 8.87 | 0.151 | 0.29 | 6.53 | 0.8180 | 0.0868 | <0.004 | 0.118 | 0.00941 | 6.76 | 7.07 | 0.05 | 51 | 51.1 |
| PFM000069 | 31011 | 0.10 | 2017-03-21 | 4.5 | 18.4 | 2.42 | 70.5 | 5.26 | 187.0 | 29.5 | 21.70 | 7.85 | 0.123 | 0.28 | 5.42 | 0.1260 | 0.0298 | 0.0024 | 0.104 | 0.00492 | 6.96 | 7.86 | 0.05 | 45 | 44.7 |
| PFM000069 | 31037 | 0.10 | 2017-04-25 | 3.4 | 17.6 | 2.36 | 56.6 | 4.54 | 153.4 | 29.8 | 17.50 | 6.26 | 0.106 | 0.28 | 4.04 | 0.0693 | 0.0029 | 0.0021 | 0.085 | 0.00433 | 7.22 | 8.27 | 3.03 | 39 | 38.7 |
| PFM000069 | 31096 | 0.10 | 2017-05-15 | 5.7 | 22.2 | 2.64 | 64.2 | 5.33 | 170.5 | 34.9 | 15.60 | 6.03 | 0.132 | 0.30 | 4.54 | 0.0820 | 0.0033 | 0.0025 | 0.100 | 0.00532 | 7.29 | | | 43 | |
| PFM000069 | 31118 | 0.10 | 2017-06-12 | 3.9 | 24.6 | 2.56 | 58.5 | 5.36 | 164.6 | 41.5 | 11.80 | 4.49 | 0.167 | 0.30 | 4.87 | 0.1800 | 0.0100 | 0.0024 | 0.099 | 0.00798 | 7.29 | 7.44 | 14.55 | 43 | 42.7 |
| PFM000069 | 31159 | 0.10 | 2017-09-11 | 3.7 | 30.6 | 1.83 | 65.2 | 6.47 | 188 | 51.9 | 9.13 | 3.89 | 0.219 | 0.29 | 5.38 | 0.14 | 0.00546 | 0.00308 | 0.112 | 0.00867 | 7.54 | 6.98 | 11.30 | 49 | 48.0 |
| PFM000069 | 31189 | 0.10 | 2017-10-09 | 6.4 | 23.7 | 4.50 | 59.0 | 5.52 | 133.2 | 42.0 | 24.40 | 10.00 | 0.160 | 0.25 | 4.46 | 0.2140 | 0.0182 | 0.0029 | 0.098 | 0.00527 | 7.13 | 7.28 | 8.61 | 41 | 40.5 |
| PFM000069 | 31200 | 0.10 | 2017-11-06 | 6.5 | 14.0 | 3.48 | 68.5 | 4.70 | 174.9 | 22.0 | 19.20 | 7.38 | 0.104 | 0.26 | 6.25 | 0.1810 | 0.0065 | 0.0021 | 0.089 | 0.00761 | 7.19 | 7.65 | 5.17 | 40 | 37.5 |
| PFM000069 | 31204 | 0.10 | 2017-12-06 | 6.0 | 12.6 | 2.99 | 67.7 | 4.51 | 183.7 | 17.9 | 14.20 | 5.70 | 0.072 | 0.27 | 6.15 | 0.2190 | 0.0150 | 0.0018 | 0.086 | 0.00834 | 7.12 | 6.98 | 0.61 | 39 | 39.0 |

| Idcode | Sample no. | Depth (m) | Sampling date (yyyy-mm-dd) | RCB (%) | Na (mg/L) | K (mg/L) | Ca (mg/L) | Mg (mg/L) | $HCO_3^-$ (mg/L) | $Cl^-$ (mg/L) | $SO_4^{2-}$ (mg/L) | $SO_4$-S (mg/L) | Br (mg/L) | $F^-$ (mg/L) | Si (mg/L) | Fe (mg/L) | Mn (mg/L) | Li (mg/L) | Sr (mg/L) | $I^-$ (mg/L) | pH_L | pH_F | Temp_F (° C) | EC_L (mS/m) | EC_F (mS/m) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PFM000070 | 30997 | 0.10 | 2017-01-17 | 3.6 | 8.1 | 2.37 | 42.8 | 2.96 | 136.1 | 7.7 | 6.09 | 2.28 | 0.049 | 0.22 | 2.07 | 0.0074 | 0.0013 | <0.004 | 0.054 | 0.00923 | 7.44 | 7.83 | 0.06 | 26 | 26.4 |
| PFM000070 | 31007 | 0.10 | 2017-02-21 | 5.0 | 7.5 | 2.12 | 41.0 | 2.73 | 124.9 | 6.7 | 6.10 | 2.36 | 0.039 | 0.23 | 1.73 | 0.0078 | 0.0070 | <0.004 | 0.050 | 0.00856 | 7.55 | 7.62 | 1.04 | 24 | 23.6 |
| PFM000070 | 31012 | 0.10 | 2017-03-21 | 5.0 | 5.3 | 1.67 | 36.6 | 2.04 | 106.3 | 5.2 | 6.65 | 2.46 | 0.032 | 0.20 | 1.37 | 0.0126 | 0.0024 | 0.0010 | 0.039 | 0.00516 | 7.66 | 8.04 | 2.89 | 21 | 20.5 |
| PFM000070 | 31038 | 0.10 | 2017-04-26 | 6.5 | 7.2 | 2.03 | 44.8 | 2.67 | 127.8 | 6.6 | 7.59 | 2.94 | 0.034 | 0.23 | 1.40 | 0.0168 | 0.0059 | 0.0012 | 0.050 | 0.00631 | 7.51 | 8.22 | 5.10 | 26 | 24.7 |
| PFM000070 | 31097 | 0.10 | 2017-05-15 | 6.8 | 7.6 | 2.10 | 45.1 | 2.71 | 129.6 | 6.9 | 6.28 | 2.63 | 0.037 | 0.25 | 1.40 | 0.0600 | 0.0931 | 0.0015 | 0.051 | 0.00644 | 7.29 | | | 26 | |
| PFM000070 | 31117 | 0.10 | 2017-06-12 | 5.1 | 7.3 | 1.76 | 45.1 | 2.62 | 140.7 | 6.0 | 2.38 | 1.16 | 0.044 | 0.24 | 2.12 | 0.1140 | 0.1110 | 0.0015 | 0.053 | 0.00807 | 7.16 | 7.25 | 16.39 | 26 | 25.5 |
| PFM000070 | 31160 | 0.10 | 2017-09-11 | 7.4 | 6.83 | 1.75 | 50.7 | 2.92 | 150 | 4.96 | 1.78 | 1.23 | 0.0409 | 0.22 | 3.01 | 0.0818 | 0.0325 | 0.00163 | 0.0562 | 0.00518 | 7.3 | 6.84 | 12.90 | 27 | 23.7 |
| PFM000070 | 31190 | 0.10 | 2017-10-09 | 11.6 | 5.3 | 4.41 | 38.4 | 2.35 | 87.3 | 7.0 | 11.80 | 5.28 | 0.038 | <0.2 | 2.48 | 0.0770 | 0.0215 | 0.0012 | 0.042 | 0.00352 | 6.99 | 7.55 | 8.82 | 20 | 15.4 |
| PFM000070 | 31201 | 0.10 | 2017-11-06 | 7.4 | 7.3 | 2.42 | 36.2 | 2.72 | 103.5 | 6.6 | 7.42 | 2.94 | 0.045 | 0.21 | 2.20 | 0.0300 | 0.0024 | 0.0013 | 0.045 | 0.00887 | 7.53 | 8.15 | 4.96 | 21 | 19.8 |
| PFM000070 | 31205 | 0.10 | 2017-12-06 | 8.1 | 7.4 | 2.48 | 44.0 | 2.98 | 123.5 | 6.6 | 6.92 | 2.93 | 0.053 | 0.21 | 3.03 | 0.0597 | 0.0041 | 0.0013 | 0.051 | 0.00920 | 7.60 | 7.77 | 0.15 | 24 | 24.4 |
| PFM000074 | 30999 | 0.50 | 2017-01-18 | 3.5 | 7.7 | 2.73 | 71.2 | 3.52 | 185.0 | 9.8 | 31.90 | 10.70 | 0.051 | <0.2 | 5.44 | 0.0552 | 0.0087 | <0.004 | 0.077 | 0.00330 | 6.99 | 7.46 | 0.48 | 41 | 39.8 |
| PFM000074 | 31029 | 0.50 | 2017-04-24 | 5.0 | 11.9 | 2.43 | 69.4 | 3.47 | 186.7 | 17.9 | 15.10 | 5.51 | 0.049 | 0.24 | 3.84 | 0.0247 | 0.0052 | 0.0017 | 0.075 | 0.00398 | 7.50 | 8.08 | 8.27 | 39 | 39.1 |
| PFM000074 | 31135 | 0.50 | 2017-07-31 | 5.2 | 21.1 | 1.81 | 60.8 | 4.37 | 170.8 | 33.0 | 6.77 | 2.92 | 0.089 | 0.29 | 4.58 | 0.0255 | 0.0076 | 0.0033 | 0.086 | 0.00667 | 7.84 | 7.90 | 21.81 | 40 | 39.6 |
| PFM000074 | 31184 | 0.50 | 2017-10-09 | 2.7 | 19.3 | 2.55 | 77.0 | 3.91 | 221.9 | 36.6 | 4.34 | 1.98 | 0.076 | 0.23 | 5.61 | 0.0446 | 0.0087 | 0.0019 | 0.090 | 0.00684 | 7.58 | 7.45 | 8.93 | 48 | 47.9 |
| PFM000083 | 30993 | 0.50 | 2017-01-17 | 0.4 | 1540 | 54.9 | 73.5 | 164 | 77.7 | 2676 | 378.4 | 127 | 9.65 | 0.33 | 0.66 | 0.0029 | 0.0015 | 0.0278 | 1.060 | <0.09 | 7.84 | 7.80 | 0.14 | 864 | 894.1 |
| PFM000083 | 31032 | 0.50 | 2017-04-25 | 0.7 | 1540 | 52.8 | 72.8 | 163 | 76.2 | 2664 | 369.4 | 122 | 9.35 | 0.29 | <0.2 | 0.0040 | 0.0028 | 0.0260 | 1.050 | 0.00894 | 8.02 | 8.37 | 5.69 | 866 | 885.9 |
| PFM000083 | 31100 | 0.50 | 2017-05-15 | 9.1 | 1850 | 71.6 | 96.3 | 216 | 77.5 | 2690 | 355.7 | 163 | 9.93 | 0.37 | 0.19 | 0.0040 | 0.0040 | 0.0306 | 1.370 | 0.01090 | 7.87 | | | 870 | |
| PFM000083 | 31115 | 0.50 | 2017-06-12 | 1.7 | 1630 | 58.2 | 77.9 | 179 | 78.1 | 2775 | 393.7 | 134 | 9.90 | 0.33 | 0.24 | 0.0052 | 0.0035 | 0.0279 | 1.130 | 0.01060 | 7.97 | 8.09 | 12.00 | 902 | 907.7 |
| PFM000083 | 31144 | 0.50 | 2017-08-02 | 0.8 | 1600 | 60.9 | 78.5 | 181 | 78.6 | 2775 | 393.3 | 141 | 10.10 | 0.32 | 0.30 | <0.002 | 0.0021 | 0.0303 | 1.090 | 0.01040 | 8.07 | 8.23 | 17.06 | 896 | 897.4 |
| PFM000083 | 31163 | 0.50 | 2017-09-11 | 0.1 | 1660 | 63.2 | 82.3 | 187 | 81.8 | 2924 | 415.9 | 147 | 10.70 | 0.32 | 0.55 | 0.0027 | 0.00556 | 0.0354 | 1.130 | 0.01240 | 7.81 | 7.75 | 10.46 | 940 | 938.3 |
| PFM000083 | 31194 | 0.50 | 2017-10-12 | −0.5 | 1580 | 62.8 | 78.1 | 178 | 78.8 | 2814 | 395.6 | 143 | 9.83 | 0.30 | 0.57 | <0.002 | 0.0007 | 0.0297 | 1.100 | 0.01050 | 7.84 | 8.37 | 10.53 | 908 | 858.3 |
| PFM000084 | 30994 | 0.50 | 2017-01-17 | 2.2 | 222 | 9.7 | 53.6 | 26.3 | 124 | 364 | 92.9 | 28.6 | 1.45 | 0.26 | 3.32 | 0.1250 | 0.0370 | 0.0072 | 0.216 | 0.00773 | 7.32 | 7.86 | 0.11 | 156 | 166.8 |
| PFM000084 | 31033 | 0.50 | 2017-04-25 | −0.6 | 926 | 36.8 | 73.3 | 111 | 108 | 1674 | 251.0 | 90.3 | 5.89 | 0.27 | 0.71 | 0.0327 | 0.0300 | 0.0194 | 0.727 | 0.00991 | 8.08 | 8.37 | 6.04 | 571 | 582.6 |
| PFM000084 | 31101 | 0.50 | 2017-05-15 | 9.8 | 1670 | 62.2 | 91.8 | 188 | 86.8 | 2373 | 331.3 | 143 | 8.81 | 0.35 | 0.22 | 0.0150 | 0.0638 | 0.0260 | 1.210 | 0.01050 | 7.87 | | | 787 | |
| PFM000084 | 31116 | 0.50 | 2017-06-12 | 0.6 | 1490 | 53.1 | 75.7 | 164 | 82.8 | 2597 | 370.4 | 124 | 9.13 | 0.32 | 0.29 | 0.0140 | 0.0298 | 0.0272 | 1.040 | 0.01240 | 7.91 | 8.10 | 11.99 | 845 | 853.1 |
| PFM000084 | 31145 | 0.50 | 2017-08-02 | 0.6 | 1530 | 58.5 | 76.7 | 172 | 81.2 | 2665 | 378.2 | 135 | 9.78 | 0.30 | 0.43 | 0.0103 | 0.0213 | 0.0310 | 1.050 | 0.01270 | 7.80 | 7.89 | 17.66 | 864 | 864.4 |
| PFM000084 | 31162 | 0.50 | 2017-09-11 | −1.2 | 1330 | 51.4 | 73.5 | 152 | 85.2 | 2416 | 356.3 | 120 | 8.68 | 0.28 | 0.63 | 0.0389 | 0.03320 | 0.0305 | 0.934 | 0.01260 | 7.82 | 7.68 | 14.48 | 786 | 782.6 |
| PFM000084 | 31195 | 0.50 | 2017-10-12 | −1.1 | 707 | 33.2 | 72.1 | 87.2 | 121.4 | 1291 | 204.1 | 77.2 | 4.56 | 0.26 | 2.59 | 0.0691 | 0.0331 | 0.0185 | 0.583 | 0.01020 | 7.60 | 8.12 | 8.52 | 457 | 440.0 |
| PFM000107 | 30988 | 0.50 | 2017-01-16 | 4.5 | 24.5 | 3.23 | 55.2 | 5.60 | 154.9 | 35.1 | 20.30 | 7.20 | 0.160 | 0.24 | 2.46 | 0.0529 | 0.0079 | <0.004 | 0.095 | 0.00670 | 7.43 | 6.90 | 1.49 | 41 | 41.6 |
| PFM000107 | 30989 | 1.00 | 2017-01-16 | 1.8 | 23.7 | 3.28 | 60.2 | 5.59 | 180.9 | 36.8 | 18.90 | 6.48 | 0.172 | 0.24 | 2.43 | 0.1160 | 0.0639 | <0.004 | 0.099 | 0.00689 | 7.39 | 6.94 | 3.57 | 45 | 43.5 |
| PFM000107 | 31031 | 0.50 | 2017-04-25 | 5.1 | 18.3 | 2.46 | 48.8 | 4.71 | 134.2 | 26.9 | 15.40 | 5.65 | 0.113 | 0.26 | 0.37 | 0.0217 | 0.0021 | 0.0023 | 0.079 | 0.00495 | 8.37 | 8.73 | 6.73 | 34 | 34.1 |
| PFM000107 | 31138 | 0.50 | 2017-07-31 | 5.0 | 25.2 | 2.42 | 24.6 | 5.32 | 67.5 | 37.1 | 15.70 | 6.20 | 0.172 | 0.30 | 1.32 | 0.0279 | 0.0037 | 0.0034 | 0.069 | 0.00738 | 9.48 | 9.48 | 21.69 | 28 | 27.8 |
| PFM000107 | 31193 | 0.50 | 2017-10-11 | 3.8 | 23.3 | 2.43 | 30.7 | 4.88 | 89.1 | 35.1 | 13.00 | 5.17 | 0.156 | 0.25 | 0.34 | 0.0287 | 0.0009 | 0.0026 | 0.069 | 0.00543 | 8.06 | 8.68 | 8.13 | 30 | 27.8 |
| PFM000117 | 30991 | 0.50 | 2017-01-16 | 3.5 | 8.2 | 2.39 | 41.0 | 2.97 | 131.0 | 7.8 | 6.50 | 2.35 | 0.049 | 0.20 | 1.94 | 0.0061 | 0.0014 | <0.004 | 0.055 | 0.00948 | 7.83 | 7.99 | 0.64 | 25 | 25.7 |
| PFM000117 | 30992 | 1.50 | 2017-01-16 | 3.6 | 7.2 | 2.24 | 46.3 | 2.84 | 136.9 | 7.0 | 11.50 | 4.15 | 0.047 | 0.21 | 2.52 | 0.0241 | 0.0186 | <0.004 | 0.055 | 0.00870 | 7.53 | 7.60 | 3.46 | 27 | 27.7 |
| PFM000117 | 31028 | 0.50 | 2017-04-24 | 7.3 | 7.1 | 2.03 | 46.5 | 2.82 | 129.8 | 6.6 | 7.90 | 3.06 | 0.044 | 0.24 | 1.13 | 0.0132 | 0.0008 | 0.0013 | 0.052 | 0.00765 | 8.38 | 8.37 | 7.65 | 26 | 25.0 |

| Idcode | Sample no. | Depth (m) | Sampling date (yyyy-mm-dd) | RCB (%) | Na (mg/L) | K (mg/L) | Ca (mg/L) | Mg (mg/L) | $HCO_3^-$ (mg/L) | $Cl^-$ (mg/L) | $SO_4^{2-}$ (mg/L) | $SO_4$-S (mg/L) | Br (mg/L) | $F^-$ (mg/L) | Si (mg/L) | Fe (mg/L) | Mn (mg/L) | Li (mg/L) | Sr (mg/L) | $I^-$ (mg/L) | pH_L | pH_F | Temp_F (° C) | EC_L (mS/m) | EC_F (mS/m) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PFM000117 | 31134 | 0.50 | 2017-07-31 | 7.5 | 7.8 | 2.14 | 24.7 | 2.87 | 73.0 | 7.1 | 7.52 | 3.08 | 0.055 | 0.25 | 1.24 | 0.0054 | 0.0014 | 0.0016 | 0.044 | 0.00962 | 9.22 | 7.77 | 21.33 | 17 | 16.6 |
| PFM000117 | 31185 | 0.50 | 2017-10-09 | 6.3 | 7.5 | 2.35 | 26.8 | 2.69 | 81.1 | 7.1 | 6.81 | 2.77 | 0.044 | 0.23 | 1.58 | 0.0043 | 0.0008 | 0.0013 | 0.043 | 0.00951 | 8.38 | 8.39 | 9.44 | 18 | 17.2 |
| PFM007783 | 30995 | 0.50 | 2017-01-17 | 1.3 | 1570 | 55.9 | 74.5 | 167 | 79.9 | 2673 | 383.8 | 129 | 9.77 | 0.32 | 0.66 | 0.0031 | 0.0015 | 0.0268 | 1.080 | <0.09 | 7.80 | 7.72 | 0.09 | 873 | 901.8 |
| PFM007783 | 31034 | 0.50 | 2017-04-25 | 3.3 | 1620 | 55.5 | 77.2 | 171 | 77.5 | 2646 | 367.3 | 128 | 9.15 | 0.29 | <0.2 | 0.0043 | 0.0028 | 0.0266 | 1.110 | 0.00963 | 7.87 | 8.23 | 5.12 | 862 | 883.5 |
| PFM007783 | 31102 | 0.50 | 2017-05-15 | 8.7 | 1830 | 69.5 | 93.7 | 211 | 77.7 | 2682 | 361.3 | 158 | 9.66 | 0.36 | <0.2 | 0.0073 | 0.0034 | 0.0301 | 1.340 | 0.01010 | 7.94 | | | 869 | |
| PFM007783 | 31120 | 0.50 | 2017-06-12 | 1.2 | 1570 | 56.8 | 75.8 | 173 | 77.5 | 2701 | 383.6 | 130 | 9.57 | 0.32 | <0.2 | 0.0089 | 0.0033 | 0.0265 | 1.100 | 0.01110 | 8.33 | 8.43 | 16.82 | 880 | 887.6 |
| PFM007783 | 31142 | 0.50 | 2017-08-01 | 1.0 | 1610 | 60.8 | 78.7 | 182 | 78.2 | 2785 | 395.0 | 141 | 10.30 | 0.31 | 0.30 | 0.0107 | 0.0028 | 0.0295 | 1.100 | 0.01170 | 8.23 | 8.25 | 19.44 | 899 | 900.7 |
| PFM007783 | 31164 | 0.50 | 2017-09-11 | 0.7 | 1630 | 61.4 | 79.5 | 182 | 79.1 | 2827 | 395.0 | 143 | 9.94 | 0.31 | 0.45 | 0.0071 | 0.00463 | 0.0312 | 1.100 | 0.01100 | 8.25 | 8.00 | 15.18 | 913 | 909.3 |
| PFM007783 | 31196 | 0.50 | 2017-10-12 | −0.5 | 1560 | 61.7 | 78.5 | 179 | 78.9 | 2786 | 389.7 | 143 | 9.76 | 0.30 | 0.49 | 0.0046 | 0.0046 | 0.0291 | 1.100 | 0.01010 | 7.88 | 8.39 | 9.49 | 904 | 854.7 |
| PFM007910 | 31139 | 0.50 | 2017-08-01 | 1.2 | 1610 | 60.7 | 76.9 | 179 | 77.7 | 2766 | 390.2 | 139 | 9.84 | 0.31 | 0.19 | 0.0034 | 0.0019 | 0.0292 | 1.090 | 0.01170 | 8.22 | 8.12 | 18.10 | 895 | 895.2 |
| PFM007911 | 31140 | 0.50 | 2017-08-01 | 0.7 | 1590 | 60.8 | 77.1 | 179 | 78.0 | 2761 | 394.9 | 140 | 10.40 | 0.30 | 0.38 | 0.0049 | 0.0021 | 0.0302 | 1.090 | 0.01100 | 8.19 | 8.12 | 18.28 | 895 | 897.1 |
| PFM007912 | 31141 | 0.50 | 2017-08-01 | 1.2 | 1610 | 60.2 | 78.2 | 180 | 78.1 | 2762 | 391.4 | 140 | 10.30 | 0.31 | 0.31 | 0.0066 | 0.0031 | 0.0294 | 1.090 | 0.01080 | 8.20 | 8.12 | 18.47 | 895 | 897.9 |
| PFM102269 | 31001 | 0.50 | 2017-01-18 | 2.0 | 1560 | 54.8 | 72.2 | 163 | 76.8 | 2612 | 377.7 | 126 | 9.47 | 0.33 | 0.67 | 0.0029 | 0.0014 | 0.0264 | 1.060 | <0.09 | 7.74 | 7.57 | 11.60 | 863 | 869.5 |
| PFM102269 | 31004 | 0.50 | 2017-02-21 | −0.2 | 1520 | 54.7 | 74.5 | 170 | 77.7 | 2700 | 381.2 | 127 | 9.64 | 0.34 | 0.60 | 0.0031 | 0.0028 | 0.0259 | 1.080 | 0.09590 | 7.87 | 7.42 | 11.87 | 873 | 864.8 |
| PFM102269 | 31009 | 0.50 | 2017-03-21 | 2.5 | 1600 | 56.9 | 77.1 | 174 | 77.9 | 2668 | 381.7 | 133 | 8.45 | 0.33 | 0.23 | <0.002 | 0.0018 | 0.0370 | 1.110 | 0.00886 | 8.10 | 8.12 | 12.68 | 876 | 877.1 |
| PFM102269 | 31035 | 0.50 | 2017-04-25 | 1.7 | 1580 | 53.7 | 74.5 | 167 | 75.7 | 2673 | 370.9 | 125 | 9.30 | 0.28 | 0.18 | 0.0028 | 0.0032 | 0.0247 | 1.070 | 0.01110 | 7.96 | 8.06 | 15.96 | 867 | 876.9 |
| PFM102269 | 31099 | 0.50 | 2017-05-15 | 8.9 | 1840 | 69.8 | 93.2 | 210 | 77.6 | 2679 | 336.7 | 158 | 10.10 | 0.38 | 0.18 | 0.0047 | 0.0040 | 0.0301 | 1.340 | 0.01120 | 8.00 | | | 886 | |
| PFM102269 | 31119 | 0.50 | 2017-06-12 | 1.7 | 1630 | 58.1 | 77.3 | 178 | 78.4 | 2768 | 395.7 | 134 | 10.10 | 0.33 | 0.27 | 0.0038 | 0.0042 | 0.0270 | 1.120 | 0.01060 | 7.95 | 7.96 | 21.18 | 900 | 911.1 |
| PFM102269 | 31143 | 0.50 | 2017-08-01 | 1.0 | 1600 | 60.9 | 78.2 | 181 | 77.7 | 2762 | 394.9 | 141 | 10.10 | 0.31 | 0.35 | 0.0032 | 0.0041 | 0.0305 | 1.100 | 0.01130 | 8.06 | 7.94 | 27.56 | 897 | 910.9 |
| PFM102269 | 31165 | 0.50 | 2017-09-11 | −0.1 | 1630 | 62.2 | 81.2 | 185 | 80.7 | 2888 | 407.4 | 145 | 10.70 | 0.31 | 0.59 | 0.0035 | 0.00591 | 0.0331 | 1.120 | 0.01300 | 7.81 | 7.64 | 23.08 | 930 | 935.6 |
| PFM102269 | 31197 | 0.50 | 2017-10-12 | 0.2 | 1580 | 62.0 | 78.4 | 179 | 79.4 | 2772 | 392.2 | 143 | 9.60 | 0.31 | 0.61 | <0.002 | 0.0033 | 0.0300 | 1.110 | 0.01090 | 7.81 | 8.28 | 15.29 | 899 | 863.5 |
| PFM102269 | 31198 | 0.50 | 2017-11-06 | 0.3 | 1540 | 57.7 | 76.9 | 175 | 78.8 | 2707 | 373.8 | 135 | 8.82 | 0.35 | 0.59 | 0.0039 | 0.0024 | 0.0258 | 1.050 | 0.00195 | 7.81 | 8.21 | 16.58 | 882 | 880.6 |
| PFM102269 | 31207 | 0.50 | 2017-12-06 | 1.5 | 1540 | 56.9 | 74.4 | 173 | 78.9 | 2629 | 371.2 | 133 | 7.80 | 0.31 | 0.68 | 0.0073 | 0.0027 | 0.0297 | 1.050 | 0.01140 | 7.78 | 7.80 | 12.48 | 860 | 913.3 |

**Table A3-4. Surface water supplements.**

| Idcode | Sample no. | Sampling date (yyyy-mm-dd) | Depth (m) | NH4_N (mg/L) | NO2_N (mg/L) | NO3_N+NO2_N (mg/L) | NO3_N (mg/L) | N TOT (mg/L) | P TOT (mg/L) | PO4_P (mg/L) | POP (mg/L) | PON (mg/L) | SIO2_SI (mg/L) | Chl. C (ug/L) | Chl. A (ug/L) | Pheop. (ug/L) | POC (mg/L) | TOC (mg/L) | DOC (mg/L) | DIC (mg/L) | Abs. coeff. (1/m) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PFM000062 | 30990 | 2017-01-16 | 0.50 | 0.0041 | 0.0017 | 0.0626 | 0.0609 | 0.2960 | 0.0210 | 0.0079 | 0.0026 | 0.0165 | 0.756 | 0.3 | 1.1 | 0.3 | 0.106 | 4.4 | 4.4 | 14.7 | 0.20 |
| PFM000062 | 31027 | 2017-04-24 | 0.50 | 0.0013 | 0.0002 | 0.0003 | 0.0001 | 0.2290 | 0.0125 | 0.0010 | 0.0069 | 0.0338 | 0.199 | 0.3 | 1.2 | <0.2 | 0.307 | 18.4 | 18.0 | 18.0 | 0.30 |
| PFM000062 | 31137 | 2017-08-01 | 0.50 | 0.0014 | 0.0003 | 0.0005 | 0.0003 | 0.2600 | 0.0132 | 0.0010 | 0.0070 | 0.0451 | b | 0.3 | 2.6 | 0.5 | 0.303 | 29.7 | 26.6 | 13.4 | 0.22 |
| PFM000062 | 31187 | 2017-10-11 | 0.50 | 0.0088 | 0.0005 | 0.0046 | 0.0041 | 0.2650 | 0.0160 | 0.0032 | 0.0072 | 0.0393 | 0.595 | 0.4 | 2.9 | 2.3 | 0.307 | 4.5 | 4.5 | 10.2 | 0.18 |
| PFM000066 | 30998 | 2017-01-18 | 0.10 | 0.0081 | 0.0006 | 0.0269 | 0.0263 | 0.7490 | 0.0057 | <0.0005 | 0.0017 | 0.0126 | 5.320 | | | | 0.088 | 18.8 | 18.7 | 35.2 | 1.34 |
| PFM000066 | 31006 | 2017-02-21 | 0.10 | 0.0185 | 0.0006 | 0.0203 | 0.0198 | 0.7722 | 0.0086 | 0.0005 | 0.0032 | 0.0263 | 5.827 | | | | 0.167 | 18.5 | 18.9 | 39.9 | 2.40 |
| PFM000066 | 31013 | 2017-03-21 | 0.10 | 0.0064 | 0.0004 | 0.0220 | 0.0216 | 0.6440 | 0.0087 | 0.0010 | 0.0032 | 0.0200 | 4.790 | | | | 0.159 | 4.5 | 4.4 | 9.9 | 2.04 |
| PFM000066 | 31039 | 2017-04-26 | 0.10 | 0.0115 | 0.0004 | 0.0063 | 0.0058 | 0.6520 | 0.0077 | 0.0007 | 0.0032 | 0.0173 | 3.880 | | | | 0.167 | 15.7 | 15.7 | 28.4 | 2.10 |
| PFM000066 | 31098 | 2017-05-15 | 0.10 | 0.0204 | 0.0005 | 0.0086 | 0.0080 | 0.7430 | 0.0103 | 0.0015 | 0.0051 | 0.0341 | 3.320 | | | | 0.258 | 16.3 | 16.1 | 27.9 | 1.84 |
| PFM000066 | 31114 | 2017-06-12 | 0.10 | 0.0137 | 0.0004 | 0.0021 | 0.0018 | 0.7960 | 0.0132 | 0.0012 | 0.0058 | 0.0381 | 4.920 | | | | 0.292 | 19.7 | 19.2 | 30.8 | 3.86 |
| PFM000066 | 31161 | 2017-09-11 | 0.10 | 0.0181 | 0.0012 | 0.0109 | 0.0097 | 0.8410 | 0.0109 | 0.0010 | 0.0044 | 0.0251 | 5.160 | | | | 0.208 | 18.1 | 18.2 | 30.3 | 2.44 |
| PFM000066 | 31191 | 2017-10-09 | 0.10 | 0.0145 | 0.0011 | 0.0477 | 0.0466 | 1.0900 | 0.0271 | 0.0023 | 0.0103 | 0.0716 | 4.950 | | | | 0.728 | 26.6 | 25.4 | 27.5 | 5.12 |
| PFM000066 | 31202 | 2017-11-06 | 0.10 | 0.0123 | 0.0004 | 0.0055 | 0.0051 | 0.9470 | 0.0093 | 0.0006 | 0.0025 | 0.0108 | 6.150 | | | | 0.138 | 26.2 | 25.8 | 33.4 | 3.96 |
| PFM000066 | 31206 | 2017-12-06 | 0.10 | 0.0072 | 0.0005 | 0.0047 | 0.0042 | 0.8270 | 0.0080 | <0.0005 | 0.0021 | 0.0119 | 5.930 | | | | 0.090 | 22.9 | 22.6 | 33.5 | 3.48 |
| PFM000068 | 31000 | 2017-01-18 | 0.10 | 0.0166 | 0.0006 | 0.0833 | 0.0827 | 0.9510 | 0.0081 | <0.0005 | 0.0030 | 0.0296 | 4.940 | | | | 0.257 | 20.5 | 20.5 | 31.9 | 1.58 |
| PFM000068 | 31005 | 2017-02-21 | 0.10 | 0.0150 | 0.0007 | 0.0478 | 0.0471 | 0.8774 | 0.0115 | <0.0005 | 0.0060 | 0.0311 | 5.250 | | | | 0.314 | 20.1 | 20.1 | 34.9 | 2.52 |
| PFM000068 | 31010 | 2017-03-21 | 0.10 | 0.0084 | 0.0006 | 0.0412 | 0.0407 | 0.7230 | 0.0075 | 0.0009 | 0.0033 | 0.0296 | 4.080 | | | | 0.261 | 15.9 | 15.6 | 23.6 | 2.02 |
| PFM000068 | 31036 | 2017-04-25 | 0.10 | 0.0101 | 0.0006 | 0.0163 | 0.0157 | 0.7100 | 0.0081 | 0.0007 | 0.0031 | 0.0172 | 3.530 | | | | 0.184 | 17.1 | 16.9 | 24.1 | 2.24 |
| PFM000068 | 31095 | 2017-05-15 | 0.10 | 0.0159 | 0.0006 | 0.0093 | 0.0087 | 0.6830 | 0.0090 | 0.0009 | a | a | 4.190 | | | | a | 16.2 | 15.8 | 25.5 | 2.26 |
| PFM000068 | 31113 | 2017-06-12 | 0.10 | 0.0176 | 0.0004 | 0.0032 | 0.0028 | 0.8540 | 0.0164 | 0.0019 | 0.0096 | 0.0482 | 3.160 | | | | 0.389 | 18.2 | 17.5 | 28.3 | 2.54 |
| PFM000068 | 31158 | 2017-09-11 | 0.10 | 0.0137 | 0.0007 | 0.0082 | 0.0075 | 0.8760 | 0.0141 | 0.0011 | 0.0020 | 0.0238 | 5.290 | | | | 0.281 | 5.5 | 5.1 | 9.7 | 4.28 |
| PFM000068 | 31188 | 2017-10-09 | 0.10 | 0.0136 | 0.0018 | 0.1160 | 0.1140 | 1.3700 | 0.0266 | 0.0017 | 0.0130 | 0.1066 | 4.680 | | | | 1.010 | 32.9 | 32.2 | 22.2 | 6.34 |
| PFM000068 | 31199 | 2017-11-06 | 0.10 | 0.0074 | 0.0005 | 0.0060 | 0.0055 | 1.1400 | 0.0122 | <0.0005 | 0.0038 | 0.0190 | 5.080 | | | | 0.212 | 31.3 | 29.2 | 26.7 | 4.64 |
| PFM000068 | 31203 | 2017-12-06 | 0.10 | 0.0198 | 0.0027 | 0.0251 | 0.0225 | 1.1200 | 0.0096 | <0.0005 | 0.0029 | 0.0116 | 5.080 | | | | 0.131 | 30.4 | 28.4 | 30.9 | 4.68 |
| PFM000069 | 30996 | 2017-01-17 | 0.10 | 0.0035 | 0.0006 | 0.0019 | 0.0014 | 0.7460 | 0.0105 | 0.0005 | 0.0044 | 0.0349 | 6.530 | | | | 0.158 | 20.4 | 20.2 | 41.1 | 1.92 |
| PFM000069 | 31008 | 2017-02-21 | 0.10 | 0.0057 | 0.0003 | 0.0012 | 0.0009 | 0.7834 | 0.0163 | <0.0005 | 0.0087 | 0.0501 | 6.788 | | | | 0.339 | 20.7 | 20.4 | 47.6 | 3.44 |
| PFM000069 | 31011 | 2017-03-21 | 0.10 | 0.0044 | 0.0004 | 0.0130 | 0.0126 | 0.5990 | 0.0090 | 0.0008 | 0.0038 | 0.0186 | 5.520 | | | | 0.168 | 15.2 | 15.1 | 35.2 | 2.18 |
| PFM000069 | 31037 | 2017-04-25 | 0.10 | 0.0046 | 0.0004 | 0.0035 | 0.0030 | 0.6030 | 0.0083 | <0.0005 | 0.0029 | 0.0149 | 4.190 | | | | 0.158 | 15.7 | 15.8 | 28.8 | 2.24 |
| PFM000069 | 31096 | 2017-05-15 | 0.10 | 0.0044 | 0.0002 | 0.0007 | 0.0004 | 0.6370 | 0.0086 | 0.0007 | 0.0034 | 0.0207 | 4.580 | | | | 0.172 | 15.9 | 15.9 | 24.2 | 2.14 |
| PFM000069 | 31118 | 2017-06-12 | 0.10 | 0.0075 | 0.0003 | 0.0028 | 0.0025 | 0.7530 | 0.0125 | 0.0009 | 0.0048 | 0.0340 | 5.050 | | | | 0.265 | 18.4 | 18.2 | 31.5 | 3.56 |
| PFM000069 | 31159 | 2017-09-11 | 0.10 | 0.0130 | 0.0009 | 0.0085 | 0.0076 | 0.8590 | 0.0125 | 0.0015 | 0.0031 | 0.0176 | 5.460 | | | | 0.211 | 21.3 | 20.7 | 33.7 | 3.80 |
| PFM000069 | 31189 | 2017-10-09 | 0.10 | 0.0149 | 0.0010 | 0.0338 | 0.0328 | 1.0700 | 0.0260 | 0.0028 | 0.0116 | 0.0912 | 4.340 | | | | 0.969 | 25.2 | 24.1 | 20.7 | 4.86 |
| PFM000069 | 31200 | 2017-11-06 | 0.10 | 0.0094 | 0.0004 | 0.0036 | 0.0032 | 1.0700 | 0.0122 | 0.0007 | 0.0031 | 0.0174 | 6.360 | | | | 0.126 | 30.0 | 30.9 | 32.3 | 5.04 |
| PFM000069 | 31204 | 2017-12-06 | 0.10 | 0.0073 | 0.0007 | 0.0125 | 0.0118 | 1.0100 | 0.0098 | <0.0005 | 0.0022 | 0.0124 | 6.110 | | | | 0.096 | 29.7 | 29.0 | 35.3 | 4.80 |

| Idcode | Sample no. | Sampling date (yyyy-mm-dd) | Depth (m) | NH4_N (mg/L) | NO2_N (mg/L) | NO3_N+NO2_N (mg/L) | NO3_N (mg/L) | N TOT (mg/L) | P TOT (mg/L) | PO4_P (mg/L) | POP (mg/L) | PON (mg/L) | SIO2_SI (mg/L) | Chl. C (ug/L) | Chl. A (ug/L) | Pheop. (ug/L) | POC (mg/L) | TOC (mg/L) | DOC (mg/L) | DIC (mg/L) | Abs. coeff. (1/m) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PFM000070 | 30997 | 2017-01-17 | 0.10 | 0.1470 | 0.0011 | 0.0727 | 0.0716 | 1.3700 | 0.0074 | 0.0008 | 0.0026 | 0.0361 | 2.250 | | | | 0.392 | 23.1 | 22.9 | 22.7 | 0.60 |
| PFM000070 | 31007 | 2017-02-21 | 0.10 | 0.1095 | 0.0011 | 0.0531 | 0.0520 | 1.1584 | 0.0065 | 0.0005 | 0.0041 | 0.0769 | 1.832 | | | | 0.506 | 18.2 | 18.4 | 20.7 | 0.80 |
| PFM000070 | 31012 | 2017-03-21 | 0.10 | 0.0184 | 0.0007 | 0.0261 | 0.0255 | 0.7710 | 0.0061 | 0.0009 | 0.0034 | 0.0406 | 1.340 | | | | 0.387 | 14.2 | 13.9 | 16.3 | 1.02 |
| PFM000070 | 31038 | 2017-04-26 | 0.10 | 0.0169 | 0.0005 | 0.0291 | 0.0286 | 0.9520 | 0.0088 | 0.0007 | 0.0037 | 0.0390 | 1.390 | | | | 0.383 | 19.4 | 19.3 | 18.1 | 1.46 |
| PFM000070 | 31097 | 2017-05-15 | 0.10 | 0.0694 | 0.0009 | 0.0576 | 0.0568 | 0.9560 | 0.0097 | 0.0015 | 0.0048 | 0.0384 | 1.450 | | | | 0.360 | 17.5 | 17.1 | 22.9 | 1.30 |
| PFM000070 | 31117 | 2017-06-12 | 0.10 | 0.0120 | 0.0002 | 0.0061 | 0.0059 | 0.8000 | 0.0096 | 0.0009 | 0.0051 | 0.0394 | 2.230 | | | | 0.329 | 19.3 | 18.5 | 27.3 | 2.42 |
| PFM000070 | 31160 | 2017-09-11 | 0.10 | 0.0092 | 0.0002 | 0.0008 | 0.0006 | 0.8620 | 0.0096 | 0.0006 | 0.0037 | 0.0189 | 3.030 | | | | 0.186 | 22.5 | 22.4 | 26.3 | 3.00 |
| PFM000070 | 31190 | 2017-10-09 | 0.10 | 0.0084 | 0.0022 | 0.2140 | 0.2110 | 1.3100 | 0.0263 | 0.0009 | 0.0143 | 0.0975 | 2.450 | | | | 0.766 | 28.0 | 27.6 | 15.1 | 4.74 |
| PFM000070 | 31201 | 2017-11-06 | 0.10 | 0.0343 | 0.0010 | 0.0101 | 0.0091 | 1.1300 | 0.0096 | 0.0007 | 0.0048 | 0.0428 | 2.230 | | | | 0.429 | 24.5 | 23.3 | 18.5 | 2.08 |
| PFM000070 | 31205 | 2017-12-06 | 0.10 | 0.1130 | <0.0002 | 0.0183 | 0.0181 | 1.2200 | 0.0086 | <0.0005 | 0.0030 | 0.0283 | 2.940 | | | | 0.275 | 25.4 | 26.3 | 21.4 | 2.94 |
| PFM000074 | 30999 | 2017-01-18 | 0.50 | 0.0047 | 0.0008 | 0.0672 | 0.0664 | 0.8050 | 0.0054 | <0.0005 | 0.0013 | 0.0127 | 5.830 | <0.2 | <0.2 | <0.2 | 0.078 | 18.9 | 18.9 | 36.5 | 1.52 |
| PFM000074 | 31029 | 2017-04-24 | 0.50 | 0.0053 | <0.0002 | <0.0003 | <0.0003 | 0.6310 | 0.0070 | <0.0005 | 0.0021 | 0.0186 | 3.930 | <0.2 | 0.7 | <0.2 | 0.155 | 17.6 | 17.0 | 25.2 | 1.86 |
| PFM000074 | 31135 | 2017-07-31 | 0.50 | 0.0085 | <0.0002 | 0.0005 | 0.0005 | 1.0700 | 0.0132 | 0.0011 | 0.0037 | 0.0506 | b | 0.2 | 2.1 | 0.8 | 0.430 | 18.8 | 18.3 | 16.4 | 2.18 |
| PFM000074 | 31184 | 2017-10-09 | 0.50 | 0.0235 | 0.0003 | 0.0028 | 0.0025 | 0.6860 | 0.0071 | 0.0008 | 0.0031 | 0.0241 | 5.750 | 0.2 | 1.2 | 0.5 | 0.271 | 16.1 | 16.1 | 26.2 | 2.34 |
| PFM000083 | 30993 | 2017-01-17 | 0.50 | 0.0021 | 0.0016 | 0.0614 | 0.0598 | 0.2720 | 0.0143 | 0.0073 | 0.0030 | 0.0290 | 0.749 | 0.4 | 1.4 | 0.4 | 0.159 | 4.4 | 4.5 | 14.6 | 0.20 |
| PFM000083 | 31032 | 2017-04-25 | 0.50 | 0.0020 | <0.0002 | 0.0012 | 0.0010 | 0.2390 | 0.0136 | 0.0014 | 0.0081 | 0.0386 | 0.160 | 0.3 | 1.2 | 0.4 | 0.312 | 4.5 | 4.3 | 9.8 | 0.32 |
| PFM000083 | 31100 | 2017-05-15 | 0.50 | 0.0013 | 0.0002 | 0.0007 | 0.0005 | 0.2560 | 0.0151 | 0.0008 | 0.0081 | 0.0366 | 0.160 | 0.4 | 1.7 | 0.3 | 0.296 | 4.4 | 4.2 | 12.0 | 0.32 |
| PFM000083 | 31115 | 2017-06-12 | 0.50 | 0.0013 | <0.0002 | 0.0006 | 0.0005 | 0.2280 | 0.0107 | 0.0019 | 0.0059 | 0.0277 | 0.273 | <0.2 | 1.0 | <0.2 | 0.195 | 4.1 | 4.1 | 11.3 | 0.30 |
| PFM000083 | 31144 | 2017-08-02 | 0.50 | 0.0016 | <0.0002 | 0.0006 | 0.0005 | 0.2530 | 0.0111 | 0.0006 | 0.0065 | 0.0418 | b | 0.2 | 1.9 | 2.6 | 0.316 | 4.4 | 4.2 | 7.0 | 0.30 |
| PFM000083 | 31163 | 2017-09-11 | 0.50 | 0.0039 | 0.0015 | 0.0124 | 0.0109 | 0.2360 | 0.0149 | 0.0056 | 0.0040 | 0.0291 | 0.614 | 0.4 | 1.8 | 2.0 | 0.195 | 4.1 | 4.0 | 13.8 | 0.10 |
| PFM000083 | 31194 | 2017-10-12 | 0.50 | 0.0071 | 0.0005 | 0.0072 | 0.0067 | 0.2530 | 0.0135 | 0.0032 | 0.0051 | 0.0585 | 0.550 | 0.3 | 2.3 | 1.0 | 0.263 | 4.4 | 4.2 | 12.6 | 0.18 |
| PFM000084 | 30994 | 2017-01-17 | 0.50 | 0.0683 | 0.0046 | 0.8298 | 0.8250 | 1.6200 | 0.0205 | 0.0041 | 0.0071 | 0.0497 | 3.910 | 0.1 | 0.8 | 0.4 | 0.335 | 18.0 | 17.4 | 21.2 | 1.42 |
| PFM000084 | 31033 | 2017-04-25 | 0.50 | 0.0046 | 0.0015 | 0.1200 | 0.1181 | 0.7010 | 0.0311 | 0.0027 | 0.0146 | 0.0961 | 0.728 | 0.7 | 4.0 | 1.3 | 0.790 | 9.7 | 8.5 | 14.5 | 1.00 |
| PFM000084 | 31101 | 2017-05-15 | 0.50 | 0.0025 | 0.0004 | 0.0008 | 0.0005 | 0.5740 | 0.0535 | 0.0066 | 0.0262 | 0.2170 | 0.185 | 1.3 | 8.1 | 4.1 | 1.650 | 7.5 | 5.8 | 13.7 | 3.42 |
| PFM000084 | 31116 | 2017-06-12 | 0.50 | 0.0018 | <0.0002 | 0.0003 | <0.0003 | 0.3290 | 0.0255 | 0.0032 | 0.0143 | 0.0986 | 0.345 | 0.5 | 3.8 | 0.9 | 0.606 | 5.7 | 5.0 | 11.8 | 0.48 |
| PFM000084 | 31145 | 2017-08-02 | 0.50 | 0.0017 | <0.0002 | 0.0010 | 0.0008 | 0.3260 | 0.0214 | 0.0010 | 0.0124 | 0.0636 | b | 0.4 | 3.2 | 5.1 | 0.500 | 4.4 | 4.2 | 9.4 | 0.26 |
| PFM000084 | 31162 | 2017-09-11 | 0.50 | 0.0026 | 0.0006 | 0.0012 | 0.0006 | 0.4480 | 0.0308 | 0.0015 | 0.0165 | 0.0998 | 0.648 | 1.0 | 6.6 | 1.5 | 0.599 | 7.5 | 7.0 | 12.6 | 0.48 |
| PFM000084 | 31195 | 2017-10-12 | 0.50 | 0.0805 | 0.0108 | 0.8930 | 0.8820 | 1.7100 | 0.0496 | 0.0088 | 0.0232 | 0.1350 | 2.570 | 0.6 | 5.3 | 3.1 | 0.940 | 13.6 | 12.8 | 14.4 | 1.94 |
| PFM000107 | 30988 | 2017-01-16 | 0.50 | 0.0425 | 0.0009 | 0.0672 | 0.0663 | 1.1000 | 0.0095 | <0.0005 | 0.0031 | 0.0395 | 2.450 | 0.6 | 1.5 | 0.2 | 0.317 | 19.7 | 19.6 | 22.4 | 0.96 |
| PFM000107 | 30989 | 2017-01-16 | 1.00 | 0.1010 | 0.0013 | 0.0239 | 0.0227 | 1.0800 | 0.0110 | <0.0005 | 0.0039 | 0.0359 | 2.680 | 0.3 | 0.4 | 0.4 | 0.322 | 20.0 | 19.7 | 26.1 | 1.08 |
| PFM000107 | 31031 | 2017-04-25 | 0.50 | 0.0067 | <0.0002 | 0.0008 | 0.0007 | 0.7970 | 0.0111 | 0.0011 | 0.0049 | 0.0488 | 0.393 | 0.3 | 1.8 | 0.3 | 0.442 | 14.9 | 14.1 | 19.3 | 1.30 |
| PFM000107 | 31138 | 2017-07-31 | 0.50 | 0.0054 | <0.0002 | 0.0005 | 0.0004 | 1.3300 | 0.0194 | 0.0017 | 0.0071 | 0.0779 | b | 0.2 | 2.5 | 0.8 | 0.737 | 4.4 | 4.2 | 9.8 | 0.60 |
| PFM000107 | 31193 | 2017-10-11 | 0.50 | 0.0081 | 0.0002 | 0.0033 | 0.0031 | 1.0800 | 0.0149 | 0.0014 | 0.0064 | 0.0921 | 0.362 | 0.2 | 2.3 | 1.0 | 0.755 | 17.8 | 17.9 | 14.1 | 0.82 |
| PFM000117 | 30991 | 2017-01-16 | 0.50 | 0.1470 | 0.0008 | 0.0344 | 0.0335 | 1.3300 | 0.0070 | 0.0005 | 0.0028 | 0.0594 | 2.100 | 0.5 | 1.0 | <0.2 | 0.708 | 22.8 | 22.5 | 20.0 | 0.52 |
| PFM000117 | 30992 | 2017-01-16 | 1.50 | 0.2820 | 0.0007 | 0.0289 | 0.0282 | 1.3800 | 0.0068 | <0.0005 | 0.0039 | 0.0586 | 2.720 | 0.3 | 1.0 | <0.2 | 0.659 | 23.5 | 22.6 | 22.7 | 0.94 |

| Idcode | Sample no. | Sampling date (yyyy-mm-dd) | Depth (m) | NH4_N (mg/L) | NO2_N (mg/L) | NO3_N+NO2_N (mg/L) | NO3_N (mg/L) | N TOT (mg/L) | P TOT (mg/L) | PO4_P (mg/L) | POP (mg/L) | PON (mg/L) | SIO2_SI (mg/L) | Chl. C (ug/L) | Chl. A (ug/L) | Pheop. (ug/L) | POC (mg/L) | TOC (mg/L) | DOC (mg/L) | DIC (mg/L) | Abs. coeff. (1/m) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PFM000117 | 31028 | 2017-04-24 | 0.50 | 0.0040 | 0.0005 | 0.0009 | 0.0004 | 0.9600 | 0.0082 | 0.0005 | 0.0027 | 0.0492 | 1.140 | 0.3 | 1.4 | 3.9 | 0.411 | 14.5 | 14.7 | 30.4 | 1.16 |
| PFM000117 | 31134 | 2017-07-31 | 0.50 | 0.0057 | <0.0002 | 0.0004 | <0.0003 | 1.2200 | 0.0101 | 0.0009 | 0.0051 | 0.0508 | b | 0.2 | 1.6 | 0.5 | 0.578 | 21.6 | 21.2 | 10.7 | 0.66 |
| PFM000117 | 31185 | 2017-10-09 | 0.50 | 0.0113 | <0.0002 | 0.0026 | 0.0024 | 1.1200 | 0.0088 | 0.0012 | 0.0043 | 0.0545 | 1.630 | 0.3 | 2.1 | 0.4 | 0.576 | 18.2 | 17.8 | 11.9 | 0.48 |
| PFM007783 | 30995 | 2017-01-17 | 0.50 | 0.0029 | 0.0015 | 0.0557 | 0.0542 | 0.2740 | 0.0121 | 0.0054 | 0.0022 | 0.0046 | 0.736 | 0.3 | 1.1 | 0.4 | 0.066 | 4.3 | 4.3 | 15.0 | 0.26 |
| PFM007783 | 31034 | 2017-04-25 | 0.50 | 0.0028 | 0.0003 | 0.0272 | 0.0269 | 0.2570 | 0.0124 | 0.0029 | 0.0063 | 0.0428 | 0.180 | <0.2 | 1.0 | 0.5 | 0.258 | 4.5 | 4.1 | 10.0 | 0.28 |
| PFM007783 | 31102 | 2017-05-15 | 0.50 | 0.0030 | 0.0002 | 0.0071 | 0.0069 | 0.3070 | 0.0196 | 0.0012 | 0.0108 | 0.0730 | 0.085 | 0.5 | 2.7 | 0.9 | 0.517 | 4.7 | 4.4 | 12.9 | 0.34 |
| PFM007783 | 31120 | 2017-06-12 | 0.50 | 0.0035 | 0.0003 | 0.0048 | 0.0045 | 0.2620 | 0.0135 | 0.0021 | 0.0075 | 0.0630 | 0.108 | 0.3 | 2.3 | <0.2 | 0.412 | 4.6 | 4.4 | 10.0 | 0.32 |
| PFM007783 | 31142 | 2017-08-01 | 0.50 | 0.0019 | 0.0002 | 0.0019 | 0.0017 | 0.3430 | 0.0232 | 0.0008 | 0.0119 | 0.0755 | b | 0.3 | 1.7 | 0.4 | 0.517 | 4.9 | 4.3 | 8.2 | 0.26 |
| PFM007783 | 31164 | 2017-09-11 | 0.50 | 0.0030 | 0.0003 | 0.0094 | 0.0091 | 0.3250 | 0.0177 | 0.0020 | 0.0091 | 0.0591 | 0.471 | 0.4 | 3.0 | 0.6 | 0.398 | 4.9 | 4.6 | 11.9 | 0.22 |
| PFM007783 | 31196 | 2017-10-12 | 0.50 | 0.0031 | 0.0004 | 0.0040 | 0.0037 | 0.2620 | 0.0127 | 0.0013 | 0.0051 | 0.0325 | 0.492 | 0.3 | 2.3 | 1.0 | 0.238 | 4.4 | 4.3 | 10.4 | 0.20 |
| PFM007910 | 31139 | 2017-08-01 | 0.50 | 0.0009 | <0.0002 | 0.0004 | <0.0003 | 0.2670 | 0.0131 | <0.0005 | 0.0038 | 0.0523 | b | 0.4 | 2.4 | 1.0 | 0.402 | 20.3 | 20.4 | 7.2 | 0.24 |
| PFM007911 | 31140 | 2017-08-01 | 0.50 | 0.0011 | <0.0002 | 0.0004 | <0.0003 | 0.2760 | 0.0165 | 0.0008 | 0.0069 | 0.0750 | b | 0.5 | 2.8 | 0.3 | 0.469 | 4.7 | 4.6 | 9.3 | 0.22 |
| PFM007912 | 31141 | 2017-08-01 | 0.50 | 0.0016 | 0.0003 | 0.0004 | <0.0003 | 0.2980 | 0.0196 | 0.0013 | 0.0118 | 0.0785 | b | 0.3 | 2.3 | 1.0 | 0.572 | 4.7 | 4.4 | 9.0 | 0.24 |
| PFM102269 | 31001 | 2017-01-18 | 0.50 | 0.0036 | 0.0017 | 0.0634 | 0.0617 | 0.2800 | 0.0158 | 0.0078 | 0.0036 | 0.0138 | 0.753 | 0.4 | 1.3 | 0.3 | 0.142 | 4.4 | 4.3 | 14.7 | 0.14 |
| PFM102269 | 31004 | 2017-02-21 | 0.50 | 0.0023 | 0.0016 | 0.0354 | 0.0339 | 0.2567 | 0.0132 | 0.0050 | 0.0028 | 0.0166 | 0.651 | | | | 0.133 | 4.8 | 4.5 | 10.3 | 0.26 |
| PFM102269 | 31009 | 2017-03-21 | 0.50 | 0.0019 | 0.0002 | 0.0013 | 0.0011 | 0.2330 | 0.0117 | 0.0008 | 0.0052 | 0.0265 | 0.251 | | | | 0.227 | 4.8 | 4.5 | 9.1 | 0.24 |
| PFM102269 | 31035 | 2017-04-25 | 0.50 | 0.0022 | 0.0002 | 0.0017 | 0.0015 | 0.2440 | 0.0152 | 0.0017 | 0.0080 | 0.0510 | 0.177 | 0.5 | 2.3 | 0.8 | 0.467 | 4.5 | 4.1 | 9.6 | 0.30 |
| PFM102269 | 31099 | 2017-05-15 | 0.50 | 0.0023 | <0.0002 | 0.0014 | 0.0012 | 0.2450 | 0.0142 | 0.0018 | 0.0077 | 0.0358 | 0.159 | 0.5 | 2.3 | 0.7 | 0.274 | 4.3 | 4.3 | 10.9 | 0.24 |
| PFM102269 | 31119 | 2017-06-12 | 0.50 | 0.0048 | 0.0002 | 0.0023 | 0.0021 | 0.2320 | 0.0138 | 0.0035 | 0.0071 | 0.0732 | 0.275 | 0.5 | 3.0 | 0.4 | 0.547 | 4.2 | 4.0 | 11.3 | 0.26 |
| PFM102269 | 31143 | 2017-08-01 | 0.50 | 0.0071 | 0.0003 | 0.0033 | 0.0030 | 0.2680 | 0.0146 | 0.0024 | 0.0056 | 0.0279 | b | <0.2 | 1.1 | 0.0 | 0.192 | 5.1 | 4.5 | 8.8 | 0.16 |
| PFM102269 | 31165 | 2017-09-11 | 0.50 | 0.0070 | 0.0008 | 0.0059 | 0.0051 | 0.2460 | 0.0136 | 0.0045 | 0.0045 | 0.0349 | 0.608 | 0.3 | 1.9 | 0.6 | 0.180 | 4.2 | 4.2 | 11.2 | 0.08 |
| PFM102269 | 31197 | 2017-10-12 | 0.50 | 0.0115 | 0.0009 | 0.0267 | 0.0258 | 0.2730 | 0.0147 | 0.0065 | 0.0028 | 0.0143 | 0.636 | 0.2 | 1.3 | 1.1 | 0.159 | 4.5 | 4.2 | 12.7 | 0.18 |
| PFM102269 | 31198 | 2017-11-06 | 0.50 | 0.0141 | 0.0026 | 0.0374 | 0.0348 | 0.2870 | 0.0164 | 0.0075 | 0.0046 | 0.0162 | 0.571 | 0.2 | 1.5 | 0.5 | 0.132 | 4.3 | 4.1 | 13.5 | 0.26 |
| PFM102269 | 31207 | 2017-12-06 | 0.50 | 0.0082 | 0.0021 | 0.0688 | 0.0667 | 0.3140 | 0.0172 | 0.0085 | 0.0023 | 0.0133 | 0.721 | 0.2 | 1.2 | <0.2 | 0.127 | 4.9 | 4.5 | 14.1 | 0.28 |

a = No results due to analytical problems.

b = No results, samples frozen when arriving at external laboratory.

**Table A3-5. Isotopes I.**

| Idcode | Sample no. | Sampling date (yyyy-mm-dd) | ∂2H ‰ SMOW | 3H TU | ∂18O ‰ SMOW |
|---|---|---|---|---|---|
| PFM000062 | 30990 | 2017-01-16 | −60.5 | 8.3 | −8.0 |
| PFM000062 | 31027 | 2017-04-24 | −60.1 | 8.4 | −8.0 |
| PFM000062 | 31137 | 2017-08-01 | −59.6 | 6.9 | −7.8 |
| PFM000062 | 31187 | 2017-10-11 | −64.2 | 9.2 | −8.0 |
| PFM000066 | 30998 | 2017-01-18 | −78.2 | 5.8 | −11.0 |
| PFM000066 | 31013 | 2017-03-21 | −83.1 | 7.4 | −11.8 |
| PFM000066 | 31039 | 2017-04-26 | −75.8 | 5.5 | −10.8 |
| PFM000066 | 31098 | 2017-05-15 | −74.3 | 6.7 | −10.2 |
| PFM000066 | 31114 | 2017-06-12 | −71.6 | 8.0 | −10.1 |
| PFM000066 | 31161 | 2017-09-11 | −60.0 | 7.8 | −8.1 |
| PFM000066 | 31191 | 2017-10-09 | −83.3 | 9.1 | −11.2 |
| PFM000066 | 31206 | 2017-12-06 | −82.6 | 8.2 | −11.8 |
| PFM000068 | 31000 | 2017-01-18 | −72.3 | 8.6 | −9.9 |
| PFM000068 | 31010 | 2017-03-21 | −76.1 | 6.7 | −10.3 |
| PFM000068 | 31036 | 2017-04-25 | −72.3 | 9.7 | −9.9 |
| PFM000068 | 31095 | 2017-05-15 | −75.6 | 8.8 | −10.5 |
| PFM000068 | 31113 | 2017-06-12 | −67.7 | 5.7 | −9.0 |
| PFM000068 | 31158 | 2017-09-11 | −70.7 | 7.0 | −10.2 |
| PFM000068 | 31188 | 2017-10-09 | −84.0 | 8.2 | −10.9 |
| PFM000068 | 31203 | 2017-12-06 | −75.1 | 7.2 | −10.4 |
| PFM000069 | 30996 | 2017-01-17 | −79.4 | 9.0 | −11.2 |
| PFM000069 | 31011 | 2017-03-21 | −83.2 | 6.7 | −11.8 |
| PFM000069 | 31037 | 2017-04-25 | −77.8 | 6.9 | −11.0 |
| PFM000069 | 31096 | 2017-05-15 | −76.2 | 9.4 | −10.7 |
| PFM000069 | 31118 | 2017-06-12 | −72.0 | 6.6 | −10.2 |
| PFM000069 | 31159 | 2017-09-11 | −69.4 | 7.4 | −10.0 |
| PFM000069 | 31189 | 2017-10-09 | −83.3 | 8.5 | −11.1 |
| PFM000069 | 31204 | 2017-12-06 | −82.1 | 8.4 | −11.6 |
| PFM000070 | 30997 | 2017-01-17 | −56.7 | 7.5 | −6.3 |
| PFM000070 | 31012 | 2017-03-21 | −63.1 | 7.9 | −7.6 |
| PFM000070 | 31038 | 2017-04-26 | −59.7 | 7.4 | −7.2 |
| PFM000070 | 31097 | 2017-05-15 | −57.3 | 7.4 | −6.8 |
| PFM000070 | 31117 | 2017-06-12 | −55.0 | 8.4 | −6.7 |
| PFM000070 | 31160 | 2017-09-11 | −56.3 | 8.0 | −7.5 |
| PFM000070 | 31190 | 2017-10-09 | −85.5 | 8.9 | −11.3 |
| PFM000070 | 31205 | 2017-12-06 | −65.5 | 8.0 | −8.2 |
| PFM000074 | 30999 | 2017-01-18 | −78.8 | 7.5 | −10.9 |
| PFM000074 | 31029 | 2017-04-24 | −74.5 | 8.7 | −10.6 |
| PFM000074 | 31135 | 2017-07-31 | −61.3 | 9.5 | −6.9 |
| PFM000074 | 31184 | 2017-10-09 | −77.3 | 9.3 | −10.4 |
| PFM000083 | 30993 | 2017-01-17 | −60.1 | 8.0 | −8.0 |
| PFM000083 | 31032 | 2017-04-25 | −59.7 | 7.1 | −8.1 |
| PFM000083 | 31100 | 2017-05-15 | −60.0 | 5.9 | −8.2 |
| PFM000083 | 31115 | 2017-06-12 | −58.4 | 6.8 | −8.1 |
| PFM000083 | 31144 | 2017-08-02 | −58.3 | 5.9 | −7.7 |
| PFM000083 | 31163 | 2017-09-11 | −58.2 | 6.4 | −8.1 |
| PFM000083 | 31194 | 2017-10-12 | −64.4 | 7.4 | −8.0 |
| PFM000084 | 30994 | 2017-01-17 | −70.4 | 5.5 | −9.5 |
| PFM000084 | 31033 | 2017-04-25 | −65.0 | 7.2 | −8.9 |
| PFM000084 | 31101 | 2017-05-15 | −60.6 | 6.7 | −8.3 |
| PFM000084 | 31116 | 2017-06-12 | −57.2 | 6.2 | −8.1 |
| PFM000084 | 31145 | 2017-08-02 | −60.5 | 7.5 | −7.7 |
| PFM000084 | 31162 | 2017-09-11 | −58.7 | 6.9 | −7.7 |
| PFM000084 | 31195 | 2017-10-12 | −75.1 | 7.5 | −9.6 |

| Idcode | Sample no. | Sampling date (yyyy-mm-dd) | ∂2H ‰ SMOW | 3H TU | ∂18O ‰ SMOW |
|---|---|---|---|---|---|
| PFM000107 | 30988 | 2017-01-16 | −65.8 | 7.5 | −8.4 |
| PFM000107 | 30989 | 2017-01-16 | −63.3 | 9.1 | −8.1 |
| PFM000107 | 31031 | 2017-04-25 | −63.1 | 6.0 | −8.0 |
| PFM000107 | 31138 | 2017-07-31 | −43.1 | 7.4 | −3.5 |
| PFM000107 | 31193 | 2017-10-11 | −56.9 | 8.7 | −6.1 |
| PFM000117 | 30991 | 2017-01-16 | −54.9 | 9.6 | −6.1 |
| PFM000117 | 30992 | 2017-01-16 | −59.0 | 7.4 | −7.1 |
| PFM000117 | 31028 | 2017-04-24 | −57.3 | 7.1 | −6.9 |
| PFM000117 | 31134 | 2017-07-31 | −48.2 | 7.8 | −4.3 |
| PFM000117 | 31185 | 2017-10-09 | −52.0 | 7.4 | −5.1 |
| PFM007783 | 30995 | 2017-01-17 | −60.8 | 8.0 | −8.1 |
| PFM007783 | 31034 | 2017-04-25 | −59.5 | 7.8 | −8.1 |
| PFM007783 | 31102 | 2017-05-15 | −58.3 | 5.6 | −8.1 |
| PFM007783 | 31120 | 2017-06-12 | −58.4 | 6.1 | −8.1 |
| PFM007783 | 31142 | 2017-08-01 | −58.2 | 6.8 | −7.6 |
| PFM007783 | 31164 | 2017-09-11 | −58.6 | 6.5 | −7.8 |
| PFM007783 | 31196 | 2017-10-12 | −66.3 | 6.5 | −8.4 |
| PFM007910 | 31139 | 2017-08-01 | −59.3 | 5.5 | −7.8 |
| PFM007911 | 31140 | 2017-08-01 | −61.6 | 6.1 | −7.7 |
| PFM007912 | 31141 | 2017-08-01 | −60.9 | 6.0 | −7.7 |
| PFM102269 | 31001 | 2017-01-18 | −60.9 | 6.9 | −8.0 |
| PFM102269 | 31004 | 2017-02-21 | −62.8 | 8.7 | −8.1 |
| PFM102269 | 31009 | 2017-03-21 | −61.7 | 6.7 | −8.2 |
| PFM102269 | 31035 | 2017-04-25 | −59.6 | 9.5 | −8.1 |
| PFM102269 | 31099 | 2017-05-15 | −58.1 | 5.1 | −8.2 |
| PFM102269 | 31119 | 2017-06-12 | −58.5 | 5.6 | −8.0 |
| PFM102269 | 31143 | 2017-08-01 | −59.8 | 7.3 | −7.8 |
| PFM102269 | 31165 | 2017-09-11 | −59.3 | 60.3 | −8.0 |
| PFM102269 | 31197 | 2017-10-12 | −67.5 | 26.9 | −8.2 |
| PFM102269 | 31198 | 2017-11-06 | −58.4 | 6.3 | −8.0 |
| PFM102269 | 31207 | 2017-12-06 | −61.1 | 6.4 | −8.0 |

**Table A3-6. Trace elements I and II. Continues on next sheet.**

| Idcode | Sample no. | Sampling date (yyyy-mm-dd) | Depth (m) | Al (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) | Se (ug/L) | U (µg/l) | Th (µg/l) | Sc (µg/l) | Rb (µg/l) | Y (µg/l) | Zr (µg/l) | Sb (µg/l) | Cs (µg/l) | La (µg/l) | Hf (µg/l) | Tl (µg/l) | Ce (µg/l) | Pr (µg/l) | Nd (µg/l) | Sm (µg/l) | Eu (µg/l) | Gd (µg/l) | Tb (µg/l) | Dy (µg/l) | Ho (µg/l) | Er (µg/l) | Tm (µg/l) | Yb (µg/l) | Lu (µg/l) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PFM000062 | 30990 | 2017-01-16 | 0.50 | 1.35 | <0.02 | 0.0838 | 0.650 | <0.02 | <0.002 | 0.616 | 1.350 | <0.1 | 0.182 | 1.360 | 17.3 | <3 | 0.630 | <0.2 | <0.4 | 15.400 | 0.065 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM000062 | 31027 | 2017-04-24 | 0.50 | 0.77 | <0.02 | 0.0465 | 0.881 | <0.02 | <0.002 | 0.921 | 3.170 | <0.1 | 0.204 | 1.470 | 16.4 | <3 | 0.619 | <0.2 | <0.4 | 17.400 | 0.043 | <0.1 | 0.322 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM000062 | 31137 | 2017-08-01 | 0.50 | 1.44 | <0.02 | <0.04 | 0.742 | 0.0211 | <0.002 | 0.571 | 0.839 | <0.1 | 0.369 | 1.700 | 20.6 | <3 | 0.797 | <0.2 | <0.4 | 17.400 | 0.015 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM000062 | 31187 | 2017-10-11 | 0.50 | 1.60 | <0.02 | 0.0739 | 0.394 | <0.02 | <0.002 | 0.950 | <0.8 | <0.1 | 0.319 | 1.550 | 17.8 | <3 | 0.589 | <0.2 | <0.4 | 17.600 | 0.012 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM000066 | 30998 | 2017-01-18 | 0.10 | 8.33 | 0.0028 | 0.1330 | 1.200 | 0.0479 | <0.002 | 0.497 | 1.650 | 0.0174 | 0.176 | 0.435 | 23.3 | <0.5 | 1.600 | 0.027 | <0.05 | 2.300 | 0.161 | 0.253 | 0.109 | <0.03 | 0.064 | 0.008 | <0.01 | 0.077 | 0.020 | 0.084 | 0.019 | 0.005 | 0.022 | <0.005 | 0.025 | 0.006 | 0.017 | <0.004 | 0.019 | <0.005 |
| PFM000066 | 31006 | 2017-02-21 | 0.10 | 8.53 | 0.0047 | 0.1810 | 1.070 | 0.0980 | <0.002 | 0.572 | 4.900 | 0.0290 | 0.268 | 0.498 | 28.0 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000066 | 31013 | 2017-03-21 | 0.10 | 10.10 | 0.0028 | 0.1600 | 1.220 | 0.0548 | <0.002 | 0.536 | 12.800 | 0.5840 | 0.262 | 0.544 | 22.8 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000066 | 31039 | 2017-04-26 | 0.10 | 5.74 | 0.0029 | 0.1110 | 0.842 | 0.0462 | <0.002 | 0.581 | 5.050 | 0.0177 | 0.279 | 0.605 | 21.9 | <0.5 | 2.080 | <0.02 | <0.05 | 2.240 | 0.116 | 0.202 | 0.050 | <0.03 | 0.043 | 0.005 | <0.01 | 0.052 | 0.014 | 0.062 | 0.015 | <0.005 | 0.014 | <0.005 | 0.016 | <0.005 | 0.011 | <0.004 | 0.014 | <0.005 |
| PFM000066 | 31098 | 2017-05-15 | 0.10 | 3.84 | <0.002 | 0.1120 | 0.683 | 0.0720 | <0.002 | 0.415 | 4.510 | 0.0170 | 0.199 | 0.575 | 25.2 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000066 | 31114 | 2017-06-12 | 0.10 | 12.00 | 0.0043 | 0.1320 | 0.429 | 0.1300 | <0.002 | 0.509 | 1.490 | 0.0300 | 0.215 | 0.337 | 26.4 | 0.554 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000066 | 31161 | 2017-09-11 | 0.10 | 4.89 | 0.0025 | 0.0677 | 0.409 | 0.0497 | <0.002 | 0.340 | 1.280 | 0.0358 | 0.360 | 0.422 | 26.0 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000066 | 31191 | 2017-10-09 | 0.10 | 18.30 | 0.0076 | 0.1990 | 3.430 | 0.1200 | 0.0022 | 1.110 | 2.840 | 0.0694 | 0.429 | 0.925 | 29.8 | <0.5 | 2.570 | 0.046 | <0.05 | 6.030 | 0.375 | 0.529 | 0.067 | <0.03 | 0.209 | 0.013 | <0.01 | 0.304 | 0.058 | 0.234 | 0.051 | 0.006 | 0.053 | 0.009 | 0.050 | 0.012 | 0.034 | 0.005 | 0.036 | <0.005 |
| PFM000066 | 31202 | 2017-11-06 | 0.10 | 18.50 | <0.002 | 0.3860 | 1.510 | 0.1050 | 0.0022 | 0.979 | 90.100 | 0.0362 | 0.567 | 0.407 | 25.9 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000066 | 31206 | 2017-12-06 | 0.10 | 24.40 | <0.002 | 0.2240 | 1.450 | 0.0675 | 0.0028 | 0.781 | 1.810 | 0.0403 | 0.441 | 0.374 | 21.3 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000068 | 31000 | 2017-01-18 | 0.10 | 13.20 | 0.0030 | 0.1360 | 0.810 | 0.0988 | <0.002 | 0.529 | 1.860 | 0.0341 | 0.176 | 0.455 | 22.1 | <0.5 | 2.810 | 0.036 | <0.05 | 2.790 | 0.232 | 0.306 | 0.085 | <0.03 | 0.168 | 0.009 | <0.01 | 0.213 | 0.043 | 0.159 | 0.034 | 0.006 | 0.030 | <0.005 | 0.034 | 0.008 | 0.022 | <0.004 | 0.023 | 0.005 |
| PFM000068 | 31005 | 2017-02-21 | 0.10 | 15.30 | 0.0045 | 0.1990 | 0.768 | 0.1070 | <0.002 | 0.626 | 3.360 | 0.0342 | 0.252 | 0.467 | 25.5 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000068 | 31010 | 2017-03-21 | 0.10 | 16.80 | 0.0041 | 0.1560 | 0.763 | 0.0699 | <0.002 | 0.507 | 15.900 | 0.0307 | 0.272 | 0.822 | 19.5 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000068 | 31036 | 2017-04-25 | 0.10 | 10.60 | 0.0035 | 0.1080 | 0.790 | 0.0492 | <0.002 | 0.526 | 2.420 | 0.0297 | 0.269 | 0.859 | 20.6 | <0.5 | 4.700 | <0.02 | <0.05 | 2.430 | 0.146 | 0.246 | 0.054 | <0.03 | 0.093 | 0.006 | <0.01 | 0.116 | 0.024 | 0.100 | 0.022 | <0.005 | 0.020 | <0.005 | 0.021 | <0.005 | 0.015 | <0.004 | 0.015 | <0.005 |
| PFM000068 | 31095 | 2017-05-15 | 0.10 | 9.65 | <0.002 | 0.1380 | 0.530 | 0.0890 | <0.002 | 0.486 | 5.400 | 0.0250 | 0.262 | 0.635 | 25.8 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000068 | 31113 | 2017-06-12 | 0.10 | 3.68 | 0.0031 | 0.0918 | 0.470 | 0.0746 | <0.002 | 0.460 | 0.934 | 0.0301 | 0.164 | 0.456 | 25.1 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000068 | 31158 | 2017-09-11 | 0.10 | 13.90 | 0.0035 | 0.1370 | 0.388 | 0.1180 | <0.002 | 0.482 | 2.350 | 0.0457 | 0.412 | 0.336 | 32.5 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000068 | 31188 | 2017-10-09 | 0.10 | 50.80 | 0.0129 | 0.2640 | 3.670 | 0.1310 | 0.0034 | 1.510 | 3.520 | 0.1130 | 0.407 | 0.726 | 26.6 | <0.5 | 2.720 | 0.109 | <0.05 | 4.630 | 0.605 | 0.609 | 0.069 | <0.03 | 0.653 | 0.017 | <0.01 | 0.923 | 0.158 | 0.593 | 0.124 | 0.013 | 0.111 | 0.016 | 0.096 | 0.021 | 0.056 | 0.009 | 0.060 | 0.008 |
| PFM000068 | 31199 | 2017-11-06 | 0.10 | 31.30 | 0.0062 | 0.1970 | 1.690 | 0.0846 | 0.0029 | 0.897 | 3.620 | 0.0685 | 0.602 | 0.854 | 20.8 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000068 | 31203 | 2017-12-06 | 0.10 | 39.00 | 0.0056 | 0.2820 | 1.900 | 0.0786 | 0.0034 | 0.916 | 2.53 | 0.0685 | 0.496 | 0.717 | 19.8 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000069 | 30996 | 2017-01-17 | 0.10 | 12.70 | 0.0035 | 0.1400 | 0.551 | 0.2130 | 0.0022 | 0.488 | 1.59 | 0.0537 | 0.205 | 0.456 | 29.6 | <0.5 | 4.290 | 0.033 | <0.05 | 3.110 | 0.265 | 0.343 | 0.062 | <0.03 | 0.133 | 0.008 | <0.01 | 0.206 | 0.038 | 0.150 | 0.034 | 0.007 | 0.032 | <0.005 | 0.037 | 0.008 | 0.026 | 0.004 | 0.027 | <0.005 |
| PFM000069 | 31008 | 2017-02-21 | 0.10 | 15.20 | 0.0037 | 0.1860 | 0.465 | 0.1460 | <0.002 | 0.553 | 3.28 | 0.0505 | 0.241 | 0.379 | 31.0 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000069 | 31011 | 2017-03-21 | 0.10 | 12.60 | 0.0021 | 0.1430 | 0.605 | 0.0721 | <0.002 | 0.623 | 11.70 | 0.0408 | 0.206 | 1.290 | 26.9 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000069 | 31037 | 2017-04-25 | 0.10 | 8.73 | 0.0030 | 0.1110 | 0.550 | 0.0363 | <0.002 | 0.418 | 2.24 | 0.0309 | 0.169 | 0.974 | 21.3 | <0.5 | 6.700 | <0.02 | <0.05 | 2.520 | 0.135 | 0.218 | 0.050 | <0.03 | 0.067 | <0.005 | <0.01 | 0.071 | 0.018 | 0.078 | 0.017 | <0.005 | 0.018 | <0.005 | 0.017 | <0.005 | 0.013 | <0.004 | 0.014 | <0.005 |
| PFM000069 | 31096 | 2017-05-15 | 0.10 | 9.88 | <0.002 | 0.0630 | 0.411 | 0.0460 | <0.002 | 0.423 | 5.05 | 0.0260 | 0.238 | 0.600 | 24.9 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000069 | 31118 | 2017-06-12 | 0.10 | 11.80 | <0.002 | 0.1300 | 0.346 | 0.0701 | <0.002 | 0.354 | 2.24 | 0.0366 | 0.180 | 0.242 | 24.8 | 0.697 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000069 | 31159 | 2017-09-11 | 0.10 | 15.90 | 0.0030 | 0.1090 | 2.760 | 0.0817 | <0.002 | 0.514 | 1.82 | 0.0548 | 0.385 | 0.240 | 31.0 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000069 | 31189 | 2017-10-09 | 0.10 | 22.60 | 0.0097 | 0.1480 | 3.180 | 0.0867 | 0.0027 | 1.050 | 4.03 | 0.0746 | 0.269 | 0.971 | 23.4 | <0.5 | 3.460 | 0.047 | <0.05 | 4.130 | 0.350 | 0.374 | 0.075 | <0.03 | 0.291 | 0.009 | <0.01 | 0.336 | 0.073 | 0.291 | 0.057 | 0.006 | 0.058 | 0.009 | 0.047 | 0.011 | 0.028 | 0.005 | 0.033 | <0.005 |
| PFM000069 | 31200 | 2017-11-06 | 0.10 | 26.00 | 0.0030 | 0.2560 | 1.840 | 0.0744 | 0.0025 | 1.150 | 2.58 | 0.0695 | 0.633 | 1.330 | 28.2 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000069 | 31204 | 2017-12-06 | 0.10 | 33.20 | 0.0040 | 0.2850 | 2.340 | 0.0714 | 0.0028 | 1.070 | 2.16 | 0.0674 | 0.498 | 1.070 | 27.7 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000070 | 30997 | 2017-01-17 | 0.10 | 1.96 | <0.002 | 0.0282 | 0.489 | 0.0367 | <0.002 | 0.176 | 1.40 | 0.0189 | 0.257 | 0.376 | 15.9 | <0.5 | 1.620 | <0.02 | <0.05 | 2.490 | 0.043 | 0.087 | 0.108 | <0.03 | 0.018 | <0.005 | <0.01 | 0.016 | <0.005 | 0.019 | <0.005 | <0.005 | <0.005 | <0.005 | 0.005 | <0.005 | <0.005 | <0.004 | <0.005 | <0.005 |
| PFM000070 | 31007 | 2017-02-21 | 0.10 | 2.78 | <0.002 | 0.0663 | 0.489 | 0.1170 | <0.002 | 0.265 | 275 | 0.0201 | 0.297 | 0.362 | 15.6 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000070 | 31012 | 2017-03-21 | 0.10 | 4.31 | <0.002 | 0.0686 | 0.527 | 0.0328 | <0.002 | 0.206 | 11.40 | 0.0302 | 0.251 | 0.320 | 13.4 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000070 | 31038 | 2017-04-26 | 0.10 | 3.69 | 0.0037 | 0.0321 | 0.530 | 0.0339 | <0.002 | 0.216 | 2.47 | 0.0263 | 0.286 | 0.386 | 15.0 | <0.5 | 1.570 | <0.02 | <0.05 | 2.370 | 0.076 | 0.149 | 0.064 | <0.03 | 0.032 | <0.005 | <0.01 | 0.038 | 0.009 | 0.038 | 0.008 | <0.005 | 0.009 | <0.005 | 0.011 | <0.005 | 0.008 | <0.004 | 0.008 | <0.005 |
| PFM000070 | 31097 | 2017-05-15 | 0.10 | 4.36 | <0.002 | 0.0770 | 0.334 | 0.0760 | <0.002 | 0.168 | 5.86 | 0.0380 | 0.187 | 0.194 | 17.8 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000070 | 31117 | 2017-06-12 | 0.10 | 6.48 | 0.0027 | 0.0653 | 0.243 | 0.1020 | <0.002 | 0.263 | 1.97 | 0.0409 | 0.172 | 0.102 | 21.0 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000070 | 31160 | 2017-09-11 | 0.10 | 8.21 | 0.0033 | 0.0905 | 0.389 | 0.0825 | <0.002 | 0.337 | 2.61 | 0.0501 | 0.352 | 0.281 | 20.1 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000070 | 31190 | 2017-10-09 | 0.10 | 14.10 | 0.0099 | 0.1160 | 2.020 | 0.0584 | <0.002 | 0.473 | 3.13 | 0.0825 | 0.327 | 0.352 | 15.4 | <0.5 | 0.515 | <0.02 | <0.05 | 5.250 | 0.143 | 0.151 | 0.079 | <0.03 | 0.096 | <0.005 | <0.01 | 0.146 | 0.026 | 0.086 | 0.020 | <0.005 | 0.016 | <0.005 | 0.017 | <0.005 | 0.012 | <0.004 | 0.014 | <0.005 |
| PFM000070 | 31201 | 2017-11-06 | 0.10 | 13.30 | <0.002 | 0.1930 | 1.270 | 0.0590 | <0.002 | 0.535 | 34.6 | 0.0688 | 0.533 | 0.396 | 13.4 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000070 | 31205 | 2017-12-06 | 0.10 | 21.80 | 0.0023 | 0.1690 | 1.140 | 0.0507 | <0.002 | 0.457 | 1.60 | 0.0626 | 0.461 | 0.369 | 14.2 | <0.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000074 | 30999 | 2017-01-18 | 0.50 | 7.96 | <0.002 | 0.1130 | 1.430 | 0.0374 | <0.002 | 0.504 | 1.10 | 0.0139 | 0.177 | 0.604 | 26.6 | <0.5 | 2.000 | 0.025 | <0.05 | 2.240 | 0.168 | 0.260 | 0.124 | <0.03 | 0.066 | 0.007 | <0.01 | 0.066 | 0.020 | 0.089 | 0.020 | 0.006 | 0.021 | <0.005 | 0.025 | 0.006 | 0.018 | <0.004 | 0.019 | <0.005 |
| PFM000074 | 31029 | 2017-04-24 | 0.50 | 4.51 | <0.002 | 0.1030 | 0.914 | 0.0359 | <0.002 | 0.435 | 16.10 | 0.0186 | 0.259 | 0.650 | 25.7 | <0.5 | 2.370 | <0.02 | <0.05 | 2.220 | 0.099 | 0.191 | 0.051 | <0.03 | 0.033 | <0.005 | <0.01 | 0.030 | 0.011 | 0.049 | 0.011 | <0.005 | 0.012 | <0.005 | 0.013 | <0.005 | 0.010 | <0.004 | 0.011 | <0.005 |
| PFM000074 | 31135 | 2017-07-31 | 0.50 | 2.73 | <0.002 | 0.0709 | 0.398 | 0.0445 | <0.002 | 0.314 | 1.15 | 0.0512 | 0.413 | 0.539 | 27.5 | <0.5 | 1.320 | <0.02 | <0.05 | 2.100 | 0.052 | 0.110 | 0.049 | <0.03 | 0.017 | <0.005 | <0.01 | 0.016 | <0.005 | 0.023 | 0.006 | <0.005 | 0.006 | <0.005 | 0.007 | <0.005 | <0.005 | <0.004 | 0.007 | <0.005 |
| PFM000074 | 31184 | 2017-10-09 | 0.50 | 5.32 | 0.0026 | 0.0751 | <0.1 | 0.0441 | <0.002 | 0.252 | 0.90 | 0.0464 | 0.094 | 0.149 | 32.1 | <0.5 | 0.766 | <0.02 | <0.05 | 2.140 | 0.076 | 0.130 | 0.024 | <0.03 | 0.029 | <0.005 | <0.01 | 0.042 | 0.009 | 0.040 | 0.009 | <0.005 | 0.009 | <0.005 | 0.010 | <0.005 | 0.008 | <0.004 | 0.010 | <0.005 |
| PFM000083 | 30993 | 2017-01-17 | 0.50 | 1.28 | <0.02 | <0.04 | 0.687 | <0.02 | <0.002 | 0.846 | 1.25 | <0.1 | 0.208 | 1.350 | 16.0 | <3 | 0.606 | <0.2 | <0.4 | 16.200 | 0.062 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM000083 | 31032 | 2017-04-25 | 0.50 | 1.40 | <0.02 | 0.0700 | 0.788 | 0.0212 | <0.002 | 1.140 | 4.32 | <0.1 | 0.218 | 1.520 | 16.7 | <3 | 0.654 | <0.2 | <0.4 | 17.700 | 0.040 | <0.1 | 0.172 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM000083 | 31100 | 2017-05-15 | 0.50 | <1 | 0.0230 | 0.1760 | 1.160 | 0.0470 | <0.002 | 0.808 | 5.61 | <0.05 | 0.093 | 1.460 | 21.6 | <3 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000083 | 31115 | 2017-06-12 | 0.50 | 0.62 | <0.02 | 0.0832 | 1.940 | <0.02 | <0.002 | 1.060 | 3.28 | <0.1 | 0.165 | 1.590 | 18.1 | 8.970 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000083 | 31144 | 2017-08-02 | 0.50 | 1.09 | <0.02 | 0.0615 | 0.841 | <0.02 | <0.002 | 0.538 | 0.81 | <0.1 | 0.219 | 1.830 | 19.4 | <3 | 0.757 | <0.2 | <0.4 | 16.900 | 0.019 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM000083 | 31163 | 2017-09-11 | 0.50 | 4.40 | <0.02 | 0.0515 | 0.769 | 0.0614 | <0.002 | 1.660 | 46.7 | <0.1 | 0.285 | 1.410 | 17.0 | <3 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000083 | 31194 | 2017-10-12 | 0.50 | 1.43 | <0.02 | <0.04 | 0.634 | <0.02 | <0.002 | 0.747 | 0.90 | <0.1 | 0.367 | 1.460 | 17.9 | <3 | 0.557 | <0.2 | <0.4 | 17.400 | 0.009 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM000084 | 30994 | 2017-01-17 | 0.50 | 52.20 | 0.0176 | 0.1880 | 1.610 | 0.2420 | <0.002 | 1.800 | 3.67 | 0.0397 | 0.303 | 0.691 | 19.0 | <0.5 | 2.430 | 0.048 | <0.05 | 4.440 | 0.556 | 0.334 | 0.093 | <0.03 | 0.481 | 0.009 | <0.01 | 0.601 | 0.095 | 0.354 | 0.068 | 0.012 | 0.066 | 0.010 | 0.065 | 0.017 | 0.043 | 0.007 | 0.041 | 0.006 |
| PFM000084 | 31033 | 2017-04-25 | 0.50 | 20.50 | <0.02 | 0.1590 | 1.310 | 0.2270 | <0.002 | 2.080 | 2.66 | <0.1 | 0.299 | 1.430 | 19.0 | <3 | 2.330 | <0.2 | <0.4 | 11.500 | 0.180 | 0.145 | 0.131 | <0.1 | 0.118 | <0.02 | <0.05 | 0.147 | 0.027 | 0.090 | 0.021 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM000084 | 31101 | 2017-05-15 | 0.50 | 3.53 | <0.01 | 0.1130 | 1.350 | 0.2050 | <0.002 | 1.120 | 5.62 | <0.05 | 0.138 | 1.430 | 21.9 | <3 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000084 | 31116 | 2017-06-12 | 0.50 | 2.81 | <0.02 | <0.04 | 0.646 | 0.0814 | <0.002 | 1.270 | 1.33 | <0.1 | 0.226 | 1.290 | 16.6 | 4.330 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000084 | 31145 | 2017-08-02 | 0.50 | 2.82 | <0.02 | <0.04 | 0.722 | 0.0675 | <0.002 | 0.931 | 0.96 | <0.1 | 0.347 | 1.780 | 23.9 | <3 | 0.782 | <0.2 | <0.4 | 16.600 | 0.024 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM000084 | 31162 | 2017-09-11 | 0.50 | 5.20 | <0.02 | <0.04 | 0.525 | 0.1490 | <0.002 | 0.895 | 74.4 | <0.1 | 0.475 | 1.250 | 23.2 | <3 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM000084 | 31195 | 2017-10-12 | 0.50 | 76.30 | 0.0311 | 0.2060 | 2.350 | 0.4300 | <0.002 | 2.040 | 2.75 | 0.1210 | 0.566 | 1.280 | 28.0 | <3 | 2.640 | 0.046 | <0.05 | 10.800 | 0.632 | 0.294 | 0.090 | 0.032 | 0.613 | 0.006 | <0.05 | 0.795 | 0.121 | 0.428 | 0.090 | 0.012 | 0.100 | 0.015 | 0.079 | 0.017 | 0.047 | 0.007 | 0.045 | 0.006 |
| PFM000107 | 30988 | 2017-01-16 | 0.50 | 7.62 | 0.0021 | 0.0907 | 0.653 | 0.0520 | <0.002 | 0.403 | 1.45 | 0.0473 | 0.215 | 0.702 | 23.4 | <0.5 | 2.700 | 0.024 | <0.05 | 2.980 | 0.160 | 0.230 | 0.084 | <0.03 | 0.100 | 0.006 | <0.01 | 0.114 | 0.026 | 0.100 | 0.022 | <0.005 | 0.019 | <0.005 | 0.021 | <0.005 | 0.015 | <0.004 | 0.016 | <0.005 |

**Table A3-6. Continued from previous sheet.**

| Idcode | Sample no. | Sampling date (yyyy-mm-dd) | Depth (m) | Al (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) | Se (ug/L) | U (µg/l) | Th (µg/l) | Sc (µg/l) | Rb (µg/l) | Y (µg/l) | Zr (µg/l) | Sb (µg/l) | Cs (µg/l) | La (µg/l) | Hf (µg/l) | Tl (µg/l) | Ce (µg/l) | Pr (µg/l) | Nd (µg/l) | Sm (µg/l) | Eu (µg/l) | Gd (µg/l) | Tb (µg/l) | Dy (µg/l) | Ho (µg/l) | Er (µg/l) | Tm (µg/l) | Yb (µg/l) | Lu (µg/l) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PFM000107 | 30989 | 2017-01-16 | 1.00 | 6.42 | <0.002 | 0.1140 | 0.487 | 0.0533 | <0.002 | 0.327 | 1.00 | 0.0394 | 0.210 | 0.479 | 26.0 | <0.5 | 2.540 | 0.022 | <0.05 | 3.000 | 0.168 | 0.210 | 0.086 | <0.03 | 0.086 | 0.006 | <0.01 | 0.110 | 0.023 | 0.092 | 0.019 | <0.005 | 0.019 | <0.005 | 0.021 | 0.005 | 0.016 | <0.004 | 0.017 | <0.005 |
| PFM000107 | 31031 | 2017-04-25 | 0.50 | 3.30 | 0.0028 | 0.0612 | 0.509 | 0.0366 | <0.002 | 0.347 | 4.09 | 0.0466 | 0.257 | 0.606 | 16.3 | <0.5 | 3.050 | <0.02 | <0.05 | 2.570 | 0.063 | 0.125 | 0.058 | <0.03 | 0.027 | <0.005 | <0.01 | 0.034 | 0.008 | 0.032 | 0.007 | <0.005 | 0.007 | <0.005 | 0.009 | <0.005 | 0.006 | <0.004 | 0.008 | <0.005 |
| PFM000107 | 31138 | 2017-07-31 | 0.50 | 20.30 | <0.002 | 0.0739 | 0.674 | 0.0654 | <0.002 | 0.290 | 1.49 | 0.1340 | 0.554 | 0.798 | 14.0 | <0.5 | 2.440 | <0.02 | <0.05 | 2.780 | 0.033 | 0.082 | 0.099 | <0.03 | 0.027 | <0.005 | <0.01 | 0.035 | 0.006 | 0.028 | 0.006 | <0.005 | 0.005 | <0.005 | 0.005 | <0.005 | <0.005 | <0.004 | <0.005 | <0.005 |
| PFM000107 | 31193 | 2017-10-11 | 0.50 | 5.94 | <0.002 | 0.0130 | 0.374 | 0.0503 | <0.002 | 0.362 | 0.93 | 0.0631 | 0.247 | 0.511 | 14.2 | <0.5 | 1.540 | <0.02 | <0.05 | 2.590 | 0.064 | 0.068 | 0.071 | <0.03 | 0.049 | <0.005 | <0.01 | 0.060 | 0.012 | 0.056 | 0.011 | <0.005 | 0.011 | <0.005 | 0.009 | <0.005 | 0.006 | <0.004 | 0.006 | <0.005 |
| PFM000117 | 30991 | 2017-01-16 | 0.50 | 2.42 | 0.0043 | 0.0590 | 0.522 | 0.0369 | <0.002 | 0.194 | 1.01 | 0.0240 | 0.327 | 0.409 | 16.5 | <0.5 | 1.830 | <0.02 | <0.05 | 2.610 | 0.051 | 0.105 | 0.112 | <0.03 | 0.017 | <0.005 | <0.01 | 0.016 | <0.005 | 0.022 | <0.005 | <0.005 | <0.005 | <0.005 | 0.006 | <0.005 | 0.005 | <0.004 | 0.006 | <0.005 |
| PFM000117 | 30992 | 2017-01-16 | 1.50 | 9.10 | <0.002 | 0.0954 | 0.769 | 0.0397 | <0.002 | 0.326 | 1.53 | 0.0246 | 0.308 | 0.379 | 18.7 | <0.5 | 1.590 | 0.023 | <0.05 | 2.380 | 0.158 | 0.206 | 0.111 | <0.03 | 0.077 | 0.006 | <0.01 | 0.076 | 0.021 | 0.084 | 0.018 | <0.005 | 0.015 | <0.005 | 0.020 | 0.005 | 0.015 | <0.004 | 0.016 | <0.005 |
| PFM000117 | 31028 | 2017-04-24 | 0.50 | 2.37 | <0.002 | 0.0691 | 0.626 | 0.0330 | <0.002 | 0.240 | 4.54 | 0.0199 | 0.245 | 0.350 | 15.6 | <0.5 | 1.730 | <0.02 | <0.05 | 2.310 | 0.075 | 0.197 | 0.067 | <0.03 | 0.021 | <0.005 | <0.01 | 0.018 | 0.007 | 0.029 | 0.008 | <0.005 | 0.007 | <0.005 | 0.009 | <0.005 | 0.008 | <0.004 | 0.009 | <0.005 |
| PFM000117 | 31134 | 2017-07-31 | 0.50 | 16.70 | <0.002 | 0.0540 | 0.586 | 0.0494 | <0.002 | 0.137 | 1.28 | 0.0330 | 0.570 | 0.521 | 10.2 | <0.5 | 1.920 | <0.02 | <0.05 | 2.550 | 0.020 | 0.129 | 0.116 | <0.03 | <0.005 | <0.005 | <0.01 | <0.005 | <0.005 | 0.008 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.004 | <0.005 | <0.005 |
| PFM000117 | 31185 | 2017-10-09 | 0.50 | 6.57 | 0.0054 | 0.0452 | 0.549 | 0.0539 | <0.002 | 0.781 | 7.06 | 0.0667 | 0.376 | 0.415 | 10.0 | <0.5 | 1.720 | <0.02 | <0.05 | 2.560 | 0.023 | 0.067 | 0.117 | <0.03 | 0.007 | <0.005 | <0.01 | 0.007 | <0.005 | 0.009 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.004 | <0.005 | <0.005 |
| PFM007783 | 30995 | 2017-01-17 | 0.50 | 0.64 | <0.02 | 0.0866 | 0.714 | <0.02 | <0.002 | 0.747 | 1.53 | <0.1 | 0.144 | 1.430 | 16.9 | <3 | 0.795 | <0.2 | <0.4 | 16.100 | 0.064 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM007783 | 31034 | 2017-04-25 | 0.50 | 1.79 | <0.02 | 0.0902 | 1.890 | 0.0285 | <0.002 | 0.786 | 3.78 | <0.1 | 0.191 | 1.490 | 17.4 | 2.81 | 0.785 | <0.2 | <0.4 | 17.100 | 0.038 | <0.1 | 0.108 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM007783 | 31102 | 2017-05-15 | 0.50 | 1.25 | 0.0202 | 0.1220 | 1.030 | 0.0297 | <0.002 | 0.745 | 5.85 | <0.05 | 0.105 | 1.380 | 20.5 | <3 | | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM007783 | 31120 | 2017-06-12 | 0.50 | 1.18 | <0.02 | 0.0772 | 1.100 | 0.0260 | <0.002 | 0.886 | 2.21 | <0.1 | 0.171 | 1.500 | 16.9 | 11.1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM007783 | 31142 | 2017-08-01 | 0.50 | 2.50 | <0.02 | <0.04 | 0.418 | 0.0208 | <0.002 | 0.738 | 1.95 | <0.1 | 0.387 | 1.720 | 21.3 | <3 | 0.821 | <0.2 | <0.4 | 16.900 | 0.020 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM007783 | 31164 | 2017-09-11 | 0.50 | 1.98 | <0.02 | <0.04 | 0.657 | 0.0259 | <0.002 | 1.120 | 3.92 | <0.1 | 0.323 | 1.450 | 17.2 | <3 | | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM007783 | 31196 | 2017-10-12 | 0.50 | 1.80 | <0.02 | <0.04 | 0.777 | <0.02 | <0.002 | 0.866 | <0.8 | <0.1 | 0.391 | 1.490 | 17.5 | <3 | 0.561 | <0.2 | <0.4 | 17.500 | 0.011 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM007910 | 31139 | 2017-08-01 | 0.50 | 1.65 | <0.02 | <0.04 | 0.693 | 0.0310 | <0.002 | 0.811 | 1.02 | <0.1 | 0.305 | 1.760 | 19.4 | <3 | 0.791 | <0.2 | <0.4 | 17.200 | 0.012 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM007911 | 31140 | 2017-08-01 | 0.50 | 0.78 | <0.02 | <0.04 | 0.660 | 0.0212 | <0.002 | 0.682 | 1.53 | <0.1 | 0.211 | 1.760 | 20.0 | <3 | 0.761 | <0.2 | <0.4 | 18.000 | 0.013 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM007912 | 31141 | 2017-08-01 | 0.50 | 2.03 | <0.02 | 0.0707 | 0.546 | <0.02 | <0.002 | 0.922 | 1.38 | <0.1 | 0.301 | 1.840 | 19.7 | <3 | 0.760 | <0.2 | <0.4 | 17.500 | 0.009 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM102269 | 31001 | 2017-01-18 | 0.50 | 1.33 | <0.02 | 0.0894 | 0.544 | 0.0213 | <0.002 | 0.838 | 1.78 | <0.1 | 0.141 | 1.310 | 17.0 | <3 | 0.592 | <0.2 | <0.4 | 15.500 | 0.068 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM102269 | 31004 | 2017-02-21 | 0.50 | 2.59 | <0.02 | 0.1180 | 0.452 | <0.02 | <0.002 | 0.924 | 3.87 | 0.1110 | 0.164 | 1.420 | 16.4 | <3 | | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM102269 | 31009 | 2017-03-21 | 0.50 | 2.06 | <0.02 | <0.04 | 0.896 | 0.0257 | <0.002 | 0.846 | 21.4 | <0.1 | 0.235 | 1.460 | 16.3 | <3 | | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM102269 | 31035 | 2017-04-25 | 0.50 | 1.14 | <0.02 | 0.0652 | 0.860 | <0.02 | <0.002 | 0.781 | 3.05 | <0.1 | 0.187 | 1.470 | 17.2 | 2.99 | 0.731 | <0.2 | <0.4 | 17.400 | 0.037 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM102269 | 31099 | 2017-05-15 | 0.50 | 1.46 | 0.0250 | 0.0987 | 1.120 | <0.03 | <0.002 | 1.010 | 7.13 | <0.05 | 0.224 | 1.410 | 20.8 | <3 | | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM102269 | 31119 | 2017-06-12 | 0.50 | 0.65 | <0.02 | <0.04 | 1.000 | 0.0285 | <0.002 | 1.350 | 3.06 | <0.1 | 0.112 | 1.410 | 16.1 | 5.95 | | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM102269 | 31143 | 2017-08-01 | 0.50 | 2.25 | <0.02 | 0.0573 | 0.646 | <0.02 | <0.002 | 0.634 | 1.28 | <0.1 | 0.164 | 1.740 | 20.0 | <3 | 0.724 | <0.2 | <0.4 | 17.400 | 0.016 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM102269 | 31165 | 2017-09-11 | 0.50 | 3.03 | <0.02 | 0.1030 | 0.949 | <0.02 | <0.002 | 1.090 | 6.00 | <0.1 | 0.303 | 1.390 | 16.6 | <3 | | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM102269 | 31197 | 2017-10-12 | 0.50 | 1.69 | <0.02 | <0.04 | 0.392 | <0.02 | <0.002 | 0.820 | 1.81 | <0.1 | 0.388 | 1.500 | 18.1 | <3 | 0.655 | <0.2 | <0.4 | 17.100 | 0.019 | <0.1 | <0.1 | <0.1 | <0.02 | <0.02 | <0.05 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| PFM102269 | 31198 | 2017-11-06 | 0.50 | 4.75 | <0.02 | 0.1040 | 0.717 | <0.02 | <0.002 | 1.180 | 3.85 | 0.1060 | 0.437 | 1.470 | 16.7 | <3 | | | | | | | | | | | | | | | | | | | | | | | | | |
| PFM102269 | 31207 | 2017-12-06 | 0.50 | 3.49 | <0.02 | 0.0757 | 1.100 | <0.02 | <0.002 | 0.805 | 2.45 | <0.1 | 0.376 | 1.340 | 15.7 | <3 | | | | | | | | | | | | | | | | | | | | | | | | | |

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SKB is responsible for managing spent nuclear fuel and radioactive waste produced by the Swedish nuclear power plants such that man and the environment are protected in the near and distant future.

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