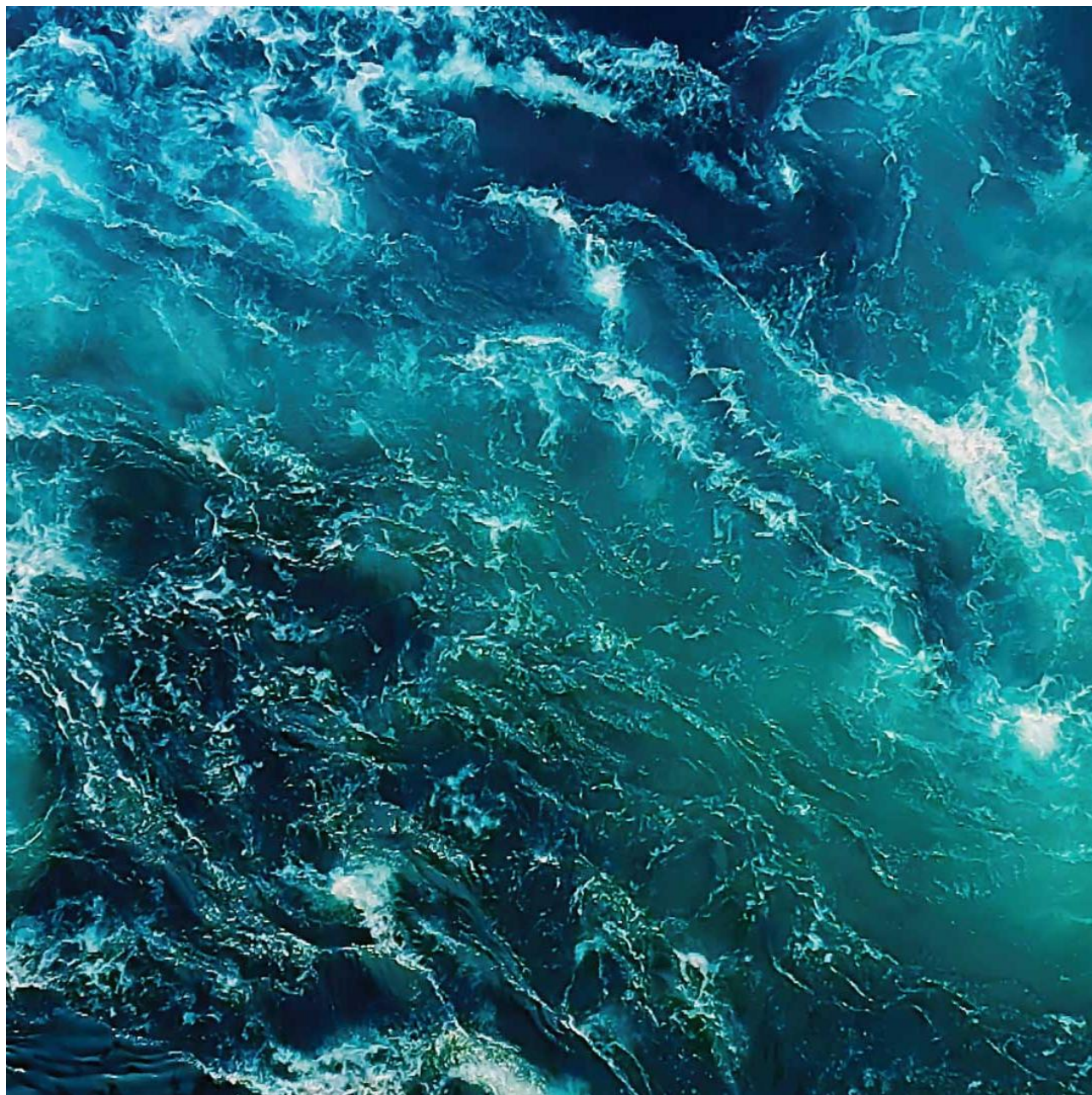


B-survey at Steinanes, August 2025 (max biomass), Arnarlax ehf

**Akvaplan-niva AS Report:
APN 2025 66876.B02**



B survey at Steinanes, August 2025 (max biomass), Arnarlax ehf

Author(s)	Snorri Gunnarsson
Date	19.09 2025
Report No.	APN 2025 66876.B02
Number of pages	20
Distribution	Through customer
Customer	Arnarlax ehf
Contact person	Silja Baldvinsdóttir

Summary

Sediment was recovered at 14 of the total stations (100% soft bottom). The sediments were in general homogenous at the site and consisted primarily of clay in the whole near zone of the fish farm but on the northern part some gravel was mixed in the sample at five stations. Fauna was recorded to be present at all stations mainly in the form of polychaetes. There was sign of out-gassing at one station in the north-western part of the local impact zone (St. 12). Strong smell of H₂S was recorded at two sampling stations, light smell at three stations and no smell at nine stations. The substrate was light/grey color at nine station and brown/black at six stations. The consistency of the sediment was solid at eleven stations and soft at three stations. Grab was full at five stations, about half full at six stations and third full or less at three stations. Thickness of sludge was between 2-8 cm thick at two stations but less than 2 cm at other stations.

Based on the classification of sediment chemistry (pH/Eh) and the sensory assessment eleven stations received status 1 - "Very good", one station received status 2 - "Good" and two stations received status 4 - "Very bad". Overall, the index score for parameter III (sensory parameters) was similar (0.85) compared with the index score for the parameter II (pH/Eh) (0.86). Status of stations within parameter II (pH/Eh) was twelve stations with status 1 - "very good" and two stations had status 4 - "very bad", while within parameter III (sensory) status of stations was eleven stations with status 1 - "very good", was eleven stations with status 1 - "very good", one station with status 2 - "good" and two stations with status 3 - "bad".

In summary, the site receives the environmental status 1 - "Very good" (average group II-III index =0.85).

Approval

Snorri Gunnarsson
Project Manager

Rikke Stabell
Quality Control

Key information

Site details and license holder information			
Site name	Steinanes	Site coordinates	65°40.388' N 23°28.123' W
County	Vesturbyggð	Municipality	Vesturbyggð
MTB (estimated max biomass)	10.693 tonnes	Operations Manager / Contact	Silja Baldvinsdóttir
License holder / customer	Arnarlax ehf		

Production status on date of survey			
Biomass at site	2.246 tonnes	Total feed use	7.586 tonnes
Farmed species	Salmon	Total biomass produced	6.725 tonnes
Type/time of survey	Indicated with X	Comments	
Maximum organic load cf. chapter 7.9	☒		
Follow-up survey	☐		
Half maximum load	☐		
Pre-stock	☐		
Required by the state administrator - baseline survey	☐		
Other	☐		
Last fallowing period:			

Results from B-survey in accordance with NS 9410:2016 (main results)			
Parameter group and index		Parameter group and status	
Gr. II. pH/Eh	0.86	Gr. II. pH/Eh	1
Gr. III. Sensory	0.85	Gr. III. Sensory	1
GR. II + III	0.85	GR. II+ III	1
Date of fieldwork	28.08 2025	Date of report	19.09 2025
Environmental status (NS 9410:2016):			1

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1 Introduction

The present survey was conducted by Akvaplan-niva AS on behalf of Arnarlax in connection with the company's fish farming activities at the site Steinanes in Arnarfjörður in Vesturbyggð county.

The purpose of a B-survey is to document the environmental status in the near zone of a fish farm by evaluating sediment condition (chemistry, sensory and presence/absence of fauna) in accordance with NS 9410:2016.

The B-survey is a tool for trend monitoring and allows to assess the status of organic enrichment beneath the net pens at different stages of the production cycle.

Figure 1 shows a map of the fjord Arnarfjörður where Steinanes farm is located (marked with a red cross).

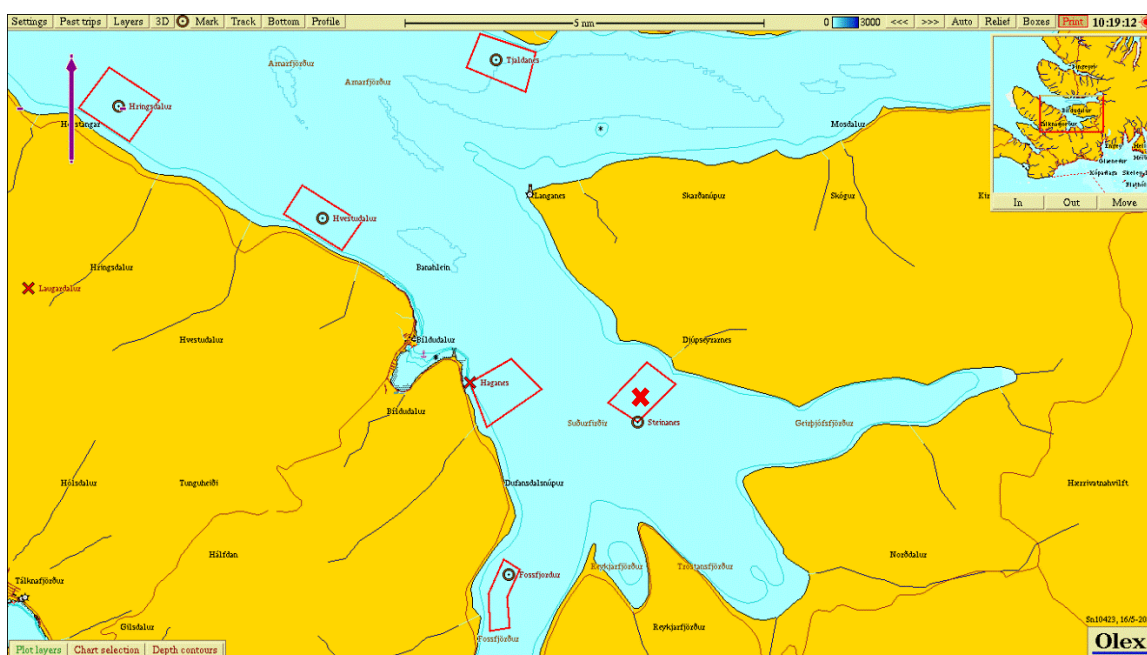


Figure 1. Overview map where Steinanes farm is marked (red cross). Other fish farming areas in the nearest vicinity (Arnarfjörður) are also shown.

2 Methods

Monitoring of the environmental impact of fish farming activities on the seabed is standardised and regulated. All fish farming sites that are in use must be regularly assessed. This B-survey follows guidelines and methods outlined in NS 9410:2016 and ISO 12878. The Icelandic Environment and Energy Agency (Umhverfis og orkustofnun) can also set specific requirements regarding frequency of surveys for different fish farming sites, which can overrule the above-mentioned standards.

The B survey is a trend monitoring tool with the focus on sediment condition (benthic impact) under and in the immediate vicinity of an aquaculture site. Sediment samples are taken using a grab (min. 250 cm²). Sediment condition for each sample is assessed applying three indicators: sediment chemistry (pH and redox potential), sensory evaluation (gas bubbles; smell, texture, colour of substrate and thickness of deposited sludge) and the presence or absence of fauna. The performance of these indicators against predefined thresholds allows to categorise the site into four different environmental statuses (Table 1), which are used to determine subsequent sampling frequency. The number of sampling stations is based on the site's allocated MTB, here the estimated max biomass of the current generation i.e. 3.805 ton (Personal reference, Silja Baldvinsdóttir, 2025).

Table 1. Frequency of B-survey based on environmental status at site.

Environmental status at maximum organic load (near zone)	Monitoring frequency for B survey
1-very good	At the next maximum load
2-good	Pre-stock and again at maximum load
3-poor	Pre-stock If the survey prior to restocking / end of fallowing provides: Status 1 – survey should be carried out at next maximum load. Status 2 – survey should be carried out at half the maximum load and at the next maximum load. Status 3 – survey should be carried out at half the maximum load and at maximum load. Implementation of measures to reduce impact should be planned for the next production cycle. If any surveys show the environmental status to be 4 – "very poor", the site's environmental capacity has been exceeded.
4- very poor	Environmental capacity at site is exceeded. The authorities decide further measures.

The following equipment was used in this survey:

Grab: Van Veen grab (0.1 m²)

Sieve 1 mm: Akvaplan-niva

pH meter: Electrode, YSI Professional Plus

Redox meter: Electrode, YSI Professional Plus

Position determination – GPS map 62s

Digital camera

3 Site, production and survey design

3.1 Site characteristics and production

The Steinanes site is located in Arnarfjörður Iceland about 5.5 km north-east from Bíldudalur. The cages are lined in a southwest direction from land (227 degrees). The depth under cages ranges from about 62 m closer to land up to about 92 further into the fjord. The shallower area of the farm is at the northernmost part. The fish farm at the site is a one-frame mooring system, with a total of 14 cages, each with 160 m circumference. Two cages were not used during current production cycle and were left out in the survey.

The current generation salmon at the site is the third one farmed at Steinanes. Table 2. shows production and feed use for present and previous generations.

Table 2. Production and feed use for farm site Steinanes. Data provided by customer.

Generation of fish (G)	Production (tonnes)	Feed use (tonnes)
Preceding generation 2017 – 2019	8.964	13.704
Preceding generation 2020- 2022	9.870	12.243
Current generation	6.725	7.586

3.2 Current and past surveys

Table 3 provides an overview on results and time of sampling for the last B-surveys at site.

Table 3. Present and previously conducted B-surveys at the site.

Date of sampling	Report number	Production status	Location condition
28.08.2025	APN 66876.B02	B survey max biomass	1
18.07.2023	APN 65074.B01	Fallow period	1
12.10.2021	APN 63543.B01	B survey max biomass	3
10.06 2020	APN 62254.B01	Fallow period	1
25.09 2018	APN-60526.B02	B survey max biomass	2
27.06 2017	Pre farming B surey not published	Pre survey new site	1

3.3 Hydrodynamic conditions

Measurement of dispersing current was done at the site in May-June 2020 measurements at 60 m depth (Hermansen, 2020). The dominating current (60 m) is in direction north-west (315 degrees) with a counter current in south-east direction Figure 2. Average current speed is measured to be 4.1 cm/s. Highest current speed is measured to be 14.2 cm/s and 5 % of the measurements are < 1 cm/s.

3.4 Survey design

Sampling stations were placed following an assessment of site configuration and local environmental conditions, i.e. bathymetry and hydrodynamics. An overview of the total 14 sampling stations can be found in Figure 2 with coordinates and depth provided in Table 4. The number of sampling stations were 14 according to guidance in ISO 12878 and NS 9410:2016. The 14 sampling stations are giving good coverage of the local impact zone of the fish farm. Sampling stations were placed to represent the environmental conditions within the near zone and cover thus both the deeper and shallower areas. The typical depth in the local impact zone is in the range from 62-92 m. Samples were collected from depths ranging from 65-91 metres. The station placement is considered representative for an environmental survey of the farm's near-zone and in accordance with the requirements outlined in NS 9410:2016.

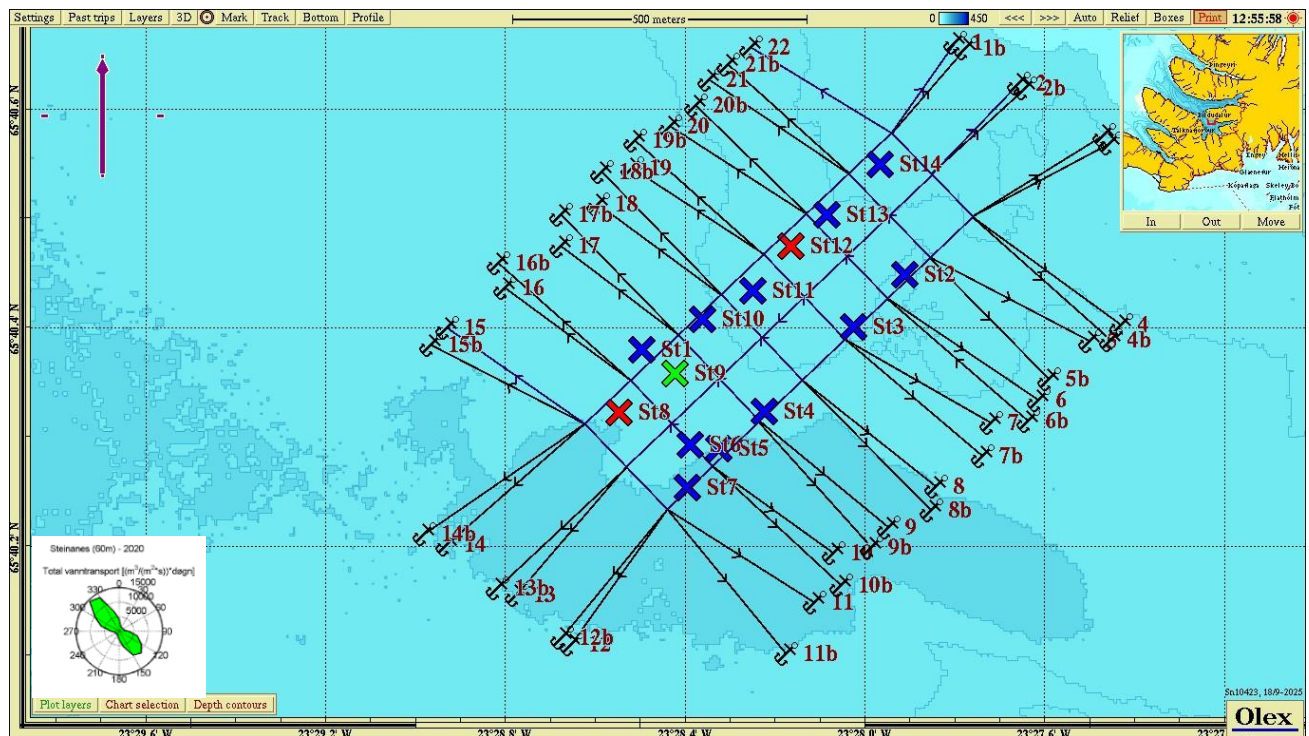


Figure 2. Overview map showing site configuration and local bathymetry at Steinanes. Sampling stations are marked by crosses and colour coded to visualise the environmental status at the respective station following the classification outlined in NS 9410:2016, chapter 7.11 (1 = blue, 2 = green, 3 = yellow, 4 = red). The current rose in the right corner shows the direction of water transport, and the red flag indicates placement of current meter for measuring dispersal current (Hermansen, 2020).

Table 4. Position and depth of the sampling stations of this survey.

Station number	Northing	Westing	Depth [m]
St 1	65°40,379	23°28,496	85
St 2	65°40,448	23°27,911	81
St 3	65°40,400	23°28,026	80
St 4	65°40,323	23°28,223	87
St 5	65°40,289	23°28,325	90
St 6	65°40,292	23°28,389	87
St 7	65°40,253	23°28,394	91
St 8	65°40,322	23°28,548	90
St 9	65°40,358	23°28,455	85
St 10	65°40,407	23°28,361	82
St 11	65°40,433	23°28,249	76
St 12	65°40,474	23°28,164	76
St 13	65°40,503	23°28,026	72
St 14	65°40,549	23°27,965	65

4 Results

Classified survey results for the different parameter categories as well as the assigned environmental status of the site are shown in Table 5. The complete survey assessment form with results and classifications for each station can be found in the attachment.

Table 5. Results from the environmental assessment of the near zone of Steinanes.

Parameter	Status
Group II parameters (pH/Eh)	1
Group III parameters (sensory)	1
Group II + III – parameters (mean)	1
Environmental status (site)	1

Sediment was recovered at 14 of the total stations (100% soft bottom). The sediments were in general homogenous at the site and consisted primarily of clay in the whole near zone of the fish farm but on the northern part some gravel was mixed in the sample at six stations. Fauna was recorded to be present at all stations mainly in the form of polychaetes. There was sign of out-gassing at one station in the north-western part of the local impact zone (St. 12). Strong smell of H₂S was recorded at two sampling stations, light smell at three stations and no smell at nine stations. The substrate was light/grey colour at nine station and brown/black at five stations. The consistency of the sediment was solid at eleven stations and soft at three stations. Grab was full at three stations, about half full at six stations and third full or less at five stations. Thickness of sludge was between 2-8 cm thick at two stations but less than 2 cm at other stations.

Based on the classification of sediment chemistry (pH/Eh) and the sensory assessment eleven stations received status 1 – "Very good", one station received status 2 - "Good" and two stations received status 4 - "Very bad". Overall, the index score for parameter III (sensory parameters) was similar (0.85) compared with the index score for the parameter II (pH/Eh) (0.86). Status of stations within parameter II (pH/Eh) was twelve stations with status 1 – "Very good" and two stations had status 4 – "Very bad", while within parameter III (sensory) status was eleven stations with status 1 – "Very good", one station with status 2 – "Good" and two stations with status 3 – "Bad".

In summary, the site receives the environmental status 1 - "Very good" (average group II-III index =0.85).

5 Summary

Applying the indicator thresholds and classification outlined in NS 9410:2016 the site Steinanes receives overall site status of 1 – "Very good" at the time of this B survey (max biomass). Samples were collected with a Van Veen grab (0.1 m²) at 14 stations distributed around the 12 cages in use during last production cycle. Sediment was successfully collected at all the 14 stations and assessment eleven stations received status 1 – "Very good", one station received status 2 - "Good" and two stations received status 4 - "Very bad". All three stations with reduced condition were found in the north-western part of the local impact zone (stations 8, 9 and 12). This is in line with the main spread current at the site in direction north-west. This indicates there's more organic load in line with main current at the site. Overall, the site condition is good but with some clear signs of organic enrichment in patches of the local impact zone.

In a previous B survey carried out in July 2023 at fallow period (Gunnarsson, 2023) the overall site status was also 1 "Very good" and of the total 19 sampling fourteen station received status 1 – "Very good", three stations received status 2 – "Good" and two stations received status 4 – "Very bad". The current results from sampling at max biomass in August 2025 show that compared the results at last fallow period there is still some organic enrichment in patches of the local impact zone. In both surveys organic load is more evident in the north-western part of the local impact zone in line with main spread current at 60 m at the side.

The site is given environmental status 1 – "Very good" following the criteria outlined in NS 9410:2016.

6 References

Forskrift om drift av akvakulturanlegg (akvakulturdriftsforskriften) §§ 35 og 36.

Gunnarsson, S. 2020a (revised edition). Arnarlax hf, B-undersøkelse, Steinanes (undersøkelse ved maksimal belastning. Akvaplan-niva AS rapport nr. 60526.01.

Gunnarsson, S. 2020b (revised edition). Steinanes Arnarlax hf, B-bottom survey, June 2020 (fallow period). Akvaplan-niva AS report nr. 62254.B01.

Gunnarsson, S. 2021. Steinanes Arnarlax ehf, B-bottom survey, October 2021 (maximum biomass). Akvaplan-niva AS report nr. 63543.B02.

Gunnarsson, S. 2023. Steinanes Arnarlax, B survey (fallow period), July 2023. Akvaplan-niva AS report nr. 65074.B01.

Hermansen, S. 2020. Arnarlax. Steinanes current measurements, 5, 15 and 60 meters. Akvaplan-niva AS report nr. 62191.04.

ISO 12878:2012. Environmental monitoring of the impacts from marine finfish farms on soft bottom.

ISO 5667-19:2004. Guidance on sampling of marine sediments.

Norsk Standard NS 9410:2016. Miljøovervåking av bunnpåvirkning fra marine akvakulturanlegg.

Personal reference, 2025. Silja Baldvinsdóttir, Quality manager Arnarlax ehf.

Steinanes Miljøundersøkelser type B (pre-survey), by av Akvaplan-niva AS sommer 2017 (not published data).

7 Attachments

7.1 Form (B.1 and B.2) NS 9410:2016

Sample scheme B.1											
Company		Arnarlax									
Site:		Steinanes									
Fieldworker:		Snorri Gunnarsson									
Date:		28.08 2025									
Site no.:		Stelltem.LokalitetsID									

Gr	Parameter	Point	Sample number															
			1	2	3	4	5	6	7	8	9	10						
	Bottom type: S (soft) eller H (hard)		S	S	S	S	S	S	S	S	S	S						
I	Animals > 1mm	Yes (0) No (1)	0	0	0	0	0	0	0	0	0	0						
II	pH	value	7,61	7,43	7,49	7,51	7,55	7,43	7,41	6,48	7,25	7,61						
	Eh (mV)	ORP	59	38	28	15	23	31	11	-178	43	14						
		plus ref. verdi	259	238	228	215	223	231	211	22	243	214						
	pH/Eh	from figure	0	0	0	0	0	0	0	5	1	0						
	Status station		1	1	1	1	1	1	1	4	1	1						
	Buffer-temp		12,0 C			Sea temp			12,0 C			Sediment temp		6,9 C				
	pH sea	8,06	ORP sea			131,0 mV			Eh sea			331,0 mV			Reference electrode		200,0 mV	
III	Gas bubbles	Yes (4) No (0)	0	0	0	0	0	0	0	0	0	0						
	Colour	Light/grey (0)	0		0	0	0	0	0									
		Brown/black (2)		2						2	2	2						
	Smell	None (0)	0	0	0	0	0	0										
		Light (2)							2		2	2						
		Strong (4)								4								
	Consistency	Solid (0)	0	0	0	0	0	0	0			0						
		Soft (2)								2	2							
		Aqueous (4)																
	Grab volume (v)	v < 1/4 (0)										0						
		1/4 < v < 3/4 (1)		1	1	1					1							
		v > 3/4 (2)	2				2	2	2	2								
	Thickness of sledge (t)	t < 2 cm (0)	0	0	0	0	0	0	0		0	0						
		2 < t < 8 cm (1)								1								
		t > 8 cm (2)																
	Sum		2,0	3,0	1,0	1,0	2,0	2,0	4,0	11,0	7,0	4,0						
	Corrected (*0,22)		0,4	0,7	0,2	0,2	0,4	0,4	0,9	2,4	1,5	0,9						
	Status station		1	1	1	1	1	1	1	3	2	1						
Average group II & III			0,2	0,3	0,1	0,1	0,2	0,2	0,4	3,7	1,3	0,4						
Status station			1	1	1	1	1	1	1	4	2	1						

Grab ID	K-3
pH / Eh ID	Ysi proff. Plus

page 1 of 4 pages

Sample scheme B.1

Company:	Arnarlax
Site:	Steinanes
Fieldworker:	Snorri Gunnarsson

Date:	28.08 2025
Site no.:	eltem.Lokalitets

Gr	Parameter	Point	Sample number										Index	
			11	12	13	14	15	16	17	18	19	20	S%	H%
	Bottom type: S (soft) or H (hard)		S	S	S	S							100	0
I	Animals > 1mm	Yes (0) No (1)	0	0	0	0								
II	pH	value	7,35	6,69	7,29	7,25								
	Eh (mV)	ORP	12	-214	-18	-21								
		plus ref. verdi	212	-14	182	179								
	pH/Eh	from figure	0	5	0	1							0,86	
	Status station		1	4	1	1								
	Status group II		1	Buffer temp	12,0 C		Sea temp	12,0 C		Sediment temp	6,9 C			
	pH sea	8,06	ORP sea	131 mV	Eh sea	331 mV		Reference electrode	200 mV					
III	Gas bubbles	Yes (4) No (0)	0	4	0	0								
	Colour	Light/grey (0)	0		0									
		Brown/black (2)		2		2								
	Smell	None (0)	0		0	0								
		Light (2)												
		Strong (4)		4										
	Consistency	Solid (0)	0		0	0								
		Soft (2)		2										
		Aqueous (4)												
	Grab volume (v)	v < 1/4 (0)	0			0								
		1/4 < v < 3/4 (1)		1	1									
		v > 3/4 (2)												
	Thickness of sledge (t)	t < 2 cm (0)	0		0	0								
		2 < t < 8 cm (1)		1										
		t > 8 cm (2)												
	Sum		0,0	14,0	1,0	2,0								
	Corrected (*0,22)		0,0	3,1	0,2	0,4							0,85	
	Status station		1	3	1	1								
	Status group III		1											
	Average group II & III		0,0	4,0	0,1	0,7							0,85	
	Status station		1	4	1	1								
	Status group II & III		1											
	pH/Eh													
	Corr.sum													
	Index													
	Average													
		< 1,1	1											
		1,1 - <2,1	2											
		2,1 - <3,1	3											
		≥3,1	4											
	Status site:		1											

Grab ID	K-3
pH / Eh ID	Ysi proff. Plus

Sample scheme B.2

Company:	Arnarlax
Site:	Steinanes
Fieldworker:	Snorri Gunnarsson

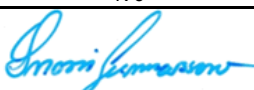
Date:	28.08 2025
Site no.:	{{SiteItem.LokalitetsID}}

Sample number		1	2	3	4	5	6	7	8	9	10
Depth (m)		85	81	80	87	90	87	91	90	85	82
Number of trials		1	1	1	1	1	1	1	1	1	1
Gas bubbles (in sample)		No	No	No	No	No	No	No	No	No	No
Sediment type	Clay	X	X	X	X	X	X	X	X	X	X
	Silt										
	Sand	X					X				
	Gravel	X			X						
	Shellsand										
Reef											
Rocky bottom (cobbles, boulders)											
Echinodermata, count											1
Crustaceans, count							1				
Molluscs, count											
Polychaetes, count		>50	>100	>100	>100	>100	>20	>20	3	>10	>10
Other animals, count											
Beggiatoa											
Feed											
Faeces									X		
Comments		St- 1; 4-6; Some dead broken shells in sample.									
Grab		Area [m ²]	0,1			Grab ID			K3		
		page 3 of 4 pages									

Sample scheme B.2

Company:	Arnarlax
Site:	Steinanes
Fieldworker:	Snorri Gunnarsson

Date:	28.08 2025
Site no.:	{{SiteItem.LokalitetsID}}

Sample number		11	12	13	14	15	16	17	18	19	20
Depth (m)		76	76	72	65						
Number of trials		3	2	1	1						
Gas bubbles (in sample)		No	Yes	No	No						
Sediment type	Clay	X	X	X	X						
	Silt										
	Sand										
	Gravel	X	X	X	X						
	Shellsand										
Reef											
Rocky bottom (cobbles, boulders)											
Echinodermata, count											
Crustaceans, count											
Molluscs, count											
Polychaetes, count		>10	2	>20	>50						
Other animals, count											
Beggiatoa											
Feed											
Faeces											
Comments											
Grab		Area [m ²]	0,1		Grab ID		K-3				
Signature fieldworker:											

7.2 Images of samples at Steinanes

<i>St</i>	<i>Image before sieving</i>	<i>Image after sieving</i>
<i>St 1</i>		
<i>St 2</i>		
<i>St 3</i>		
<i>St 4</i>		
<i>St 5</i>		

St 6		
St 7		
St 8		
St 9		
St 10		NA

St 11		
St 12		
St 13		
St 14		

7.3 3D-bathymetry

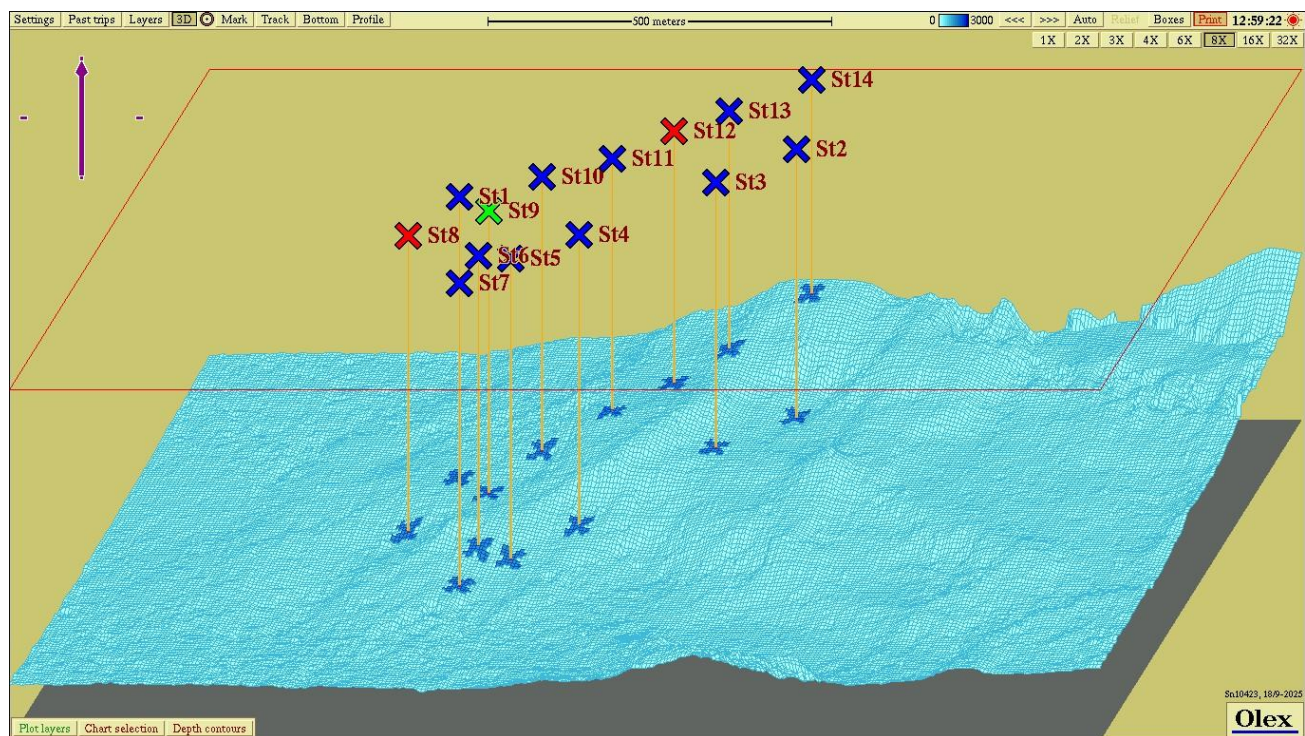


Figure 3. 3D-view of bathymetry at Steinanes with stations as shown in Figure 2 and Table 4. The map is oriented towards the north.