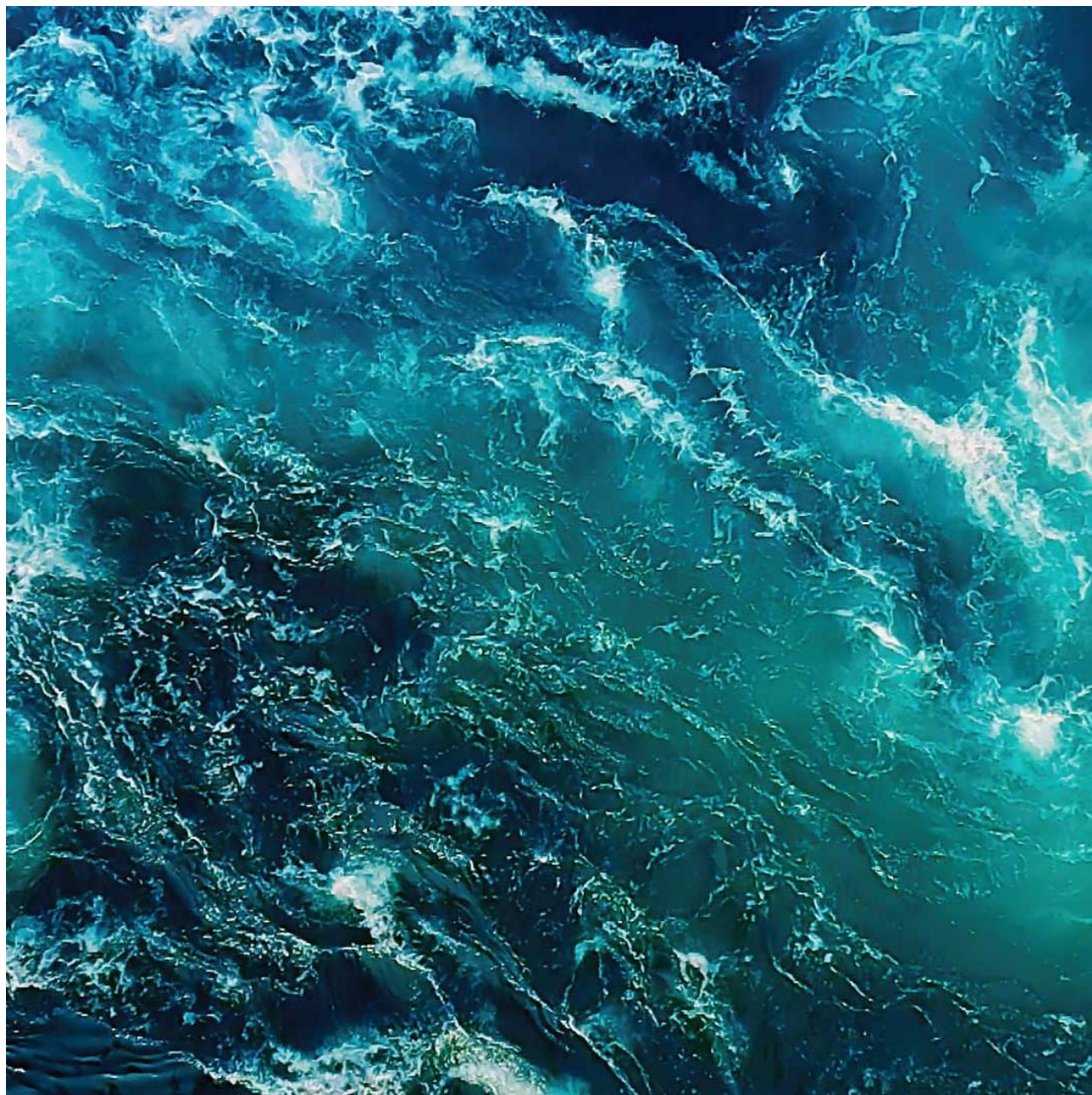


B-survey at Laugardalur 1, May 2025 (fallow period), Arnarlax ehf

**Akvaplan-niva AS Report:
APN 2025 66705.B01**



B survey at Laugardalur 1 May 2025 (fallow period), Arnarlax ehf

Author(s)	Snorri Gunnarsson
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Customer	Arnarlax ehf
Contact person	Silja Baldvinsdóttir

Summary

Sediment was recovered at 19 of the total stations (95% soft bottom). The sediments consisted primarily of clay in the whole near zone of the fish farm. Fauna was recorded to be present at all stations mainly in the form of polychaetes. There were no signs of out-gassing. Light smell of H₂S was recorded at seven sampling stations and no smell at twelve stations. The substrate was light/grey colour at fifteen stations and brown/black at four stations. Consistency of the sediment was solid at seventeen stations and evaluated soft at two stations. Grab was full at twelve stations and 1/4 – 3/4 full at two stations and less than 1/4 full at five stations.

Based on the classification of sediment chemistry (pH/Eh) and the sensory assessment eighteen stations received status 1 – "Very good" and two station received status 3 - "Bad". Overall, the index score for parameter III (sensory parameters) was somewhat higher 0.59 compared with the index score for the parameter II (pH/Eh) 0.32. Status of stations within parameter II (pH/Eh) was seventeen stations with status 1 – "very good" and two stations with status 3 – "bad" while within parameter III (sensory) fifteen stations had status 1 – "Very good" and five stations with status 2 – "good"

In summary, the site receives the environmental status 1 - "Very good" (average group II-III index =0.45).

Approval

Snorri Gunnarsson
Project Manager

Eva Synvis
Quality Control

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Key information

Site details and license holder information			
Site name	Laugardalur 1	Site coordinates	65°39.170' N 23°55.813' V
County	Vesturbyggð	Municipality	Bíldudalur
MTB (estimated max biomass)	10.693 tonnes	Operations Manager / Contact	Silja Baldvinsdóttir
License holder / customer	Arnarlax		

Production status on date of survey			
Biomass at site	0 tonnes	Total feed use	0 tonnes
Farmed species	Salmon	Total biomass produced	0 tonnes
Type/time of survey	Indicated with X	Comments Sampling during fallowing period prior to putting next generation smolt to sea. Fallowing period started 26.11.2024 (i.e. about 6 months).	
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:	26. November 2024 – date of sampling		

Results from B-survey in accordance with NS 9410:2016 (main results)			
Parameter group and index		Parameter group and status	
Gr. II. pH/Eh	0.32	Gr. II. pH/Eh	1
Gr. III. Sensory	0.57	Gr. III. Sensory	1
GR. II + III	0.44	GR. II+ III	1
Date of fieldwork	20.05 2025	Date of report	27.05 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 Laugardalur 1 in Patreksfjörður in Vesturbyggð count.

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 Tálknafjörður where Laugardalur 1 farm is located (marked with red X in upper right side).

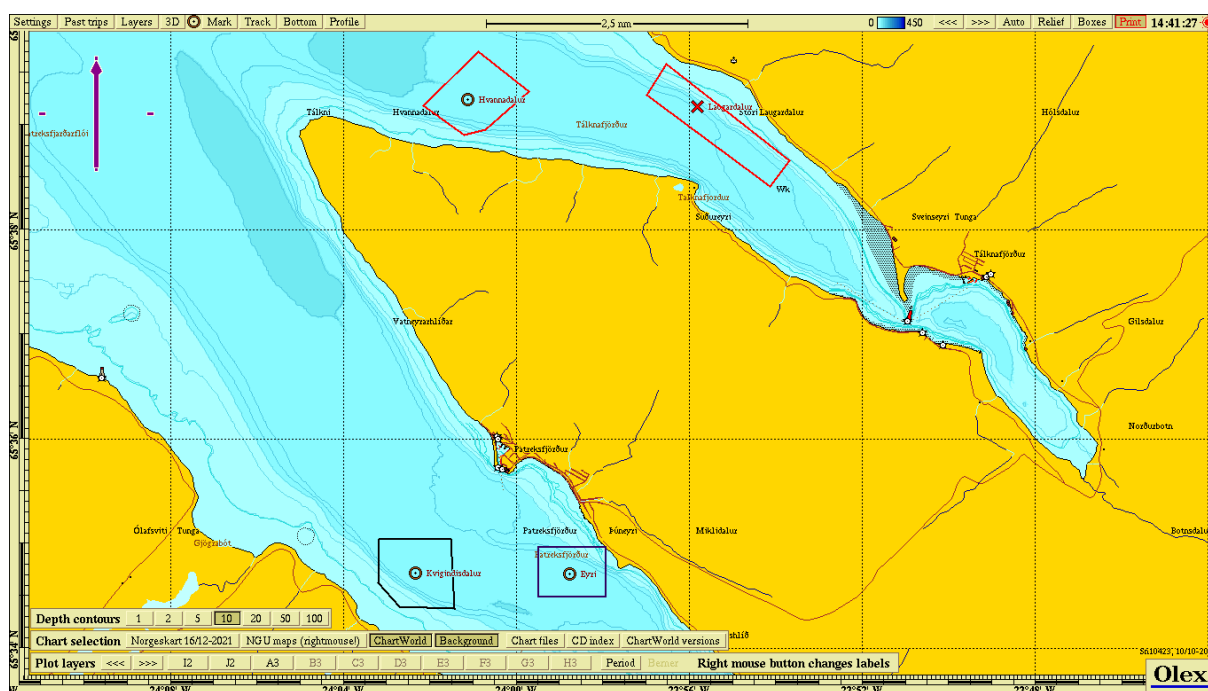


Figure 1. Overview map where Laugardalur 1 farm is in the upper right corner (marked with red x). Other fish farming areas in the nearest vicinity (Tálknafjörður and Patreksfjörður) are also shown.

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. 10.693 ton (Personal reference, Rolf Ørjan Nordli, 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 and 0.025 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

Laugardalur1 is located in the northern side of Tálknafjörður, approximately 3nm northwest of the town of Tálknfjörður. The installed frame is suited for up to 14 net-pens with a circumference of 160 m. The frame is positioned in north- northwest direction (297°) with depth below the cages ranging from 24 to 51 m.

Previously there have been farmed five generations of salmon at the site. The fallow period started on the 26th of November 2024.

Table 2 shows production and feed use for the previous generation.

Table 2. Production and feed use for farm site Laugardalur 1. Data provided by customer.

Generation of fish (G)	Production (tonnes)	Feed use (tonnes)
Preceding generation 5	6.243	8.396
Preceding generation 4	9.410	11.946
Preceding generation 3	9.113	8.107
Preceding generation 2	2.836	3.406
Preceding generation 1	734	959

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
20.05.2025	APN 66705.B01	Fallow period	1
12.09.2024	APN 66115.B01	B survey max biomass	1
06.09.2022	APN 64189.B01	Fallow period	1
25.03.2021	APN-62334.B01	B survey max biomass	1
27.05.2019	APN-60938.B01	Fallow period	1
03.11.2017	APN-9207	B survey max biomass	1

3.3 Hydrodynamic conditions

Measurement of dispersing current was done at the site in March – April 2019 measurements at 42 m depth (Heggem, 2019). The dominating current at 42 m is in north-westerly direction (315 degrees) with a small counter current in the opposite direction (**Feil! Fant ikke referansekilden.**). Average current speed is 4.2 cm/s. Highest current speed is measured to be 21,2 cm/s and 8.2 % of the measurements are zero current.

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 20 sampling stations can be found in Figure 2 with coordinates and depth provided in Table 4. Regarding the

number of sampling stations they should be maximum 20 according to guidance in ISO 12878. We follow that despite that according to NS 9410:2016 the number of sampling stations is 27 given the estimated max biomass as ISO 12878 is the minimum requirement according to Icelandic officials. The 20 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 24-51 m with the deepest waters being in the southern part of the frame area. Samples were collected from depths ranging from 36-51 metres. The client has stated that 13 cages at the site were used at some point during last production cycle (pers. Comm Rolf Ørjan Nordli). 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.

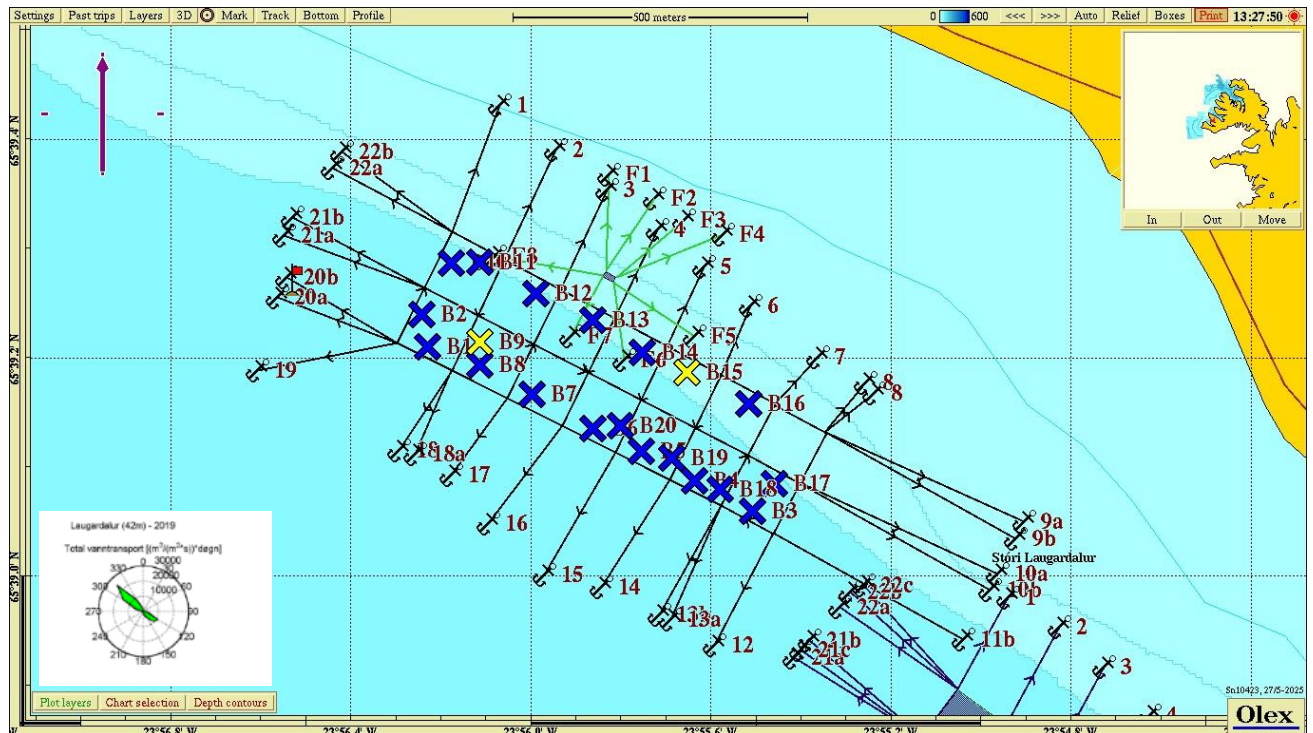


Figure 2. Overview map showing site configuration and local bathymetry at Laugardalur 1. Sampling stations are marked by crosses and colour coded to visualise the environmental status at the respective station following the classification outlined in NS 9410:2016, chapter 7.11 (1 = blue, 2 = green, 3 = yellow, 4 = red). The current rose in the left corner shows the direction of water transport at dispersal depths at the site (Heggem, 2019). The red flag indicates placement of current meter for measuring dispersal current.

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

Station number	Northing	Westing	Depth [m]
St 1	65°39,210	23°56,230	51
St 2	65°39,239	23°56,242	51
St 3	65°39,059	23°55,507	49
St 4	65°39,087	23°55,637	50
St 5	65°39,114	23°55,754	51
St 6	65°39,135	23°55,862	51
St 7	65°39,166	23°55,997	51
St 8	65°39,193	23°56,113	51
St 9	65°39,214	23°56,114	51
St 10	65°39,286	23°56,177	44
St 11	65°39,287	23°56,114	40
St 12	65°39,258	23°55,988	40
St 13	65°39,234	23°55,863	38
St 14	65°39,204	23°55,735	37
St 15	65°39,185	23°55,652	36
St 16	65°39,157	23°55,516	31
St 17	65°39,084	23°55,458	43
St 18	65°39,079	23°55,589	49
St 19	65°39,108	23°55,686	50
St 20	65°39,137	23°55,800	51

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 Laugardalur 1.

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 19 of the total stations (95% soft bottom). The sediments consisted primarily of clay in the whole near zone of the fish farm. Fauna was recorded to be present at all stations mainly in the form of polychaetes. There were no signs of out-gassing. Light smell of H₂S was recorded at seven sampling stations and no smell at thirteen stations. The substrate was light/grey colour at sixteen stations and brown/black at four stations. Consistency of the sediment was solid at seventeen stations and evaluated soft at two stations. Grab was full at twelve stations and 1/4 – 3/4 full at two stations and less than 1/4 full at six stations.

Based on the classification of sediment chemistry (pH/Eh) and the sensory assessment eighteen stations received status 1 – "Very good" and two stations received status 3 – "Bad". Overall, the index score for parameter III (sensory parameters) was somewhat higher (0.57) compared with the index score for the parameter II (pH/Eh) (0.32). Status of stations within parameter II (pH/Eh) was seventeen stations with status 1 – "very good" and two stations with status 3 – "bad" while within parameter III (sensory) sixteen stations had status 1 – "Very good" and four stations with status 2 – "good"

In summary, the site receives the environmental status 1 – "Very good" (average group II-III index =0.44).

5 Summary

Applying the indicator thresholds and classification outlined in NS 9410:2016 it is shown that the site Laugardalur 1 receives overall site status of 1 – "Very good" at the time of this B survey (fallow period). Samples were collected with a Van Veen grab (0.1 m²) at 20 stations distributed around the 13 cages in use during last production cycle. Sediment was successfully collected at all the 19 stations and eighteen stations received status 1 – "Very good" and two stations received status 3 – "Bad". The two stations with status 3 were located at southern part (station 9) and northern part (station 15) of the local impact zone, so there is no clear pattern of reduced sediment condition regarding depth or ocean current at the site. Overall, the site condition is very good with these two patches of reduced condition. These results indicate overall very good condition in the local impact zone with some patches with organic enrichment.

Previous B surveys carried out at max biomass for last generation gave the site also an overall environmental status of 1 – Very good (Gunnarsson, 2024) and all the sampling stations received status 1 – "very good". Compared with the current results at fallowing period in 2025 the score for parameter III (sensory) are somewhat reduced between the two surveys as the index score was 0,34 in 2024 but is now 0,59. However the overall environmental status is condition 1 – "Very good" in both surveys.

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.

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Gunnarsson, S., 2019b. Arnarlax, B-survey local impact zone, Laugardalur, May 2019 (fallow period). APN B rapport nr. 60938.B01. 21 s.

Gunnarsson, S., 2021. Arnarlax, B-survey local impact zone, Laugardalur, March 2021 (Max biomass). APN rapport nr. 62334.B01. 21 s.

Gunnarsson, S., 2022. Arnarlax, Laugardalur, Arnarlax. B-survey (post fallow), July 2022. APN rapport nr. 64189.B01. 21 s.

Gunnarsson, S., 2024. B-survey at Laugardalur 1, September 2024 (max biomass), Arnarlax ehf. APN rapport nr. 66115.B01. 19 s.

Heggem, T., 2019. Arnarlax hf. Strømmålinger Laugardalur. Spredningsstrøm 42 m. APN report 61178.01. 10 s.

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. Rolf Ørjan Nordli, COO biology, Arnarlax. 2025.

7 Attachments

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

Sample scheme B.1											
Company:		Arnarlax						Date:		20.05 2025	
Site:		Laugardalur 1						Site no.:		Laugardalur 1	
Fieldworker:		Snorri Gunnarsson									

Gr	Parameter	Score	Sample number													
			1	2	3	4	5	6	7	8	9	10				
	Bottom type: S (soft) or H (hard)		S	S	S	S	S	S	S	S	S	S				
I	Organism > 1mm	Yes (0) No (1)	0	0	0	0	0	0	0	0	0	0				
II	pH	pH	7,55	7,28	7,49	7,43	7,47	7,44	7,35	7,36	6,91	7,56				
	Eh (mV)	ORP	122	129	143	48	45	22	49	91	-187	49				
		plus ref. value	322	329	343	248	245	222	249	291	13	249				
	pH/Eh	from figure	0	0	0	0	0	0	0	0	3	0				
	Status station		1	1	1	1	1	1	1	1	3	1				
		Buffer-temp	12,0 C			Sea temp			7,9 C			Sediment temp		6,0 C		
		pH sea	8		ORP sea		256,0 mV		Eh sea		456,0 mV		Reference electrode		200,0 mV	
III	Out-gassing	Yes (4) No (0)	0	0	0	0	0	0	0	0	0	0				
	Colour	Light/grey (0)	0	0	0	0	0	0		0		0				
		Brown/black (2)		2					2		2					
	Smell	None (0)			0		0	0		0						
		Light (2)	2	2		2			2		2	2				
		Strong (4)														
	Consistency	Solid (0)	0	0	0	0	0	0	0	0		0				
		Soft (2)									2					
		Aqueous (4)														
	Grab volume (v)	v < 1/4 (0)														
		1/4 < v < 3/4 (1)										1				
		v > 3/4 (2)	2	2	2	2	2	2	2	2	2					
	Thickness of sludge (t)	t < 2 cm (0)	0	0	0	0	0	0	0	0	0	0				
		2 < t < 8 cm (1)														
		t > 8 cm (2)														
	Sum		4,0	6,0	2,0	4,0	2,0	2,0	6,0	2,0	8,0	3,0				
	Corrected (*0,22)		0,9	1,3	0,4	0,9	0,4	0,4	1,3	0,4	1,8	0,7				
	Status station		1	2	1	1	1	1	2	1	2	1				
	Average group II & III		0,4	0,7	0,2	0,4	0,2	0,2	0,7	0,2	2,4	0,3				
	Status station		1	1	1	1	1	1	1	1	3	1				

Grab ID	K-3/K-21
pH / Eh ID	Ysi professional plus

page 1 of 4

Sample scheme B.1

Company:	Arnarlax
Site:	Laugardalur 1
Fieldworker:	Snorri Gunnarsson

Date:	20.05 2025
Site no.:	Laugardalur 1

Gr	Parameter	Score	Sample number										Index	
			11	12	13	14	15	16	17	18	19	20	S%	H%
	Bottom type: S (soft) or H (hard)		S	H	S	S	S	S	S	S	S	S	95	5
I	Organism > 1mm	Yes (0) No (1)	0		0	0	0	0	0	0	0	0		
II	pH	pH	7,44	ut	7,56	7,64	6,85	7,43	7,52	7,53	7,48	7,43		
	Eh (mV)	ORP	82	ut	85	98	-214	26	46	60	32	135		
		plus ref. verdi	282		285	298	-14	226	246	260	232	335		
	pH/Eh	from figure	0	ut	0	0	3	0	0	0	0	0	0,32	
	Status station		1	ut	1	1	3	1	1	1	1	1		
	Status group II		1	Buffer temp	12,0 C		Sea temp	7,9 C		Sediment temp	6,0 C			
	pH sea	8	ORP sea	256 mV	Eh sea	456 mV		Reference electrode		200 mV				
III	Out-gassing	Yes (4) No (0)	0	0	0	0	0	0	0	0	0	0		
	Colour	Light/grey (0)	0	0	0	0		0	0	0	0	0		
		Brown/black (2)					2							
	Smell	None (0)	0	0	0	0		0	0	0	0	0		
		Light (2)					2							
		Strong (4)												
	Consistency	Solid (0)	0	0	0	0		0	0	0	0	0		
		Soft (2)					2							
		Aqueous (4)												
	Grab volume (v)	v < 1/4 (0)	0	0	0	0		0	0					
		1/4 < v < 3/4 (1)					1							
		v > 3/4 (2)								2	2	2		
	Thickness of sludge (t)	t < 2 cm (0)	0	0	0	0	0	0	0	0	0	0		
		2 < t < 8 cm (1)												
		t > 8 cm (2)												
	Sum		0,0	0,0	0,0	0,0	7,0	0,0	0,0	2,0	2,0	2,0		
	Corrected (*0,22)		0,0	0,0	0,0	0,0	1,5	0,0	0,0	0,4	0,4	0,4	0,57	
	Status station		1	1	1	1	2	1	1	1	1	1		
	Status group III		1											
	Average group II & III		0,0	0,0	0,0	0,0	2,3	0,0	0,0	0,2	0,2	0,2	0,44	
	Status station		1	1	1	1	3	1	1	1	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/K-21												
	pH / Eh ID	Ysi professional plus												

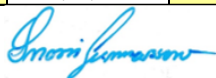
Sample scheme B.2

Company:	Arnarlax	Date:	20.05 2025
Site:	Laugardalur 1	Site no.:	Laugardalur 1
Fieldworker:	Snorri Gunnarsson		

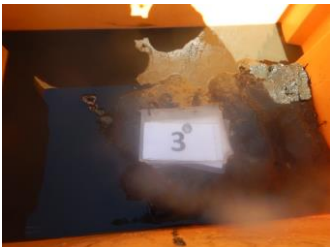
Sample number		1	2	3	4	5	6	7	8	9	10
Depth (m)		51	51	49	50	51	51	51	51	51	49
Number of grab deployments		1	1	3	1	1	1	1	1	1	1
Out-gassing (in sample)		No	No	No	No	No	No	No	No	No	No
Sediment type	Clay	X	X	X	X	X	X	X	X	X	X
	Silt										
	Sand										
	Gravel										
	Shellsand										
Bedrock											
Rocky bottom (cobbles, boulders)											
Echinodermata, count											
Crustaceans, count											
Molluscs, count											
Polychaetes, count		2	9	>10	>10	>10	>10	4	6	2	4
Other organism, count											
<i>Beggiatoa / bacteria mat</i>											
Feed											
Faeces											
Comments											
Grab		Area [m²]		0,1/0,025		Grab ID			K-3/K-21		
		page 3 of 4									

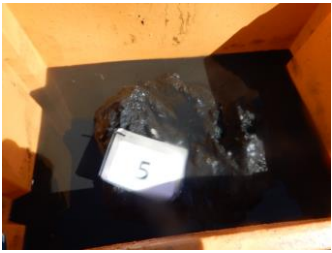
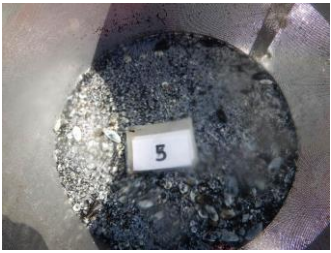
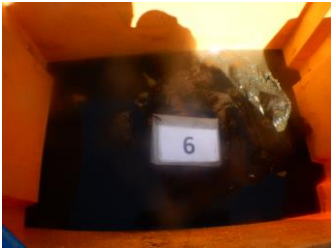
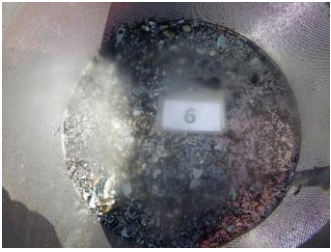
Sample scheme B.2

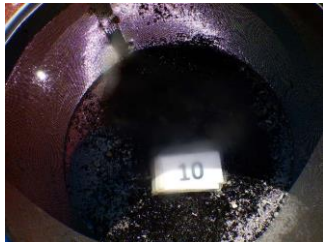
Company:	Arnarlax	Date:	20.05 2025
Site:	Laugardalur 1	Site no.:	Laugardalur 1
Fieldworker:	Snorri Gunnarsson		

Sample number		11	12	13	14	15	16	17	18	19	20
Depth (m)		40	40	38	37	36	31	43	49	50	51
Number of grab deployments		1	3	1	2	1	1	1	1	1	1
Out-gassing (in sample)		No		No	No	No	No	No	No	No	No
Sediment type	Clay	X		X	X	X	X	X	X	X	X
	Silt										
	Sand										
	Gravel										
	Shellsand										
Bedrock											
Rocky bottom (cobbles, boulders)											
Echinodermata, count											
Crustaceans, count											
Molluscs, count						14					
Polychaetes, count		2		2	4		3	1	>10	>10	8
Other organism, count											
Beggiatoa / bacteria mat											
Feed											
Faeces											
Comments		Station 12 3 attempts with empty grab, therefore defined as hard bottom. Very small sediment sample in grabs 16 and 17.									
Grab		Area [m²]		0,1/0,025		Grab ID			K-3/K-21		
Signature fieldworker:											

7.2 Images of samples at Laugardalur 1

<i>St</i>	<i>Image before sieving</i>	<i>Image after sieving</i>
<i>St 1</i>	 A dark, irregularly shaped sample labeled '1' is shown in a wooden container. The sample is dark and appears to be a solid mass.	 The sample labeled '1' after sieving, showing a dark, granular material in a circular container.
<i>St 2</i>	 A dark, irregularly shaped sample labeled '2' is shown in a wooden container. The sample is dark and appears to be a solid mass.	 The sample labeled '2' after sieving, showing a dark, granular material in a circular container.
<i>St 3</i>	 A dark, irregularly shaped sample labeled '3' is shown in a wooden container. The sample is dark and appears to be a solid mass.	 The sample labeled '3' after sieving, showing a dark, granular material in a circular container.
<i>St 4</i>	 A dark, irregularly shaped sample labeled '4' is shown in a wooden container. The sample is dark and appears to be a solid mass.	 The sample labeled '4' after sieving, showing a dark, granular material in a circular container.

St 5		
St 6		
St 7		
St 8		
St 9		

St 10		
St 11		
St 12	NA	NA
St 13		
St 14		

St 15		
St 16	NA	
St 17		
St 18		
St 19		

St 20		
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7.3 3D-bathymetry

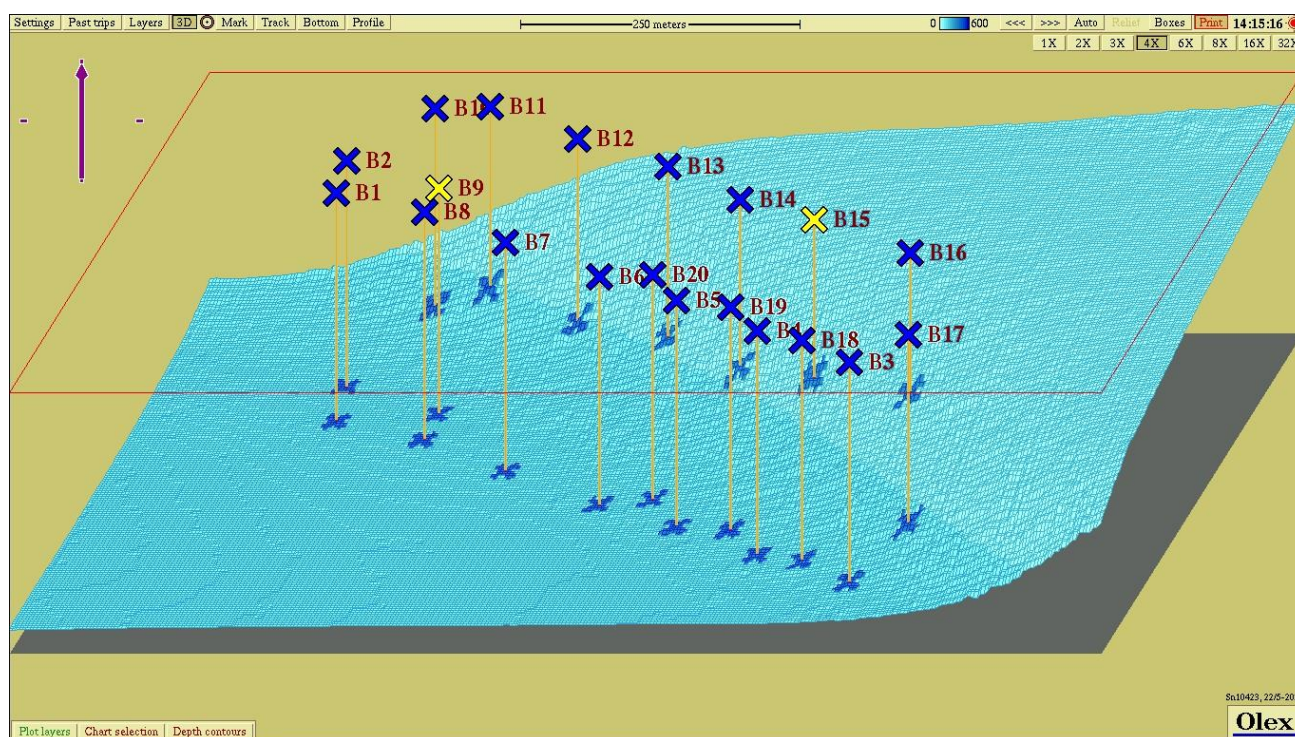


Figure 3. 3D-view of bathymetry at Laugardalur 1 with stations as shown in Figure 2 and Table 4. The map is oriented towards the north.