C-survey at Vatneyri (pre survey), 2024

Arnarlax ehf

Akvaplan-niva AS Report: 2024 65907.01

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Customer

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Summary

The results from the monitoring at the farming site Vatneyri in May 2024 showed that the sediment was somewhat loaded with organic carbon. The copper levels in the sediments at the stations were slightly elevated (35.4 to 51.0 mg/kg) and are categorized into environmental limit I and II or "very low and low values". EMB concentration is less than 50 ng/kg and thus below the defined concentration of 272 ng/kg for stations outside the mixing zone. Accordingly, the station is fulfilling the "good status standard".

No load effect was recorded at any of the stations and faunal index nEQR was above 0.6, indicating relatively good faunal conditions at all the sampling stations. The diversity index H ' varied between 2.59 and 3.10. The NS 9410:2016-assessment of the community in the local impact zone (C1) showed environmental condition 1 (Very good). No pollution indicator species were found among the most dominant species at any of the stations.

The redox measurements (pH/Eh) gave point 0 acc. Appendix D in NS 9410:2016 for all the sampling stations. The oxygen saturation in April was good in the whole water column with 88 % in the bottom water.

Approval

Project leader

Kamila Sztybor
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Quality control

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Preface

Akvaplan-niva carried out a type C (NS 9410:2016) environmental survey at the new Vatneyri site. It includes pH/redox measurements (Eh), hydrography, geochemical analyses, and analyses of the bottom fauna from six stations at the fish farming site. The following personnel contributed:

Snorri Gunnarsson	Akvaplan-niva	Field work, report, project leader.
Hans-Petter Mannvik	Akvaplan-niva	Identification of bottom fauna (Echinodermata). Report, professional assessments, and interpretations
Kamila Sztybor	Akvaplan-niva	Identification of bottom fauna (Polychaeta). QA report, professional assessments, and interpretations.
Roger Velvin	Akvaplan-niva	Identification of bottom fauna (Various taxa).
Rune Palerud	Akvaplan-niva	Identification of bottom fauna (Crustaceans). Statistics.
Jesper Hansen	Akvaplan-niva	Identification of bottom fauna (Mollusca).
Stine Hermansen	Akvaplan-niva	Hydrographical vertical profiles
Kristine H Sperre	Akvaplan-niva	Coordination of sorting of bottom fauna.
Lisa Torske	Akvaplan-niva	Coordination of geo-chemical analyses.

Akvaplan-niva would like to thank Arnarlax ehf and Silja Baldvinsdóttir for good cooperation.

Accreditation information:

The survey was carried out by Akvaplan-niva AS with ALS Laboratory Group (Czech Republic) as a sub-contractor.

NORSK AKKREDITERING TEST 079

Akvaplan-niva AS is accredited under NS-EN ISO/IEC 17025 by Norwegian Accreditation for field sampling of sediments and fauna, analyses of TOC, TOM, TN, particle size and macrofauna, and for professional evaluations and interpretations. Our Accreditation number is TEST 079.

Czech Accreditation Institute (Lab nr 1163)

ALS Laboratory Group is accredited by the Czech Accreditation Institute (Lab nr 1163) for copper analyses.

Non-accredited services: Analyses of emamectin benzoate, hydrographical measurements and mapping of bottom topography (Olex).

1 Data Summary

Client information			
Report title:	C-Survey at Vatneyri (pre-survey), 2024.		
Report nr.	2024 65907.01	Site:	Vatneyri
Municipality:		Map Coordinates (construction):	65°37,692 N 24°04,507 V
MTB permitted:		Operations manager:	Rolf Ørjan Nordli
Client:	Arnarlax ehf		

Biomass/production status at time of survey (23.04.2024)			
Fish group:	Salmon	Biomass on examination:	0
Feed input:	0	Produced amount of fish:	0
Type/time of survey			
Maximum biomass:		Follow up study:	
Fallow (resting period):		New location:	X

Results from the C study /NS 9410 (2016) – Main results from soft bottom fauna			
Faunal index nEQR (Veileder 02:2018)		**Diversity index H' (Shannon-Wiener)**	
Fauna C1 (impact zone)	0.632	Fauna C1 (impact zone)	2.99
Fauna C2	0.611	Fauna C2	2.590
Fauna C3	0.607	Fauna C3	2.71
Fauna C4 (deep area)	0.606	Fauna C4 (deep area)	2.68
Fauna C5	0.627	Fauna C5	2.69
Fauna Cref	0.631	Fauna CREF	3.10
Date fieldwork:	(08.05.2024)	**Date of report:**	30.09 2024
Notes to other results (sediment, pH/Eh, oxygen)			nTOC from 42.2 to 48.2 mg/g. Copper 39.1 mg/kg at C1 Eh positive at all stations O_2-conditions were good throughout the water column.

2 Introduction

2.1 Background and aim of the study

On behalf of Arnarlax ehf, Akvaplan-niva completed a pre-survey (type C) for a new fish farming site at Vatneyri (Figure 1).

The survey fulfils the requirements of the Icelandic authorities for bottom surveys according to ISO 12878 and the requirements for environmental bottom surveys (according to Vöktunaráætlun). An environmental study was simultaneously undertaken, with reference to Chapter 5.0 in NS 9410:2016 which follows the methodology for C- study. A pre-survey (type C) is aimed at studying the environmental conditions of the bottom sediments along a transect sector from the fish farm that extends from the local, to the intermediate and to the regional impact zones. The main emphasis is on the study of the soft bottom fauna which is conducted according to standards ISO 5567-19:2004 and ISO 16665:2014. The obligatory parameters that are included in the survey are described in NS 9410:2016.

A classification or threshold values for this type of survey have not been developed by Icelandic officials so it is not possible to strictly apply the classification based on Norwegian threshold values to Icelandic conditions. We do however report the results with these same indexes with reference to Norwegian threshold values but it should be emphasized that some of these (such as NSI) are developed according to Norwegian conditions. For further descriptions of these indexes see details in Appendix 1 and Miljødirektoratets Veileder 02:2018.

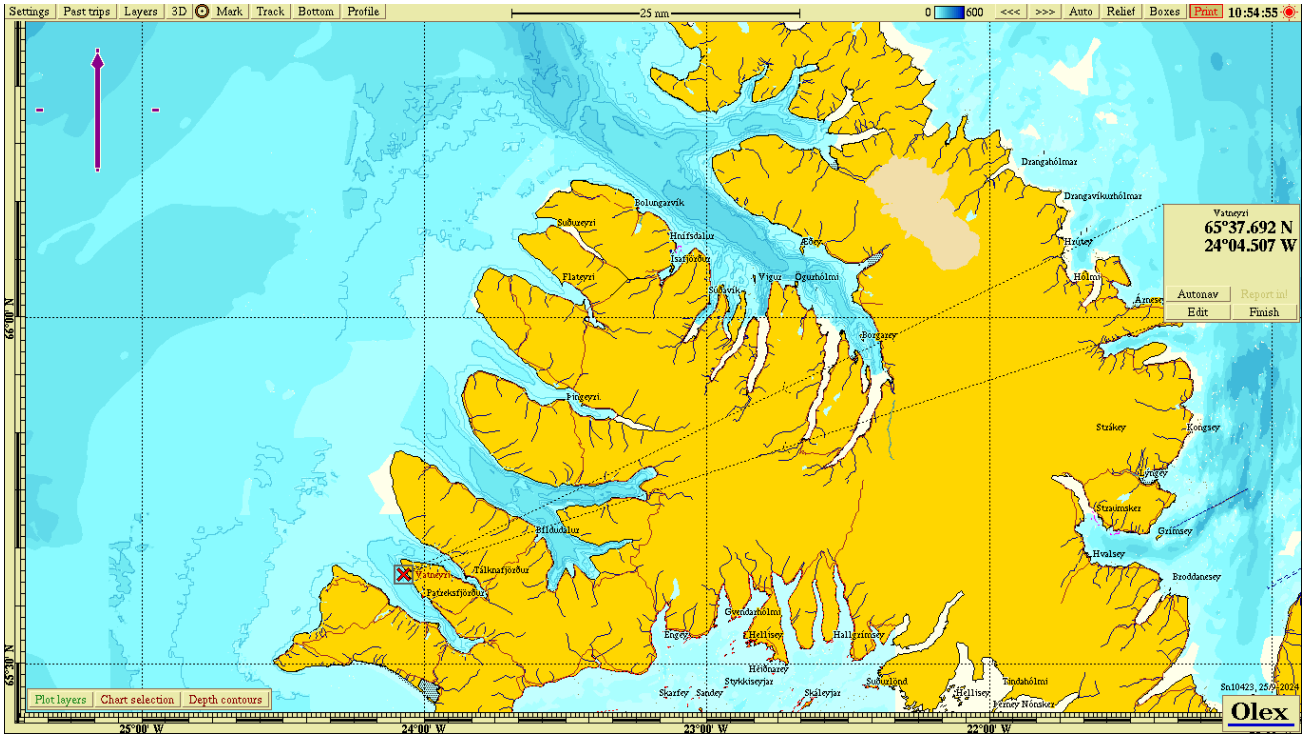

Figure 1. Overview of Vestfjord with the farming site Vatneyri (red cross). The map coordinates for the midpoint of the farming site are given to the right.

2.2 Site operation and feed use

The Vatneyri site is in Patreksfjörður, in the outer and northern part of Patreksfjörður and about 5.5 km northwest from Patreksfjörður harbour. The planned plant is a frame mooring with a total of 16 200 metre circumference cages in a 2 x 8 configuration.

There has been no prior fish farming activity at the site, so this is pre-survey prior to putting out first smolts at Vatneyri site.

In Iceland, the MTB (maximum allowed biomass) limit is not given a site level as in Norway. The MTB limit determines how much live fish the holder of the permit can have standing in the sea at any one time. In Iceland the allowed production is regulated at two levels, site level and company level. For this site the estimated maximal standing biomass for the next generation is 8.842 tonnes, used as MTB here (Baldvinsdóttir, pers. reference).

2.3 Previous surveys

Akvaplan-niva AS has not done any previous environmental surveys of the type C (NS 9410) at the site but survey type B (local impact zone) was done on in May (Gunnarsson. 2024) with overall site condition 1 (very good).

3 Materials and methods

3.1 Survey program

The choice of study parameters, placement of sampling stations and other criteria for the study is based on descriptions in NS 9410 (C-surveys). An overview of the planned professional program is given in Table 1.

Akvaplan-niva is accredited for field work, analyses of samples and for the professional evaluation of results in accordance with applicable standards and guidelines ("Veiledere"). For implementation and follow through, the following standards and quality assurance systems were used:

- ISO 5667-19:2004: *Guidance on sampling of marine sediments.*
- ISO 16665:2014. *Water quality – Guidelines for quantitative sampling and sample processing of marine soft-bottom macro fauna.*
- NS 9410:2016. *Miljøovervåking av bunnpåvirkning fra marine oppdrettsanlegg.*
- Internal procedures. *Quality Manual for Akvaplan-niva.*
- Veileder 02:2018 (rev. 2020). *Klassifisering av miljøtilstand i vann*. Norsk klassifiseringssystem for vann i henhold til Vannforskriften. Veileder fra Direktoratgruppen.

Table 1: Survey program for the C-survey at Vatneyri, 2024. TOC = total organic carbon. GSA = grain size analysis sediment. TOM = total organic material. TN = total nitrogen. Cu = Copper. pH/Eh = acidity and redox potential.

Station	Type analyses/parameters
C1 (local impact zone)	Quantitative analyses of bottom fauna. TOC. GSA, TOM. TN. Cu. Tot-P. pH/Eh.
C2 (transition zone outer)	Quantitative analyses of bottom fauna. TOC. GSA, TOM. TN. 2xCu. Tot-P. pH/Eh.
C3 (transition zone)	Quantitative analyses of bottom fauna. TOC. GSA, TOM. TN. 2xCu. Tot-P. pH/Eh.
C4 (transition zone, deep area)	Quantitative analyses of bottom fauna. TOC. GSA, TOM. TN. 2xCu. Tot-P. pH/Eh. Emamectin benzoate.
C5 (transition zone)	Quantitative analyses of bottom fauna. TOC. GSA, TOM. TN. 2xCu. Tot-P. pH/Eh.
Cref/Cu1 (reference station)	Quantitative analyses of bottom fauna. TOC. GSA, TOM. TN. 2xCu. Tot-P. pH/Eh.
Cu2	2xCu.
Cu3	2xCu.

Field work was completed on 23.04.2024.

Placement of stations and local conditions

The number of stations was calculated with reference to the sites estimated maximal standing biomass for the first generation which is 8.823 tonnes (used as MTB here). According to the standard six sampling stations should be examined. Depth and position of the stations are given in Table 2 and shown in Figure 2. Five stations were placed in the direction of the main oceanic current

direction at 48 m depth (Hermansen, 2020) and one station in the opposite direction of main current 1000 m from the farm as a reference station.

Table 2: Depth, distance between the nearest frame of the fish farm and sampling stations and coordinates for C-stations at Vatneyri, 2024.

Station	Depth, m	Distance from frame, m	Position	
			N	W
C1	62	25	65°37.929	24°04.736
C2	67	500	65°38.140	24°05.147
C3	65	117	65°37.954	24°04.908
C4	66	234	65°38.011	24°04.982
C5	67	351	65°38.720	24°04.082
Cref/Cu1	59	1000	65°36.943	24°04.032
Cu2	58	1000	65°37.046	24°03.532
Cu3	59	1000	65°36.934	24°04.586

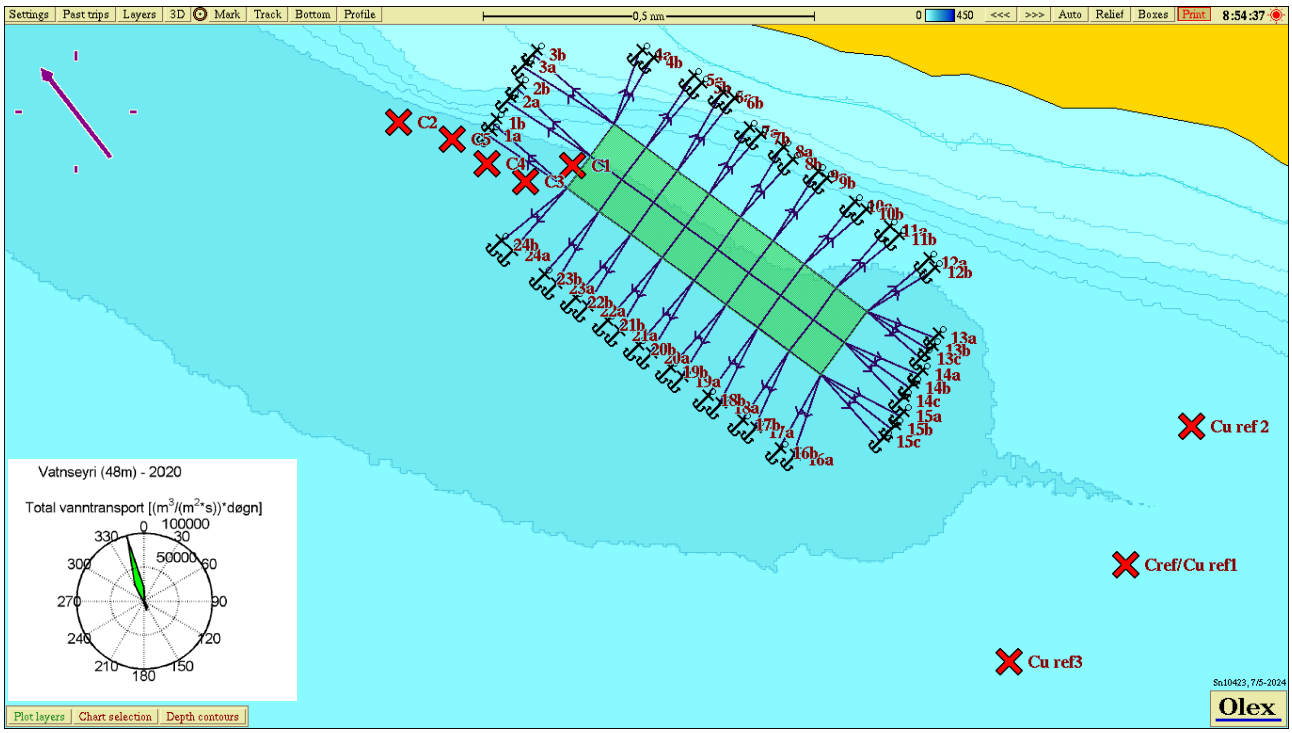

Figure 2. Map showing the sampling stations for the C-survey at Vatneyri, 2024. Current measurements used were from 48 m depth (Hermansen, 2020).

3.2 Hydrography and oxygen

At station C4, hydrographic measurements, salinity, temperature, density, and oxygen saturation were taken for vertical surface to bottom profiles using a Sensordata CTDO 204 probe.

3.3 Soft bottom sampling and analyses

3.3.1 Fieldwork

Sediment samples were collected with a 0.1 m^2 bottom grab (van Veen). The sample material was collected through inspection openings. Samples for TOC, TN and Cu were taken from the top 1 cm layer of the sediment and for TOM and grain size analyses from the top 5 cm using a hollow pipe. Only samples with an undisturbed surface were used. The samples were frozen prior to further processing in the laboratory.

3.3.2 Total organic material (TOM)

The amount of TOM in sediment was determined by weight loss after combustion at 495 °C. The percent weight loss was calculated. The reproducibility of the TOM analyses is checked during the analyses by using a standard sediment that contains TOM with a known level. Standard calcium carbonate was burned together with the samples as a control of the amount of carbonate that was not burned in the analyses process.

3.3.3 Total nitrogen (TN)

After drying the samples at 40°C, the amount of total nitrogen (TN) was quantified by electrochemical determination using Akvaplan niva internal method that is based on NS-EN 12260:2003 (Vannundersøkelse – Bestemmelse av bundet nitrogen (TNb) etter oksidasjon til nitrogenoksider).

3.3.4 Total organic carbon (TOC) and grain size

The proportion of fine material, the fraction less than 63 μm, was determined gravimetrically after wet sieving of the samples. The results are presented as proportion of fine material on a dry weight basis.

After drying the samples at 40 °C, the content of total organic carbon (TOC) was determined by NDIR-detection in accordance with DIN19539:2016 (Investigation of solids – Temperature-dependent differentiation of total carbon (TOC_{400}, ROC, TIC_{900})). To classify the environmental conditions based on the content of TOC, the measured concentrations are normalized for the proportion of fine substance (nTOC) using the equation: nTOC = TOC + 18 (1 – F), where TOC and F represent a measured TOC value and the proportion of fine substance (%) in the sample (Aure *et al.,* 1993).

3.3.5 Metal analysis - copper (Cu)

The samples for metal analysis were freeze-dried before being placed in a microwave oven in a sealed Teflon container with concentrated ultrapure nitric acid and hydrogen peroxide. The concentration of copper (Cu) was determined by means of ICP-SFMS. The levels of copper are classified in accordance with Icelandic regulation 769:1999.

3.3.6 Emamectin benzoate (EMB)

The sediments were lyophilized prior to solvent extraction. The actual quantification was determined by high-resolution liquid chromatography coupled to tandem mass spectroscopy (HPLC-MS/MS). The LOD and LOQ are determined in accordance with the guidelines of the EU's reference laboratories for pesticide analyses, SANTE/2020/12830, 24/02/2021. The results are evaluated according to the Scottish Environmental Protection Agency (SEPA) standards (SEPA, 2022 & 2023).

3.3.7 Phosphorus (P)

Following a pre-treatment, the samples were quantified according to ČSN 720116-1 (720116) where phosphoruspentaoxide, P_2O_5 forms a phosphorusmolybden-vanadiumcomplex. The samples for metal analysis were freeze-dried before being placed in a microwave oven in a sealed Teflon container with concentrated ultrapure nitric acid and hydrogen peroxide.

3.3.8 Redox- and pH measurements

At all the stations, a quantitative chemical examination of the sediment was carried out. Acidity (pH) and redox potential (Eh) were measured using electrodes and the YSI Professional Plus instrument. In accordance with the manual of the instrument, 200 mV was added to the measured ORP (the Oxidation Reduction Potential) value.

3.4 Soft bottom fauna investigation

3.4.1 About effect of organic material on bottom fauna

The emission of organic material from fish farms can contribute to the deterioration of conditions for many of the organisms living in the bottom sediment. Negative effects in the bottom fauna can best be assessed through quantitative bottom fauna analyses. Many soft bottom species have low mobility, the fauna composition will largely reflect the local environmental conditions. Changes in the bottom fauna communities are a good indication of unwanted organic loads. Under natural conditions, the communities typically consist of many species. High number of species (diversity) is, amongst other things, that is dependent on favourable conditions for the fauna. However, moderate increases in organic load can stimulate the fauna and result in an increased number of species found. Larger organic loads can result in less favourable conditions where opportunistic species increase their individual numbers, while the species not suited are knocked out resulting in a reduced diversity of species. Changes in species diversity near emission points of feed and faecal matter can, to a large degree, be attributed to changes in organic content (from the feed and faecal matter) in the sediment.

3.4.2 Sampling and fixation

All the bottom fauna samples were taken with a 0.1 m^2 van Veen grab. Only grab samples where the grab was completely closed and the surface undisturbed were approved. The contents were washed through a 1 mm sieve and the remaining material fixed with 4 % formalin with Bengal Rose dye added and then neutralized with borax. In the laboratory, the animals were sorted from the remaining sediment.

3.4.3 Quantitative bottom fauna analysis

At all stations, two samples (replicates) were collected in accordance with guidelines in NS 9410 (2016). After sorting the sample material was processed quantitatively. The bottom fauna was identified to the lowest taxonomic level possible and quantified by specialists (taxonomists). The quantitative lists of species were statistically analysed. See Appendix 1 for description of analysis methods. The following statistical methods were used to describe community structure and to assess the similarity between different communities:

- Shannon-Wiener diversity index (H')
- Hurlberts diversity index (ES_{100}) – expected number of species pr. 100 individuals
- Pielou's evenness index (J)
- Sensitivities index (Ømfintlighet) (ISI_{2012}), unsuitable at low individual/species number
- Sensitivity index (NSI)
- Composite index for diversity of species and sensitivity (NQI1)
- Sensitivities index which is included in NQI1 (AMBI)
- Normalized EQR (nEQR)
- Number of species plotted against the number of individuals in geometric classes
- Cluster analyses
- The ten most dominant taxa per station (top-ten)

4 Results

4.1 Hydrography and oxygen

The hydrographical profile for the deep station C4 in April 2024 is presented in Figure 3.

Temperature dropped from 4 °C at the surface to 2 °C in the bottom layer. Oxygen saturation was 110 % in the upper layer and 88 % in the bottom layer.

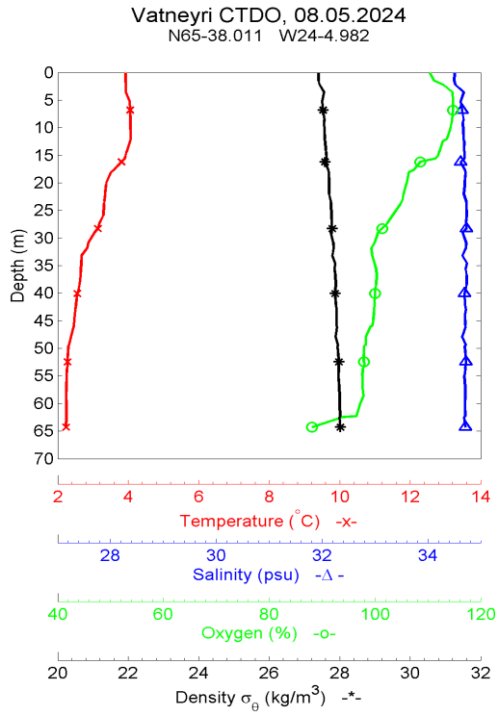

Figure 3. Vertical profiles. Temperature, salinity, density, and oxygen at C4 at Vatneyri, 2024.

4.2 Sediment

4.2.1 TOC, TOM, TN, C/N, grain size and pH/Eh

Levels of total organic material (TOM), total organic carbon (TOC), total nitrogen (TN), C/N-relationship, grain size distribution in sediment (pelite) and pH/Eh in the sediment are presented in Table 3.

TOM-levels varied from 12.3 to 13.4 %. TN-levels were low (5.7 – 7.1 mg/g) as was the C/N-ratio. TOC was high at all stations and nTOC varied from 42.2 to 48.2 mg/g TS. The bottom sediments grain size was fine with a pelite ratio ranging from 80 to 88 %.

Redox measurements (pH/Eh) gave a point of 0 for all the sampling stations according to Appendix D in NS 9410:2016.

Table 3. Sediment description, TOM (%), TOC (mg/g), TN (mg/g), C/N, grain size distribution (pelite ratio % <0,063 mm) and pH/Eh. Vatneyri, 2024.

St.	Sediment description	TOM	TOC	nTOC	TN	C/N	Pelite	pH/Eh
C1	Olive green mud, some black organic layer on top, some black algae. No smell of H_2S.	13.4	44	47.3	6.7	6.5	80.0	7.6/ 273
C2	Olive green mud. Litle left after sieving of sample. Some black algae. No smell of H_2S.	12.3	45	48.2	7.0	6.4	81.1	7.8/ 284
C3	Olive green mud, some black algae. No smell of H_2S	12.6	70	42.2	5.7	7.0	88.2	7.9/ 276
C4	Olive green mud, some black algae. No smell of H_2S	12.4	43	46.8	6.6	6.5	81.1	7.7/ 285
C5	Olive green mud, some black algae. No smell of H_2S	13.2	43	46.0	7.1	6.0	81.0	7.9/ 289
Cref	Olive green mud. Litle left after sieving of sample. No smell of H_2S.	13.2	44	46.3	6.4	6.8	87.0	7.7/ 273

4.2.2 Copper

Levels of copper in bottom sediment at C1 are shown in Table 4. The level of copper varied from 35.4 to 51.0 mg/kg or very low and low (limit I and II) according to environmental limits in Icelandic regulation nr. 796/199 (Regulation on prevention of water pollution nr. 796/1999).

Table 4. Copper (Cu), mg/kg DS. Vatneyri, 2024.

St.	Cu	Cu
C1	39.1	-
C2	39.0	39.2
C3	37.9	44.0
C4	40.6	37.0
C5	40.4	51.0
Cref/Cu1	37.8	37.6
Cu2	39.2	40.2
Cu3	34.1	35.4

4.2.3 Emamectin benzoate

Concentration of emamectin benzoate in sediment at C4 is presented in Table 5. Station C4 is located 234 m from the cage edge and is thus placed outside the mixing zone (SEPA 2022).

EMB concentration is less than 50 ng/kg and thus below the defined concentration of 272 ng/kg for stations outside the mixing zone. Accordingly, the station is fulfilling the "good status standard".

Table 5. Emamectin benzoate in the sediment at C4, ng/kg. Vatneyri, 2024.

St.	Emamectin benzoate
C4	<50

4.2.4 Phosphorus

Levels of phosphorus in bottom sediments at Vatneyri are shown in Table 6. The level of phosphorus varied from 853 mg/kg (C3) to 1070 mg/kg (C2).

Table 6. Phosphorus (P), mg/kg DS. Vatneyri, 2024.

St.	P
C1	953
C2	1070
C3	853
C4	920
C5	934
Cref	998

4.3 Soft-bottom fauna

4.3.1 Faunal indices

Results from the quantitative soft bottom faunal analyses at the C-stations are presented in Table 7.

The number of individuals varied from 530 (Cref) to 883 (C1) and number of species from 30 (C4 and Cref) to 40 (C1). The diversity H' varied from 2.59 to 3.10. At all stations, the overall index of nEQR was higher than 0.6. The nEQR values indicate relatively good condition at all stations.

J (Pielous evenness index) is a measure of how equally individuals are divided between species and will vary between 0 and 1. A station with low value has a "crooked" individual distribution between the species, indicating a disturbed bottom fauna community. The index varied from 0.53 to 0.67 which indicates a somewhat uneven distribution.

Table 7. Number of species and individuals pr. 0,2 m2. H´ = Shannon-Wiener's diversity index. ES100 = Hurlberts diversity index. NQI1 = overall index (diversity and sensitivity). ISI2012 = sensitivity index. NSI = sensitivity index. J = Pielous evenness index. AMBI = AZTI marine biotic index (part of NQI1). nEQR = normalized EQR (excl. DI). C-stations at Vatneyri, 2024.

St.	No. of individuals.	No. of species	H´	ES_{100}	NQI1	ISI_{2012}	NSI	nEQR	AMBI	J
C1	883	40	2.99	15.7	0.700	8.22	21.40	0.632	2.014	0.61
C2	877	36	2.59	14.5	0.695	8.39	21.18	0.611	2.067	0.53
C3	808	34	2.71	14.9	0.684	8.10	20.82	0.607	2.122	0.57
C4	787	30	2.68	14.2	0.680	8.33	20.89	0.606	2.036	0.58
C5	694	37	2.69	15.0	0.692	9.00	20.98	0.627	0.069	0.57
Cref	530	30	3.10	16.5	0.981	8.19	21.02	0.631	2.236	0.67

4.3.2 NS 9410 Evaluation of the bottom fauna at station C1 (local impact zone).

According to NS 9410 the classification of the environmental status in the local impact zone can also be evaluated based on the number of species and their dominance in the bottom faunal community (see Chapter 8.6.2 in NS 9410:2016).

The soft bottom communities were classified to environmental condition 1 "Very good". The criteria for condition 1 are that there are at least 20 species/0.2 m^2 and that none of these are in numbers exceeding 65 % of the individuals (Table 8).

Table 8. Classification of the environmental status of the soft bottom fauna at station C1 at the Vatneyri site 2024.

Station	Site name	Num. species	Dominating taxa	Environmental condition-NS 9410
C1	Vatneyri	40	Galathowenia oculata – 32 %	1 – Very good

Geometric classes

Figure 4 shows the number of species plotted against the number of individuals, where the number of individuals is divided into geometric classes. For an explanation of the concept of geometric classes is given in Appendix 1.

All curves started relatively low (≤ 15 species) and stretched out in varying degrees towards higher classes. These did not give any clear indications of fauna condition.

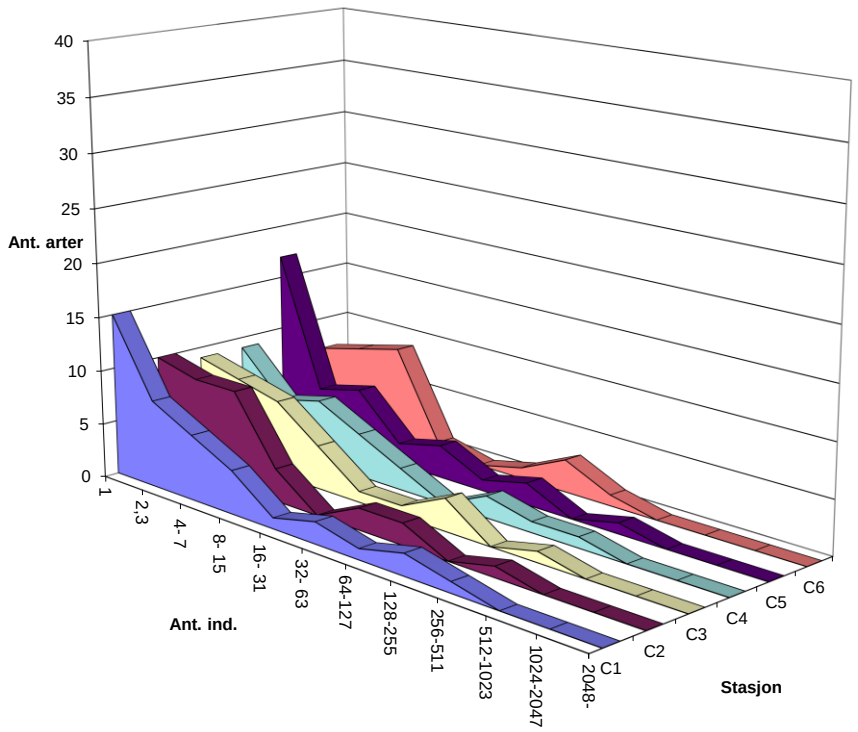

Figure 4. The soft bottom fauna shown as number of species against number of individuals pr. species in geometric classes. Vatneyri, 2024.

4.3.3 Cluster analyses

To investigate the similarity of the faunal composition between the sampling stations, the multivariate technique cluster analysis was used. The results of this are presented in dendrogram in Figure 5.

The fauna composition was more than 75 % similar for all stations in the survey.

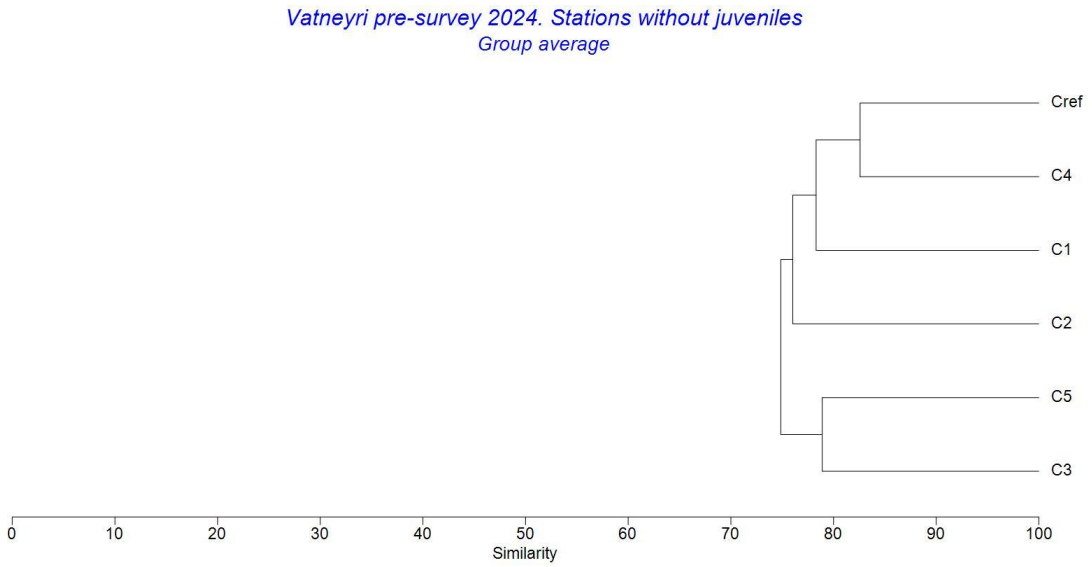

Figure 5. Cluster diagram for the soft bottom fauna at the C- sampling stations at Vatneyri, 2024.

4.3.4 Species composition

The main features of the species composition are shown in the form of a top ten species list from each station in Table 9.

In Rygg and Norling (2013) the species are divided into five ecological groups (EG) based on the value of the sensitivity index. These groups run from sensitive species (EG I) to pollution indicators (EG V).

Table 9. Number of individuals, cumulative percentage, and ecological group for the ten most dominant species at the C stations. Vatneyri, 2024.*

C1	EG	Ant. ind.	Kum.
Galathowenia oculata	III	283	32 %
Ennucula tenuis	II	167	51 %
Parougia nigridentata	Ik	141	67 %
Prionospio steenstrupi	II	67	74 %
Sternaspis scutata	Ik	54	80 %
Thyasira sarsii	IV	36	85 %
Nuculana pernula	II	26	87 %
Leucon sp.	Ik	13	89 %
Cossura longocirrata	IV	11	90 %
Maldane sarsi	IV	10	91 %

C2	EG	Ant. ind.	Kum.
Galathowenia oculata	III	446	51 %
Ennucula tenuis	II	125	65 %
Prionospio steenstrupi	II	99	76 %
Thyasira sarsii	IV	50	82 %
Sternaspis scutata	Ik	49	88 %
Leucon sp.	Ik	13	89 %
Maldane sarsi	IV	9	90 %
Praxillella praetermissa	II	8	91 %
Mediomastus fragilis	IV	7	92 %
Spio limicola	Ik	7	93 %

C3	EG	Ant. ind.	Kum.
Galathowenia oculata	III	389	48 %
Ennucula tenuis	II	95	60 %
Prionospio steenstrupi	II	85	70 %
Thyasira sarsii	IV	71	79 %
Sternaspis scutata	Ik	42	84 %
Leucon sp.	Ik	23	87 %
Chaetozone sp.	III	11	88 %
Cossura longocirrata	IV	9	89 %
Nephtys ciliata	III	9	90 %
Euchone incolor	Ik	8	91 %

C4	EG	Ant. ind.	Kum.
Galathowenia oculata	III	364	46 %
Ennucula tenuis	II	142	64 %
Prionospio steenstrupi	II	70	73 %
Thyasira sarsii	IV	69	82 %
Sternaspis scutata	Ik	27	85 %
Maldane sarsi	IV	23	88 %
Leucon sp.	Ik	14	90 %
Cossura longocirrata	IV	10	91 %
Praxillella praetermissa	II	10	92 %
Nuculana pernula	II	8	93 %

C5	EG	Ant. ind.	Kum.
Galathowenia oculata	III	338	48 %
Ennucula tenuis	II	95	62 %
Prionospio steenstrupi	II	68	71 %
Thyasira sarsii	IV	54	79 %
Sternaspis scutata	Ik	28	83 %
Leucon sp.	Ik	20	86 %
Parougia nigridentata	Ik	17	88 %
Euchone incolor	Ik	9	89 %
Nephtys sp. juv.	II	9	91 %
Praxillella praetermissa	II	9	92 %

C6	EG	Ant. ind.	Kum.
Galathowenia oculata	III	136	26 %
Ennucula tenuis	II	124	49 %
Sternaspis scutata	Ik	73	63 %
Thyasira sarsii	IV	64	75 %
Prionospio steenstrupi	II	47	84 %
Nuculana pernula	II	15	86 %
Mediomastus fragilis	IV	7	88 %
Chaetozone sp.	III	6	89 %
Leucon sp.	Ik	6	90 %
Aricidea sp.	I	5	91 %

*Ecological groups: EG I = sensitive species. EG II = neutral species. EG III = tolerant species. EG IV = opportunistic species. EG V = pollution indicator species. From Rygg and Norling, 2013. Ik = unidentified group.

The fauna at all stations was dominated by the tolerant polychaete *Galathowenia oculata* with between 26 and 51 % of the individuals. The other most dominant species at the stations were a mixture of neutral, tolerant and opportunistic species, together with one sensitive species at Cref.

5 Summary and Conclusions

5.1 Summary

The results from the environmental monitoring (type C) at Vatneyri, 2024, can be summarised as follows:

- The hydrography measurements showed good oxygen conditions throughout the water column with 88 % saturation in the bottom layer in April 2024.
- TOC was high at all stations and nTOC varied from 42.2 to 48.2 mg/g TS. TOM-levels varied from 12.3 to 13.4 %. TN-levels were low (5.7 – 7.1 mg/g) as was the C/N-ratio. The copper levels in the sediments at all stations were somewhat elevated (35.4 to 51.0 mg/kg) and are categorized into environmental limit I and II or "very low and low values". EMB concentration at C4 is below 50 ng/kg and thus below the defined concentration of 272 ng/kg for stations outside the mixing zone. Accordingly, the station is fulfilling the "good status standard". The phosphorus levels varied between 853 and 1070 mg/kg. The sediment was fine grained with a pelite share between 80 and 88 %. The redox measurements (pH/Eh) gave point 0 acc. Appendix D in NS 9410:2016 for all the stations.
- The number of individuals varied from 530 to 883 and number of species from 30 to 40. The diversity H' varied from 2.59 to 3.10. At all stations, the overall index of nEQR was higher than 0.6. The nEQR values indicates good conditions and no disturbance of the communities.

5.2 Conclusions

The results from the monitoring at the farming site Vatneyri in April 2024 showed that the sediment was somewhat loaded with organic carbon. The copper levels in the sediments at the stations were slightly elevated (35.4 to 51.0 mg/kg) and are categorized into environmental limit I and II or "very low and low values". EMB concentration is less than 50 ng/kg and thus below the defined concentration of 272 ng/kg for stations outside the mixing zone. Accordingly, the station is fulfilling the "good status standard".

No load effect was recorded at any of the stations and faunal index nEQR was above 0.6, indicating relatively good faunal conditions at these stations. The diversity index H ' varied between 2.59 and 3.10. The NS 9410:2016-assessment of the community in the local impact zone (C1) showed environmental condition 1 (Very good). No pollution indicator species were found among the most dominant species at any of the stations.

The redox measurements (pH/Eh) gave point 0 acc. Appendix D in NS 9410:2016 for all the sampling stations. The oxygen saturation in April was good in the whole water column with 88 % in the bottom water.

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7 Appendix (in Norwegian)

7.1 Statistiske metoder

Diversitet

Diversitet er et begrep som uttrykker mangfoldet i dyre- og plantesamfunnet på en lokalitet. Det finnes en rekke ulike mål for diversitet. Noen tar mest hensyn til artsrikheten (mål for artsrikheten), andre legger mer vekt på individfordelingen mellom artene (mål for jevnhet og dominans). Ulike mål uttrykker derved forskjellige sider ved dyresamfunnet. Diversitetsmål er "klassiske" i forurensningsundersøkelser fordi miljøforstyrrelser typisk påvirker samfunnets sammensetning. Svakheten ved diversitetsmålene er at de ikke alltid fanger opp endringer i samfunnsstrukturen. Dersom en art blir erstattet med like mange individer av en ny art, vil ikke det gjøre noe utslag på diversitetsindeksene.

Shannon-Wieners indeks (Shannon & Weaver, 1949) er gitt ved formelen:

$$H' = -\sum_{i=1}^{s} \frac{n_i}{N} \log_2 \left(\frac{n_i}{N} \right)$$

der n_i = antall individer av art i i prøven
N = total antall individer
s = antall arter

Indeksen tar hensyn både til antall arter og mengdefordelingen mellom artene, men det synes som indeksen er mest følsom for individfordelingen. En lav verdi indikerer et artsfattig samfunn og/eller et samfunn som er dominert av en eller få arter. En høy verdi indikerer et artsrikt samfunn.

Pielous mål for jevnhet (Pielou, 1966)

har følgende formel, der symbolene er som i Shannon-Wieners indeks

$$J = \frac{H'}{\log_2 s}$$

Hurlberts diversitetskurver

Grafisk kan diversiteten uttrykkes i form av antall arter som funksjon av antall individer. Med utgangspunkt i total antall arter og individer i en prøve søker man å beregne hvor mange arter man ville vente å finne i delprøver med færre individer. Diversitetsmålet blir derved uavhengig av prøvestørrelsen og gjør at lokaliteter med ulik individtetthet kan sammenlignes direkte. Hurlbert (1971) har gitt en metode for å beregne slike diversitetskurver basert på sannsynlighetsberegning.

ES_n er forventet antall arter i en delprøve på n tilfeldig valgte individer fra en prøve som inneholder total N individer og s arter og har følgende formel:

$$ES_n = \sum_{i=1}^{s} \left[1 - \frac{\binom{N-N_i}{n}}{\binom{N}{n}} \right]$$

der N = total antall individ i prøven
N_i = antall individ av art i

n = antall individ i en gitt delprøve (av de N)
s = total antall arter i prøven

Plott av antall arter i forhold til antall individer

Artene deles inn i grupper/klasser etter hvor mange individer som er registrert i en prøve. Det vanlige er å sette klasse I = 1 individ pr. art, klasse II = 2-3 individer, klasse III = 4-7 individer, klasse IV = 8-15 individer, osv., slik at de nedre klassegrensene danner en følge av ledd på formen 2^x, x=0,1,2, ... En slik følge kalles en geometrisk følge, derfor kalles klassene for geometriske klasser. Hvis antall arter innenfor hver klasse plottes mot klasseverdien på en lineær skala, vil det fremkomme en kurve som uttrykker individfordelingen mellom artene i samfunnet. Det har vist seg at i prøver fra upåvirkede samfunn vil det være mange arter med lavt individantall og få arter med høyt individantall, slik at vi får en entoppet, asymmetrisk kurve med lang "hale" mot høye klasseverdier. Denne kurven vil være godt tilpasset en log-normal fordelingskurve.

Ved moderat forurensing forsvinner en del av de individfattige artene, mens noen som blir begunstiget, øker i antall. Slik flater kurven ut, og strekker seg mot høyere klasser eller den får ekstra topper. Under slike forhold mister kurven enhver likhet med den statistiske log-normalfordelingen. Derfor kan avvik fra log-normalfordelingen tolkes som et resultat av en påvirkning/forurensing. Det har vist seg at denne metoden tidlig gir utslag ved miljøforstyrrelse. Ved sterk forurensning blir det bare noen få, men ofte svært tallrike arter tilbake. Log-normalfordelingskurven vil da ofte gjenoppstå, men med en lavere topp og spredt over flere klasser enn for uforstyrrede samfunn.

Faunaens fordelingsmønster

Variasjoner i faunaens fordelingsmønster over området beskrives ved å sammenligne tettheten av artene på hver stasjon. Til dette brukes multivariate klassifikasjons- og ordinasjons-analyser (Cluster og MDS).

Analysene i denne undersøkelsen ble utført ved hjelp av programpakken PRIMER v5. Inngangsdata er individantall pr. art, pr. prøve. Prøvene kan være replikater eller stasjoner. Det tas ikke hensyn til hvilke arter som opptrer. Forut for klassifikasjons- og ordinasjonsanalysene ble artslistene dobbelt kvadratrot-transformert. Dette ble gjort for å redusere avviket mellom høye og lave tetthetsverdier og dermed redusere eventuelle effekter av tallmessig dominans hos noen få arter i datasettet.

Clusteranalyse

Analysen undersøker faunalikheten mellom prøver. For å sammenligne to prøver ble Bray-Curtis ulikhetsindeks benyttet (Bray & Curtis, 1957):

$$d_{ij} = \frac{\sum_{k=1}^{n} \left| X_{ki} - X_{kj} \right|}{\sum_{k=1}^{n} (X_{ki} + X_{kj})}$$

der n = antall arter sammenlignet
X_{ki} = antall individ av art k i prøve nr. i
X_{kj} = antall individ av art k i prøve nr. j

Indeksen avtar med økende likhet. Vi får verdien 1 hvis prøvene er helt ulike, dvs. ikke har noen felles arter. Identiske arts- og individtall vil gi verdien 0. Prøver blir gruppert sammen etter graden av likhet ved å bruke "group-average linkage". Forholdsvis like prøver danner en gruppe (cluster). Resultatet presenteres i et trediagram (dendrogram).

Ømfintlighet (AMBI, ISI og NSI)

Ømfintligheten bestemmes ved indeksene ISI og AMBI. Beregning av ISI er beskrevet av Rygg (2002). Sensitivitetsindeksen AMBI (Azti Marin Biotic Index) tilordner en ømfintlighetsklasse (økologisk gruppe, EG): EG-1: sensitive arter, EG-II: indifferente arter, EG-III: tolerante arter, EG-IV: opportunistiske arter, EG-V: forurensningsindikerende arter. Sammensetningen av makroevertebratsamfunnet i form av andelen av økologiske grupper indikerer omfanget av en forurensningspåvirkning.

NSI er en sensitivitetsindeks som ligner AMBI, men er utviklet med basis i norske faunadata og ved bruk av en objektiv statistisk metode. En prøves NSI verdi beregnes ved gjennomsnittet av sensitivitetsverdiene av alle individene i prøven.

Sammensatte indekser (NQI1 og NQI2)

Sammensatte indekser NQI1 og NQI2 bestemmes både ut fra artsmangfold og ømfintlighet. NQI1 er brukt i NEAGIG (den nordøst-atlantiske interkalibreringen). De fleste land bruker nå sammensatte indekser av samme type som NQI1 og NQI2.

NQI1 indeksen er beskrevet ved hjelp av formelen:

NQI1 (Norwegian quality status, version 1) = [0.5* (1-AMBI/7) + 0.5*(SN/2.7)* (N/(N+5)]

Diversitetsindeksen SN = lnS/ln(lnN), hvor S er antall arter og N er antall individer i prøven

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7.2 Statistical results Vatneyri, 2024

Benthos indices per replicate

st.nr.	tot.	C1_01	C1_02	C2_01	C2_02	C3_01	C3_02	C4_01	C4_02	C5_01	C5_02	Cref_01	Cref_02
no. ind.	4579	313	570	400	477	289	519	402	385	281	413	292	238
no. spe.	63	27	32	27	32	24	29	25	23	28	25	23	27
Shannon-Wiener:		3,0	3,0	2,4	2,8	2,5	2,9	2,9	2,5	3,2	2,2	3,0	3,2
Pielou		0,63	0,60	0,51	0,55	0,55	0,59	0,62	0,55	0,67	0,46	0,66	0,68
ES100		17	15	13	16	14	15	15	13	18	12	15	18
SN		1,88	1,88	1,84	1,90	1,83	1,84	1,80	1,76	1,93	1,79	1,81	1,94
ISI-2012		8,27	8,17	8,41	8,38	7,59	8,61	8,05	8,62	9,02	8,99	8,39	7,99
AMBI		2,141	1,886	2,027	2,106	2,133	2,11	2,014	2,058	2,153	1,984	2,099	2,373
NQI1		0,69	0,71	0,69	0,70	0,68	0,69	0,68	0,67	0,70	0,69	0,68	0,68
NSI		21,0	21,8	21,0	21,3	20,8	20,8	21,1	20,7	20,9	21,0	21,1	21,0

Geometrical classes

int.	cla.	C1	C2	C3	C4	C5	Cref
1	1	15	10	9	9	17	7
2,3	2	8	9	8	5	5	8
4- 7	3	6	9	7	6	6	9
8- 15	4	4	3	4	4	2	1
16- 31	5	1	0	1	2	3	0
32- 63	6	2	2	1	0	1	1
64-127	7	1	2	3	2	2	3
128-255	8	2	0	0	1	0	1
256-511	9	1	1	1	1	1	0
512-1023	10	0	0	0	0	0	0
1024-2047	11	0	0	0	0	0	0
2048-	12	0	0	0	0	0	0

7.3 Species lists

Artsliste pr stasjon

Vatneyri pre-survey 2024

Rekke	Klasse	Orden	Art/Taxa	Replikat: 01	02	-	Sum
Stasjonsnr.: C1							
NEMERTINI							
			Nemertea indet.	3		-	3
ANNELIDA							
	Polychaeta						
		Orbiniida					
			Aricidea sp.	3	3	-	6
			Scoloplos armiger		1	-	1
		Cossurida					
			Cossura longocirrata	8	3	-	11
		Spionida					
			Chaetozone sp.	1	2	-	3
			Prionospio steenstrupi	31	36	-	67
			Spio limicola	1		-	1
		Capitellida					
			Maldane sarsi	1	9	-	10
			Mediomastus fragilis	4	1	-	5
			Praxillella gracilis		1	-	1
			Praxillella praetermissa	2	3	-	5
		Phyllodocida					
			Bylgides groenlandicus		1	-	1
			Eteone flava/longa	1	1	-	2
			Gattyana amondseni		1	-	1
			Microphthalmus sczelkowii	2	1	-	3
			Nephtys ciliata	3	7	-	10
			Nephtys sp. juv.		1	-	1
			Pholoe baltica	3	1	-	4
			Syllis cornuta		1	-	1
			Syllis sp.	1		-	1
		Amphinomida					
			Paramphinome jeffreysii		2	-	2
		Eunicida					
			Parougia nigridentata		141	-	141
		Sternaspida					
			Sternaspis scutata	29	25	-	54
		Oweniida					
			Galathowenia oculata	136	147	-	283
		Terebellida					
			Melinna cristata	1		-	1
			Terebellides sp.	1		-	1
		Sabellida					
			Euchone incolor	2	4	-	6
			Euchone papillosa	2		-	2
CRUSTACEA							
	Ostracoda						
			Ostracoda indet.		1	-	1
	Malacostraca						
		Cumacea					
			Eudorella sp.	1		-	1
			Leucon sp.	11	2	-	13
MOLLUSCA							
	Prosobranchia						
		Mesogastropoda					
			Euspira pallida		1	-	1
	Opistobranchia						
		Cephalaspidea					
			Retusa obtusa		1	-	1
	Bivalvia						
		Nuculoida					
			Ennucula tenuis	40	127	-	167
			Nuculana pernula	3	23	-	26

Rekke	Klasse	Orden	Art/Taxa	Replikat:	01	02	-	Sum
			Yoldia hyperborea		2	2	-	4
		Veneroida						
			Abra nitida			3	-	3
			Arctica islandica		1		-	1
			Axinopsida orbiculata			2	-	2
			Thyasira sarsii		20	16	-	36
ECHINODERMATA								
	Asteroidea							
		Paxillosida						
			Ctenodiscus crispatus			1	-	1
	Ophiuroidea							
			Ophiuroidea indet. juv.			1	-	1
				Maksverdi:	136	147		283
				Antall arter/taxa:	27	34		42
				Sum antall individ:				885

Stasjonsnr.: C2

NEMERTINI								
			Nemertea indet.		1		-	1
SIPUNCULIDA								
			Golfingia vulgaris			1	-	1
ANNELIDA								
	Polychaeta							
		Orbiniida						
			Aricidea sp.		2	3	-	5
		Cossurida						
			Cossura longocirrata		1		-	1
		Spionida						
			Chaetozone sp.		1	4	-	5
			Dipolydora sp.			1	-	1
			Prionospio steenstrupi		41	58	-	99
			Spio limicola		3	4	-	7
			Spio sp.			1	-	1
			Spiophanes kroyeri			1	-	1
		Capitellida						
			Maldane sarsi		7	2	-	9
			Mediomastus fragilis		1	6	-	7
			Praxillella gracilis		1	1	-	2
			Praxillella praetermissa		3	5	-	8
		Phyllodocida						
			Eteone flava/longa		1	2	-	3
			Microphthalmus sczelkowii		1	3	-	4
			Nephtys ciliata		1	5	-	6
			Nephtys sp. juv.		1		-	1
			Pholoe assimilis		1	3	-	4
			Pholoe baltica		1	1	-	2
			Syllis cornuta			1	-	1
		Sternaspida						
			Sternaspis scutata		23	26	-	49
		Oweniida						
			Galathowenia oculata		228	218	-	446
			Myriochele malmgreni/olgae			1	-	1
		Terebellida						
			Laphania boecki		2	1	-	3
			Melinna cristata		1	1	-	2
		Sabellida						
			Euchone incolor		2	2	-	4
			Euchone papillosa			3	-	3
			Euchone sp.		1		-	1
CRUSTACEA								
	Malacostraca							
		Cumacea						
			Eudorella sp.		2		-	2
			Leucon sp.		8	5	-	13
		Amphipoda						

Rekke	Klasse	Orden	Art/Taxa	Replikat:	01	02	-	Sum
			Dulichiidae indet.			3	-	3
MOLLUSCA								
	Bivalvia							
		Nuculoida						
			Ennucula tenuis		39	86	-	125
			Nuculana pernula		2	2	-	4
			Yoldia hyperborea		1	1	-	2
		Veneroida						
			Abra nitida			1	-	1
			Thyasira sarsii		25	25	-	50
				Maksverdi:	228	218		446
				Antall arter/taxa:	28	32		37
				Sum antall individ:				878

Stasjonsnr.: C3

NEMERTINI								
			Nemertea indet.		1	3	-	4
ANNELIDA								
	Polychaeta							
		Orbiniida						
			Aricidea sp.		1	2	-	3
		Cossurida						
			Cossura longocirrata		2	7	-	9
		Spionida						
			Chaetozone sp.		5	6	-	11
			Prionospio steenstrupi		33	52	-	85
			Spio limicola			2	-	2
		Capitellida						
			Maldane sarsi		1		-	1
			Mediomastus fragilis		1	4	-	5
			Praxillella praetermissa		1	2	-	3
		Phyllodocida						
			Eteone flava/longa		1	2	-	3
			Microphthalmus sczelkowii		5		-	5
			Nephtys ciliata		6	3	-	9
			Nephtys sp. juv.		2	2	-	4
			Pholoe baltica		1	1	-	2
		Eunicida						
			Lumbrineris sp.		1		-	1
			Parougia nigridentata		5	2	-	7
		Sternaspida						
			Sternaspis scutata		15	27	-	42
		Oweniida						
			Galathowenia oculata		155	234	-	389
		Terebellida						
			Laphania boecki			1	-	1
			Melinna cristata		1	2	-	3
			Terebellides sp.			1	-	1
		Sabellida						
			Euchone incolor			8	-	8
			Euchone papillosa			1	-	1
	Oligochaeta							
			Oligochaeta indet.		1		-	1
CRUSTACEA								
	Malacostraca							
		Cumacea						
			Eudorella sp.		1	4	-	5
			Leucon sp.			23	-	23
		Amphipoda						
			Acidostoma sp.			2	-	2
			Bathymedon obtusifrons			1	-	1
			Dulichiidae indet.			2	-	2
MOLLUSCA								
	Bivalvia							
		Nuculoida						
			Ennucula tenuis		26	69	-	95
			Nuculana pernula		2	5	-	7

Rekke	Klasse	Orden	Art/Taxa	Replikat:	01	02	-	Sum
			Yoldia hyperborea		1	3	-	4
		Veneroida						
			Axinopsida orbiculata			1	-	1
			Ciliatocardium ciliatum		1		-	1
			Thyasira sarsii		22	49	-	71
				Maksverdi:	155	234		389
				Antall arter/taxa:	25	30		35
				Sum antall individ:				812

Stasjonsnr.: C4

NEMERTINI

			Nemertea indet.	2		-	2
ANNELIDA							
	Polychaeta						
		Orbiniida					
			Aricidea sp.	1	2	-	3
		Cossurida					
			Cossura longocirrata	7	3	-	10
		Spionida					
			Chaetozone sp.	2	5	-	7
			Prionospio steenstrupi	35	35	-	70
			Spio limicola	3	1	-	4
		Capitellida					
			Maldane sarsi	16	7	-	23
			Mediomastus fragilis	1	3	-	4
			Praxillella gracilis	1	2	-	3
			Praxillella praetermissa	6	4	-	10
		Phyllodocida					
			Eteone flava/longa		2	-	2
			Microphthalmus sczelkowii	1		-	1
			Nephtys ciliata	3	2	-	5
			Nephtys sp. juv.	2		-	2
			Pholoe baltica	3	1	-	4
			Syllis cornuta		1	-	1
			Syllis sp.		1	-	1
		Eunicida					
			Parougia nigridentata	1		-	1
		Sternaspida					
			Sternaspis scutata	15	12	-	27
		Oweniida					
			Galathowenia oculata	159	205	-	364
		Terebellida					
			Laphania boecki	1		-	1
			Melinna cristata	1		-	1
			Pectinariidae indet. juv.	1		-	1
		Sabellida					
			Euchone incolor	3		-	3
CRUSTACEA							
	Malacostraca						
		Cumacea					
			Eudorella sp.		1	-	1
			Leucon sp.	7	7	-	14
		Amphipoda					
			Acidostoma sp.		1	-	1
MOLLUSCA							
	Bivalvia						
		Nuculoida					
			Ennucula tenuis	90	52	-	142
			Nuculana pernula	7	1	-	8
			Yoldia hyperborea	3	1	-	4
		Veneroida					
			Abra nitida	1		-	1
			Thyasira sarsii	33	36	-	69

Rekke	Klasse	Orden	Art/Taxa	Replikat:	01	02	-	Sum
				Maksverdi:	159	205		364
				Antall arter/taxa:	27	23		32
				Sum antall individ:				790

Stasjonsnr.: C5

NEMERTINI							
			Nemertea indet.	1	1	-	2
ANNELIDA							
	Polychaeta						
		Orbiniida					
			Aricidea sp.		2	-	2
			Levinsenia gracilis		1	-	1
		Spionida					
			Chaetozone sp.	5	1	-	6
			Prionospio steenstrupi	29	39	-	68
			Pseudopolydora nordica		1	-	1
			Spio limicola		1	-	1
		Capitellida					
			Capitella capitata	1		-	1
			Maldane sarsi	3	1	-	4
			Mediomastus fragilis	5	1	-	6
			Praxillella gracilis		1	-	1
			Praxillella praetermissa	3	6	-	9
		Phyllodocida					
			Eteone flava/longa		3	-	3
			Microphthalmus sczelkowii		1	-	1
			Nephtys ciliata	4		-	4
			Nephtys sp. juv.	7	2	-	9
			Pholoe assimilis	1		-	1
			Pholoe baltica	1		-	1
			Polynoidae indet. juv.	1		-	1
		Eunicida					
			Parougia nigridentata	17		-	17
		Sternaspida					
			Sternaspis scutata	7	21	-	28
		Oweniida					
			Galathowenia oculata	75	263	-	338
		Terebellida					
			Ampharete borealis	1		-	1
			Laphania boecki	1		-	1
			Melinna cristata		1	-	1
		Sabellida					
			Euchone incolor	6	3	-	9
CRUSTACEA							
	Malacostraca						
		Cumacea					
			Eudorella sp.	2	2	-	4
			Leptostylis sp.	1		-	1
			Leucon sp.	5	15	-	20
		Amphipoda					
			Acidostoma sp.	1		-	1
			Bathymedon obtusifrons	1		-	1
			Stenothoidae indet.	1		-	1
		Decapoda					
			Paguridae indet.	1		-	1
MOLLUSCA							
	Bivalvia						
		Nuculoida					
			Ennucula tenuis	71	24	-	95
			Nuculana pernula	1	1	-	2
			Yoldia hyperborea	2	2	-	4
		Veneroida					
			Ciliatocardium ciliatum	1	1	-	2
			Thyasira gouldii		1	-	1
			Thyasira sarsii	34	20	-	54

Rekke	Klasse	Orden	Art/Taxa	Replikat:	01	02	-	Sum
				Maksverdi:	75	263		338
				Antall arter/taxa:	30	26		39
				Sum antall individ:				704

Stasjonsnr.: Cref

NEMERTINI							
			Nemertea indet.	1	1	-	2
ANNELIDA							
	Polychaeta						
		Orbiniida					
			Aricidea sp.	2	3	-	5
			Levinsenia gracilis		2	-	2
		Cossurida					
			Cossura longocirrata		3	-	3
		Spionida					
			Chaetozone sp.	2	4	-	6
			Prionospio steenstrupi	22	25	-	47
			Spio limicola		1	-	1
		Capitellida					
			Mediomastus fragilis	5	2	-	7
			Notoproctus sp.		1	-	1
			Praxillella gracilis	1	1	-	2
			Praxillella praetermissa	2	3	-	5
		Phyllodocida					
			Eteone flava/longa	1		-	1
			Microphthalmus sczelkowii	2		-	2
			Nephtys ciliata		1	-	1
			Pholoe baltica		1	-	1
			Syllis cornuta	1	3	-	4
			Syllis sp.		1	-	1
		Eunicida					
			Parougia nigridentata	2	2	-	4
		Sternaspida					
			Sternaspis scutata	28	45	-	73
		Oweniida					
			Galathowenia oculata	65	71	-	136
		Terebellida					
			Ampharete borealis	1		-	1
			Melinna cristata	2	1	-	3
			Terebellides sp.	1	1	-	2
		Sabellida					
			Euchone incolor	3	1	-	4
CRUSTACEA							
	Malacostraca						
		Cumacea					
			Leucon sp.	3	3	-	6
MOLLUSCA							
	Bivalvia						
		Nuculoida					
			Ennucula tenuis	94	30	-	124
			Nuculana pernula	9	6	-	15
			Yoldia hyperborea	3	1	-	4
		Veneroida					
			Abra nitida	2	1	-	3
			Thyasira sarsii	40	24	-	64
ECHINODERMATA							
	Echinoidea						
		Echinoida					
			Echinidea indet. juv.	1		-	1
				Maksverdi:	94	71	136
				Antall arter/taxa:	24	27	31
				Sum antall individ:			531

7.4 Analytical report

Akvaplan niva

NORSK AKKREDITERING TEST 079

ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P240083
Kundemerking:	Vaneyri		
Kontaktperson:		**Rapportdato**	2024-09-06
Prosjektnr.:	65907	**Ankomst dato:**	2024-05-07

Lab-id. P240083-01

Objekt	Prøvestasjon/ID	ASC-stasjon	FU-stasjon	Prosjektnr. og prosjektnavn	Notering	Mottatt lab
Sediment	C1			65907 - Vatneyri prestudy (C and B) 2024	Resultatet for TNb er utenfor akkreditert måleområde	2024-05-07

Analyseresultat

Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
TOC	44	mg/g TS	2024-07-09	2024-07-15	Intern metode (NS-EN 17505:2023)	±4.4
TNb	*6.7	mg/g TS	2024-07-09	2024-07-15	Intern metode (NS-EN 16168:2012)	±1.5
nTOC	47.3		2024-07-29	2024-07-29	Veileder 02:2018	
C/N - forhold	*6.5		2024-07-29	2024-07-29	Beregning TOC:TN	
TOM	13.4	% TS	2024-05-28	2024-05-31	Intern metode	±0.25
Vekt% ≥2 mm	0.8	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 1 mm - <2 mm	1.6	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.500 mm - <1 mm	2.3	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.250 mm - <0.500 mm	2.9	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.125 mm - <0.250 mm	4.5	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.3
Vekt% 0.063 mm - <0.125 mm	7.9	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.7
Vekt% <0.063 mm	80.0	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±7.9
Pelitt	*80.0	wt% TS	2024-05-28	2024-06-06	Fraksjonen <0.063 mm	±7.9
Sand	*19.1	wt% TS	2024-05-28	2024-06-06	Summering av fraksjonene mellom 0.063 mm opptil 2 mm	±0.9
Grus	*0.8	wt% TS	2024-05-28	2024-06-06	Fraksjonen ≥2 mm	±0.1
Kobber (Cu) [a]	39.1	mg/kg TS	2024-05-19	2024-05-19	Intern metode	
P (Fosfor) [a]	953	mg/kg TS	2024-05-19	2024-05-19	Intern metode	

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group

* = Ikke akkreditert resultat

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Analyserapporten er digitalt undertegnet av:
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ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P240083
Kundemerking:	Vaneyri		
Kontaktperson:		**Rapportdato**	**2024-09-06**
Prosjektnr.:	**65907**	**Ankomst dato:**	2024-05-07

Lab-id. P240083-02

Objekt	Prøvestasjon/ID	ASC-stasjon	FU-stasjon	Prosjektnr. og prosjektnavn	Notering	Mottatt lab
Sediment	C2			65907 - Vatneyri prestudy (C and B) 2024	Resultatet for TNb er utenfor akkreditert måleområde	2024-05-07

Analyseresultat

Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
TOC	45	mg/g TS	2024-07-09	2024-07-15	Intern metode (NS-EN 17505:2023)	±4.5
TNb	*7.0	mg/g TS	2024-07-09	2024-07-15	Intern metode (NS-EN 16168:2012)	±1.5
nTOC	48.2	mg/g TS	2024-07-29	2024-07-29	Veileder 02:2018	
C/N - forhold	*6.4		2024-07-29	2024-07-29	Beregning TOC:TN	
TOM	12.3	% TS	2024-05-28	2024-05-31	Intern metode	±0.25
Vekt% ≥2 mm	1.4	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.2
Vekt% 1 mm - <2 mm	1.8	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.500 mm - <1 mm	1.8	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.250 mm - <0.500 mm	2.4	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.125 mm - <0.250 mm	3.6	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.2
Vekt% 0.063 mm - <0.125 mm	7.9	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.7
Vekt% <0.063 mm	81.1	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±8.0
Pelitt	*81.1	wt% TS	2024-05-28	2024-06-06	Fraksjonen <0.063 mm	±8.0
Sand	*17.5	wt% TS	2024-05-28	2024-06-06	Summering av fraksjonene mellom 0.063 mm opptil 2 mm	±0.9
Grus	*1.4	wt% TS	2024-05-28	2024-06-06	Fraksjonen ≥2 mm	±0.2
Kobber (Cu) [a]	39.0 39.2	mg/kg TS	2024-05-19	2024-05-19	Intern metode	
P (Fosfor) [a]	1070	mg/kg TS	2024-05-19	2024-05-19	Intern metode	

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group

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ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P240083
Kundemerking:	Vaneyri		
Kontaktperson:		**Rapportdato**	**2024-09-06**
Prosjektnr.:	**65907**	**Ankomst dato:**	2024-05-07

Lab-id. P240083-03

Objekt	Prøvestasjon/ID	ASC-stasjon	FU-stasjon	Prosjektnr. og prosjektnavn	Notering	Mottatt lab
Sediment	C3			65907 - Vatneyri prestudy (C and B) 2024	Resultatet for TNb er utenfor akkreditert måleområde	2024-05-07

Analyseresultat

Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
TOC	40	mg/g TS	2024-07-09	2024-07-15	Intern metode (NS-EN 17505:2023)	±4.0
TNb	*5.7	mg/g TS	2024-07-09	2024-07-15	Intern metode (NS-EN 16168:2012)	±1.3
nTOC	42.2	mg/g TS	2024-07-29	2024-07-29	Veileder 02:2018	
C/N - forhold	*7.0		2024-07-29	2024-07-29	Beregning TOC:TN	
TOM	12.6	% TS	2024-05-28	2024-05-31	Intern metode	±0.25
Vekt% ≥2 mm	2.6	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.3
Vekt% 1 mm - <2 mm	0.7	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.0
Vekt% 0.500 mm - <1 mm	1.1	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.0
Vekt% 0.250 mm - <0.500 mm	0.9	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.0
Vekt% 0.125 mm - <0.250 mm	2.0	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.063 mm - <0.125 mm	4.5	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.4
Vekt% <0.063 mm	88.2	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±8.7
Pelitt	*88.2	wt% TS	2024-05-28	2024-06-06	Fraksjonen <0.063 mm	±8.7
Sand	*9.1	wt% TS	2024-05-28	2024-06-06	Summering av fraksjonene mellom 0.063 mm opptil 2 mm	±0.5
Grus	*2.6	wt% TS	2024-05-28	2024-06-06	Fraksjonen ≥2 mm	±0.3
Kobber (Cu) [a]	37.9 44.0	mg/kg TS	2024-05-19	2024-05-19	Intern metode	
P (Fosfor) [a]	853	mg/kg TS	2024-05-19	2024-05-19	Intern metode	

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group

* = Ikke akkreditert resultat

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ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P240083
Kundemerking:	Vaneyri		
Kontaktperson:		**Rapportdato**	**2024-09-06**
Prosjektnr.:	**65907**	**Ankomst dato:**	2024-05-07

Lab-id. P240083-04

Objekt	Prøvestasjon/ID	ASC-stasjon	FU-stasjon	Prosjektnr. og prosjektnavn	Notering	Mottatt lab
Sediment	C4			65907 - Vatneyri prestudy (C and B) 2024	Resultatet for TNb er utenfor akkreditert måleområde	2024-05-07

Analyseresultat

Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
TOC	43	mg/g TS	2024-07-09	2024-07-15	Intern metode (NS-EN 17505:2023)	±4.3
TNb	*6.6	mg/g TS	2024-07-09	2024-07-15	Intern metode (NS-EN 16168:2012)	±1.5
nTOC	46.8	mg/g TS	2024-07-29	2024-07-29	Veileder 02:2018	
C/N - forhold	*6.5		2024-07-29	2024-07-29	Beregning TOC:TN	
TOM	12.4	% TS	2024-05-28	2024-05-31	Intern metode	±0.25
Vekt% ≥2 mm	1.6	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.2
Vekt% 1 mm - <2 mm	1.4	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.500 mm - <1 mm	1.6	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.250 mm - <0.500 mm	2.3	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.125 mm - <0.250 mm	4.2	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.2
Vekt% 0.063 mm - <0.125 mm	7.6	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±0.7
Vekt% <0.063 mm	81.1	wt% TS	2024-05-28	2024-06-06	Intern metode (Bale/Kenny 2005)	±8.0
Pelitt	*81.1	wt% TS	2024-05-28	2024-06-06	Fraksjonen <0.063 mm	±8.0
Sand	*17.2	wt% TS	2024-05-28	2024-06-06	Summering av fraksjonene mellom 0.063 mm opptil 2 mm	±0.9
Grus	*1.6	wt% TS	2024-05-28	2024-06-06	Fraksjonen ≥2 mm	±0.2
Kobber (Cu) [a]	40.6 37.0	mg/kg TS	2024-05-19	2024-05-19	Intern metode	
P (Fosfor) [a]	920	mg/kg TS	2024-05-19	2024-05-19	Intern metode	
Emamectinbenzoat [b]	*<50	ng/kg TS	2024-08-06	2024-08-06	Intern metode	

Tabellen fortsetter på neste side...

* = Ikke akkreditert resultat

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ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P240083
Kundemerking:	Vaneyri		
Kontaktperson:		**Rapportdato**	**2024-09-06**
Prosjektnr.:	**65907**	**Ankomst dato:**	2024-05-07

Fortsettelse av tabell fra forrige side.

Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group
[b] Prøvingen er utført av eksternt laboratorium, NIVA

Lab-id. P240083-05

Objekt	Prøvestasjon/ID	ASC-stasjon	FU-stasjon	Prosjektnr. og prosjektnavn	Notering	Mottatt lab
Sediment	C5			65907 - Vatneyri prestudy (C and B) 2024	Resultatet for TNb er utenfor akkreditert måleområde	2024-05-07

Analyseresultat

Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
TOC	43	mg/g TS	2024-07-09	2024-07-15	Intern metode (NS-EN 17505:2023)	±4.3
TNb	*7.1	mg/g TS	2024-07-09	2024-07-15	Intern metode (NS-EN 16168:2012)	±1.6
nTOC	46.0	mg/g TS	2024-07-29	2024-07-29	Veileder 02:2018	
C/N - forhold	*6.0		2024-07-29	2024-07-29	Beregning TOC:TN	
TOM	13.2	% TS	2024-05-28	2024-05-31	Intern metode	±0.25
Vekt% ≥2 mm	1.5	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±0.2
Vekt% 1 mm - <2 mm	2.1	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.500 mm - <1 mm	2.0	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.250 mm - <0.500 mm	3.3	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.125 mm - <0.250 mm	3.9	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±0.2
Vekt% 0.063 mm - <0.125 mm	6.2	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±0.5
Vekt% <0.063 mm	81.0	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±8.0
Pelitt	*81.0	wt% TS	2024-05-28	2024-06-07	Fraksjonen <0.063 mm	±8.0

Tabellen fortsetter på neste side...

* = Ikke akkreditert resultat

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Analyserapporten er digitalt undertegnet av:
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ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P240083
Kundemerking:	Vaneyri		
Kontaktperson:		**Rapportdato**	**2024-09-06**
Prosjektnr.:	**65907**	**Ankomst dato:**	2024-05-07

Fortsettelse av tabell fra forrige side.

Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
Sand	*17.5	wt% TS	2024-05-28	2024-06-07	Summering av fraksjonene mellom 0.063 mm opptil 2 mm	±0.9
Grus	*1.5	wt% TS	2024-05-28	2024-06-07	Fraksjonen ≥2 mm	±0.2
Kobber (Cu) [a]	40.4 41.0	mg/kg TS	2024-05-19	2024-05-19	Intern metode	
P (Fosfor) [a]	934	mg/kg TS	2024-05-19	2024-05-19	Intern metode	

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group

Lab-id. P240083-06

Objekt	Prøvestasjon/ID	ASC-stasjon	FU-stasjon	Prosjektnr. og prosjektnavn	Notering	Mottatt lab
Sediment	Cref			65907 - Vatneyri prestudy (C and B) 2024	Agglomerering i siktene i kornfordelingsanalysen.Resultatet for TNb er utenfor akkreditert måleområde	2024-05-07

Analyseresultat

Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
TOC	44	mg/g TS	2024-07-09	2024-07-15	Intern metode (NS-EN 17505:2023)	±4.4
TNb	*6.4	mg/g TS	2024-07-09	2024-07-15	Intern metode (NS-EN 16168:2012)	±1.4
nTOC	46.3	mg/g TS	2024-07-29	2024-07-29	Veileder 02:2018	
C/N - forhold	*6.8		2024-07-29	2024-07-29	Beregning TOC:TN	
TOM	13.2	% TS	2024-05-28	2024-05-31	Intern metode	±0.25
Vekt% ≥2 mm	1.4	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±0.2
Vekt% 1 mm - <2 mm	1.4	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.500 mm - <1 mm	1.9	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.250 mm - <0.500 mm	1.8	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±0.1
Vekt% 0.125 mm - <0.250 mm	2.4	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±0.1

Tabellen fortsetter på neste side...

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ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P240083
Kundemerking:	Vaneyri		
Kontaktperson:		**Rapportdato**	**2024-09-06**
Prosjektnr.:	**65907**	**Ankomst dato:**	2024-05-07

Fortsettelse av tabell fra forrige side.

Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
Vekt% 0.063 mm - <0.125 mm	4.2	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±0.4
Vekt% <0.063 mm	87.0	wt% TS	2024-05-28	2024-06-07	Intern metode (Bale/Kenny 2005)	±8.6
Pelitt	*87.0	wt% TS	2024-05-28	2024-06-07	Fraksjonen <0.063 mm	±8.6
Sand	*11.7	wt% TS	2024-05-28	2024-06-07	Summering av fraksjonene mellom 0.063 mm opptil 2 mm	±0.6
Grus	*1.4	wt% TS	2024-05-28	2024-06-07	Fraksjonen >2 mm	±0.2
Kobber (Cu) [a]	37.8 37.6	mg/kg TS	2024-05-19	2024-05-19	Intern metode	
P (Fosfor) [a]	998	mg/kg TS	2024-05-19	2024-05-19	Intern metode	

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group

Lab-id. P240083-07

Objekt	Prøvestasjon/ID	ASC-stasjon	FU-stasjon	Prosjektnr. og prosjektnavn	Notering	Mottatt lab
Sediment	Cu ref 2			65907 - Vatneyri prestudy (C and B) 2024		2024-05-07

Analyseresultat

Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
Kobber (Cu) [a]	39.2 40.2	mg/kg TS	2024-05-19	2024-05-19	Intern metode	

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group

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ANALYSERAPPORT

Kunde:	Arnarlax	**Rapport nr.:**	P240083
Kundemerking:	Vaneyri		
Kontaktperson:		**Rapportdato**	2024-09-06
Prosjektnr.:	65907	**Ankomst dato:**	2024-05-07

Lab-id. P240083-08

Objekt	Prøvestasjon/ID	ASC-stasjon	FU-stasjon	Prosjektnr. og prosjektnavn	Notering	Mottatt lab
Sediment	Cu ref 3			65907 - Vatneyri prestudy (C and B) 2024		2024-05-07

Analyseresultat

Parameter	Resultat	Enhet	Analysedato start	Analysedato slutt	Standard	Måleusikkerhet
Kobber (Cu) [a]	34.1 35.4	mg/kg TS	2024-05-19	2024-05-19	Intern metode	

[a] Prøvingen er utført av eksternt laboratorium, ALS Laboratory Group

Analyseansvarlig: Oda Sofie Bye Wilhelmsen

Signatur: Oda Sofie Bye Wilhelmsen

Underskriftsberettiget: Lisa Torske

Signatur: Lisa Torske

Analysene gjelder bare for de prøver som er testet. De oppgitte analyseresultat omfatter ikke feil som måtte følge av prøvetagningen, inhomogenitet eller andre forhold som kan ha påvirket prøven før den ble mottatt av laboratoriet. Rapporten får kun kopieres i sin helhet og uten noen form for endringer. En eventuell klage skal leveres laboratoriet senest en måned etter mottak av analyseresultat. Nærmere informasjon om analysemetodene (måleusikkerhet, metodeprinsipp etc.) fås ved henvendelse til Akvaplan-Niva AS

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