DANMARKS OG GRØNLANDS GEOLOGISKE UNDERSØGELSE **RAPPORT 2026/15**

Revision af stationsnettet; Johnsonfiltre

Mette Hilleke Mortensen, Lærke Thorling, Denitza Voutchkova

DE NATIONALE GEOLOGISKE UNDERSØGELSER
FOR DANMARK OG GRØNLAND
KLIMA-, ENERGI- OG FORSYNINGSMINISTERIET

G E U S

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G E U S

Indholdsfortegnelse

1. Baggrund

Der har været rejst tvivl om sporstofkoncentrationer fra grundvandsprøver udtaget i stålfiltre, Johnsonfiltre, kunne være udsat fra afsmitning fra metallet i filteret i forbindelse med tilstandsvurderingen for sporstoffer til VP3 (Mortensen, mfl. 2021). I denne rapport præsenteres resultaterne fra undersøgelsen af risikoen for afsmitning af sporstoffer fra metalfiltre, konkret fra Johnsonfiltre placeret som indtag i grundvandsovervågningen (GRUMO).

Redegørelsen består af tre dele:

- Første del er en indledende undersøgelse, hvor eksisterende data er gennemgået (Kapitel 2, dokumentation Bilag A: Gennemgang af eksisterende data. Indledende undersøgelse.). Denne del af undersøgelsen er udført i 2022.
- Anden del består af resultater fra en feltkampagne med prøvetagning af udvalgte Johnsonfiltre i 2023 (Kapitel 3, dokumentation Bilag D: Feltkampagne).
- Tredje del består af en videoinspektion af 2 indtag med Johnsonfiltre i 2025 (Kapitel 4).

De to bilag er udarbejdet på engelsk.

Feltarbejdet er udført af Miljøstyrelsens enhed for grundvandsovervågning, nu overflyttet til Styrelsens for Grøn Arealomlægning og Vandmiljø (SGAV).

2. Gennemgang af eksisterende data

2.1 Indledning

Ved udbygning af GRUMO-stationsnettet er der flere steder benyttet Johnsonfiltre ved etablering af overvågningsindtag i perioden 2000-2006.

Et Johnsonfilter er et filter af rustfrit stål, der i denne sammenhæng typisk er 1 m langt og har en diameter på 63 mm. Diameteren varierer dog mellem 50-125 mm. Filtrene er installeret i boringer lokaliseret i Jylland samt Nordsjælland, mens der ikke er anvendt Johnson filtre på Fyn eller det øvrige Sjælland og øerne. Filtrene er overvejende benyttet i forbindelse med terrænnære grundvandsforekomster, typisk 10-20 meter under terræn. Filtrene blev anvendt, da det var forventet, at de stoppede mindre til, og dermed ville sikre en bedre ydelse ved prøvetagning end de hidtil anvendte typer af filtre (GEUS, 2003).

Der er i forbindelse med tilstandsvurderingerne for sporstoffer (Mortensen mfl., 2021) rejst mistanke om, at der kan være afsmitning med forskellige sporstoffer i vandprøver udtaget fra indtag med Johnsonfiltre, som giver anledning væsentligt forhøjede koncentrationer.

Indledningsvist vurderes det, om denne mistanke kan verificeres ved at belyse, om indtag med Johnsonfiltrene har givet anledning til et forhøjet indhold af sporstoffer, sammenlignet med indtag uden Johnsonfiltre.

Formålet med undersøgelsen er at give en anbefaling for den fremtidige anvendelse af indtag med Johnsonfiltre i forbindelse med prøvetagning af sporstoffer.

2.2 Metode

Anvendelsen af Johnsonfiltre er sjældent direkte dokumenteret i Jupiter, hvorfor indtagene er identificeret som de filtre, der er angivet som stålfiltre, der endvidere kan være udført i forskellige legeringer.
Kun indtag, der er etableret i perioden 2000-2006, er medtaget i undersøgelsen, da det er i denne periode, at Johnsonfiltre blev benyttet ved etablering af nye boringer.

Undersøgelsen er udarbejdet på baggrund af det standardiserede GRUMO-udtræk fra 2021, og den indledende vurdering inkluderer sporstofferne Fe, As, Al, Cd, Cu, Cr, Ni, Pb og Zn, hvilket svarer til de uorganiske sporstoffer, der indgik i arbejdet med vandområde-plan 3 (Mortensen et al, 2021).
Arbejdet og den metodiske tilgang er dokumenteret i Bilag A: Gennemgang af eksisterende data. Indledende undersøgelse. (engelsk)

2.3 Resultat

Den indledende analyse viser, at der er en mulig påvirkning fra Johnsonfiltre for stofferne As, Cu, Zn og Pb ved pH mindre end 6, og data fra disse stoffer er undersøgt yderligere. Der kunne ligeledes være en påvirkning af Ni ved pH over 6.

På baggrund af tidsserier for koncentration og pH er der identificeret indtag, hvor analyserne for de udvalgte sporstoffer viser stor variation eller har outliers. Derudover er der efterfølgende identificeret indtag, der adskiller sig markant i forhold til de øvrige data fra GRUMO-datasættet.

Gennemgangen af data for As, Cu, Zn og Pb ved pH < 6 viste, at der ikke var en systematisk generel afvigelse i indholdet for disse sporstoffer i indtag med Johnsonfiltre i forhold til sammenlignelige indtag uden Johnsonfiltre. Enkelte indtag afveg markant i forhold til omkringliggende indtag, men det var ikke muligt at identificere en entydig årsag på baggrund af denne undersøgelse.

For Ni ved pH > 6, kunne der heller ikke konkluderes med sikkerhed at være nogen afsmitning fra Johnsonfiltrene.

Afslutningsvist blev det undersøgt om afvigelser i sporstoffer var knyttet til specifikke lokaliteter eller geologiske forhold, men data kunne ikke understøtte en entydig konklusion.

Generelt indikerer data, at der fortsat kan udtages prøver til overvågning af grundvandets indhold af sporstoffer fra indtag udbygget med Johnsonfiltre ved neutralt pH.

2.4 Anbefalinger på baggrund af datagennemgangen

Gennemgangen af eksisterende data ledte til følgende anbefalinger til videre arbejde:

Det anbefales at udføre yderligere undersøgelser, i form af feltundersøgelser i de indtag, hvor der er fundet afvigelser i koncentrationen af sporstoffer, med henblik på at se om der er en sammenhæng mellem opholdstid i indtaget og sporstofkoncentrationen, der kan være et udtryk for frigivelse fra stålfilteret.

Der bør være fokus på de boringstekniske aspekter ved feltundersøgelsen, ligesom de lokale geologiske forhold bør undersøges, da dette også kan give anledning til variationer i den vandkemiske sammensætning. Specielt bør prøvetagningsprocedurerne gennemgås for at vurdere om der er for kort forpumpningstid.

Herefter bør foretages en systematisk gennemgang af data for at vurdere risikoen for afsmitning af sporstoffer fra Johnsonfiltrene til grundvandet.

Anbefalingerne fra den indledende undersøgelse er fulgt op i form af aktiviteterne i kapitel 3 og kapitel 4.

3. Feltkampagne

3.1 Indledning

For at belyse en eventuel sammenhæng mellem grundvandets opholdstid i filteret og sporstofkoncentrationen, er der udført en feltkampagne, hvor udvalgte indtag med Johnsonfiltre er blevet prøvetaget af feltfolk fra SGAV. Indtagene er prøvetaget løbende i løbet af 2023.

Der er udvalgt tre lokaliteter, som alle har Johnsonfiltre liggende inden for kort afstand af hinanden, og hvor den indledende undersøgelse indikerede, at der både var indtag med en mulig påvirkning af sporstoffer samt indtag, der ikke viste påvirkning af sporstoffer. I forbindelse med feltarbejdet har der været ekstra fokus på de boringstekniske forhold ved prøvetagningen for at belyse, om en eventuel påvirkning af sporstofkoncentrationer kan skyldes udfældninger, suspenderet materiale eller hydrologiske forhold ved prøvetagning.
Der er prøvetaget 12 indtag med Johnsonfiltre, fordelt på de tre udvalgte områder. Analyseresultater fra fem af indtagene indikerede i den indledende undersøgelse, at der var en mulig afsmitning fra Johnsonfiltrene på sporstofkoncentrationen, mens de øvrige indtag viste begrænset eller ingen afsmitning, se Tabel 1.

Tabel 1: Oversigt over prøvetagede indtag i 2023.

DGU, indtag	Mistanke for afsmitning	Område
65. 1513_1		Haderup
65. 1514_1		Haderup
65. 1515_1	x	Haderup
65. 1516_1		Haderup
65. 1517_1	x	Haderup
65. 1520_1		Haderup
65. 1523_1	x	Haderup
83. 1702_1	x	Finderup
83. 1703_1		Finderup
186. 843_1		Asserbo
186. 844_1		Asserbo
186. 846_1	x	Asserbo

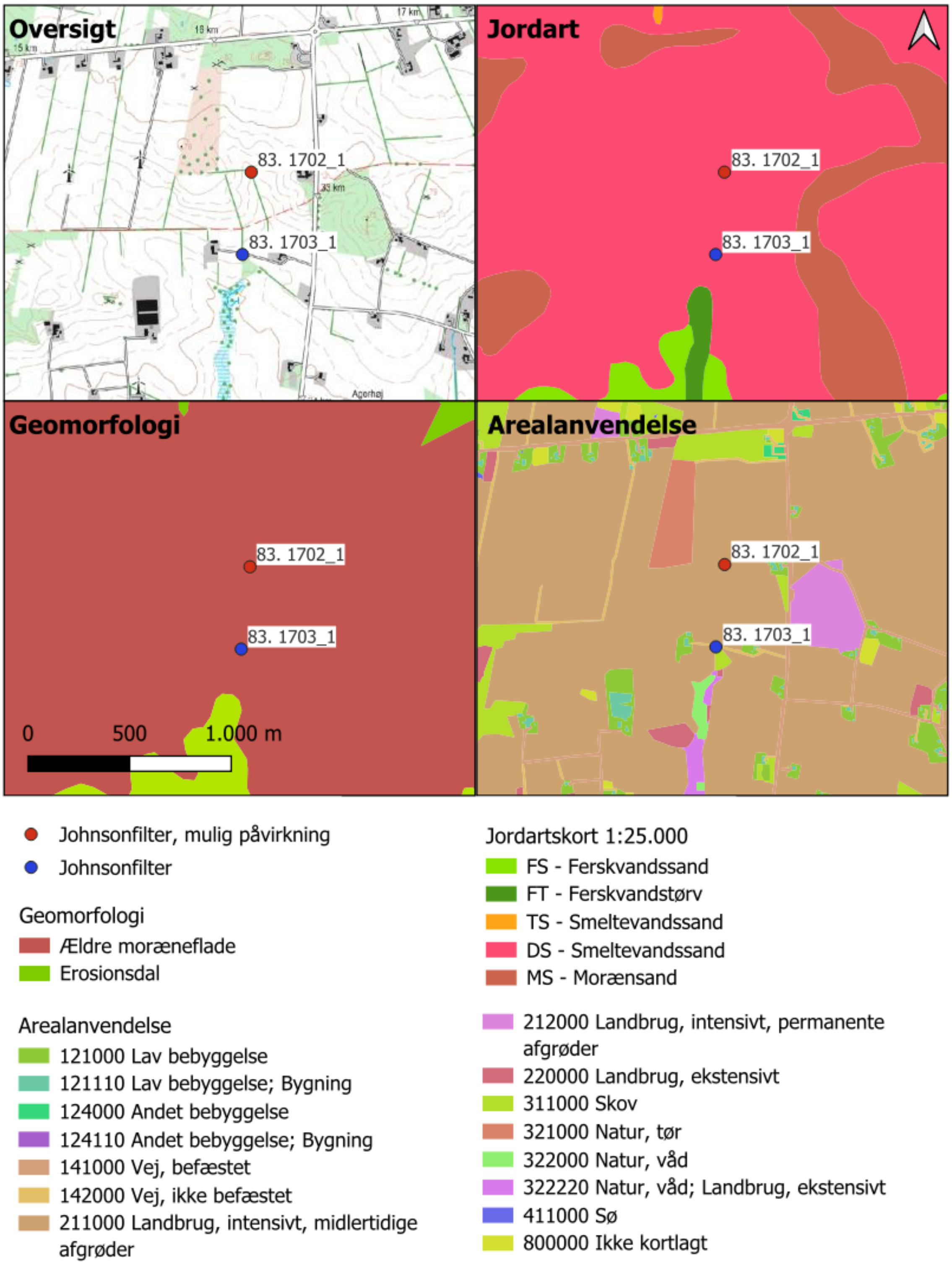
3.2 Områder

3.2.1 Finderup

Nord for byen Finderup, mellem Ringkøbing og Videbæk, er t to indtag med Johnsonfiltre undersøgt: 83.1702, indtag 1 og 83.1703, indtag 1, se Figur 1. Boringerne ligger ca. 400 m fra hinanden og er filtersat med 1 m Johnsonfilter i ca. kote 44-45. Boring 83.1702 er filtersat ca. 17 m u.t., mens boring 83.1703 er mere terrænnær og filtersat ca. 11 m u.t. De to boringer er beliggende på Skovbjerg bakkeø, som er et istidslandskab fra Saale-istiden. Bakkeøen er præget af erosion (Larsen og Kronborg, 1994), og den nordligste af de to boringer er placeret i en mindre erosionsdal, mens den sydlige boring er placeret på skråningen af samme dalstruktur. Terrænet falder mod syd fra kote 64 ved boring 83.1702 til kote 56 ved boring 83.1703. Jordartskortet (1:25.000) for området viser, at det øverste jordlag ved de to boringer består af smeltevandssand. Lithologien i boring 83.1702 er beskrevet i Jupiter som overvejende mellemkornet sand uden væsentligt finstof, mens det i boring 83.1703 er beskrevet som mere finkornet sand, der indeholder en del finstof samt med lerlag og lerindslag. Sedimenterne er af glacial oprindelse (Holm-Nielsen et al, 2005), og er aflejret i forbindelse med Saale-istiden eller ældre. Boring 83.1702 er placeret i et område med landbrugsarealer, mens boring 83.1703 er placeret på kanten til et skovområde (Levin, G., 2022). Tabel 2 viser redoxvandtypen og pH i de to indtag. Begge boringer er gennemiltede og har lavt pH.

Tabel 2: Udvalgte kemiske parameter for de to indtag med Johnsonfilter, der er prøvetaget ved Finderup. Vandtyper jf. Hansen og Thorling (2018).

Parameter/Indtag	pH	Vandtype
83.1702, indtag 1	4,8	A
83.1703, indtag 1	5,1	A



Figur 1: Indtagene 83.1702, 1 og 83.1703, 1 med Johnsonfiltre, der er prøvetaget i forbindelse med undersøgelsen for afsmitning af sporstoffer i 2023. Øverst til venstre: Oversigtskort over placeringen af de to indtag. Øverst til højre: Jordartskort 1:25.000. Nederst til venstre: Geomorfologisk kort 1:200.000. Nederst til højre: Arealanvendelse, 2021.

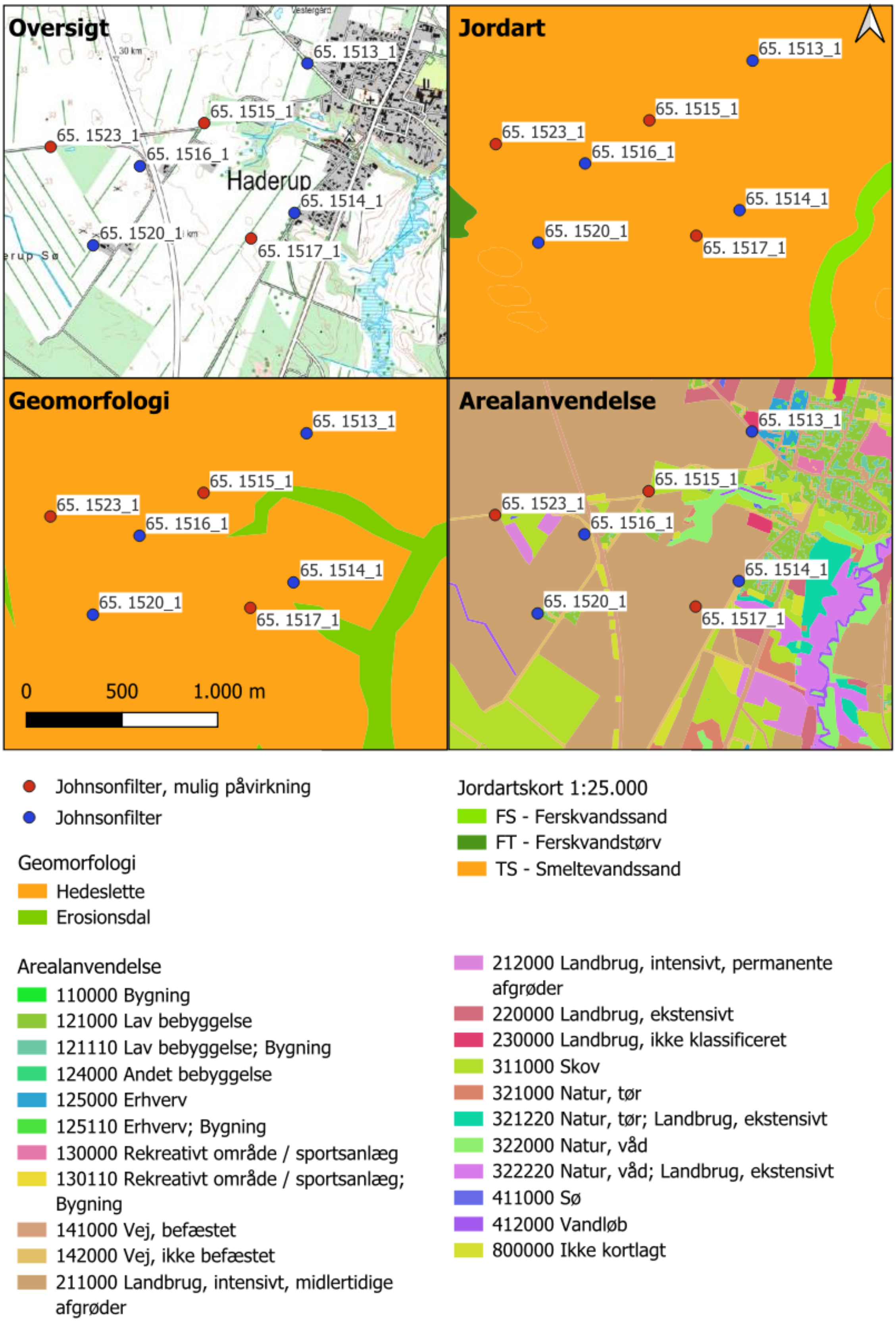
3.2.2 Haderup

Der er prøvetaget 7 indtag med johnsonfiltre sydvest for Haderup by i Midtjylland, se Figur 2. Boringerne har en indbyrdes afstand på op til 800 m, og er alle filtersat med 1 m Johnson-filter omkring kote ca. 23-28. Alle boringer er terrænnære med en boringsdybde på mindre end 10 m. Boringerne er beliggende på en smeltevandsflade fra Weichsel-istiden, fra perioden, hvor isen stod ved Hovedopholdslinjen. De øverste aflejringer er afsat i et system af flettede floder, overvejende foran isranden, og er karakteriseret ved vekslende lithologi og ringe udbredelse af enhederne (Knudsen, et al., 2001). Herunder ses miocæne sandede og lerede aflejringer. Der er ikke angivet alder og aflejringsmiljø for sedimenterne i GRUMO-boringerne, men på baggrund af lithologibeskrivelser og boringsinformation fra andre omkringliggende boringer vurderes det, at sedimenterne omkring filterintervallet er af kvartær oprindelse. Boringerne er placeret vest for Haderup Ådal, og terrænet viser et fald mod Karup Ådal, fra kote ca. 32 mod sydvest til kote ca. 28 mod nordøst. Boringerne er beliggende i et område med landbrugsarealer, der mod nord og øst grænser op til hhv. skov og bebyggelse (Levin, G., 2022).

Tabel 3 viser redoxvandtypen og pH i de syv indtag. Alle boringer har lavt pH, og på nær DGU nr. 65.1515 indeholder alle indtag nitrat.
Skønt pH ligger lav i alle indtag, er der relativ store variationer inden for den korte afstand mellem boringerne. Dette indikerer, sammen med variationerne i redoxforholdene, at grundvandet er påvirket af meget lokale forskelle, det være sig geologi eller arealanvendelse.

Tabel 3: Udvalgte kemiske parameter for de syv indtag med Johnsonfilter, der er prøvetaget ved Haderup. Vandtyper jf. Hansen og Thorling (2018).

Parameter	pH	Vandtype
65.1513, indtag 1	4,8	Vekslende A og B
65.1514, indtag 1	4,6	A
65.1515, indtag 1	4,8	C
65.1516, indtag 1	4,4	A
65.1517, indtag 1	4,6	B
65.1520, indtag 1	5,9	B
65.1523, indtag 1	5,1	B



Figur 2: Syv GRUMO-indtag med Johnsonfiltre ved Haderup, der er prøvetaget i forbindelse undersøgelsen for afsmitning af sporstoffer. Øverst til venstre: Oversigtskort over placeringen af de syv indtag. Øverst til højre: Jordartskort 1:25.000. Nederst til venstre: Geomorfologisk kort 1:200.000. Nederst til højre: Arealanvendelse, 2021.

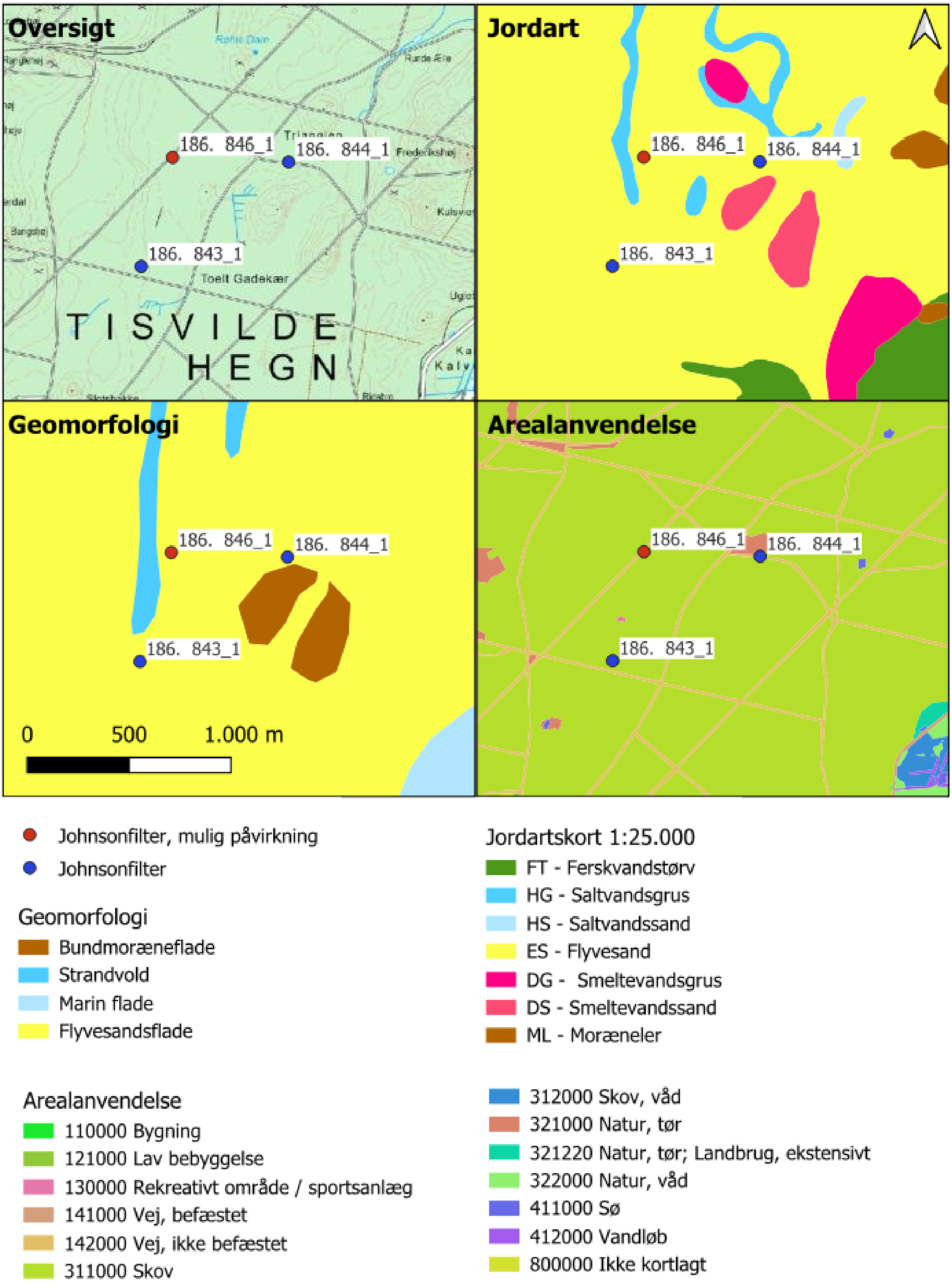
3.2.3 Asserbo (Tisvilde Hegn)

Der er prøvetaget 3 indtag med Johnsonfilter i Tisvilde Hegn, Asserbo, på Nordsjælland. Boringerne har en indbyrdes afstand på 500-800 m og er filtersat med 1 m Johnsonfilter. Boring 186.843 og boring 186.846 er meget terrænnære og filtersat ca. 2-3 m u.t. i hhv. kote 16-17 og kote 8-9, mens boring 186.844 er filtersat 8-9 m u.t. svarende til kote 7-8. Boringerne er beliggende på en postglacial flyvesandsflade. Området har været præget af isostatiske ændringer efter sidste istid, hvor området efter fastlandstiden oversvømmedes helt eller delvist af havet, før landhævningen oversteg havniveaustigningen og området blev landfast (Houmark-Nielsen, 2024). Sedimenterne i de tre boringer er ikke miljø- eller aldersbedømt, og de komplekse aflejringsforhold, der fulgte istidens ophør, betyder, at det ikke er muligt at fastlægge sedimenternes aflejringsmiljø. Dog må der forventes flyvesand terrænnært samt indslag af saltvandsaflejringer før de glaciale aflejringer anbores (Binderup, 2021; Møller et al, 2024). Mægtigheden af eventuelle ferskvandsaflejringer er ukendt. Boringerne er beliggende i klitplantage (Levin, G., 2022).

Tabel 4 viser redoxvandtypen og pH i de tre indtag. Det ses, at de to terrænnære indtag har væsentlig lavere pH end det dybere indtag, samt stærkt reduceret grundvand, mens det dybere indtag har en oxideret vandtype. Dette understreger heterogeniteten i aflejringerne i området. Kalkfrie aflejringer med højt indhold af yngre organisk stof, fx ferskvandsaflejringer, kan give sure og stærkt reducerede forhold tæt på terræn, mens andre aflejringer, forventeligt i fx smeltevandsaflejringerne, er bedre bufferet og indeholder langt mindre reduktionskapacitet. Der ses ved nærmere undersøgelse af det totale antal boringer i området, en tilsyneladende adskillelse af sydvestligt og nordøstligt placeret boringer, hvor de sydvestlige er stærkt reduceret, mens de nordøstlige er oxideret, uafhængigt af indtagsdybde.

Tabel 4: Udvalgte kemiske parameter for de tre indtag med Johnsonfilter, der er prøvetaget ved Asserbo. Vandtyper jf. Hansen og Thorling (2018).

Parameter	pH	Vandtype
186.843, indtag 1	6	D
186.844, indtag 1	7,3	A
186.846, indtag 1	5,9	D



Figur 3: Tre GRUMO-indtag med Johnsonfiltre ved Asserbo (Tisvilde Hegn), der er prøvetaget i forbindelse med undersøgelsen for afsmitning af sporstoffer. Øverst til venstre: Oversigtskort over placeringen af de tre indtag. Øverst til højre: Jordartskort 1:25.000. Nederst til venstre: Geomorfologisk kort 1:200.000. Nederst til højre: Arealanvendelse, 2021.

3.3 Prøvetagningsmetode

Hvert indtag er prøvetaget tre gange. Den første vandprøve er taget umiddelbart efter opstart af pumpe (annulusvand) for at undersøge, om der ophobes en højere koncentration af sporstoffer i forerøret. Den anden prøve er taget efter almindelig forpumpning, og den tredje prøve er taget efter tre gange forpumpning.

Indtagene er analyseret for følgende sporstoffer:

- Aluminium
- Arsen
- Barium
- Bly
- Cadmium
- Chrom
- Kobber
- Kviksølv
- Nikkel
- Vanadium
- Zink

3.4 Resultat

Resultaterne fra vandanalyserne som funktion af forskellig af forpumpningstid er beskrevet i detalje i Bilag D: Feltkampagne (engelsk), mens hovedkonklusionerne gengives her.

I dette studie er der kun prøvetaget indtag med Johnsonfiltre. Derfor er det ikke muligt at vurdere baseline til sporstofkoncentrationer i områderne for andre filtertyper. Alle indtag viser stor variation i sporstofkoncentrationer, med undtagelse af Hg, selv inden for samme område.

I Tabel 5 ses hvilke sporstoffer, der viser et fald eller en stigning i sporstofkoncentration fra første prøvetagning af annulusvandet og de efterfølgende to prøvetagninger med stigende forpumpningstid.
Vurderingen er baseret på, hvordan de tre prøver varierer indbyrdes, se Bilag D: Feltkampagne.

Der ses ikke et fald i sporstofkoncentration for As og Ba, med forpumpningstiden i de tre områder. For Hg og V er koncentrationerne så lave, at det ikke er muligt at drage en sikker konklusion på baggrund af data.

Det skal også bemærkes, at for enkelte indtag og parametre ses en stigning i koncentrationen fra første prøve til de efterfølgende prøver. Det er ikke muligt på baggrund af denne undersøgelse at vurdere grunden til dette.

Undersøgelsen viser, at forpumpningen har betydning for flere af de undersøgte parametre, selvom der ses variationer inden for både parametre og indtag. Det betyder, at der er en risiko for at metalanalyserne for især Cd, Cr, Cu, Ni, Pb og Zn ikke vil være repræsentative for det grundvand, som overvåges. Dette har betydning for mulighederne for at lave tidsserier og kvaliteten af tilstandsvurderinger mm. baseret på data fra indtag med Johnsonfiltre. Dette gælder især, hvis der ikke er taget højde for afsmitningsrisikoen under fastlæggelse af prøvetagningsproceduren.

*Tabel 5: Oversigt over parameter med fald eller stigning i sporstofkoncentration mellem første prøve og de efterfølgende to prøver (fra Bilag D: Feltkampagne). yes: Alle målinger inklusiv usikkerhedsintervaller var uden for Q25/Q75. (yes): Alle målinger eksklusiv usikkerhedsintervaller, var uden for Q25/Q75. *: Faldet var inden for Q25/Q75.*

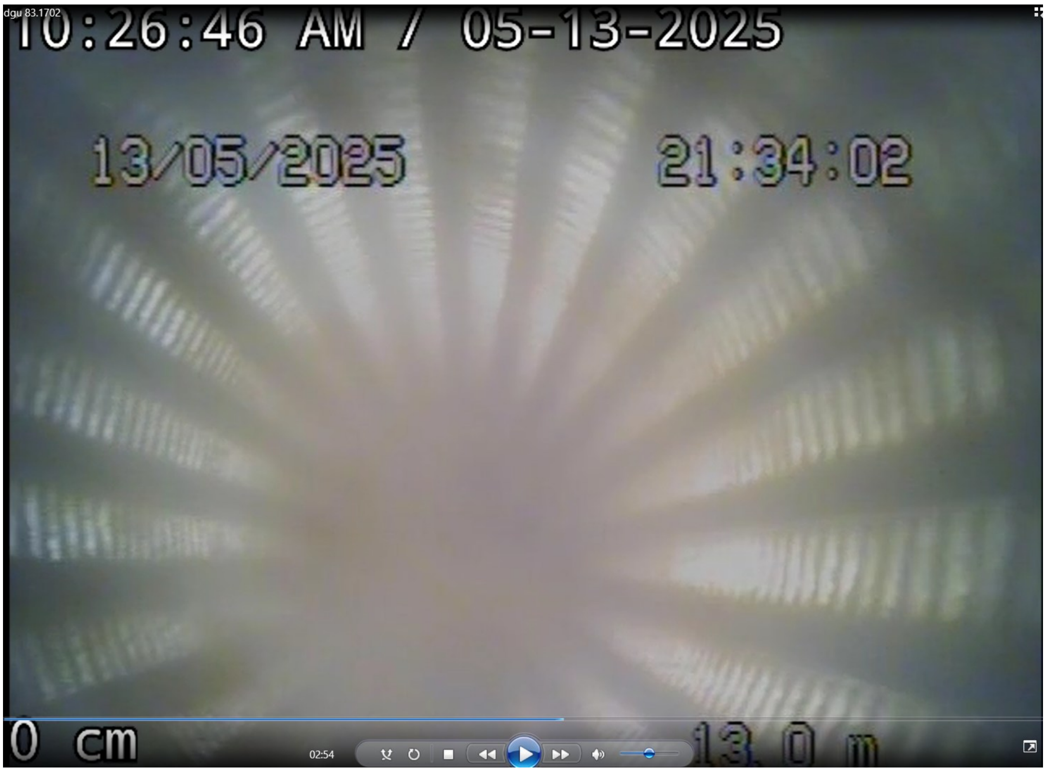
	Al	As	Ba	Cd	Cr	Cu	Hg	Ni	Pb	V	Zn
186.843_1				(yes)		yes		*	yes		yes
186.844_1				yes		yes		yes	yes		yes
186.846_1											(yes)
83.1702_1					yes	yes		yes	yes		*
83.1703_1	yes							(yes)			
65.1513_1					yes	*		yes	*		yes
65.1514_1				yes	yes	yes		(yes)	*		yes
65.1515_1						yes					
65.1516_1					yes	yes			yes		yes
65.1517_1						yes		yes	yes		
65.1520_1				(yes)	yes	yes		(yes)	(yes)		yes
65.1523_1				(yes)	yes	yes			yes		yes

4. Videoinspektion

SGAV har udført videoinspektion i to boringer med Johnsonfilter den 13. maj 2025, boring 83.1702, indtag 1 og 83.1703, indtag 1. Formålet med inspektionen var at se om der var synlige tegn på tæring af metallet eller andre tegn på, at det sure vand reagerer med stålfilteret.

Indtaget i boring 83.1703 havde i den indledende undersøgelse vist indikation på mulig påvirkning af sporstoffer, mens indtaget i boring 83.1702 ikke er entydigt påvirket.
Begge indtag er filtersat terrænnært i smeltevandssand, se kapitel 3.2.1, hvor grundvandet er oxideret og har lav pH.

Videoinspektionen fra boring 83.1702 viser ingen synlige tegn på tæring i Johnsonfilteret eller i forerøret, se Figur 4. Der ses en smule suspenderet materiale i vandsøjlen.



Figur 4: Videoinspektion af boring 83.1702 med Johnsonfilter (indtag 1), udført 13. maj 2025. Billede er fra filterintervallet i boringen.

Videoinspektionen af boring 83.1703 er udført to gange på grund af højt indhold af suspenderet materiale, der giver meget lav sigtbarhed. Der ses ikke umiddelbart tegn på tæring i Johnsonfilteret eller i forerøret, se Figur 5.

Figur 5: Videoinspektion af boring 83.1703 med Johnsonfilter (indtag 1), udført 13. maj 2025. Billede er fra filterintervallet i boringen. Der er et højt indhold af suspenderet materiale i boringen, der giver lav sigtbarhed.

5. Konklusion

Den indledende gennemgang af eksisterende data for sporstofanalyser fra indtag med Johnsonfiltre viste, at der kunne være en mulig påvirkning af sporstofferne As, Cu, Zn og Pb ved lav pH, samt af Ni ved pH over 6, men afvigelserne var ikke systematiske.

Det er forventeligt, at en evt. påvirkning af prøverne med sporstoffer opløst fra metalfilteret vil variere meget. Det skyldes blandt andet, at omfanget af påvirkning i vandprøverne er meget afhængig af prøvetagningen. Dertil kommer påvirkningens størrelse også afhænger af længe påvirkningen har stået på, samt i hvilket omfang, der løber grundvand igennem indtaget og på den måde fører påvirkningen ud i formationen og væk fra indtaget. På samme måde vil pH og indholdet af forskellige salte i grundvandet også kunne spille en rolle for korrosionen af metalfilteret. Det er således forventeligt at der er en betydelig spredning på analyseresultaterne, herunder at der forekommer markante outliere, hvis ikke der er udtaget en repræsentativ prøve fra grundvandet, se også Thorling, 2023a). Det bør så vidt muligt belyses, hvilke årsager der kan ligge til grund for forekomst af outliers eller tidsserier, der fremstår med stor spredning. Det bør vurderes om prøver fra disse indtag skal mærkes som ”forkastet” i Jupiter.

Den efterfølgende feltundersøgelse med vandprøvetagning viste, at koncentrationen af de fleste sporstoffer var påvirket af forpumpningsperioden, uden at det var muligt at afgøre, hvor lang forpumpning var nødvendig før sporstofkoncentrationerne var stabile.

Det anbefales derfor at sikre en lang, ensartet og systematisk forpumpning ved prøvetagning af sporstoffer, når der prøvetages sporstoffer i Johnsonfiltre. Dette kan bestå af en forlænget forpumpning (f.eks. tre gange almindelig forpumpning, jf. den tekniske anvisning for prøvetagning, Thorling mfl. 2023) før prøveudtagning.

Det har ikke været muligt at afgøre, om der ses en tilsvarende udvikling i sporstofkoncentrationer med længere forpumpning i andre filtertyper på baggrund af denne undersøgelse. En nærmere analyse af grundvandskemien med inddragelse af andre typer filtre, dybder og geologi vil muligvis kunne afklare, om der kan opnås mere stabile sporstofkoncentrationer, hvis der ikke prøvetages fra Johnsonfiltre.

Videoinspektionen af de to indtag ved Finderup viste, at det ene indtag havde et meget højt indhold af suspenderet materiale. Hvis problemstillingen skal forfølges yderlige, anbefales det at analysere det opslemmede materiale for at se, om det påvirker sporstofkoncentrationen i indtaget, ligesom det kunne være relevant at se, om andre boringer med og uden Johnsonfilter har tilsvarende suspenderet materiale.

Undervejs i projektet er det blevet diskuteret løbende, om grunden til, at nogle indtag med Johnsonfiltre viser en mulig påvirkning af sporstoffer, mens andre nærliggende ikke gør, kan skyldes forskellig legering i stålet i Johnsonfiltrene. Det har ikke været muligt at undersøge dette nærmere i projektet.

Det frarådes i fremtiden at anvende metalfiltre, for at undgå risiko for forurening af prøverne fra det indbyggede filter (Thorling et al, 2022) og undgå, at der kan rejses tvivl om resultaternes kvalitet.

6. Litteratur

Binderup, M., 2021: Klitter og flyvesand. Sandflugtens historie i Nordsjælland. Rapport til Nationalpark Kongernes Nordsjælland. https://nationalparkkongernesnordsjaelland.dk/media/0xjjkki2/webtilg_klitter-og-flyvesand-sandflugtens-historie-i-nordsjaelland1.pdf

Hansen, B. & Thorling, L., 2018: Kemisk grundvandskortlægning. GEO-VEJLEDNING 2018/2. Særudgivelse fra GEUS. https://data.geus.dk/pure-pdf/Geovejledning%202018-2.pdf#

Holm-Nielsen, U., Foldager, C., Krarup, H. C., 2005: NOVANA grundvandsovervågning Etablering af overvågningsboringer. Udarbejdet af Carl Bro for Ringkjøbing Amt. https://data.geus.dk/JupiterWWW/document.jsp?fileid=11662

Houmark-Nielsen, M., 2024: Nordøstsjællands geologi og landskaber – fra istid til nutid. Geologisk Tidsskrift 2024, side 32–106. ISSN 2245-7097, København. https://nationalparkkongernesnordsjaelland.dk/media/incphcfu/webtilg-nordoestsjaellands-geologi-og-landskaber-fra-istid-til-nutid-et-saernummer-af-geologisk-tidsskrift.pdf

Jacobsen, P. R., 2022: Geomorphological map of Denmark, version 3. 1:200.000

Knudsen M. B., Pallesen, T., Christensen, S. R., 2001: Konceptuel geologisk model for GRUMO område Haderup. Udarbejdet af Carl Bro for Ringkjøbing Amt Grundvands- og industrimiljøafdelingen. file:///C:/Users/B362790/Downloads/_Rapporter_Konceptuel%20geologisk%20model%20for%20GRUMO%20haderup.pdf

Larsen og Kronborg, 1994: Geologisk set det mellemste Jylland

Levin, G. 2022. Basemap04. Documentation of the data and method for the elaboration of a land use and land cover map for Denmark.
Aarhus University, DCE – Danish Centre for Environment and Energy, 77 pp. Technical Report No. 252 https://dce2.au.dk/pub/TR252.pdf

Møller, I., Binderup, M., Nielsen, L., Rosner, O. S., Thomasen, L., M., 2024: Pilotprojektomopmåling af flyvesandstykkelser vha. georadarmålinger i Tisvilde Hegn og på Melby Overdrev Udarbejdet for Nationalpark Kongernes Nordsjælland. Danmarks og Grønlands geologiske undersøgelser. Rapport 2024/14. https://nationalparkkongernesnordsjaelland.dk/media/ahtes2f1/sandtykkelser-georadar-pilotprojekt.pdf

Thorling, L., 2023: Prøvetagning af grundvand i felten. Teknisk anvisning. GEUS 2023. https://data.geus.dk/pure-pdf/Pr%C3%B8vetagning%20af%20grundvand.pdf

Thorling, L., 2023a: Filtrering af grundvandsprøver, afsmitning fra filtre. GEUS-rapport 2023/27

7. Bilag A: Gennemgang af eksisterende data. Indledende undersøgelse.

Stainless steel filters (i.e. Johnson filters) and trace elements

7.1 Background

Error in the groundwater sampling can be introduced because of the interaction between the monitoring well casing material and the groundwater (Llopis, 1991). The processes that could be responsible for such errors are a) chemical attack of the casing material, b) sorption/desorption, c) leaching of the casing material, and d) microbial colonization and attack, ibid. Llopis (1991) summarized the factors that could influence the sorption of metals and organics:

1. the surface area of the casing – the greater the area, the greater sorption potential
2. nature of the analyte (chemical form and concentration)
3. characteristics of the solution, incl. factors like pH, dissolved material (e.g. salinity, hardness), complexing agents, dissolved gasses (esp. oxygen, which may influence the oxidation state), suspended matter, and microorganisms (e.g. trace element take-up by algae)
4. nature of the casing material (chemical and physical properties of the casing material)
5. external factors, e.g. temperature, contact time, access of light, and occurrence of agitation.

The US Environmental Protection Agency (EPA) reviewed the effects of well casing material on groundwater quality based on results from laboratory and field experiments (Llopis, 1991) and concluded that if metals are to be determined, metallic casing of any type should not be used.

Experimental work (in the field) by the US Army Corps of Engineers showed that material effects from stainless-steel well screen material are significant under dynamic conditions, which are typical for groundwater sampling protocols (Hewitt 1993). Hewitt (1993) performed different residence time experiments, where screens made of different materials (incl. two different types of stainless-steel screens) were exposed to groundwater for different periods under dynamic conditions. The results showed that there were significant material effects for Fe, Cr, and Ni, linked to corrosion on the surface of the stainless-steel screens, which resulted in the leaching of Ni and Cr, ibid. The leaching was observed under both anoxic and oxic conditions, ibid. Under the same experimental conditions, Cd and Pb were not consistently found above the detection limit, and Cu was either depleted from solution by the chamber flushing or sorbed by surface-active Fe oxides, ibid. Hewitt (1993) concluded that stainless steel casings present the greatest challenge for obtaining representative metal concentrations in groundwater samples, and that the magnitude of influence appears directly correlated with how much corrosion there is on the stainless steel casings.

7.2 GRUMO wells with Johnson screens

Johnson well-screens have been used in the GRUMO monitoring wells, established in the period 2000-2006. In the well-documentation in Jupiter database, it is rarely written if the screen is Johnson-type, more often only the screen material is provided, e.g. steel or stainless steel (Bilag B: Identificering af Johnson-filtre i GRUMO-boringer) identified 150 well-screens belonging to 127 active wells which were made of either metal, stainless steel, or there was no information on the screen material.

Figure 7-1 shows the location of metal/stainless steel screens (n = 131), called further Johnson screens or filters, that belong to 112 currently active GRUMO wells.

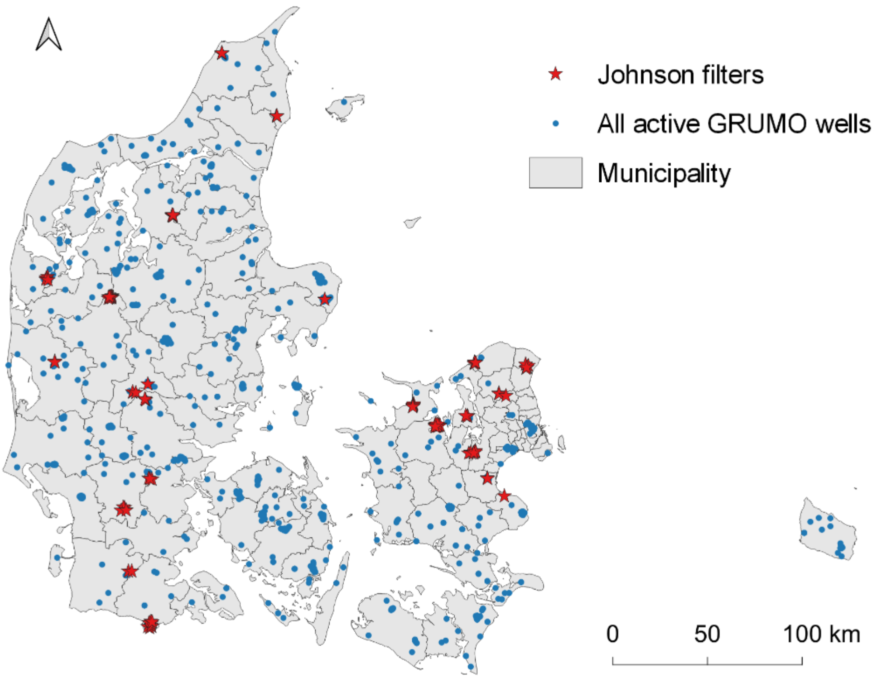


Figure 7-1: Location of metal screens/filters (n = 131), assumed to be Johnson stain-less-steel screens

These screens are located mostly in western Jutland and the northern and eastern part of Zealand (Figure 7-1) and are primarily shallow with a median depth to top/bottom screen of 11.50/12.50 m (Figure 7-2 and Figure 7-3). Most of the screens (n = 111, 85%) are with 1m length, and the rest (n = 20, 15%) are with length 0.25 m. All these short screens are in two wells with DGU nr. 198.686 and 198.687.

Figure 7-2: Depth to top screen (m below ground surface, m b.g.s) of the active GRUMO wells with Johnson filters. The filters are shown in a matrix around the cluster centre (black dot) to avoid overplotting. Bornholm is not shown as there are no Johnson filters there.

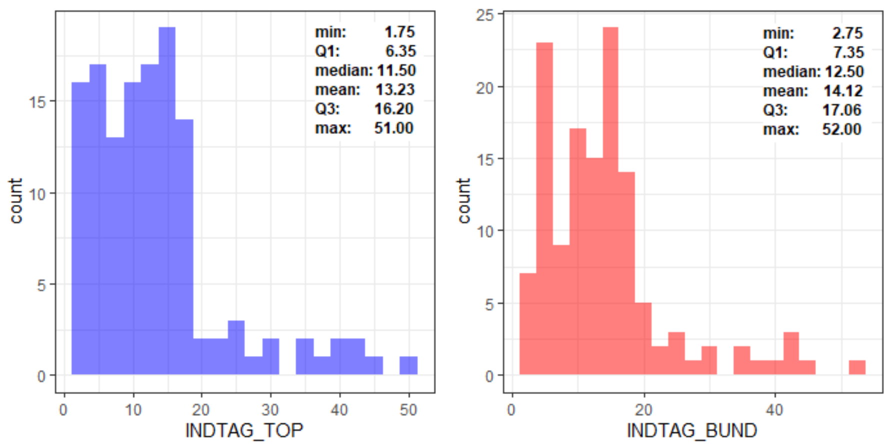


Figure 7-3: Depth distribution for the Johnson screens based on the depth to top screen (INDTAG_TOP) and bottom screen (INDTAG_BUND) in m b.g.s.

7.3 Assessment tasks definition

The following three tasks were defined and carried out in this order:

Task 1: Initial assessment: to investigate if the trace metal concentrations measured in the groundwater sampled at the Johnson screens stand out from the rest of the measurements made at the active GRUMO wells. This was done based on the latest GRUMO dataset at the time (Thorling et al., 2021). The elements included in this initial assessment were Fe, As, Al, Cd, Cu, Cr, Ni, Pb, and Zn. The initial assessment was based on scatter plots of pH vs the trace elements, where the samples from Johnson filters were coloured differently from the other active GRUMO wells.

Task 2: follow-up assessment based on time-series for As, Cu, Zn, and Pb (see example in Figure 7-4), so the patterns observed at Johnsons filters can be studied closer. The information that the time-series provided was whether there are outliers (suspiciously low/high values) or whether there was a clear pattern (increase/decrease/stable concentrations). The time-series without a clear pattern with a large variation in the measured concentrations (i.e. noisy time-series), may indicate that the concentrations are influenced by the screen material, the sampling procedure, or other environmental factor. Similarly, outlying samples may be indicating a potential sampling or reporting issue.

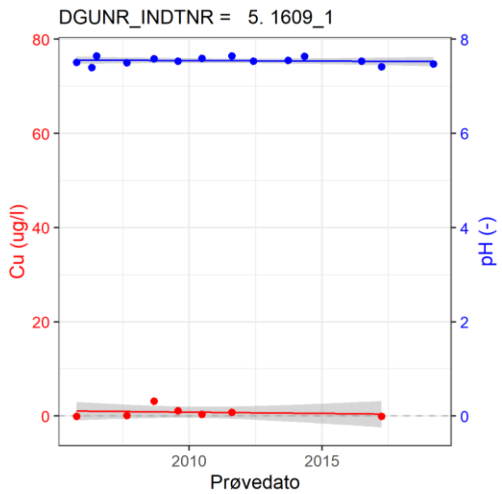


Figure 7-4: Example of time-series plot for Cu (red, left y-axis) and pH (blue, secondary y-axis, right); linear regression and 95 confidence interval are also plotted to aid the visual inspection of the plots. In this specific example for Cu, the secondary axis is with a factor of 10 (pH = 8, Cu = 80 are at the same level), which is done so the variability of both Cu and pH can be visualised on the same plot. This was not necessary for As, where As and pH were in the same order of magnitude

Task 3: final assessment: to better understand the results from first and second tasks, we further focused on two areas and tried to find out whether the anomalously high and noisy time-series are only characteristic for the Johnson filters in the area, or also other types of GRUMO wells were also affected. The two areas were area 83/93 (Finderup) and area 65 (Haderup).

The results from these three tasks are presented in the next section.

7.4 Results

7.4.1 Task 1

In the following figures (Figure 7-5 - Figure 7-13) are shown all samples from active GRUMO wells, analysed for both pH and the specific chemical element. Those from Johnson screens or from screens with unknown material are plotted on top and with a different colour, so if there is any suspicious distribution, it would be easy to spot them.

From these figures, we could potentially conclude that the samples from Johnson screens have different distribution for:

- As, Cu, Zn, Pb at lower pH (< 6),
- and maybe Ni at higher pH (> 6), however it is not so well de-fined as for As, Cu, Zn, and Pb.

For the rest of the elements (Fe, Al, Cd, and Cr), it is hard to determine if there is a difference in the distribution based on these figures, as there is an overlap with the rest of the GRUMO active wells.

It must be noted that for Cr, the scatter plot is not very useful, as there is no relation between pH and Cr concentration, however it looks like the Johnson screens are lacking very low values. This issue is not investigated further here but should be followed up on.

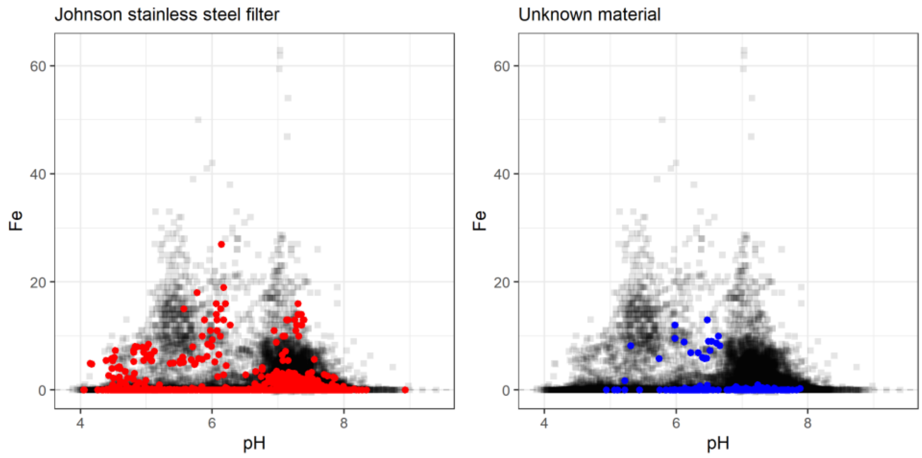


Figure 7-5: Only samples with pH/Fe analyses from active GRUMO wells; red – samples from Johnson screens, blue – samples from screens with unknown material, black (with 0.1 transpar-ency) – all samples from active GRUMO wells, used as back-ground, irrespective of the screen type.

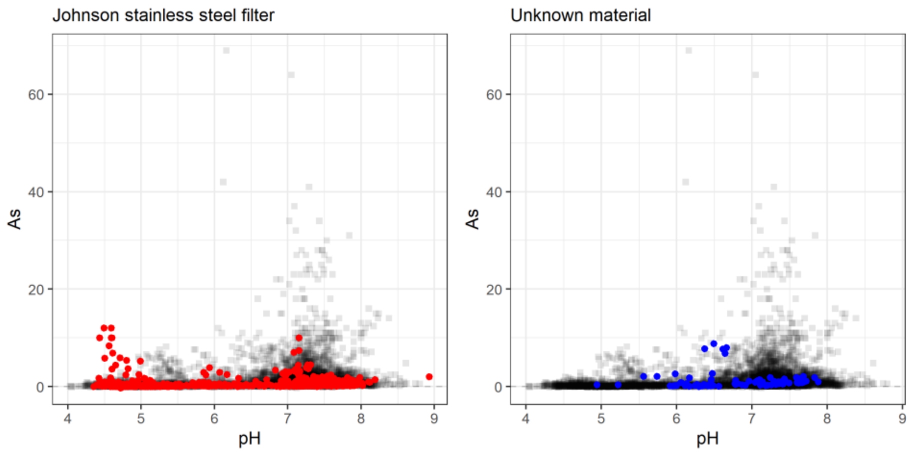


Figure 7-6: Only samples with pH/As analyses from active GRUMO wells; on the right the samples from Johnson screens are not shown

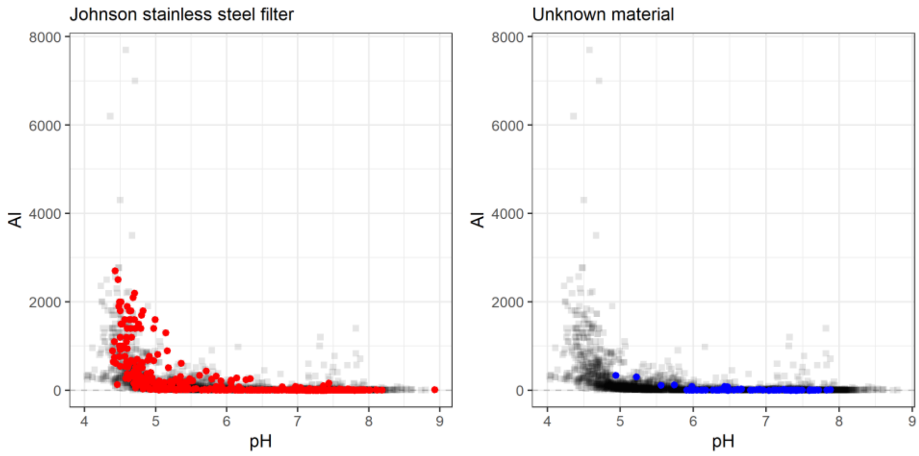


Figure 7-7: Only samples with pH/Al analyses from active GRUMO wells; on the right the samples from Johnson screens are not shown

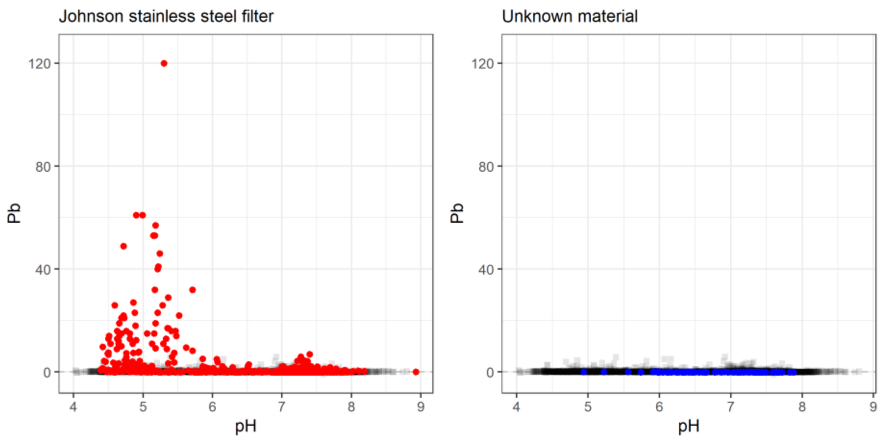


Figure 7-8: Only samples with pH/Pb analyses from active GRUMO wells; on the right the samples from Johnson screens are not shown

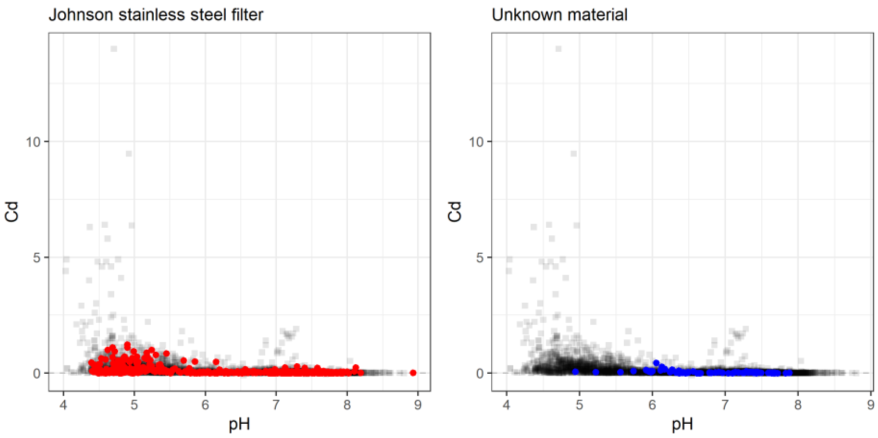


Figure 7-9: Only samples with pH/Cd analyses from active GRUMO wells; on the right the samples from Johnson screens are not shown

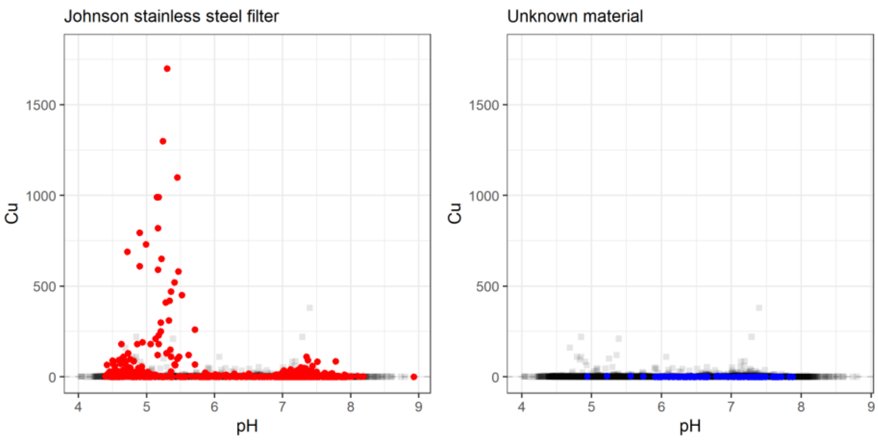


Figure 7-10: Only samples with pH/Cu analyses from active GRUMO wells; on the right the samples from Johnson screens are not shown

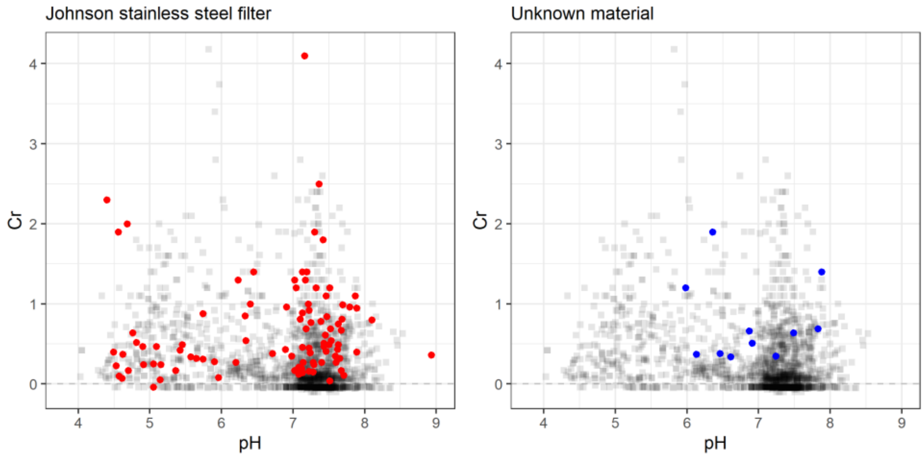


Figure 7-11: Only samples with pH/Cu analyses from active GRUMO wells; on the right the samples from Johnson screens are not shown

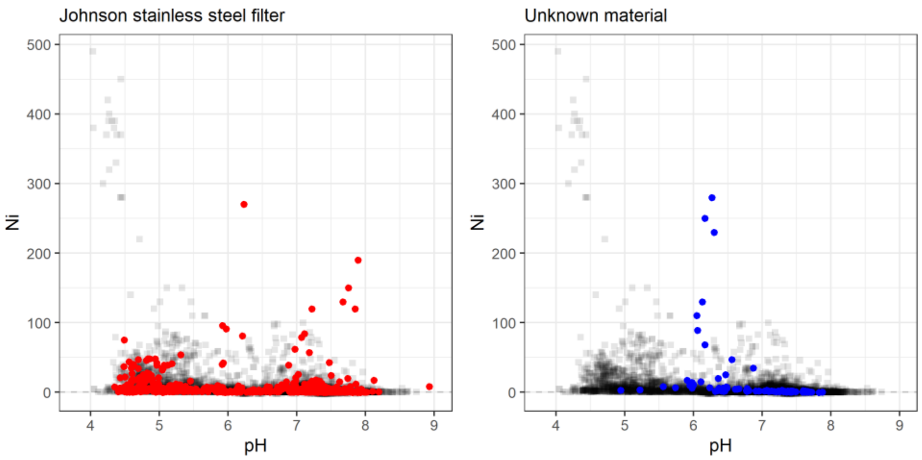


Figure 7-12: Only samples with pH/Ni analyses from active GRUMO wells; on the right the samples from Johnson screens are not shown

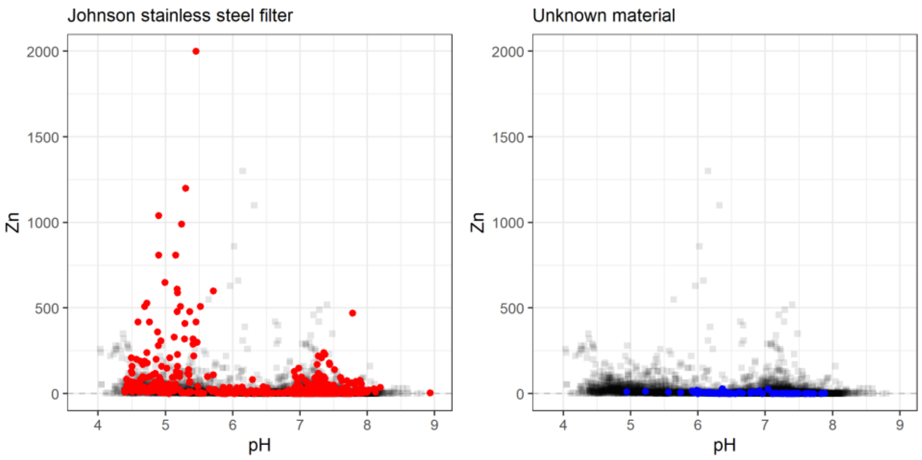


Figure 7-13: Only samples with pH/Zn analyses from active GRUMO wells; on the right the samples from Johnson screens are not shown

7.4.2 Task 2

The time-series for each Johnson screen are available at Voutchkova (2026): Table 7-1 provides a list with the identified outliers and noisy time-series based on visual inspection of these time-series. The time-series for Zn are noisier (wider range of values) than for the rest of the elements.

Table 7-1: List with identified outliers (O) or noisy time-series (N) for specific element and Johnson screen. The notes provide information on the range of concentrations for noisy time-series, and the sample ID (PROEVEID) and sampling date

DGUNR	INDT	Elem.	O/N	Notes
5.1616	1	Cu	O	Cu (48 µg/l) PROEVEID = 2020049520 from 2020-09-17
		Zn	N	Zn range 5.3 – 82 µg/l
18.385	1	As	O	As/pH → PROEVEID = 2006023456 from 2005-08-09
53.612	1	Cu	N	Cu range 20 – 230 µg/l, with 3 samples > 190 µg/l (y 2007-2009)
		Pb	N	Pb range 0.16 – 11 µg/l
		Zn	N	Zn range 67 – 330 µg/l
53.613	1	Zn	O	Outlier i 3. punkt
63.1051	1	Cu	N	Cu↑, range 2.7 – 68.0 µg/l

DGUNR	INDT	Elem.	O/N	Notes
		Pb	N	Pb↑, range 0.91 – 6.3 µg/l
		Zn	O	Zn (310 µg/l) PROEVEID = 2009036792 from 2009-09-28
63.1052	1	As	O	As → PROEVEID = 2006034002 from 2005-09-08
65.1514	1	Cu	N	Cu range 17 – 50 µg/l, the max Cu may be outlier (PROEVEID = 2016017458)
		Pb	N	Pb range 0.6 – 5.8 µg/l
65.1515	1	Cu	O	Cu (85 µg/l) PROEVEID = 2006034026 from 2005-08-31
		Pb	O	Pb (13 µg/l) PROEVEID = 2006034026 from 2005-08-31
65.1516	1	Cu	N	Cu↑, range <0.04 – 35 µg/l
		Pb	N	Pb range 0.076 – 3.2 µg/l
65.1517	1	As	O	As → PROEVEID = 2006034034 from 2005-09-01
		Cu	N	Cu range 0.07 – 180 µg/l, the max Cu may be outlier (PROEVEID = 2011025402)
		Pb	N	Pb range 0.11 – 16 µg/l
		Zn	N	Zn range 30 – 190 µg/l, the max Zn may be outlier (PROEVEID = 2011025402)
65.1518	1	Cu	N	Cu range <0.04 – 180 µg/l
		Pb	N	Pb range 0.071 – 27 µg/l
		Zn	N	Zn range 25 – 200 µg/l
65.1519	1	Cu	N	Cu range 0.88 – 47 µg/l
		Pb	N	Pb range 0.10 – 11 µg/l
		Zn	N	Zn range 14 – 120 µg/l
65.1523	1	Cu	N	Cu range 5.1 – 92 µg/l
		Pb	N	Pb range 0.48 – 36 µg/l
		Zn	N	Zn range 16 – 580 µg/l
83.1702	1	Cu	N	Cu↓, range 2.7 – 29 µg/l
		Pb	N	Pb range 0.079 – 4.1 µg/l
		Zn	O	Zn (150 µg/l) PROEVEID = 2011011757 from 2011-05-23
83.1703	1	Cu	N	Cu range 590 – 1700 µg/l
		Pb	N	Pb range 7.5 – 120 µg/l
		Zn	N	Zn range 480 – 2000 µg/l
104.2620	1	Cu	N	Cu range 68 – 300 µg/l
		Pb	N	Pb range 8.3 – 40 µg/l
		Zn	N	Zn range 44 – 200 µg/l
104.2621	1	As	N	As↓, pH↑, As range 2.5 – 8.4 µg/l
		Zn	N	Zn↓, Zn range 5.5 – 49 µg/l
105.1827	1	Cu	N	Cu range 93 – 910 µg/l
		Pb	N	Pb range 22 – 39 µg/l
		Zn	N	Zn range 68 – 1100 µg/l, the max Zn is potential outlier PROEVEID = 2017001412 from 2016-08-31
141.1093	1	As	N	As range 3.5 – 10 µg/l
174.281	1	As	N	As range 0.84 – 12 µg/l, the lowest value is a potential outlier PROEVEID = 2007046824 from 2007-04-30
		Zn	N	Zn range 37 – 130 µg/l
186.843	1	Pb	N	Pb range 0.33 – 5 µg/l
186.844	1	Zn	O	Zn (260 µg/l) PROEVEID = 2017002427 from 2017-03-20
186.845	1	Cu	N	Cu range 68 – 260 µg/l
		Pb	N	Pb range 1.0 – 32 µg/l
		Zn	N	Zn range 320 – 600 µg/l
186.846	1	As	N	As range 0.14 – 3.9 µg/l, the lowest value is a potential outlier PROEVEID = 2006031455 from 2005-12-13
186.847	1	Cu	N	Cu range 0.41 – 86 µg/l
		Zn	N	Zn range 2.6 – 470 µg/l, the max Zn is potential outlier PROEVEID = 2010009552 from 2010-04-27
188.1083	1	Cu	O	Cu (25 µg/l) PROEVEID = 2009007190 from 2008-08-07
		Zn	O	Zn (170 µg/l) PROEVEID = 2009007190 from 2008-08-07
188.1086	1	As	O	As → PROEVEID = 2006031481 from 2005-12-21
		Pb	N	Pb range 0.26 – 6.9 µg/l

DGUNR	INDT	Elem.	O/N	Notes
188.1089	1	Cu	N	Cu↓, range 7.1 – 52 µg/l
		Pb	N	Pb range 0.8 – 5.9 µg/l
		Zn	N	Zn range 33 – 120 µg/l
193.2113	1	Cu	N	Cu range 8.6 – 41 µg/l
		Zn	N	Zn range 8.7 – 97 µg/l
193.2114	1	Zn	N	Zn range 10 – 220 µg/l, max Zn is a potential outlier PROEVEID = 2009007180 from 2008-06-25
193.2115	1	Cu	N	Cu range 3.0 – 54 µg/l
		Pb	O	Pb (6.2 µg/) PROEVEID = 2011020888 from 2011-05-12
		Zn	N	Zn range 19 – 210 µg/l
193.2116	1	Zn	N	Zn↑, range 1.5 – 90 µg/l
198.689	1	Cu	O	Cu (29 µg/l) PROEVEID = 2013020813 from 2013-11-05
199.1237	1	Cu	N	Cu range 0.74 – 83 µg/l, the max Cu is potentially an outlier (PROEVEID = 2008007792)
		Zn	N	Zn range 4.9 – 140 µg/l, the max Zn is potentially an outlier (PROEVEID = 2008007792)
199.1238	1	Cu	N	Cu↓, range 3.9 – 35 µg/l
199.1239	1	Cu	N	Cu range 4.9 – 32 µg/l
199.1241	1	Cu	N	Cu range 6.2 – 110 µg/l
		Pb	N	Pb range 0.98 – 4.1 µg/l, potential outlier (PROEVEID = 2009007159)
		Zn	N	Zn range 28 – 240 µg/l
206.1679	1	Zn	N	Zn range approx. 15-150 µg/l. Sharp decreasing trend instead of noisy
212.1369	1	As	O	As → PROEVEID = 2011023380 from 2011-09-01
212.1370	1	As	O	As → PROEVEID = 2011023381 from 2011-08-31

Based on the assessment presented in Table 7-1, fifteen screens stood out due to a large variability and high concentration of one or more of the elements (Table 7-2 and Figure 7-14).

Table 7-2: Identified Johnson screens that have very high concentrations for one or more elements and stand out from the rest of those listed in Table 1 (the screens identified for Ni are not included here)

DGUNR	INDT	GRUMO_NR	INDTTOP	INDTBUN	High conc.
53. 612	1	65.15.07.01	17	18	Zn, Cu
63. 1051	1	65.15.09.01	11.4	12.4	Zn
65. 1515	1	65.12.07.01	4.6	5.6	Pb
65. 1517	1	65.12.09.01	3.1	4.1	Cu, Pb, As
65. 1518	1	65.12.10.01	4	5	Zn, Pb
65. 1523	1	65.12.15.01	3.5	4.5	Zn, Pb
83. 1703	1	65.14.08.01	11.5	12.5	Zn, Cu, Pb
104. 2620	1	65.11.11.01	3	4	Zn, Cu, Pb
104. 2621	1	65.11.12.01	3	4	As
105. 1827	1	65.11.06.01	3	4	Zn, Cu, Pb
141. 1093	1	50.12.14.01	7.2	8.2	As
174. 281	1	50.14.20.01	4.5	5.5	As
186. 845	1	20.12.10.01	5	6	Zn, Cu, Pb
186. 846	1	20.12.09.01	2.4	3.4	As
186. 847	1	20.12.11.01	6.5	7.5	Zn

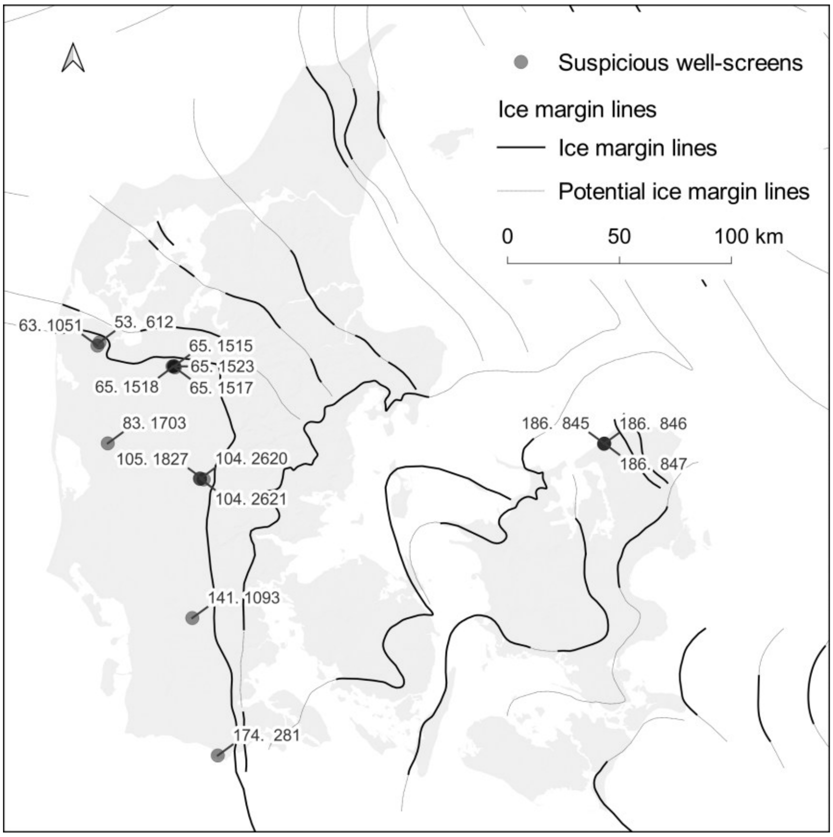


Figure 7-14: Location of the "suspicious" well-screens (the labels show DGUnr, for all of them, screen number 1) in relation to the ice margin lines of the last glaciation (Stig Schack, 1995)

Figure 7-15- Figure 7-25 highlight the samples from these fifteen well screens.

The screen with the largest range and highest observed concentrations for for Cu, Zn, and Pb is DGU nr. 83.1703, screen 1 (Figure 7-19, Figure 7-21, Figure 7-23).

Another notable pattern is that the wells with DGU nr. 65.1515, 65.1517, 65.1518, 65.1523 (Table 7-2), located in the same GRUMO area, were identified to have relatively high concentrations and noisy time-series for one of more of the elements.

However, based only on the time-series or the relation between pH and the trace elements it is impossible to point at the process responsible for the large variation and the high concentrations.

We could hypothesise that the screen material plays a role (via sorption/desorption and/or leaching), but it is also possible that other factors are responsible or interacting. Some such factors or could be:

- varying quality of the pre-pumping (purging of the well), differing sampling or sample-treatment procedures, or laboratory handling issues
- local pollution source, which has dynamic leaching patterns
- due to the shallow nature of the screens, the groundwater table and the redox conditions may be very sensitive to the hydrological conditions.

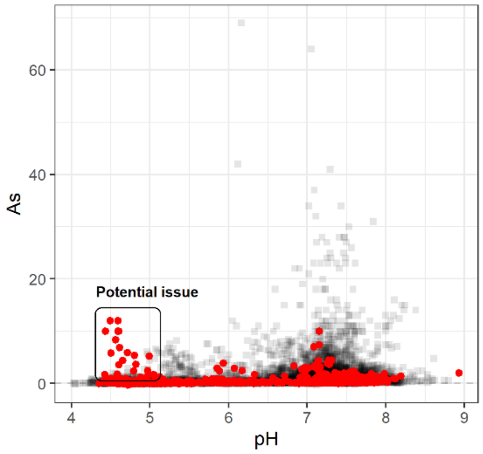


Figure 7-15: (same as Figure 7-6) the "Potential issue" area of pH-As distribution – it shows the As samples taken at Johnson screens that fall outside the range for the rest of the active GRUMO screens (black transparent symbols)

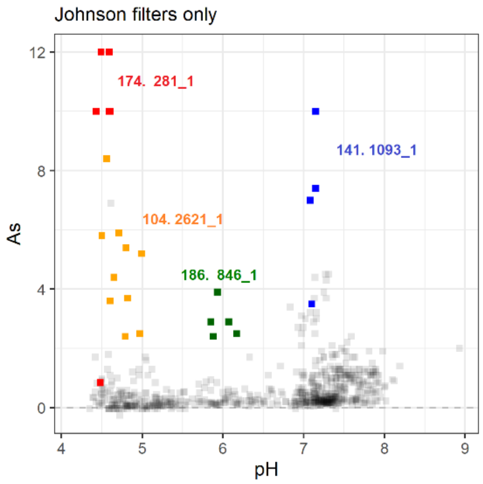


Figure 7-16: Identified Johnson filters with noisy time-series and high As; different colours, labelled in the plot, are used for identifying the samples belonging to one screen

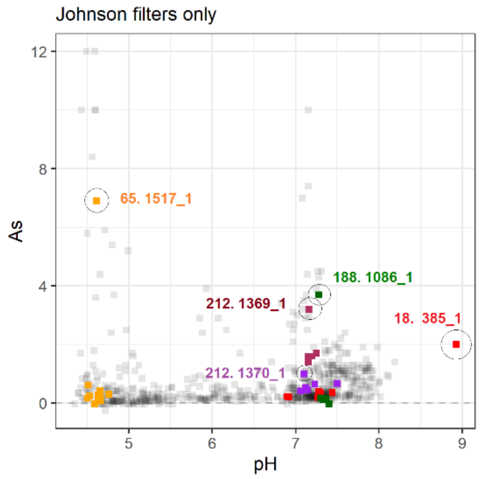


Figure 7-17: Identified Johnson filters with outliers for As; the 65.1517_1 screen falls into the "Potential issue" area from Figure 7-15

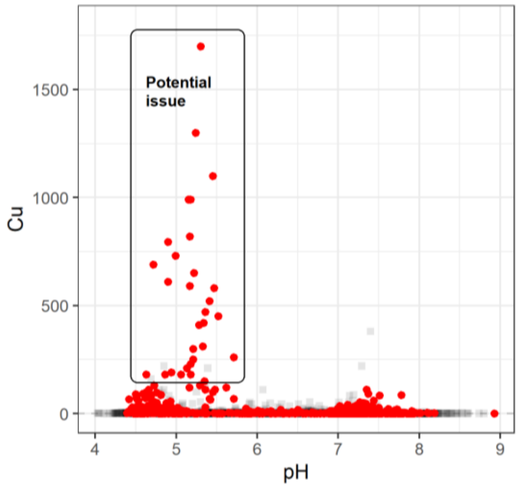


Figure 7-18: (same as Figure 7-10). The “Potential issue” area of pH-Cu distribution; it shows the Cu samples taken at Johnson screens that fall outside the range for the rest of the active GRUMO screens (black transparent symbols)

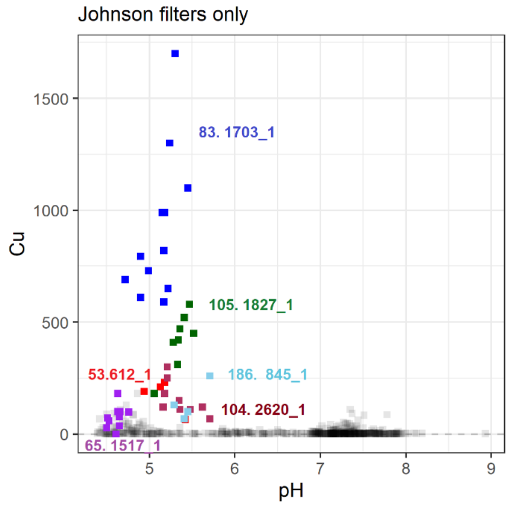


Figure 7-19: Identified Johnson filters with noisy time-series and high Cu

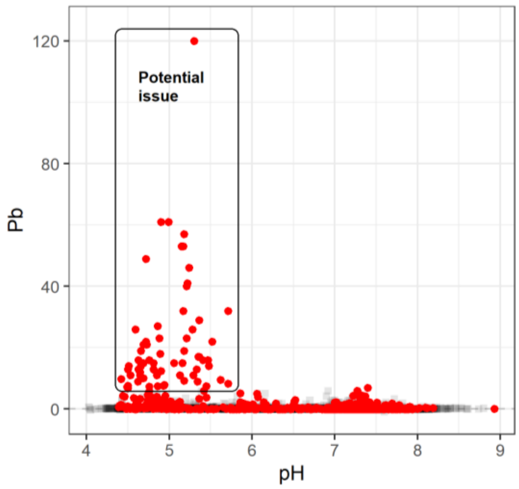


Figure 7-20: (same as Figure 7-8). The “Potential issue” area of pH-Pb distribution; it shows the Pb samples taken at Johnson screens that fall outside the range for the rest of the active GRUMO screens (black transparent symbols)

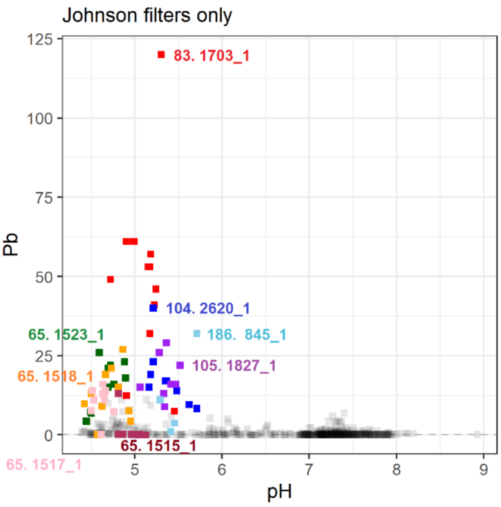


Figure 7-21: Identified Johnson filters with noisy time-series and high Pb

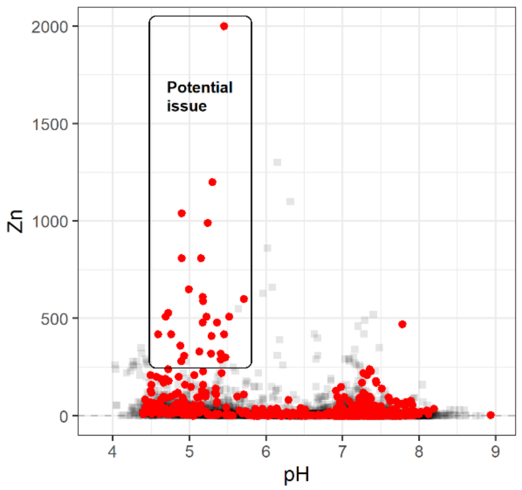


Figure 7-22: (same as Figure 7-13). The "Potential issue" area of pH-Zn distribution; it shows the Zn samples taken at Johnson screens that fall outside the range for the rest of the active GRUMO screens (black transparent symbols)

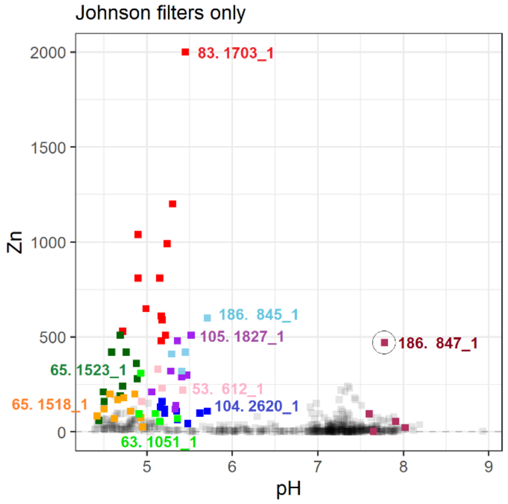


Figure 7-23: Identified Johnson filters with noisy time-series and high Zn

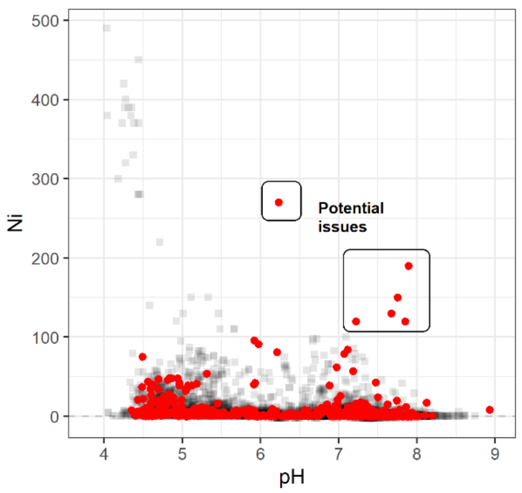


Figure 7-24: (same as Figure 7-12). The "Potential issue" area of pH-Ni distribution; it shows the Ni samples taken at Johnson screens that potentially fall outside the range for the rest of the active GRUMO screens (black transparent symbols)

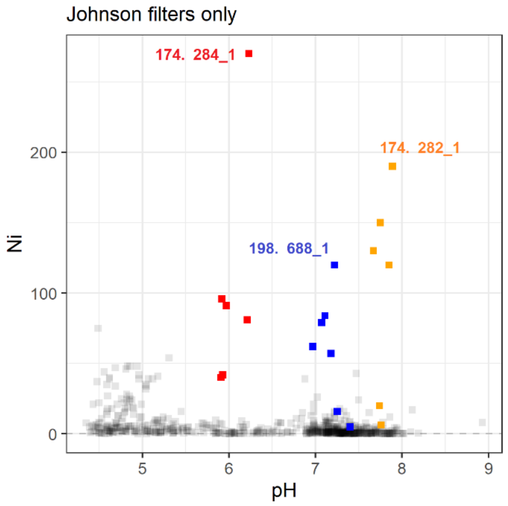


Figure 7-25: Identified Johnson filters with noisy time-series and high Ni

7.4.3 Task 3

The two areas that were further assessed here were:

1. Finderup area 83/93 – where well DGU nr. 83.1703, screen 1 with a Johnson filter is located (Figure 7-26)
2. Haderup area 65 – where the suspicious Johnson screens in wells with DGU nr. 65.1515, 65.1517, 65.1518, 65.1523 are located (Figure 7-27)

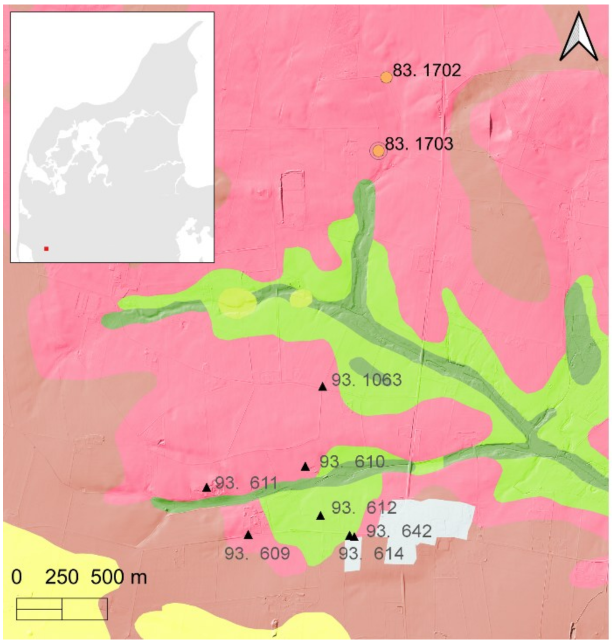


Figure 7-26: Location of the suspicious Johnson screens (shallow depth 10-20 m) for wells with DGU nr. 83.1703 and 83.1702, of which 83.1703 had the highest concentrations for Cu, Pb, Zn and large concentration variation in time. South from these two wells is located another site with other GRUMO wells (see wells with DGU nr. starting with 93); Soil map symbols: FS - Freshwater sand, FL - Freshwater clay, FT - Freshwater peat, ES - Aeolian sand, DS - Meltwater sand, MS - Sandy till (DS and MS are Glacial)

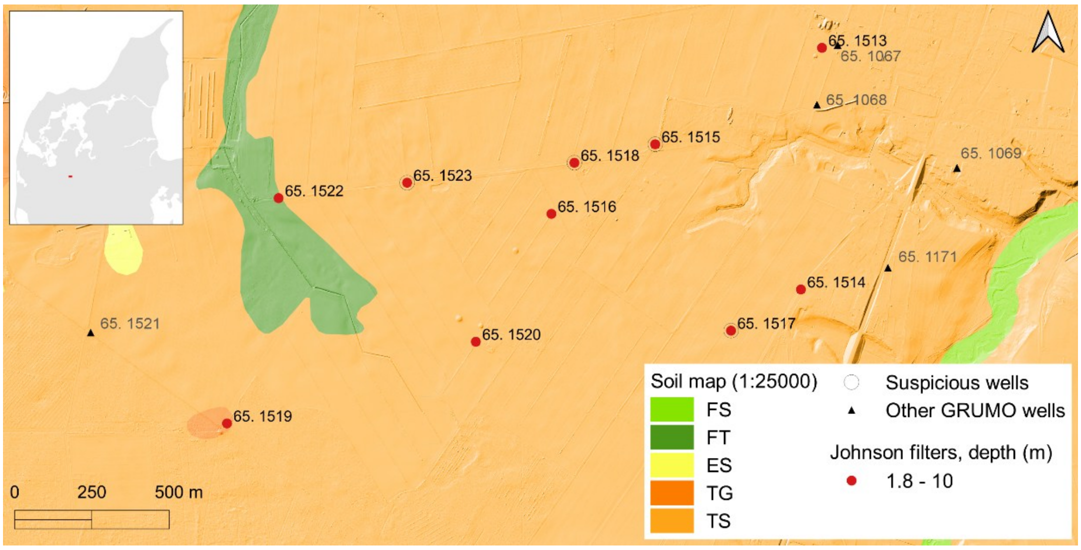


Figure 7-27: Location of the suspicious Johnson screens (shallow depth < 10m) for wells with DGU nr. starting with 65 that had noisy time-series and relatively high concentrations for Cu, Pb, Zn. There are few other GRUMO wells in the area that are not with Johnson screens; Soil map symbols: FS - Freshwater sand, FT - Freshwater peat, ES - Aeolian sand, TG - Meltwater gravel, TS - Meltwater sand (TG and TS are Proglacial)

Figure 7-26 and Figure 7-27 show both the suspicious Johnson wells and other GRUMO wells in their vicinity. The dominating surface geology (at 1 m depth) is glacial meltwater sand (ds) (Figure 7-26) and proglacial meltwater sand (Figure 7-27). It is not possible to rule-out a potential geological or geomorphological reason for the observed differences on the time-series for the wells in these two areas.

Time series for all screens of the wells shown on Figure 7-26 and Figure 7-27 were prepared. The time-series for each element and the two areas (area 82/92 and area 65) are shown in Bilag C: Time series for all screens of the wells shown on Figure 7-26 and Figure 7-27.

7.5 Conclusions and recommendations

Based on the results from these three tasks, we cannot conclude that there is a systematic issue with the observed concentration of trace elements at the stainless-steel screens. This means that even if there is influence from the screen material, this influence does not affect the measured concentrations the same way everywhere all the time. It is possible that the noisy time-series are indicative for such influence, but this cannot be determined conclusively, based alone on the used methods and historical data.

Therefore, there are few possible ways to continue this work and get more conclusive answers, for example:

- To perform camera inspection of the screens from Table 2 (see also Figure 14 for location); if there is rusting of the metal, it is most probable that the measurements from these screens are not representative for the trace metal concentrations in the shallow aquifers but are influenced by the interaction of the screen material with the groundwater. With a camera inspection it can be easily determined what is the state of the filter.
- If the budget allows, various field or lab experiments (comprising additional sampling and desk studies) could be performed, see examples in Llopis (1991) and Hewitt (1993).

The reason for the noisiness of the time-series is an issue that needs further investigation.

It is especially important to determine if the pre-pumping (or the other sampling and sample preparation procedures) could explain the large variability in observed concentrations and the outliers.

Based on the literature reviewed for this work (see Background section), stainless steel filters should be avoided for monitoring metals in groundwater.

The recommendations in Thorling et al. 2022 are that such filters should not be used when establishing new monitoring wells for the national groundwater monitoring network (GRUMO).

7.6 References

GEUS, 2004: Udkast til teknisk anvisning for grundvandsovervågningen. Version 3 af 2. december 2003. https://www.geus.dk/Media/638530019928085106/TA_GRUMO_2004-for%C3%A6ldet.pdf

Llopis, J. L. (1991) The effects of well casing material on ground water-quality. United States Environmental Protection Agency, re-port: EPA/540/4-91/005 https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=600016K0.PDF (accessed: 1 Mar 2022)

Hewitt, A. D. (1993) A dynamic study of common well screen materials. US Army Corps of Engineers, CRREL Report 93-7. (accessed: 1 Mar 2022)

Mortensen, M. H., Ernstsen, V., Voutchkova, D. & Thorling, L. (2021) Udvikling af metode til vurdering af grundvandsforekomsters kemiske tilstand for udvalgte uorganiske sporstoffer og salte. Dokumentationsrapport. GEUS rapport nr. 2021/19. https://www.geus.dk/Media/637607297652239325/Udvikling%20af%20metode%20til%20vurdering%20af%20grundvandsforekomsters%20kemiske%20tilstand%20for%20udvalgte%20uorganiske%20sporstoffer%20og%20salte.pdf

Thorling, L., Albers, C.N., Ditlefsen, C. Hansen, B., Johnsen, A.R., Mortensen, M.H. & Troldborg, L. (2021) Grundvand. Status og udvikling 1989–2020. Teknisk rapport, GEUS 2021. https://www.geus.dk/Media/637753300019725848/Grundvand%201989-2020_a.pdf (accessed: 1 Mar 2022)

Thorling, L., Ditlefsen, C., Mortensen, M. H., Sivertsen, J., Wandall, T., Iversen, L. T. (2022): Etablering og vedligeholdelse af overvågningsboringer i grundvandsovervågningen. Teknisk anvisning G01. GEUS 2022.

Voutchkova, Denitza, 2026, "Time Series Plots for As, Cu, Pb, Zn, and pH for the GRUMO wells with stainless steel filters", https://doi.org/10.22008/FK2/TJHYZO, GEUS Dataverse, V1

8. Bilag B: Identificering af Johnson-filtre i GRUMO-boringer

Johnson filtre blev brugt i perioden 2000-2006.

For at finde de boringer der potentielt kunne have et Johnson filer er følgende procedure fulgt: I det standardiserede GRUMO-udtræk fra 2020 udvælges alle indtag med etableringsår 2000-2006 og samtidig blank i feltet ”udgået_år”. På denne måde udvælges alle indtag, der er etableret i perioden 2000-2006, som stadig eksisterer. Det drejer sig om 319 indtag ud af 2408. Derefter er tilføjet 8 indtag, hvor der ikke er noteret et etableringsår, men hvor boreår er angivet som værende i perioden 2000-2006, og der ikke er angivet et ”udgået år”. Til sidst er tilføjet 12 indtag, hvor der ikke er angivet informationer om boreår eller etableringsår, og hvor der ikke er noteret et ”udgået år”.

I alt er der tale om 339 indtag fordelt på 274 boringer, der skal undersøges for om indtaget er et Johnsonfiltre.

Det er sjældent dokumenteret direkte, at det er installeret et Johnson filter. Derfor afgrænses de potentielle indtag med Johnsonfiltre ud fra, om filteret er angivet som et stålfilter.

Der er 150 indtag, fordelt på 127 boringer, som enten er angivet med jern/rustfrit stål, eller hvor der mangler oplysninger om hvilke materiale, filteret er fremstillet af, se Tabel 6.

DGUNR	INDTNR	DGUNR	INDTNR	DGUNR	INDTNR	DGUNR	INDTNR	DGUNR	INDTNR
5. 1606	1	65. 1517	1	125. 2028	1	188. 1085	1	198. 687	6
5. 1607	2	65. 1518	1	125. 2029	2	188. 1086	1	198. 687	9
5. 1609	1	65. 1519	1	125. 2030	3	188. 1088	1	198. 687	11
5. 1610	1	65. 1520	1	125. 2033	1	188. 1089	1	198. 687	13
5. 1616	1	65. 1522	1	133. 1382	1	190. 278	1	198. 687	15
18. 381	1	65. 1523	1	133. 1383	1	190. 279	1	198. 687	17
18. 382	1	71. 765	3	133. 1385	1	190. 280	1	198. 687	19
18. 383	1	71. 773	2	141. 1086	1	190. 281	1	198. 688	1
18. 384	1	71. 775	1	141. 1087	1	190. 282	1	198. 689	1
18. 385	1	71. 775	2	141. 1091	1	190. 283	1	198. 690	1
40. 1366	1	83. 1702	1	141. 1093	1	193. 2113	1	198. 691	1
40. 1367	1	83. 1703	1	159. 1249	1	193. 2114	1	198. 692	1
40. 1368	1	86. 2075	4	159. 1250	1	193. 2115	1	198. 693	1
40. 1369	1	87. 1281	4	174. 280	1	193. 2116	1	198. 694	1
40. 1370	1	96. 2272	1	174. 281	1	198. 683	1	199. 1237	1
40. 1371	1	104. 1993	4	174. 282	1	198. 684	1	199. 1238	1
40. 1372	1	104. 1993	5	174. 283	1	198. 685	1	199. 1239	1
40. 1373	1	104. 2620	1	174. 284	1	198. 686	1	199. 1240	1
40. 1374	1	104. 2621	1	174. 285	1	198. 686	3	199. 1241	1
40. 1375	1	105. 1827	1	174. 286	1	198. 686	5	199. 1242	1

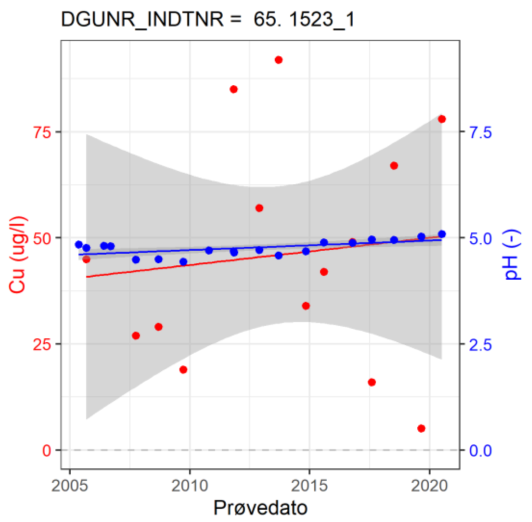
40. 1376	1	105. 1851	1	174. 287	1	198. 686	7	206. 1677	1
40. 1377	1	105. 1851	2	186. 843	1	198. 686	8	206. 1678	1
53. 612	1	105. 1852	1	186. 844	1	198. 686	10	206. 1679	1
53. 613	1	125. 2021	1	186. 845	1	198. 686	12	206. 1682	1
63. 1051	1	125. 2021	2	186. 846	1	198. 686	14	206. 1684	1
63. 1052	1	125. 2023	2	186. 847	1	198. 686	16	206. 1685	1
65. 1513	1	125. 2024	1	186. 848	1	198. 686	18	206. 1686	1
65. 1514	1	125. 2025	1	186. 855	16	198. 686	20	212. 1369	1
65. 1515	1	125. 2025	2	188. 1081	1	198. 687	2	212. 1370	1
65. 1516	1	125. 2026	1	188. 1083	1	198. 687	4	213. 617	1

Tabel 6: Indtag og boringsnummer, hvor der er noteret filter med jern/rustfrit stål, eller hvor der ikke er oplysninger om filtermateriale. Blå: Jern eller rustfrit stål. Grøn: Ingen oplysninger

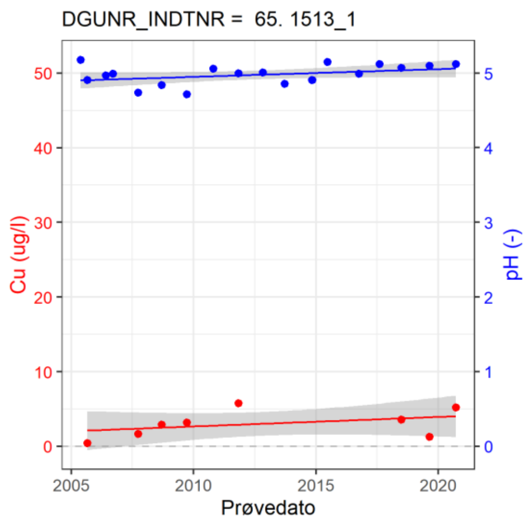
9. Bilag C: Time series for all screens of the wells shown on Figure 7-26 and Figure 7-27

Cu. Area 65.
Pb. Area 65.
Zn. Area 65.
Cu. Area 83 and area 93.
Pb. Area 83 and area 93.
Zn. Area 83 and area 93.

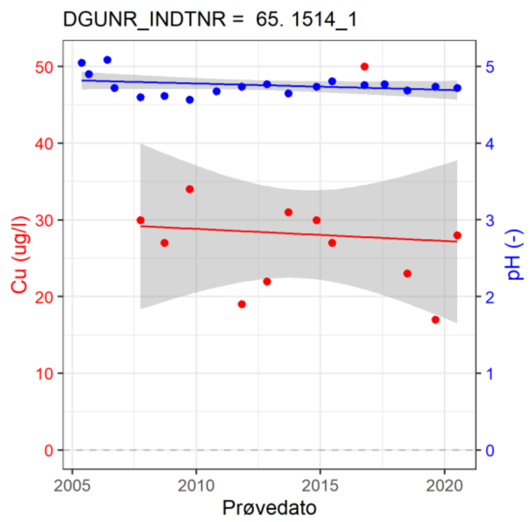
Depth 3.5 – 4.5 m



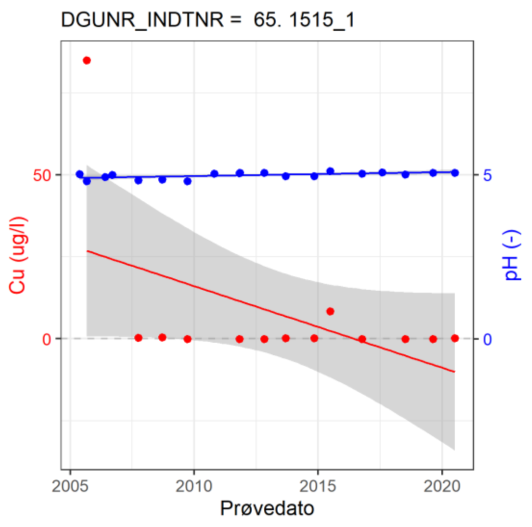
Depth 4.5 – 5.5



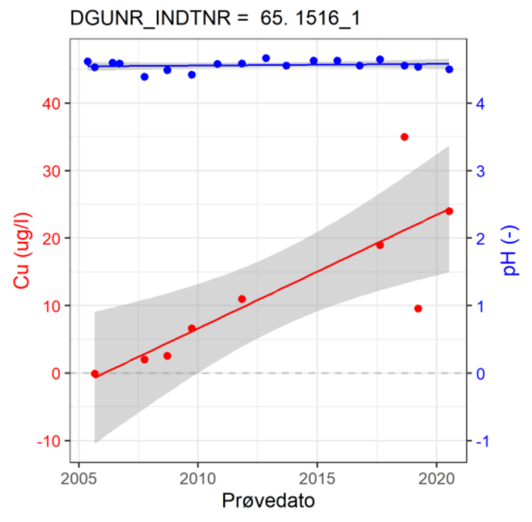
Depth 5 – 6 m



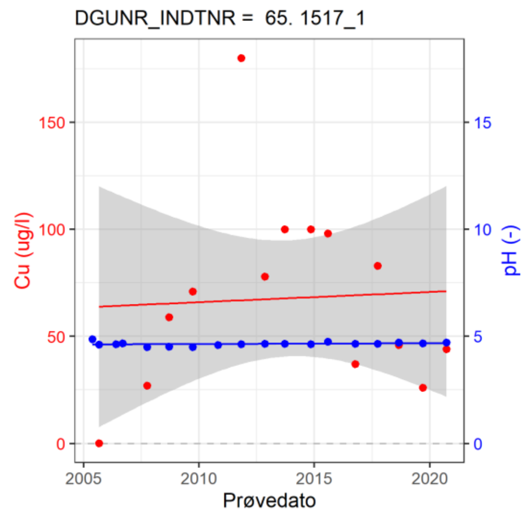
Depth 4.6 – 5.6



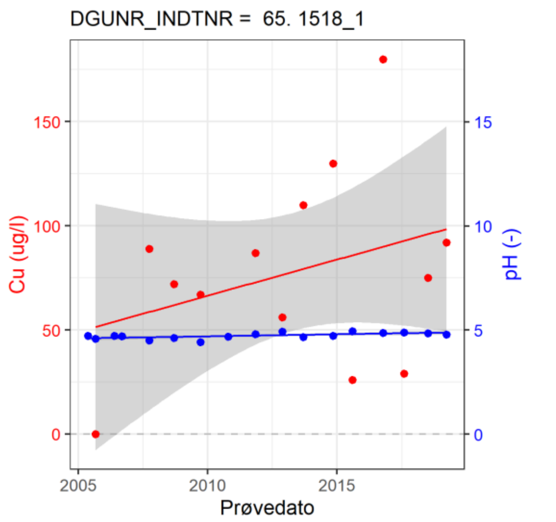
Depth 3 – 4 m



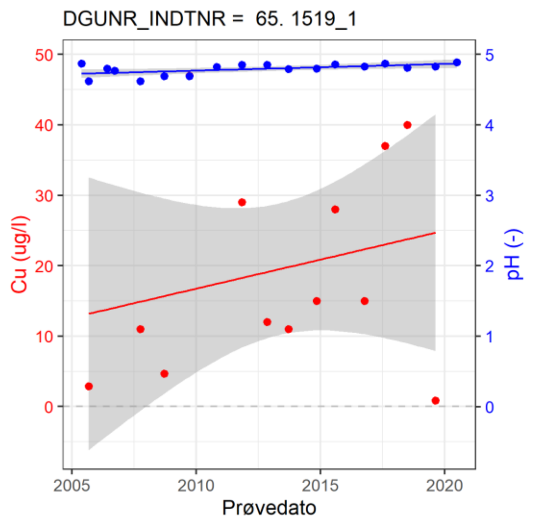
Depth 3.1 – 4.1 m



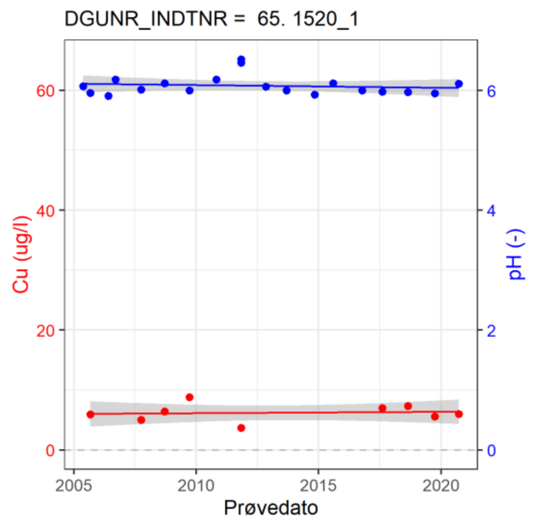
Depth 4 – 5 m



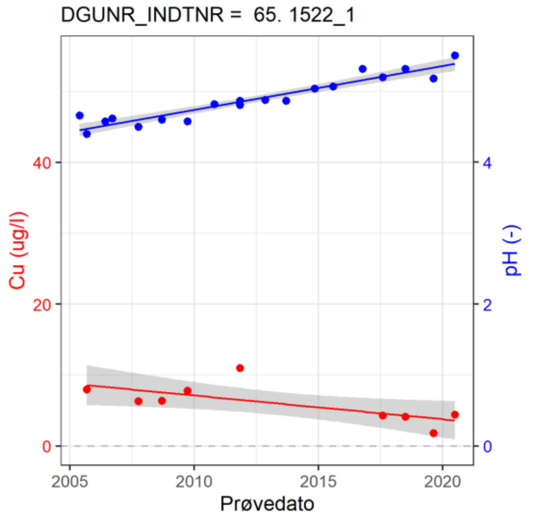
Depth 5 – 6 m



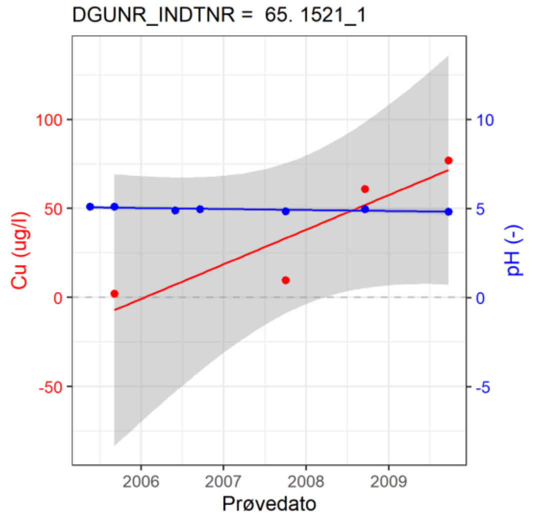
Depth 4.5 – 5.5

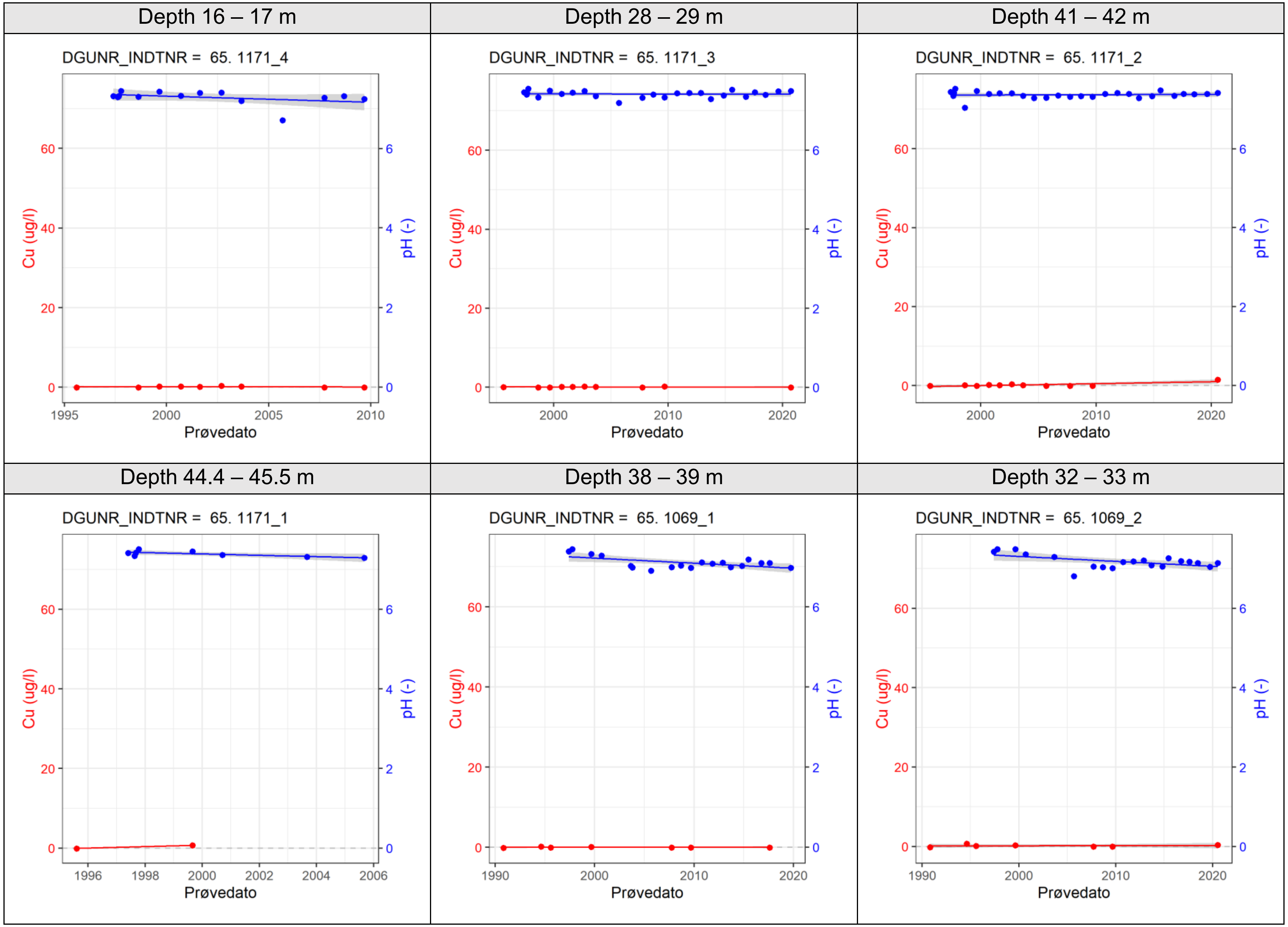


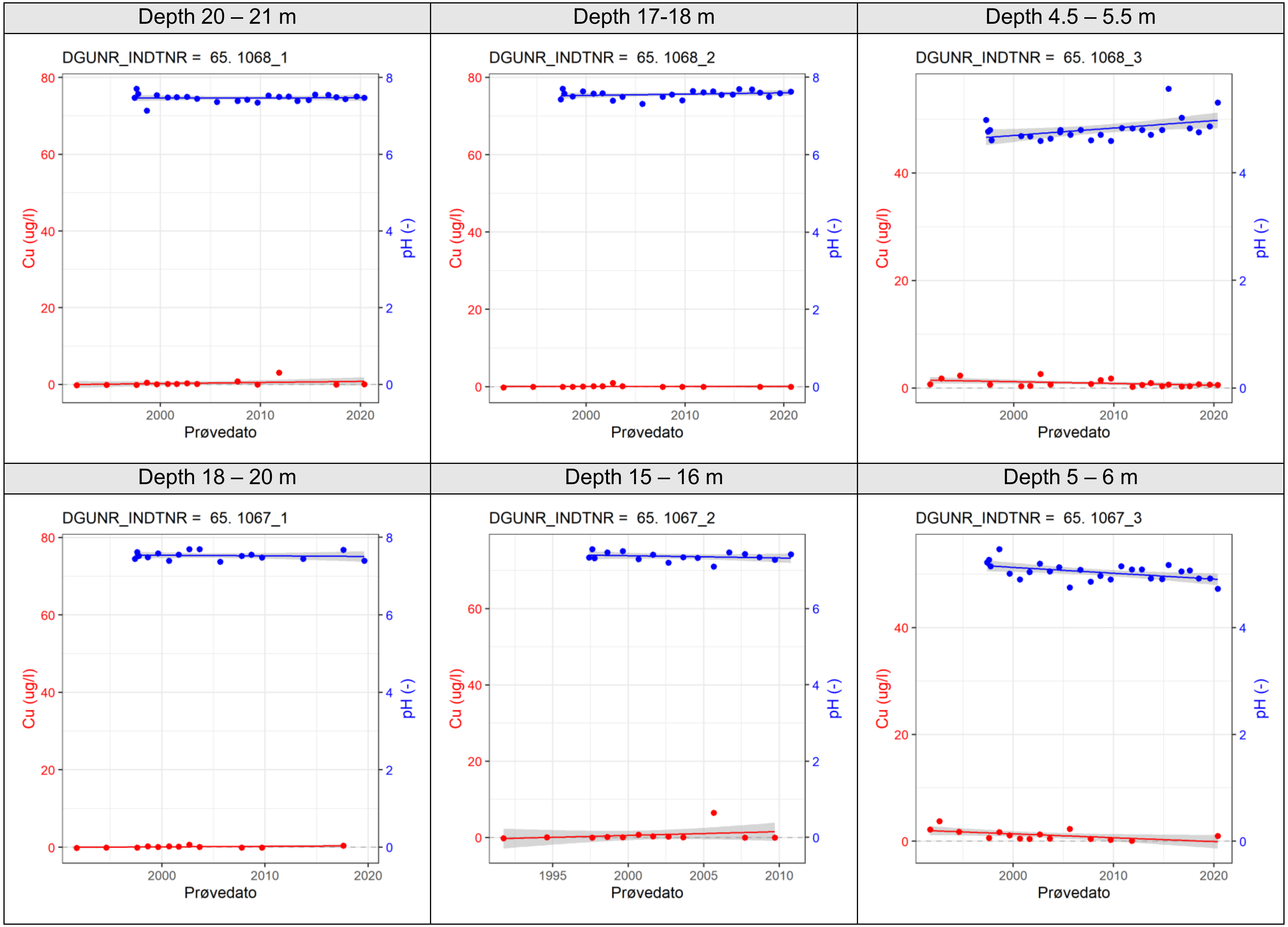
Depth 3.7 – 4.7

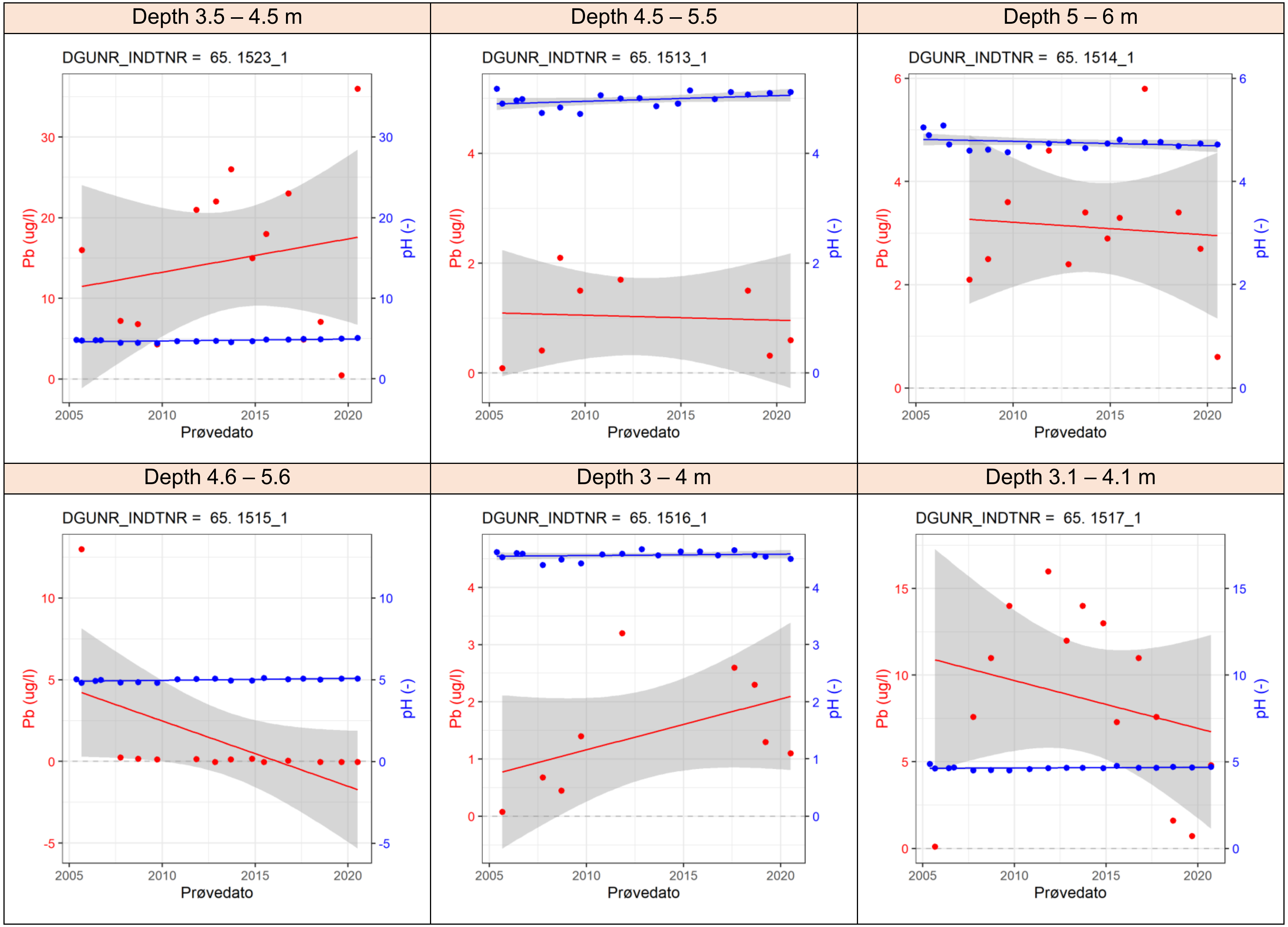


Depth 6.5 – 7.5 m



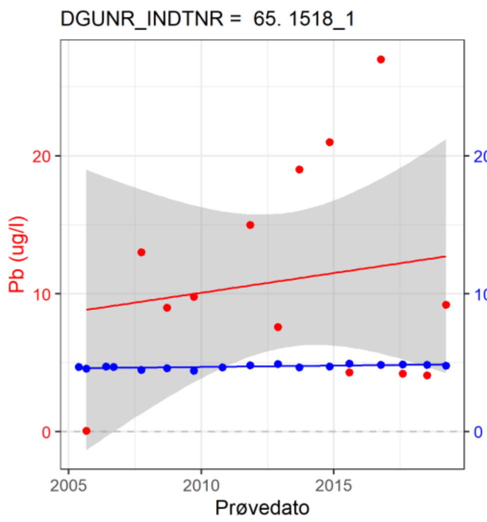

Depth 16 – 17 m
DGUNR_INDTNR = 65. 1171_4
Cu (ug/l)
pH (-)
0
20
40
60
0
2
4
6
1995
2000
2005
2010
Prøvedato
Depth 28 – 29 m
DGUNR_INDTNR = 65. 1171_3
Cu (ug/l)
pH (-)
2000
2010
2020
Prøvedato
Depth 41 – 42 m
DGUNR_INDTNR = 65. 1171_2
Cu (ug/l)
pH (-)
2000
2010
2020
Prøvedato
Depth 44.4 – 45.5 m
DGUNR_INDTNR = 65. 1171_1
Cu (ug/l)
pH (-)
1996
1998
2000
2002
2004
2006
Prøvedato
Depth 38 – 39 m
DGUNR_INDTNR = 65. 1069_1
Cu (ug/l)
pH (-)
1990
2000
2010
2020
Prøvedato
Depth 32 – 33 m
DGUNR_INDTNR = 65. 1069_2
Cu (ug/l)
pH (-)
1990
2000
2010
2020
Prøvedato


Depth 20 – 21 m
Depth 17-18 m
Depth 4.5 – 5.5 m
DGUNR_INDTNR = 65. 1068_1
DGUNR_INDTNR = 65. 1068_2
DGUNR_INDTNR = 65. 1068_3
Depth 18 – 20 m
Depth 15 – 16 m
Depth 5 – 6 m
DGUNR_INDTNR = 65. 1067_1
DGUNR_INDTNR = 65. 1067_2
DGUNR_INDTNR = 65. 1067_3
Cu (ug/l)
pH (-)
Prøvedato

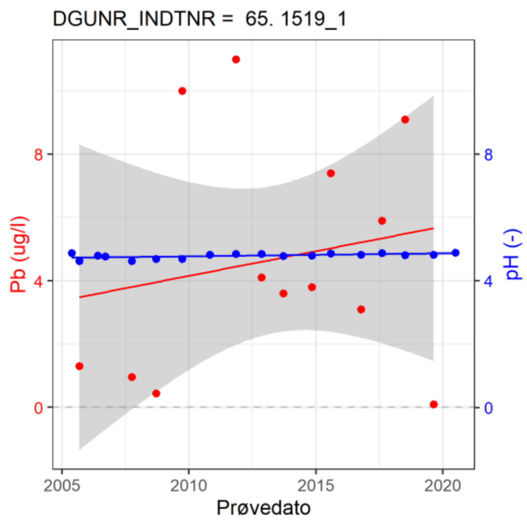


Depth 3.5 – 4.5 m
DGUNR_INDTNR = 65. 1523_1
Depth 4.5 – 5.5
DGUNR_INDTNR = 65. 1513_1
Depth 5 – 6 m
DGUNR_INDTNR = 65. 1514_1
Depth 4.6 – 5.6
DGUNR_INDTNR = 65. 1515_1
Depth 3 – 4 m
DGUNR_INDTNR = 65. 1516_1
Depth 3.1 – 4.1 m
DGUNR_INDTNR = 65. 1517_1
Pb (ug/l)
pH (-)
Prøvedato
2005
2010
2015
2020

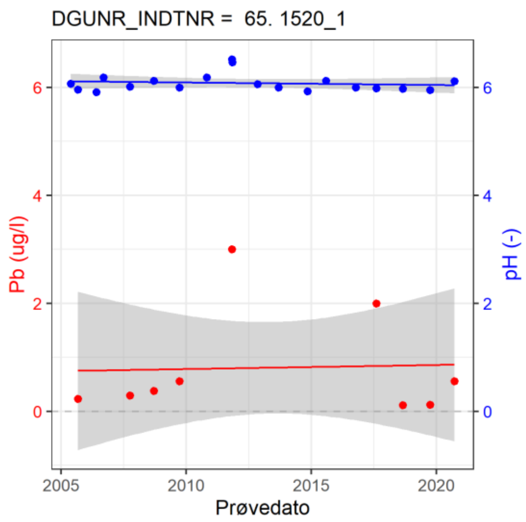
Depth 4 – 5 m



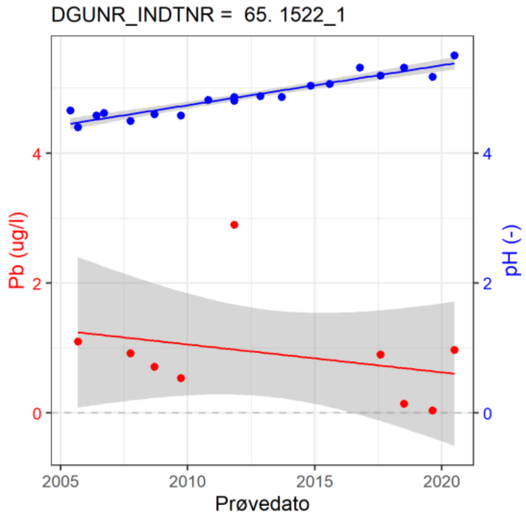
Depth 5 – 6 m



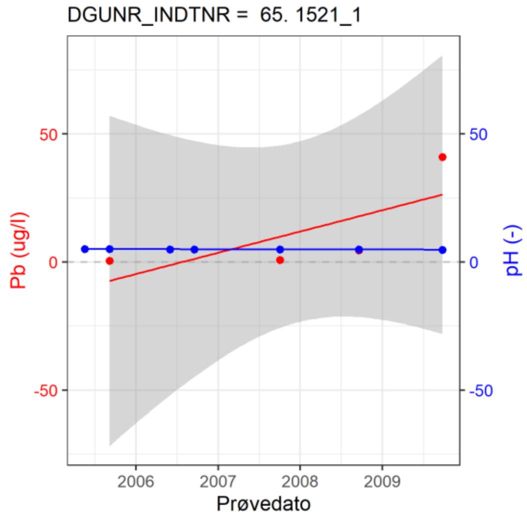
Depth 4.5 – 5.5

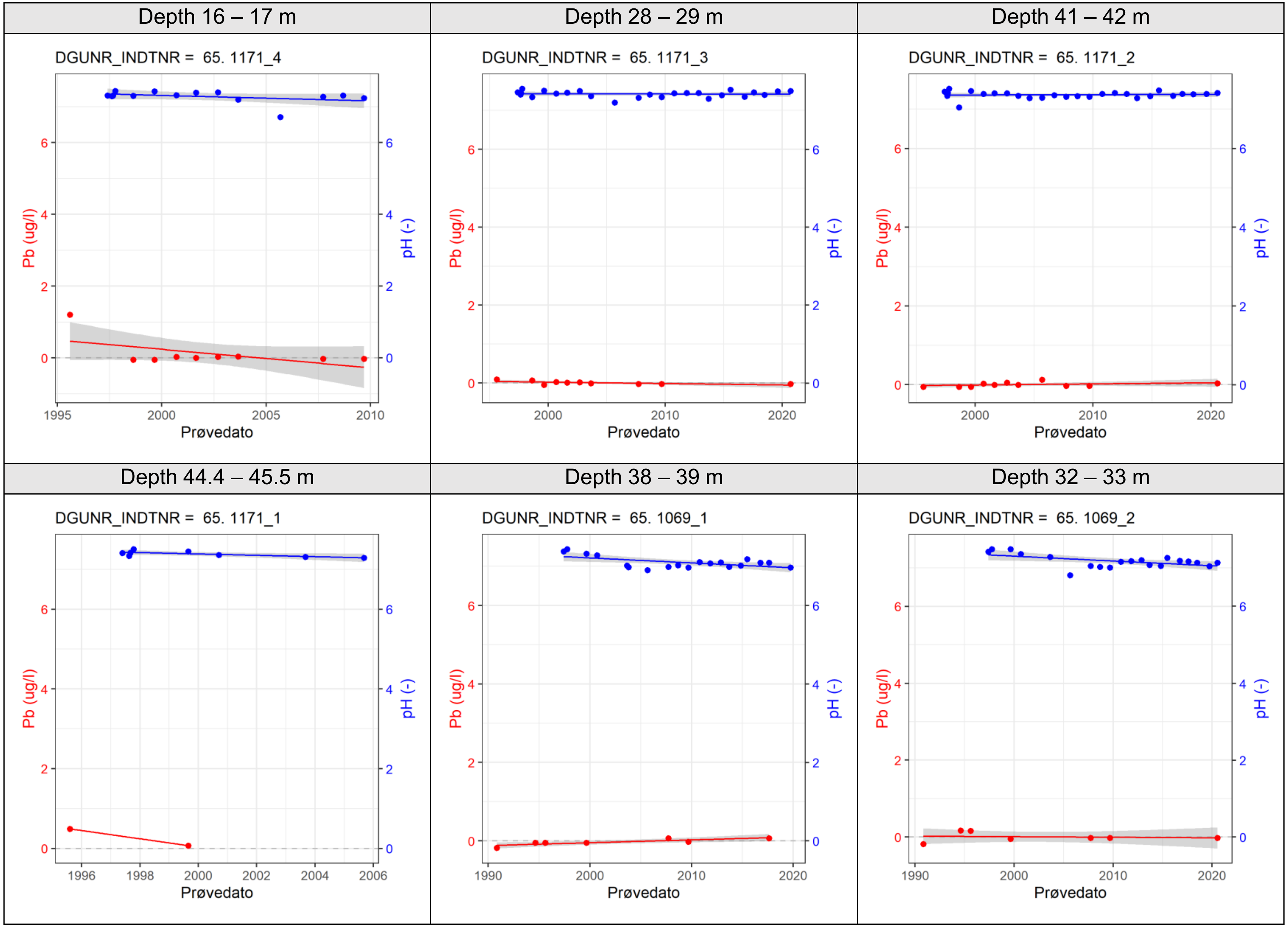


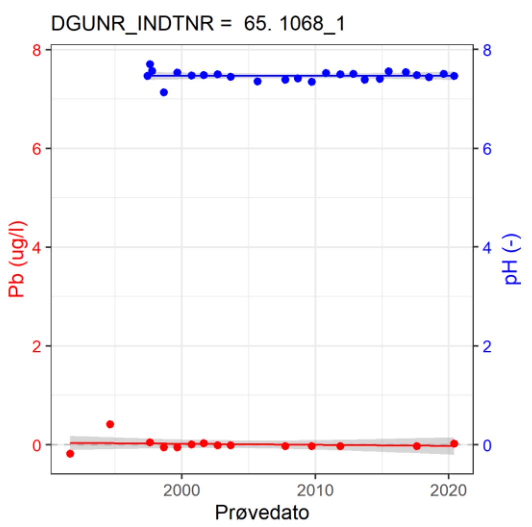
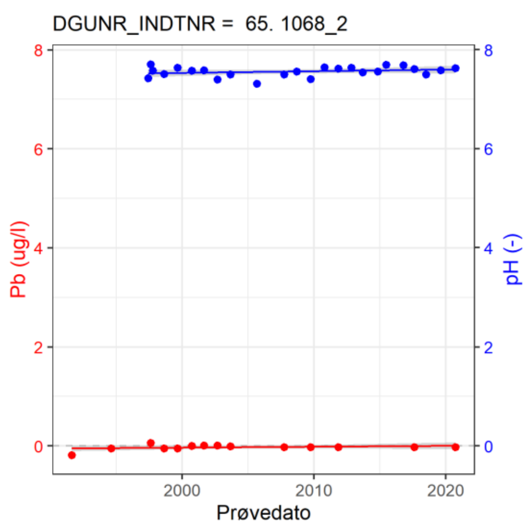
Depth 3.7 – 4.7



Depth 6.5 – 7.5 m




Depth 16 – 17 m
DGUNR_INDTNR = 65. 1171_4
Depth 28 – 29 m
DGUNR_INDTNR = 65. 1171_3
Depth 41 – 42 m
DGUNR_INDTNR = 65. 1171_2
Depth 44.4 – 45.5 m
DGUNR_INDTNR = 65. 1171_1
Depth 38 – 39 m
DGUNR_INDTNR = 65. 1069_1
Depth 32 – 33 m
DGUNR_INDTNR = 65. 1069_2
Pb (ug/l)
pH (-)
Prøvedato

Depth 20 – 21 m	Depth 17-18 m	
		

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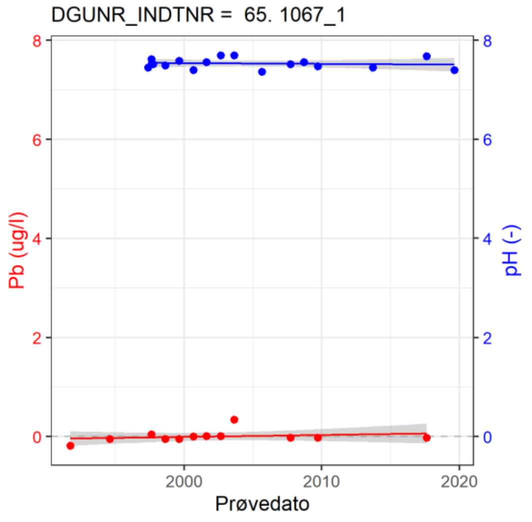	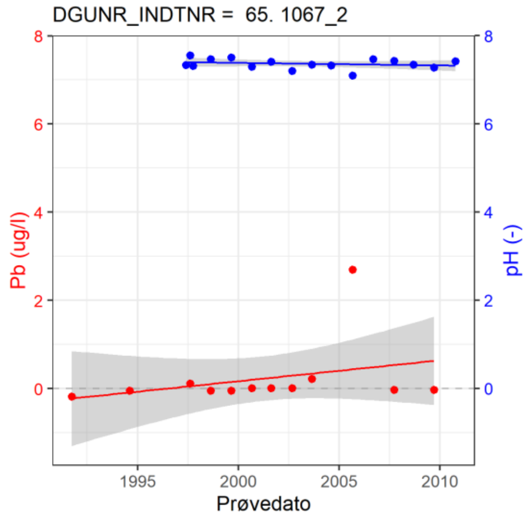	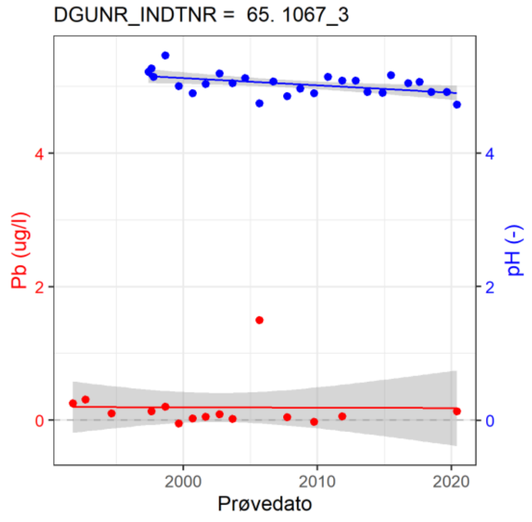

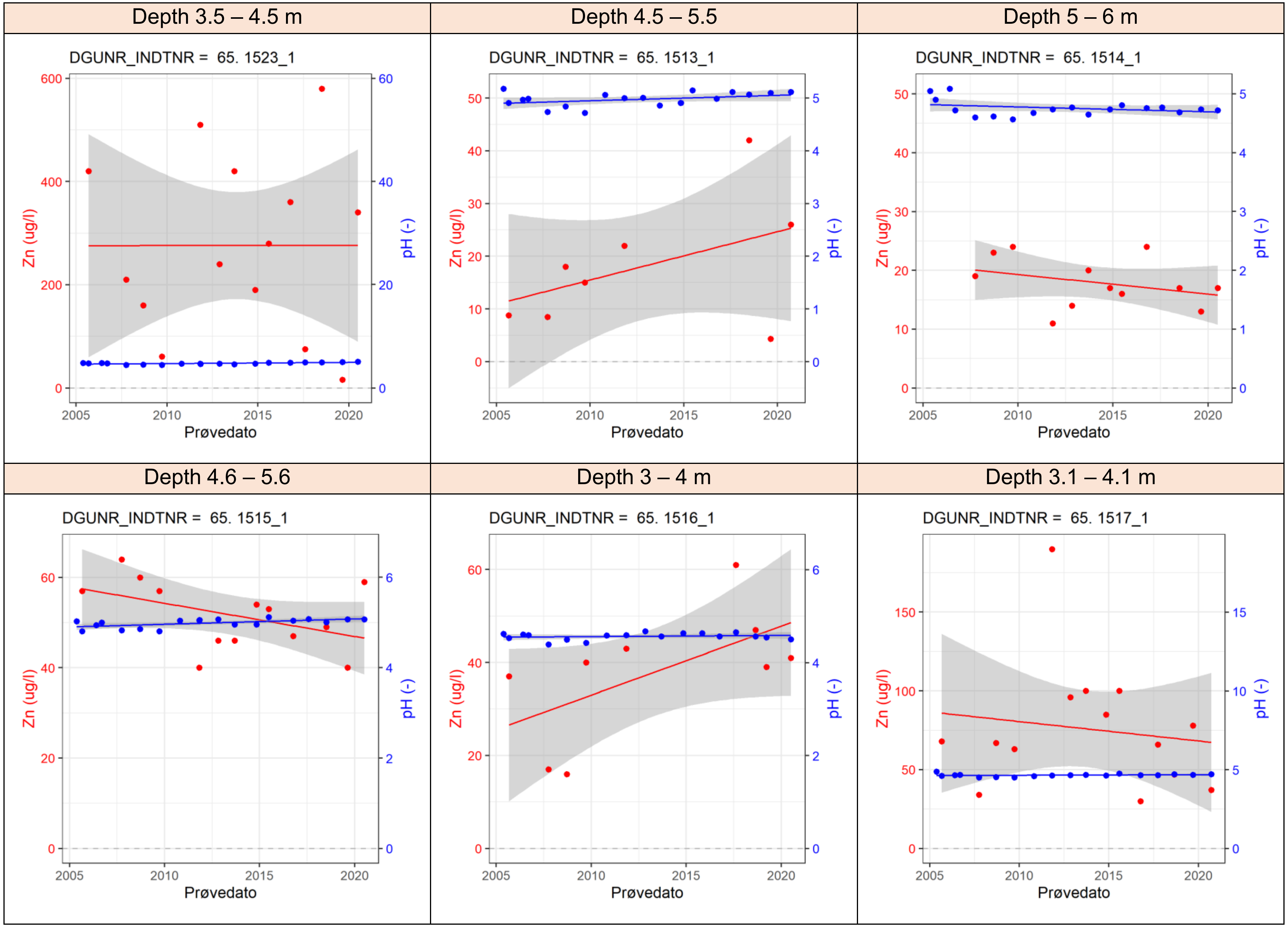
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DGUNR_INDTNR = 65. 1514_1
Depth 4.6 – 5.6
DGUNR_INDTNR = 65. 1515_1
Depth 3 – 4 m
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Depth 3.1 – 4.1 m
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Zn (ug/l)
pH (-)
Prøvedato

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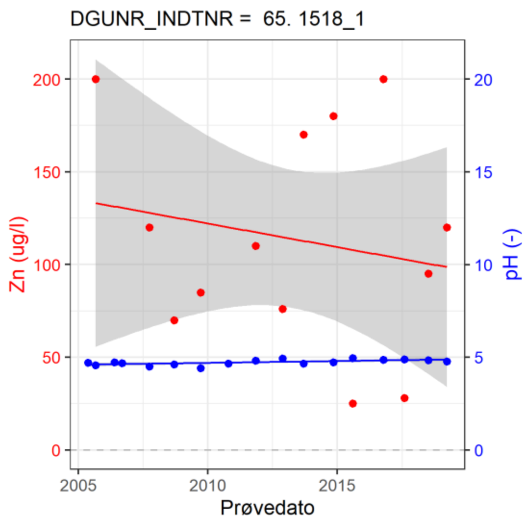
<td>
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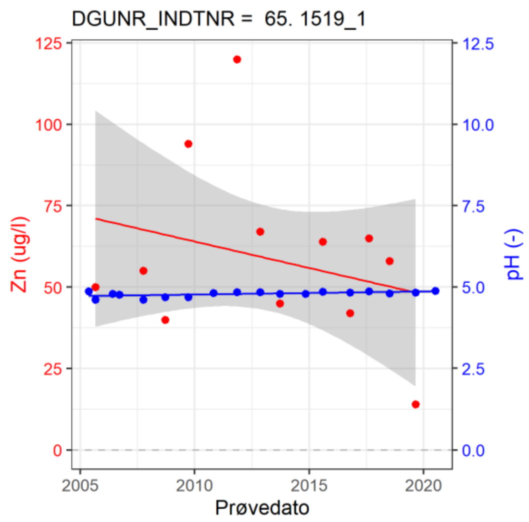
<td>
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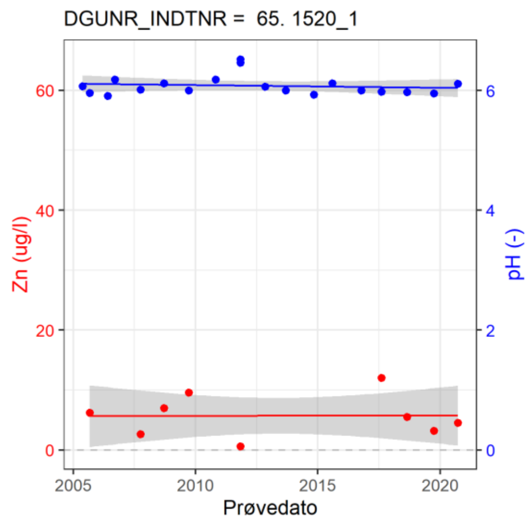
<td>
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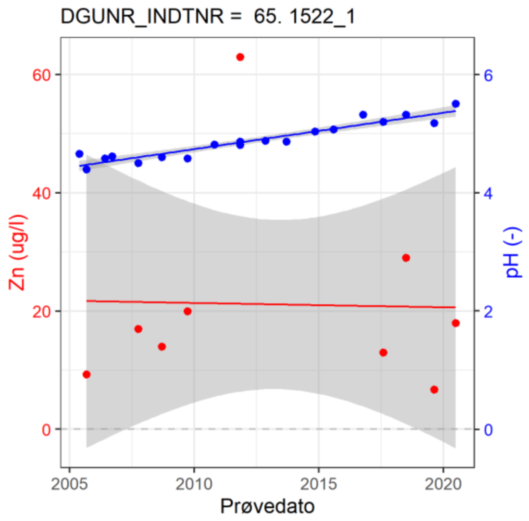
<td>
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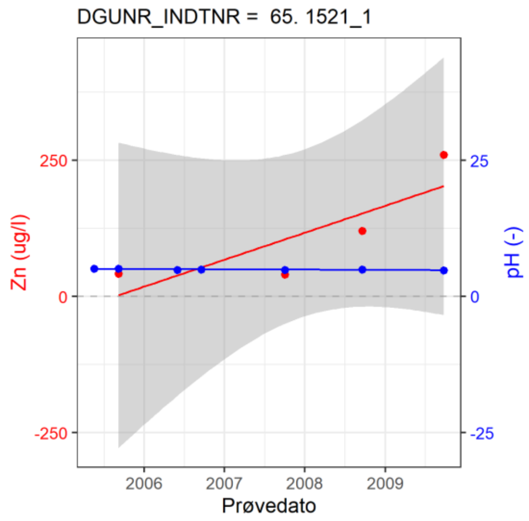
<td>
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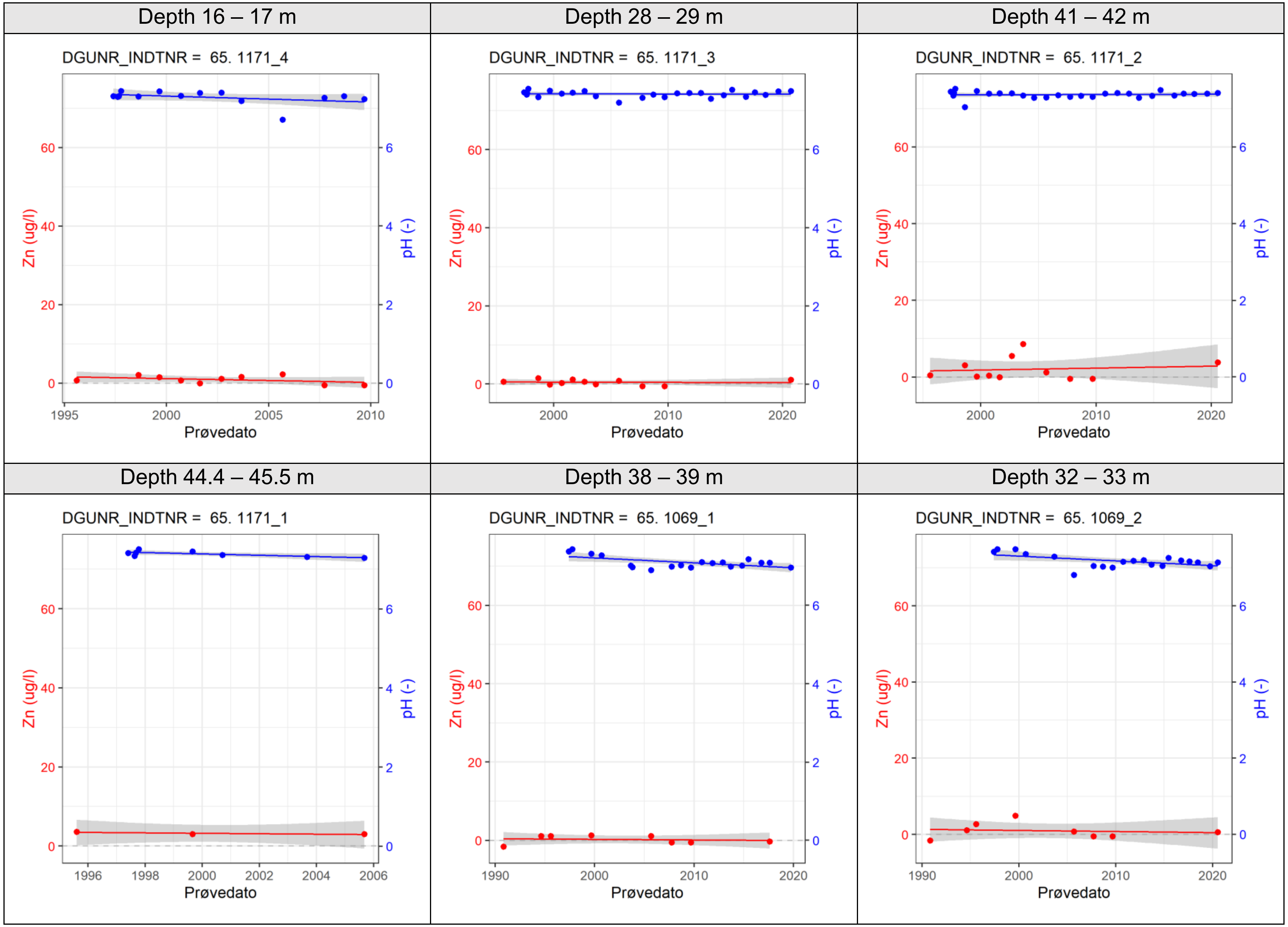
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Depth 38 – 39 m
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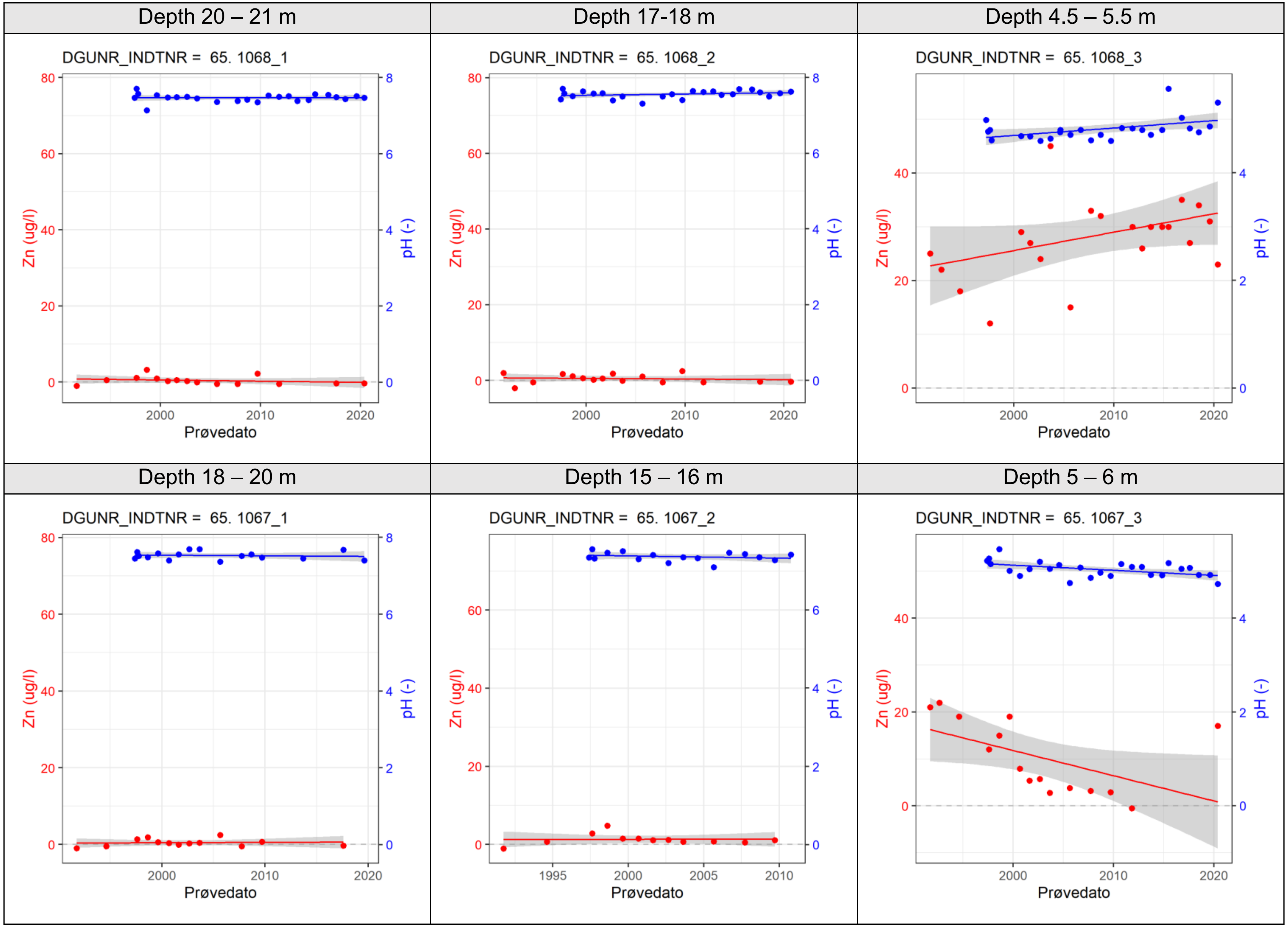
Zn (ug/l)
pH (-)
Prøvedato



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Depth 15 – 16 m
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Depth 5 – 6 m
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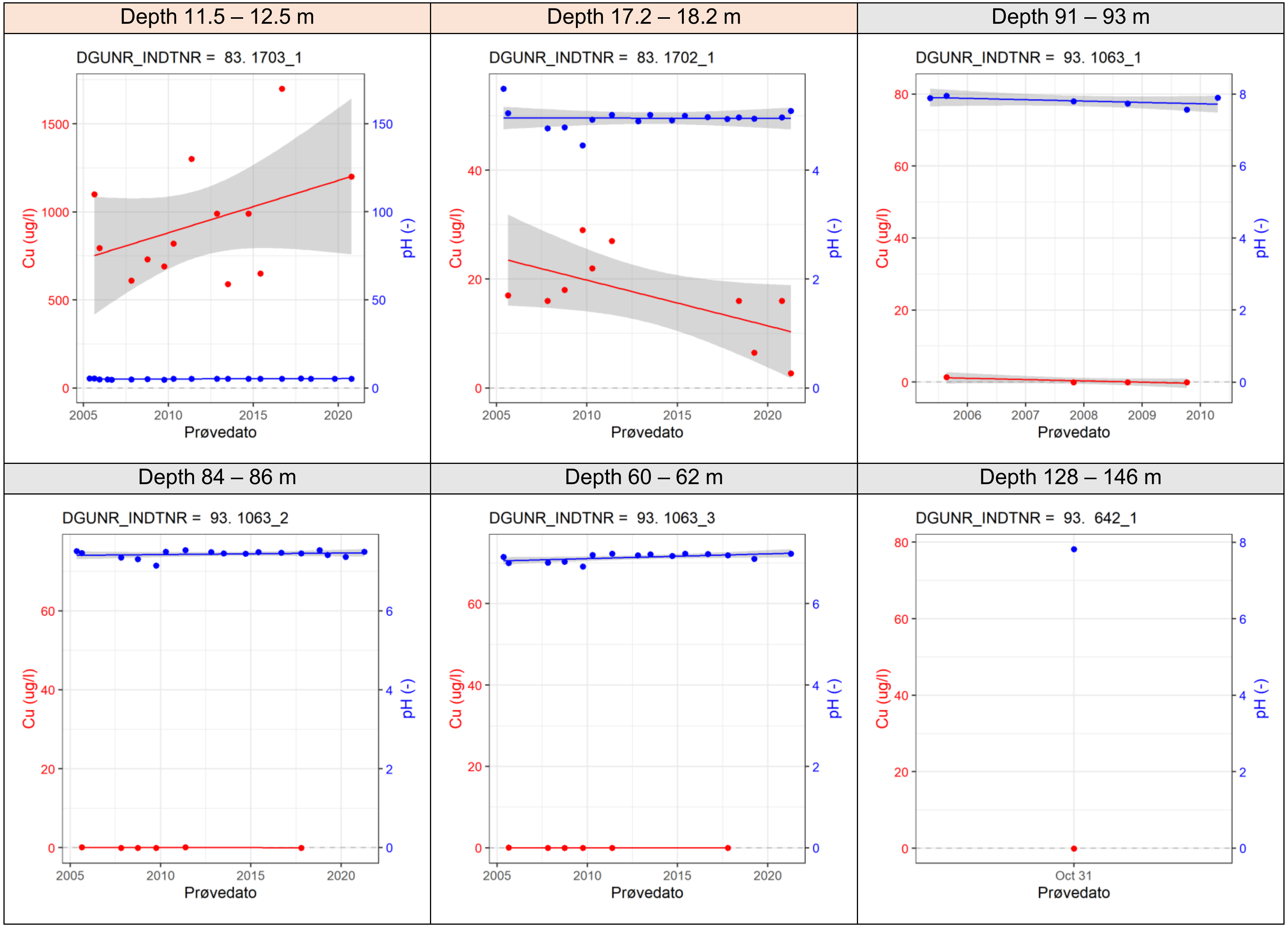
Zn (ug/l)
pH (-)
Prøvedato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DGUNR_INDTNR = 93. 1063_1
Depth 84 – 86 m
Depth 60 – 62 m
Depth 128 – 146 m
DGUNR_INDTNR = 93. 1063_2
DGUNR_INDTNR = 93. 1063_3
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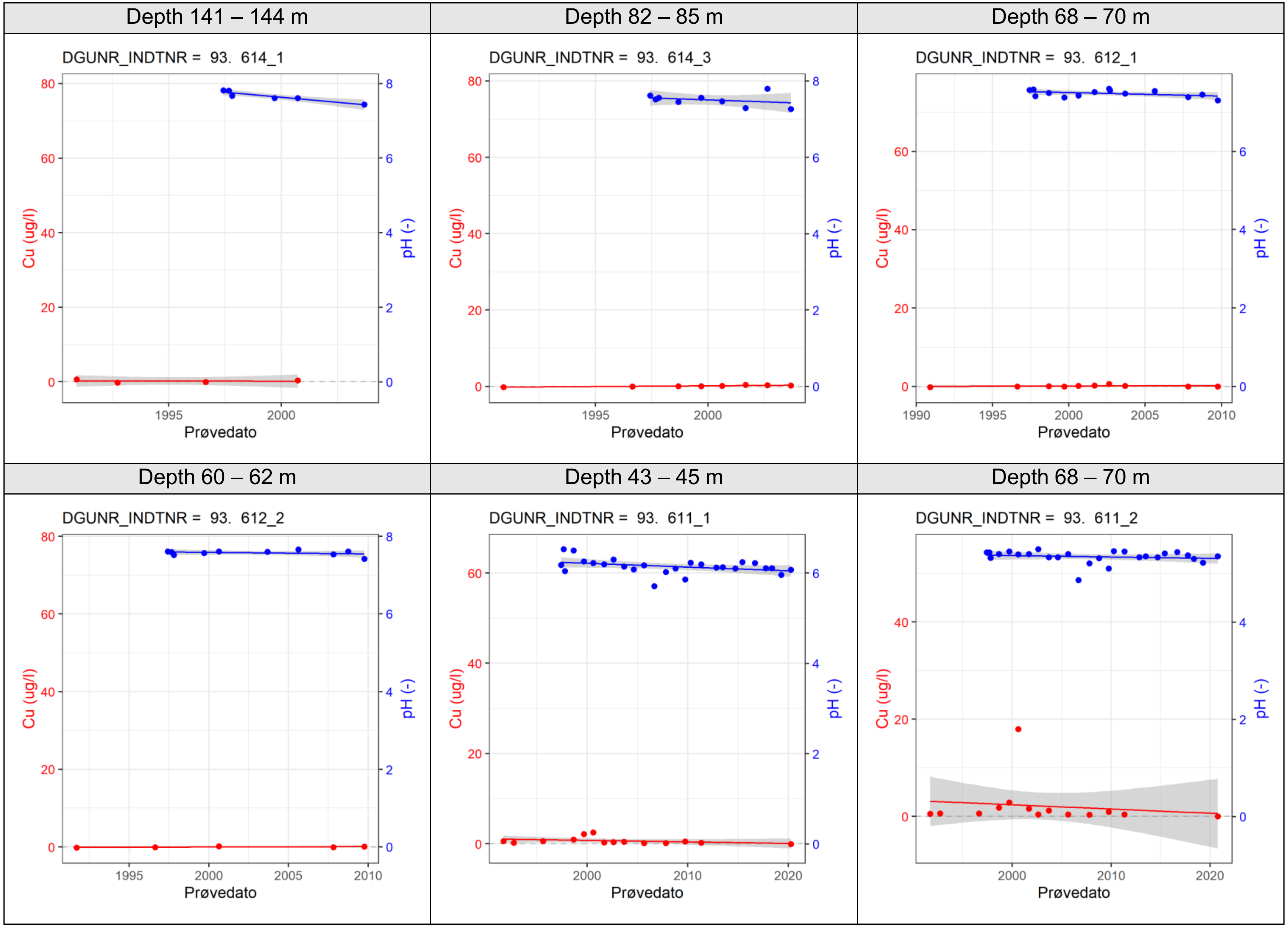
Cu (ug/l)
pH (-)
Prøvedato
Oct 31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Depth 68 – 70 m
DGUNR_INDTNR = 93. 612_1
Depth 60 – 62 m
DGUNR_INDTNR = 93. 612_2
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DGUNR_INDTNR = 93. 611_1
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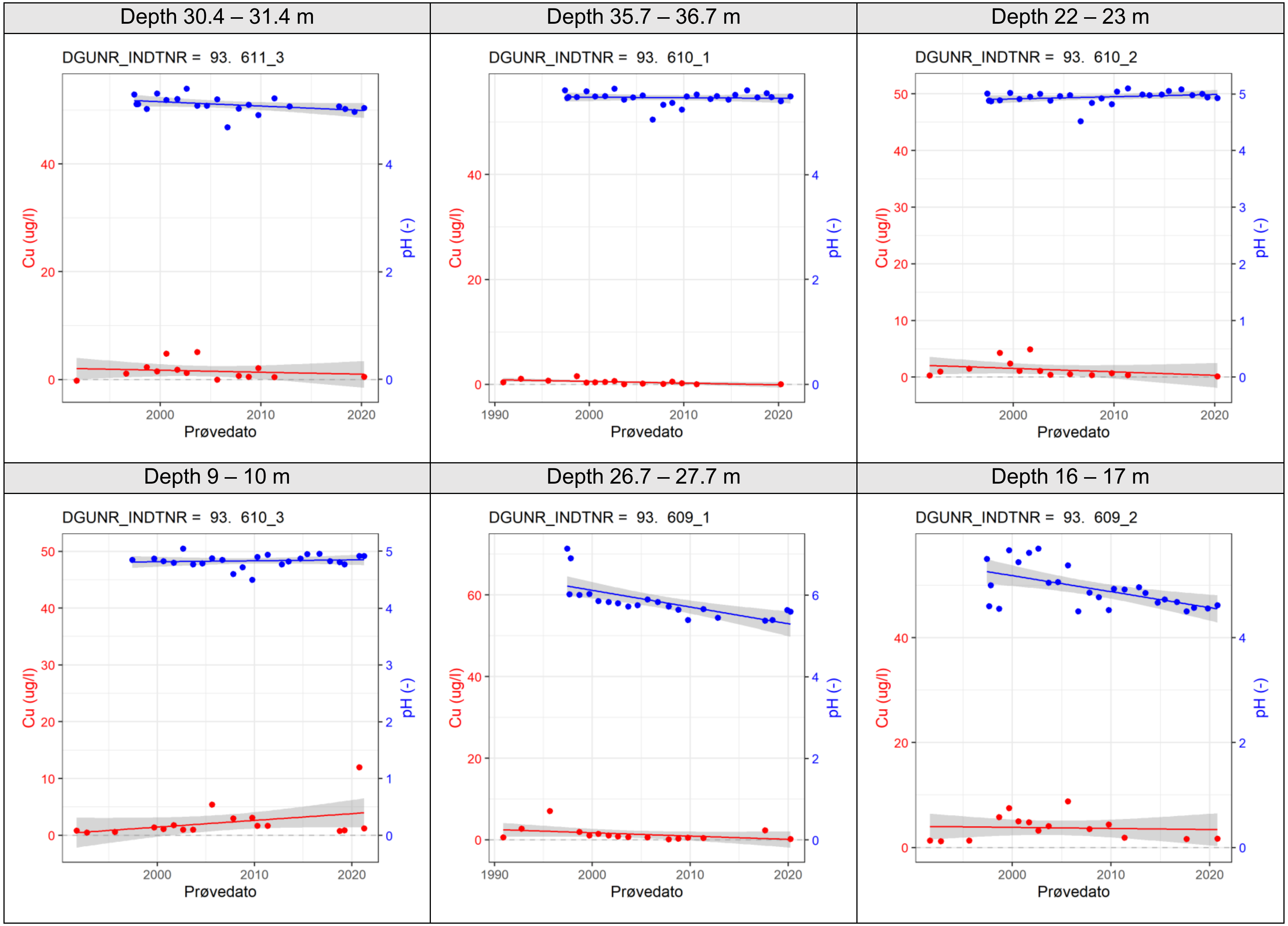
DGUNR_INDTNR = 93. 611_2
Cu (ug/l)
pH (-)
Prøvedato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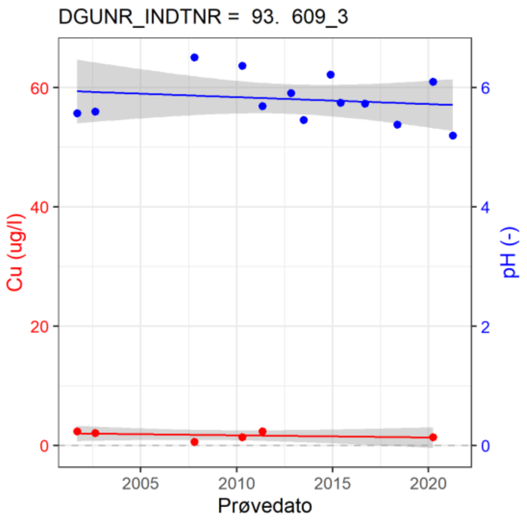
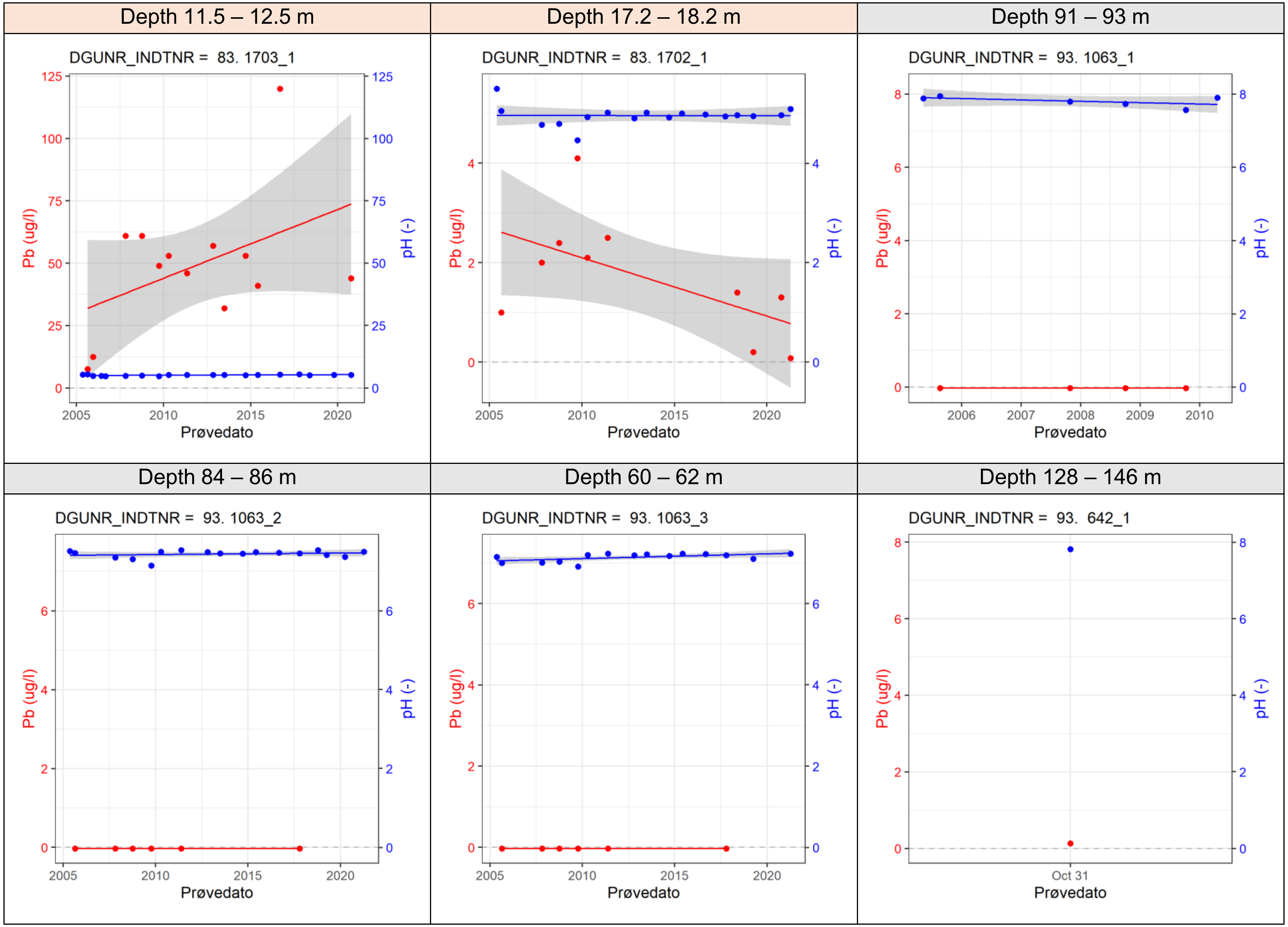
DGUNR_INDTNR = 93. 610_1
Depth 22 – 23 m
DGUNR_INDTNR = 93. 610_2
Depth 9 – 10 m
DGUNR_INDTNR = 93. 610_3
Depth 26.7 – 27.7 m
DGUNR_INDTNR = 93. 609_1
Depth 16 – 17 m
DGUNR_INDTNR = 93. 609_2
Cu (ug/l)
pH (-)
Prøvedato

Depth 8 – 9 m		
DGUNR_INDTNR = 93. 609_3 Cu (ug/l) pH (-) Prøvedato 60 40 20 0 6 4 2 0 2005 2010 2015 2020		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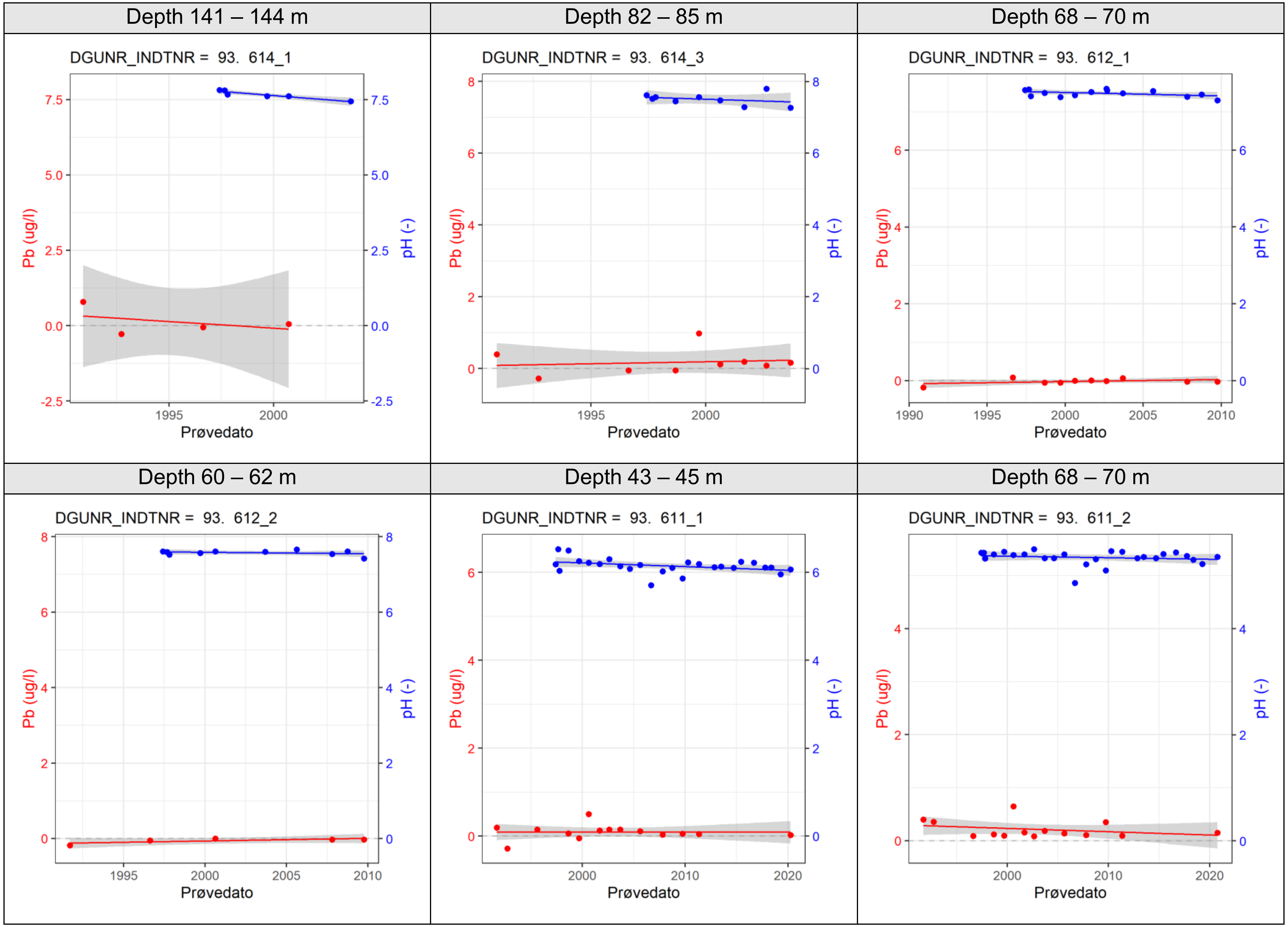
Depth 17.2 – 18.2 m
DGUNR_INDTNR = 83. 1702_1
Depth 91 – 93 m
DGUNR_INDTNR = 93. 1063_1
Depth 84 – 86 m
DGUNR_INDTNR = 93. 1063_2
Depth 60 – 62 m
DGUNR_INDTNR = 93. 1063_3
Depth 128 – 146 m
DGUNR_INDTNR = 93. 642_1
Pb (ug/l)
pH (-)
Prøvedato
Oct 31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Depth 60 – 62 m
DGUNR_INDTNR = 93. 612_2
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Depth 68 – 70 m
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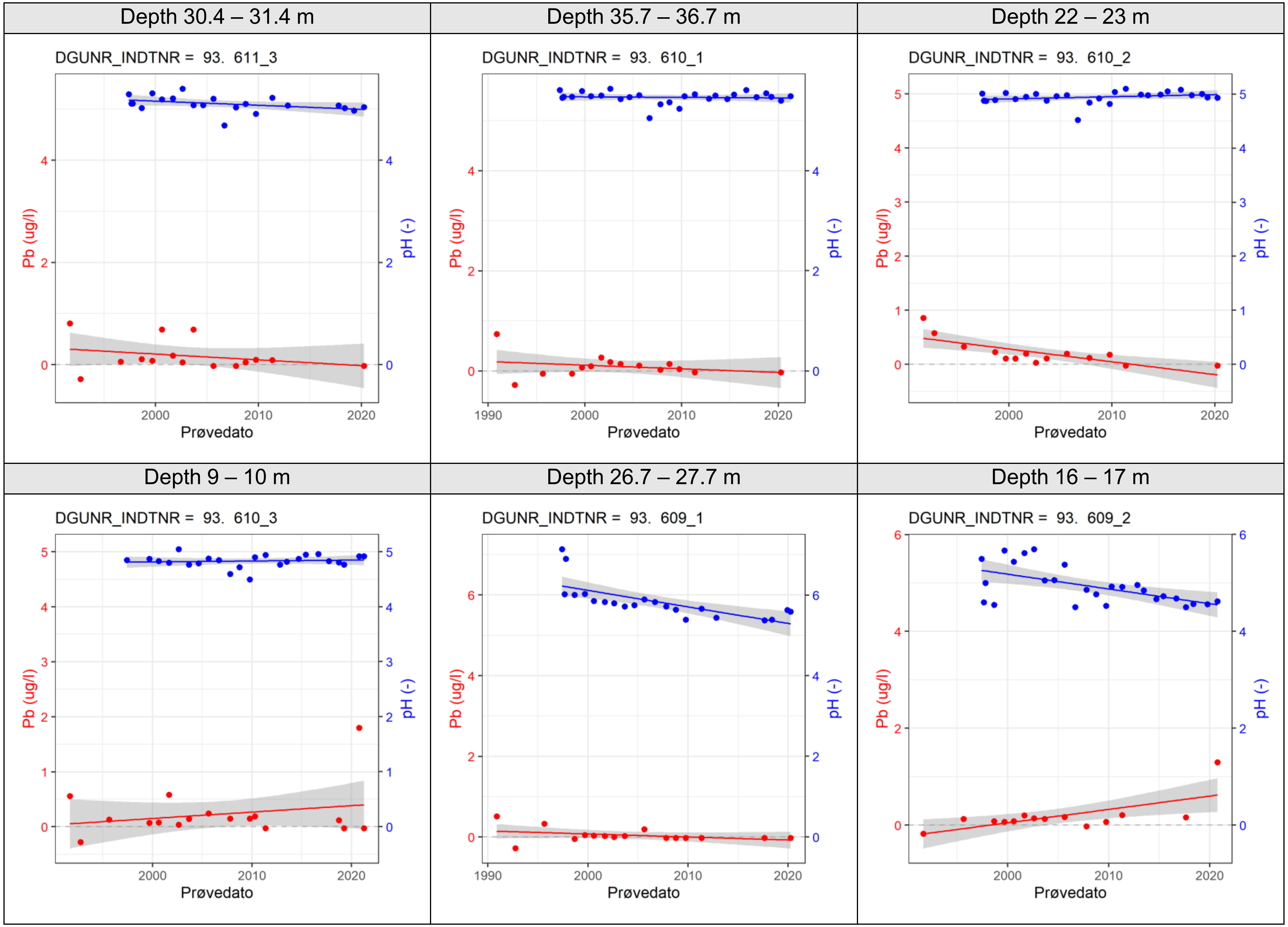
Pb (ug/l)
pH (-)
Prøvedato



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Depth 9 – 10 m
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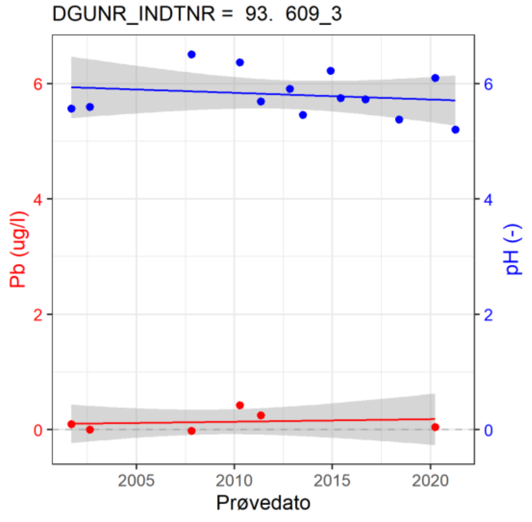
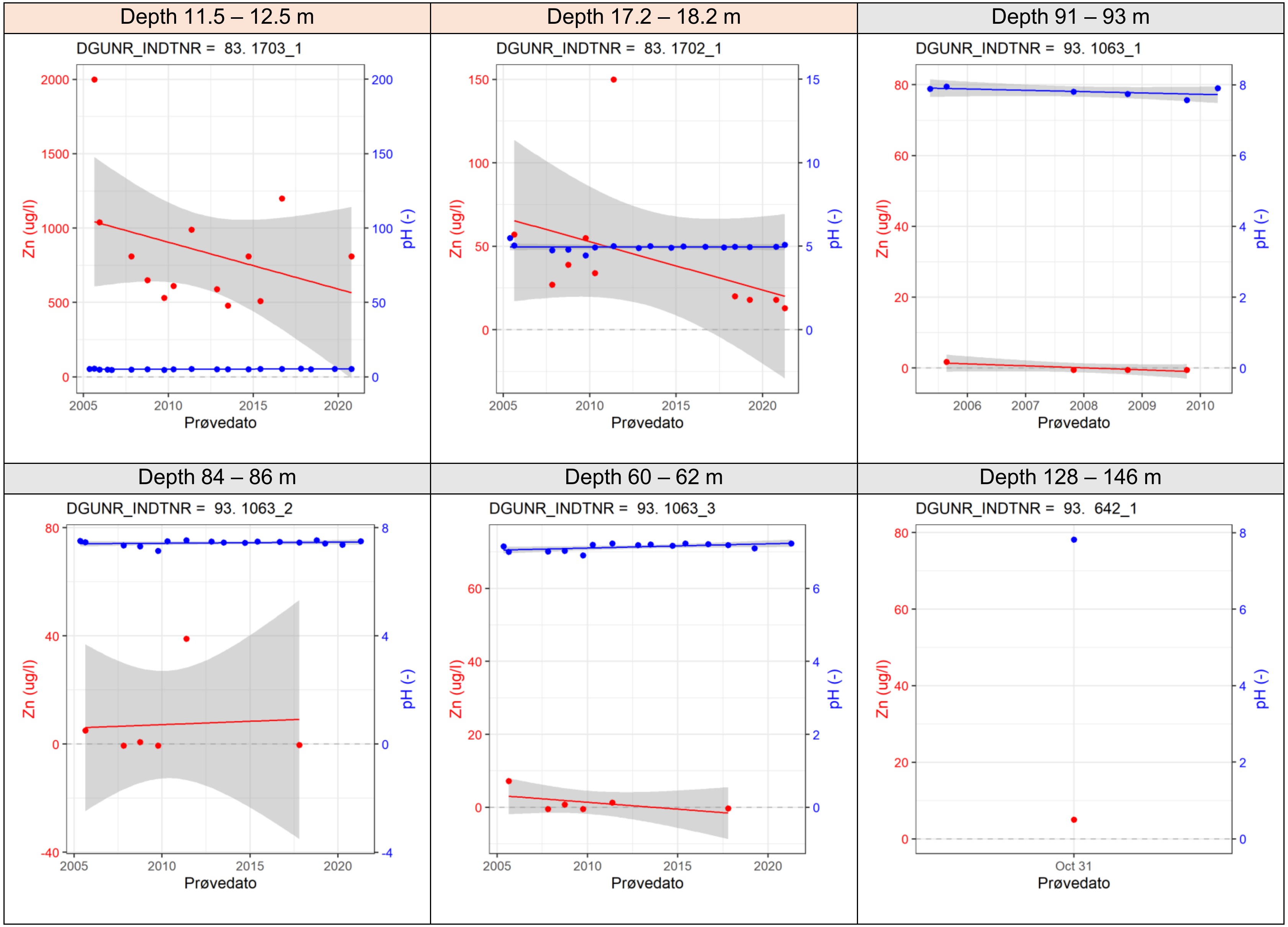
Depth 26.7 – 27.7 m
DGUNR_INDTNR = 93. 609_1
Depth 16 – 17 m
DGUNR_INDTNR = 93. 609_2
Pb (ug/l)
pH (-)
Prøvedato

Depth 8 – 9 m		
DGUNR_INDTNR = 93. 609_3 Pb (ug/l) pH (-) 0 2 4 6 2005 2010 2015 2020 Prøvedato		



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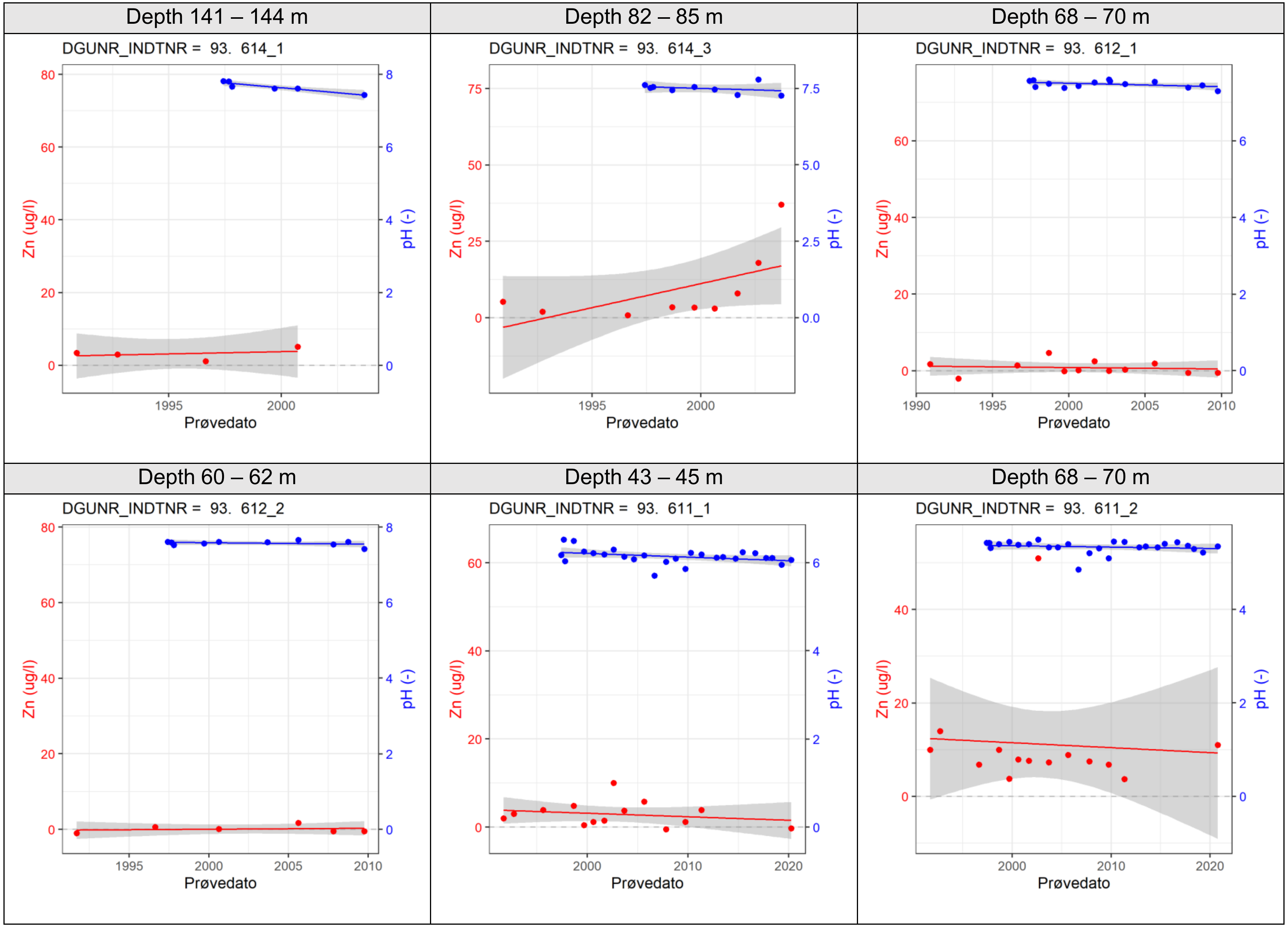
Depth 17.2 – 18.2 m
DGUNR_INDTNR = 83. 1702_1
Depth 91 – 93 m
DGUNR_INDTNR = 93. 1063_1
Depth 84 – 86 m
DGUNR_INDTNR = 93. 1063_2
Depth 60 – 62 m
DGUNR_INDTNR = 93. 1063_3
Depth 128 – 146 m
DGUNR_INDTNR = 93. 642_1
Zn (ug/l)
pH (-)
Prøvedato
Oct 31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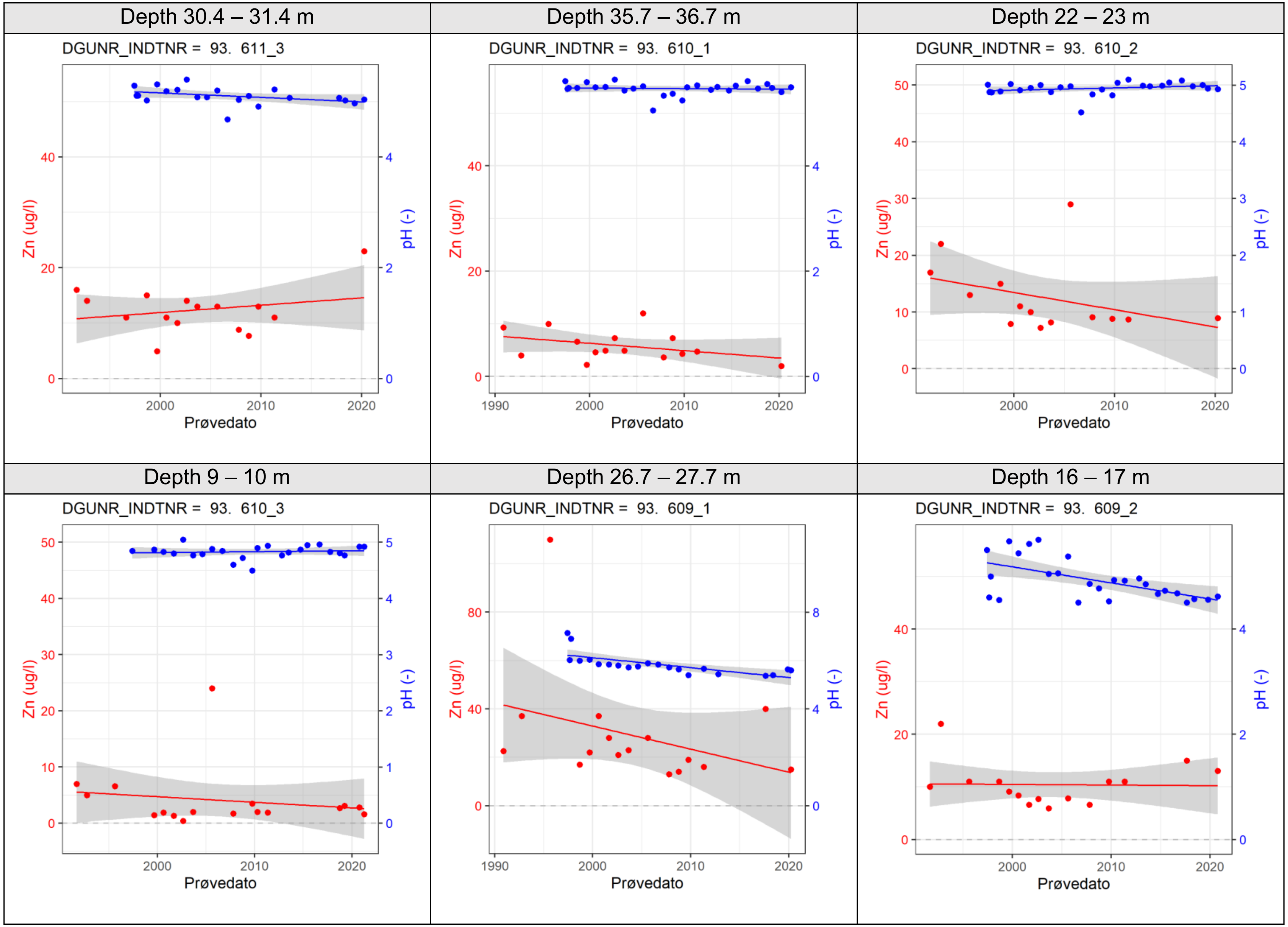
Depth 82 – 85 m
DGUNR_INDTNR = 93. 614_3
Depth 68 – 70 m
DGUNR_INDTNR = 93. 612_1
Depth 60 – 62 m
DGUNR_INDTNR = 93. 612_2
Depth 43 – 45 m
DGUNR_INDTNR = 93. 611_1
Depth 68 – 70 m
DGUNR_INDTNR = 93. 611_2
Zn (ug/l)
pH (-)
Prøvedato



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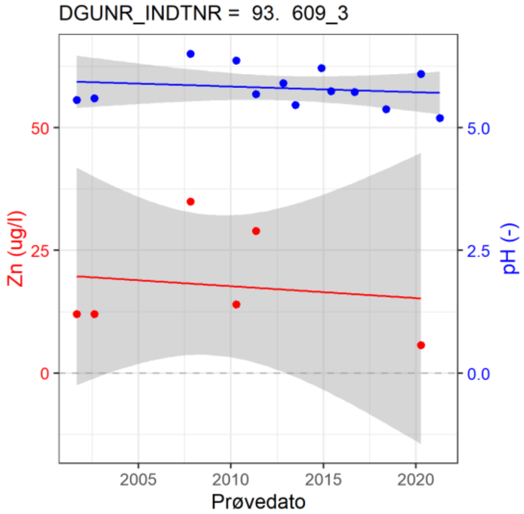
DGUNR_INDTNR = 93. 611_3
Depth 35.7 – 36.7 m
DGUNR_INDTNR = 93. 610_1
Depth 22 – 23 m
DGUNR_INDTNR = 93. 610_2
Depth 9 – 10 m
DGUNR_INDTNR = 93. 610_3
Depth 26.7 – 27.7 m
DGUNR_INDTNR = 93. 609_1
Depth 16 – 17 m
DGUNR_INDTNR = 93. 609_2
Zn (ug/l)
pH (-)
Prøvedato

Depth 8 – 9 m		
DGUNR_INDTNR = 93. 609_3 Zn (ug/l) pH (-) 50 25 0 5.0 2.5 0.0 2005 2010 2015 2020 Prøvedato		

10. Bilag D: Feltkampagne

10.1 Assessment task definition

This was a follow up task, based on the conclusions and recommendations made previously (see section 7.5). The purpose was to examine the difference in the measured concentrations at three sampling times: without pre-pumping, normal pre-pumping, and prolonged pre-pumping. This could allow addressing the hypothesis that the pre-pumping length (volume) could influence the concentrations of the trace metals.

10.2 Methods

10.2.1 Analytical uncertainty

When comparing the sampling results, the analytical uncertainty was also considered. We used both the relative and absolute uncertainties, as provided in the relevant at the time of assessment Danish legislation (Table 10-1).

Table 10-1: Analytical uncertainty: Uabs – absolute uncertainty, Urel – relative uncertainty; source: "1.3 Kontrol/overvågning af grundvand" from BEK nr 811 af 19/06/2024 (https://www.retsinformation.dk/eli/lta/2024/811)

Parameter	Enhed	Uabs	Urel
Al	µg/L	1	20%
As	µg/L	0.05	20%
Ba	µg/L	3	20%
Cd	µg/L	0.005	20%
Cr	µg/L	0.05	20%
Cu	µg/L	0.1	20%
Hg	µg/L	0.003	20%
Ni	µg/L	0.1	20%
Pb	µg/L	0.05	20%
V	µg/L	0.5	20%
Zn	µg/L	1	20%

When comparing the sampling results, the larger of the two uncertainties was used, as BEK nr 811 af 19/06/2024 states that for low concentrations the Uabs is relevant, while for high concentration it is Urel. However, it is not specified which concentrations are considered low or high.

10.2.2 Values below detection limit

The attribute for below limit of detection (LOD) was ignored here, thus if a sample was < LOD, it is visualized as = LOD on the figures.

10.2.3 Long-term summary statistics

The sampling results were compared to the long-term median and interquartile range (25th and 75th percentiles, i.e. Q25 and Q75). The summary statistics used here were based on the GRUMO dataset, extracted from Jupiter on 22 June 2021. Table 10-1 to

Table 10-9 show the long-term statistics for each of the well-screens, used here for comparison purposes.

Table 10-2: Long-term statistics for aluminium (Al) concentrations in µg/l

Well screen	period	Years (n)	Samples (n)	min	Q25	median	Q75	max
65. 1513_1	2005-2020	8	8	100	135	160	195	220
65. 1514_1	2007-2020	12	12	370	572.5	640	707.5	820
65. 1515_1	2005-2020	13	13	55	150	180	200	280
65. 1516_1	2005-2020	9	9	730	760	890	950	2400
65. 1517_1	2005-2020	14	14	170	800	1300	1575	2000
65. 1520_1	2005-2020	9	9	2.5	4.4	5.2	6.5	8.6
65. 1523_1	2005-2020	14	14	62	305	470	640	1200
83. 1702_1	2005-2021	10	10	6.3	91.25	145	225	310
83. 1703_1	2005-2020	12	13	16	34	49	57.9	61
186. 843_1	2007-2017	6	6	180	207.5	235	270	300
186. 844_1	2005-2017	7	7	0.97	1.4	2	2.95	4.1
186. 846_1	2007-2017	6	6	72	79.25	83.5	87.75	92

Table 10-3: Long-term statistics for arsenic (As) concentrations in µg/l

ID_label	period	Years (n)	Samples (n)	min	Q25	median	Q75	max
65. 1513_1	2005-2020	9	9	0.03	0.04	0.28	0.38	0.6
65. 1514_1	2005-2020	14	14	0.03	0.055	0.505	0.5525	1.3
65. 1515_1	2005-2020	14	14	0.06	0.4375	1.04	1.3	1.7
65. 1516_1	2005-2020	10	10	0.03	0.175	0.315	0.4675	0.69
65. 1517_1	2005-2020	15	15	0.03	0.119	0.24	0.3	6.9
65. 1520_1	2005-2020	10	10	0.098	0.1525	0.25	0.3725	0.51
65. 1523_1	2005-2020	15	15	0.03	0.175	0.5	0.955	1.3
83. 1702_1	2005-2021	10	10	0.03	0.0365	0.058	0.1275	0.25
83. 1703_1	2005-2020	12	13	0.073	0.28	0.29	0.34	0.61
186. 843_1	2005-2017	7	7	0.42	0.545	0.61	0.625	0.68
186. 844_1	2005-2017	7	7	0.88	1.2	1.3	1.3	1.4
186. 846_1	2005-2017	7	7	0.14	2.4	2.5	2.9	3.9

Table 10-4: Long-term statistics for cadmium (Cd) concentrations in µg/l

ID_label	period	Years (n)	Samples (n)	min	Q25	median	Q75	max
65. 1513_1	2005-2020	8	8	0.079	0.115	0.15	0.2225	0.35
65. 1514_1	2007-2020	12	12	0.046	0.05475	0.066	0.06875	0.076
65. 1515_1	2005-2020	13	13	0.074	0.15	0.18	0.25	0.38
65. 1516_1	2005-2020	9	9	0.006	0.29	0.38	0.45	0.68
65. 1517_1	2005-2020	14	14	0.008	0.032	0.0405	0.0515	0.057
65. 1520_1	2005-2020	9	9	0.0038	0.0075	0.01	0.012	0.033
65. 1523_1	2005-2020	14	14	0.0074	0.0665	0.0905	0.1075	0.14
83. 1702_1	2005-2021	10	10	0.084	0.26	0.395	0.48	0.54
83. 1703_1	2005-2020	12	13	0.56	0.69	0.85	0.94	1.23
186. 843_1	2007-2017	6	6	0.003	0.00325	0.004	0.004	0.004
186. 844_1	2005-2017	7	7	0.004	0.00405	0.006	0.0086	0.042
186. 846_1	2005-2017	7	7	0.003	0.004	0.004	0.00475	0.056

Table 10-5: Long-term statistics for chromium (Cr) concentrations in µg/l

ID_label	period	Years (n)	Samples (n)	min	Q25	median	Q75	max
65. 1513_1	2005-2005	1	1	0.24	0.24	0.24	0.24	0.24

65. 1515_1	2005-2005	1	1	0.52	0.52	0.52	0.52	0.52
65. 1516_1	2005-2005	1	1	0.23	0.23	0.23	0.23	0.23
65. 1517_1	2005-2005	1	1	0.07	0.07	0.07	0.07	0.07
65. 1520_1	2005-2005	1	1	0.08	0.08	0.08	0.08	0.08
65. 1523_1	2005-2005	1	1	0.64	0.64	0.64	0.64	0.64
83. 1702_1	2005-2005	1	1	0.25	0.25	0.25	0.25	0.25
83. 1703_1	2005-2005	1	2	0.47	0.475	0.48	0.485	0.49
186. 844_1	2005-2005	1	1	0.96	0.96	0.96	0.96	0.96
186. 846_1	2005-2005	1	1	1.2	1.2	1.2	1.2	1.2

Table 10-6: Long-term statistics for copper (Cu) concentrations in µg/l

ID_label	period	Years (n)	Samples (n)	min	Q25	median	Q75	max
65. 1513_1	2005-2020	8	8	0.43	1.6	3.05	4	5.8
65. 1514_1	2007-2020	12	12	17	22.75	27.5	30.25	50
65. 1515_1	2005-2020	13	13	0.03	0.04	0.12	0.27	85
65. 1516_1	2005-2020	9	9	0.04	2.6	9.6	19	35
65. 1517_1	2005-2020	14	14	0.07	38.75	65	94.25	180
65. 1520_1	2005-2020	9	9	3.7	5.6	6	7	8.8
65. 1523_1	2005-2020	14	14	5.1	27.5	43.5	64.5	92
83. 1702_1	2005-2021	10	10	2.7	16	16.5	21	29
83. 1703_1	2005-2020	12	13	590	690	820	1100	1700
186. 843_1	2007-2017	6	6	2.2	3.6	6.6	7.5	8.3
186. 844_1	2005-2017	7	7	0.47	0.71	2.7	3.9	9.9
186. 846_1	2007-2017	6	6	0.04	0.08225	0.17	0.2675	0.55

Table 10-7: Long-term statistics for nickel (Ni) concentrations in µg/l

ID_label	Stof	period	Years (n)	Samples (n)	min	Q25	median	Q75	max
65. 1513_1	Ni	2005-2020	9	9	2.1	4.5	4.8	14	34
65. 1514_1	Ni	2007-2020	13	13	2.1	2.8	3.5	4.9	11
65. 1515_1	Ni	2005-2020	14	14	3.4	35	39	41.5	48
65. 1516_1	Ni	2005-2020	10	10	0.39	5.05	5.35	6.075	14
65. 1517_1	Ni	2005-2020	15	15	0.03	0.64	0.88	1.95	4.5
65. 1520_1	Ni	2005-2020	10	10	0.03	0.2275	0.42	1.01	2.2
65. 1523_1	Ni	2005-2020	15	15	2	4.55	8.1	18.5	26
83. 1702_1	Ni	2005-2021	10	10	1.1	1.45	1.8	2.375	4.2
83. 1703_1	Ni	2005-2020	12	13	7.4	9.8	11	13	18.3
186. 843_1	Ni	2007-2017	6	6	0.053	0.3125	0.525	0.7075	0.79
186. 844_1	Ni	2005-2017	7	7	0.03	0.095	0.24	0.41	1.5
186. 846_1	Ni	2007-2017	6	6	0.29	0.415	0.615	0.815	0.97

Table 10-8: Long-term statistics for lead (Pb) concentrations in µg/l

ID_label	Stof	period	Years (n)	Samples (n)	min	Q25	median	Q75	max
65. 1513_1	Pb	2005-2020	8	8	0.088	0.3875	1.05	1.55	2.1
65. 1514_1	Pb	2007-2020	12	12	0.6	2.475	3.1	3.45	5.8
65. 1515_1	Pb	2005-2020	13	13	0.025	0.025	0.12	0.16	13
65. 1516_1	Pb	2005-2020	9	9	0.076	0.68	1.3	2.3	3.2
65. 1517_1	Pb	2005-2020	14	14	0.11	5.425	9.3	12.75	16
65. 1520_1	Pb	2005-2020	9	9	0.11	0.23	0.38	0.56	3
65. 1523_1	Pb	2005-2020	14	14	0.48	6.875	15.5	21.75	36
83. 1702_1	Pb	2005-2021	10	10	0.079	1.075	1.7	2.325	4.1
83. 1703_1	Pb	2005-2020	12	13	7.5	41	49	57	120
186. 843_1	Pb	2007-2017	6	6	0.33	0.925	2.25	3.5	5
186. 844_1	Pb	2005-2017	7	7	0.086	0.124	0.33	0.46	0.6
186. 846_1	Pb	2007-2017	6	6	0.031	0.03475	0.068	0.144	0.34

Table 10-9: Long-term statistics for zinc (Zn) concentrations in µg/l

ID_label	Stof	period	Years (n)	Samples (n)	min	Q25	median	Q75	max
65. 1513_1	Zn	2005-2020	8	8	4.3	8.725	16.5	23	42
65. 1514_1	Zn	2007-2020	12	12	11	15.5	17	20.75	24

65. 1515_1	Zn	2005-2020	13	13	40	46	53	57	64
65. 1516_1	Zn	2005-2020	9	9	16	37	40	43	61
65. 1517_1	Zn	2005-2020	14	14	30	51	67.5	93.25	190
65. 1520_1	Zn	2005-2020	9	9	0.61	3.2	5.5	7	12
65. 1523_1	Zn	2005-2020	14	14	16	167.5	260	405	580
83. 1702_1	Zn	2005-2021	10	10	13	18.5	30.5	51	150
83. 1703_1	Zn	2005-2020	12	13	480	590	810	990	2000
186. 843_1	Zn	2007-2017	6	6	7.9	17.75	20.5	31.5	39
186. 844_1	Zn	2005-2017	7	7	11	22.5	38	69.5	260
186. 846_1	Zn	2005-2017	7	7	0.72	1.35	2.4	10.5	18

10.2.4 Data visualisation

The three samples were taken at different sampling times, so to be able to plot them on the same graph, either the sampling order was used (1: first same without well-purging, 2: with pre-pumping, 3: last sample), or the sampling time was formatted to a numeric format (e.g. 8.83 instead of 8:50).

Two different types of plots were made, allowing for:

- intercomparison between well-screens within an area (Figure 10-1, Figure 10-2, Figure 10-3)
- comparison with the long-term median and interquartile ranges, each individual plots for each well-screen and parameter (see plots without captions).

10.3 Results

The focus of the assessment was on changes in concentrations between the first sample (without well-purging) and the following two samples (with well-purging, different duration).

10.3.1 Intercomparison between well-screens within an area

Figure 10-1, Figure 10-2, and Figure 10-3 show the sampling results with the associated analytical uncertainty (Table 10-1) for GRUMO wells in areas 186 (Asserbo), 83 (Finderup), and 65 (Haderup), respectively.

All well-screens that have been sampled for this assessment are with Johnsons filters, so none of these well-screens can be considered as a “baseline” for the specific GRUMO well-site. The plots show that there is considerable variation in concentration between different well-screens for almost all parameters. Exception in this respect is Hg, for which the measured concentrations are low in comparison to the analytical uncertainty. Similar conclusion could be drawn for V for GRUMO wells in area 83. The general trends can also be interpreted, but this is best done on the individual plots for each well-screen (see next section).

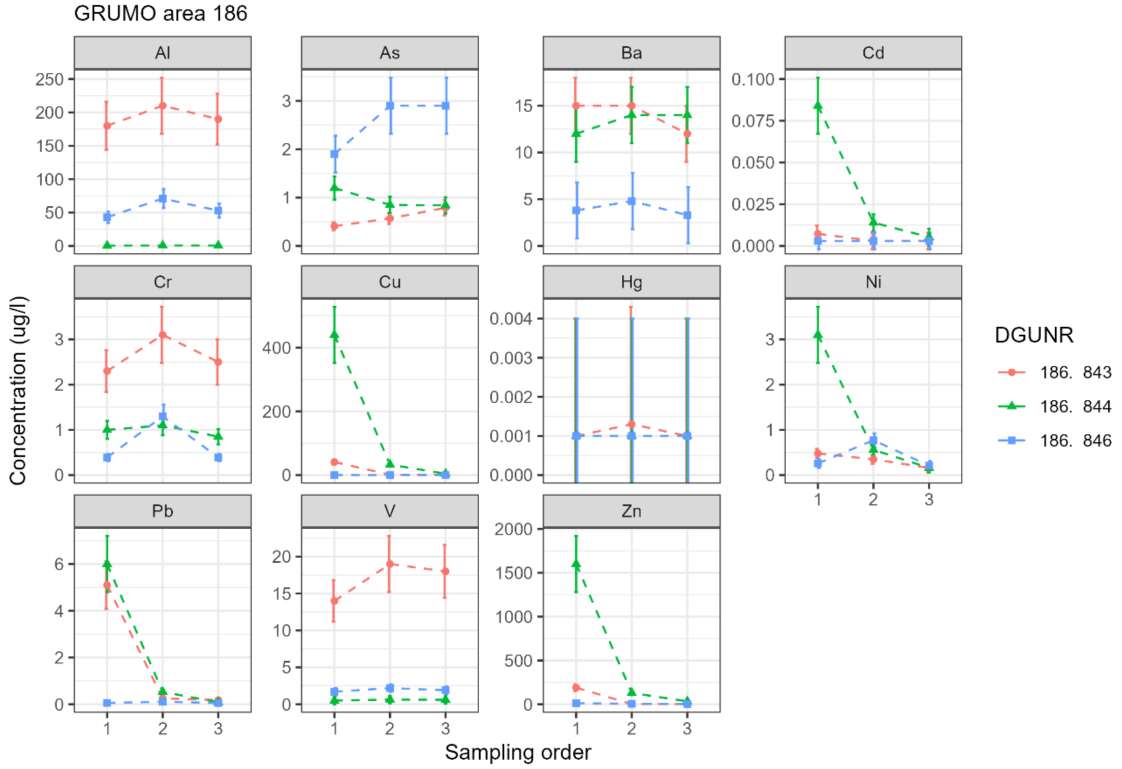


Figure 10-1: GRUMO wells in area 186 including samples for Al, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, V, and Zn from well-screen 1 of wells with DGUnr 186.843, 186.844, 186.846; the error-bars are showing the theoretical (expected) analytical uncertainty (see text for more details)

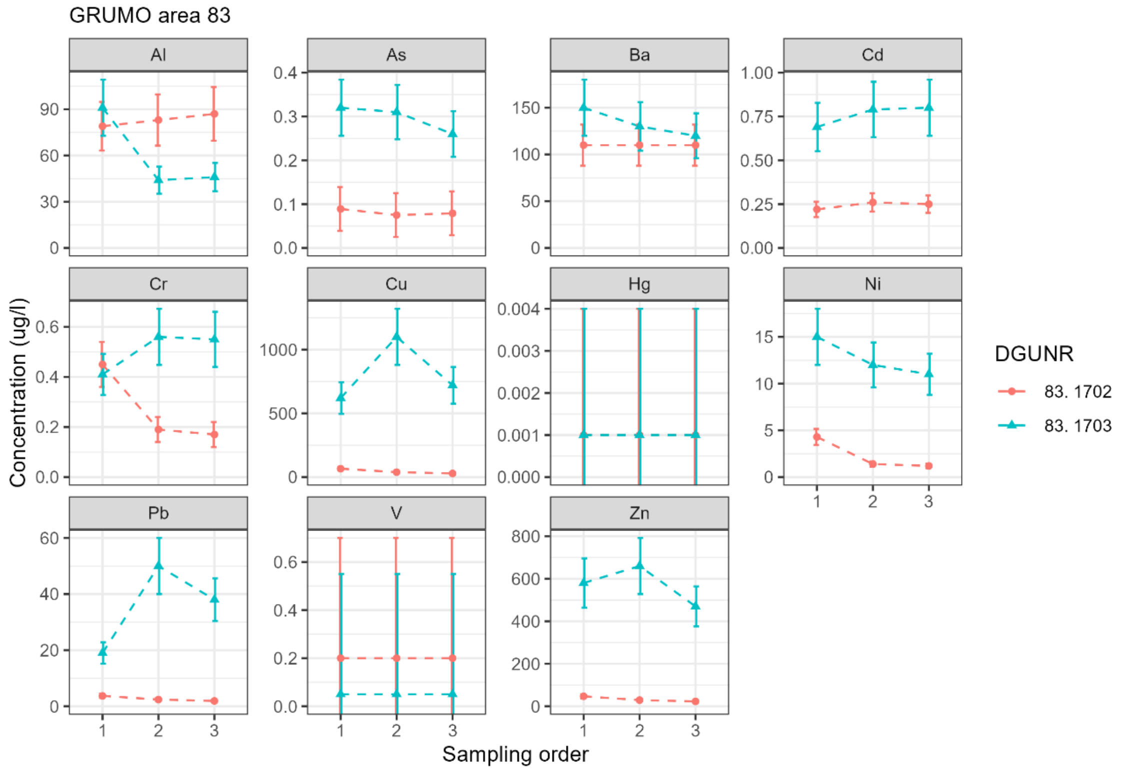


Figure 10-2: GRUMO wells in area 83 including samples for Al, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, V, and Zn from well-screen 1 of wells with DGUnr 83.1702 and 83.1703; the error-bars are showing the theoretical (expected) analytical uncertainty (see text for more details)

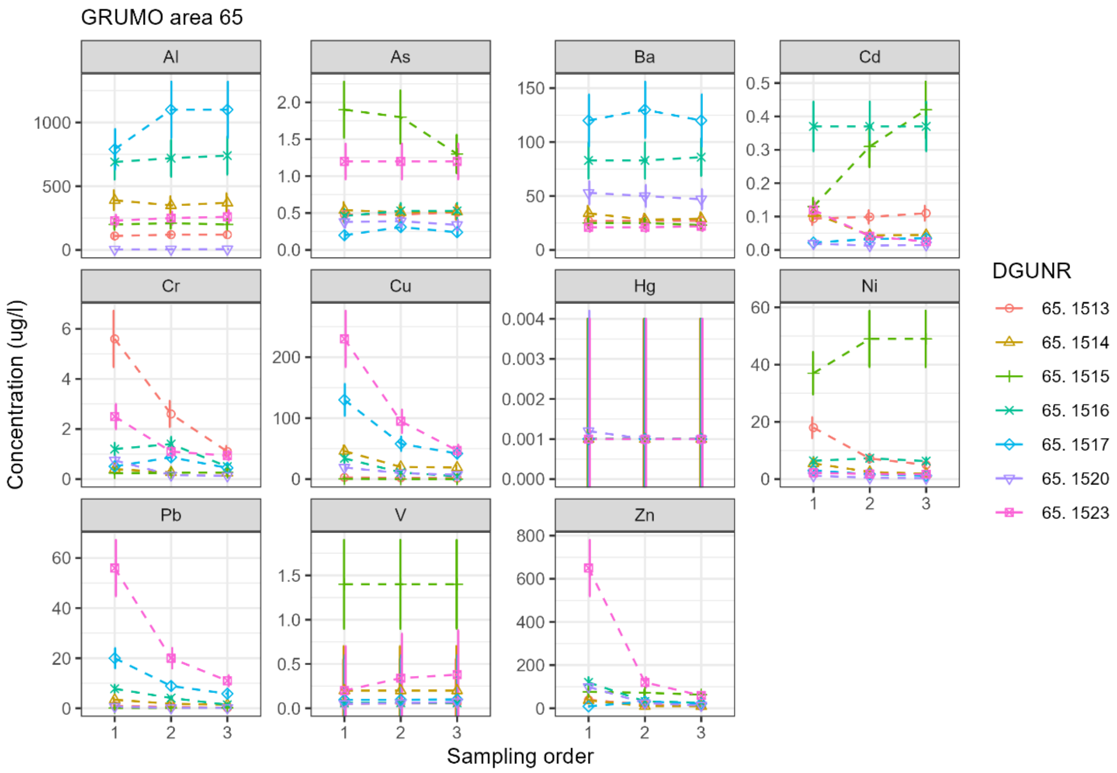


Figure 10-3: GRUMO wells in area 65 including samples for Al, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, V, and Zn from well-screen 1 of wells with DGUnr 65.1513, 65.1513, 65.1515, 65.1516, 65.1517, 65.1520, and 65.1523; the error-bars are showing the theoretical (expected) analytical uncertainty (see text for more details)

10.3.2 Comparison between samples at individual well-screens

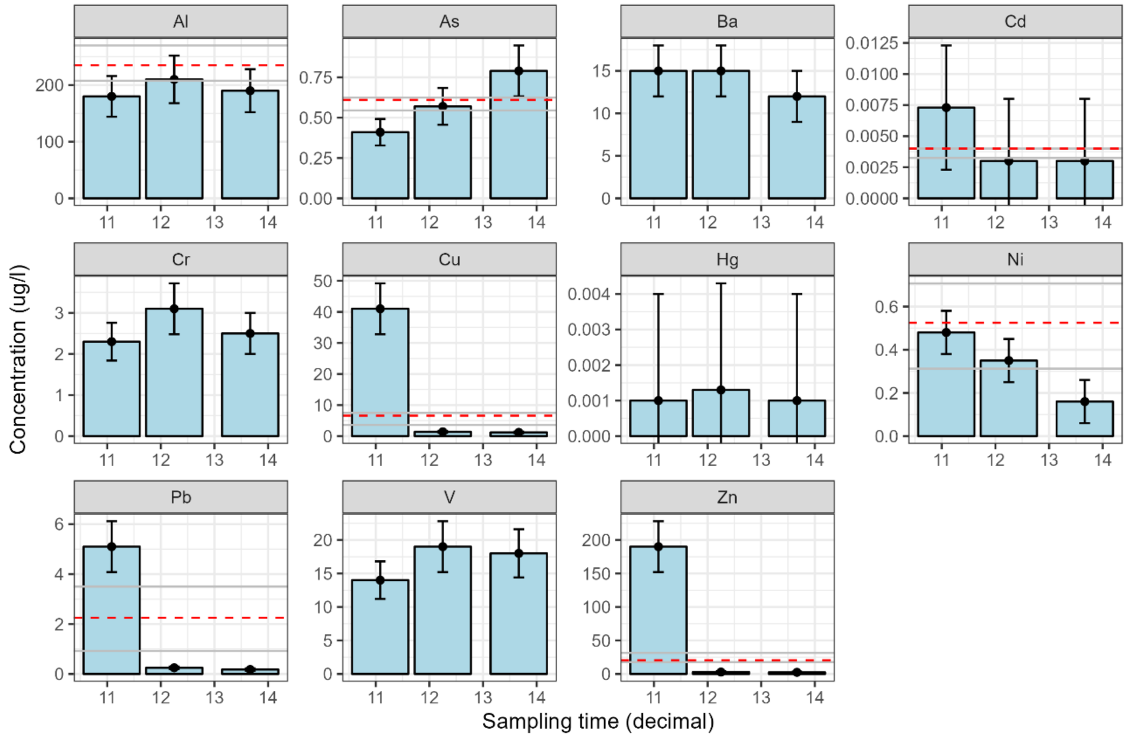
The following plots show the results for the three samples for each well-screen together with the analytical uncertainty (Table 10-1). To be able to put into perspective these sampling results, we also have visualised the long-term median (red line) and the quartile range (Q25, Q75, grey lines) for each well-screen and parameter. No captions are provided for the individual figures, the description provided in this paragraph can serve as a figure caption to all.

This provides information on the typical concentration at the specific well-screen and most of the variability. Here we preferred to use the interquartile range instead of min-max range to minimise the influence of extreme values.

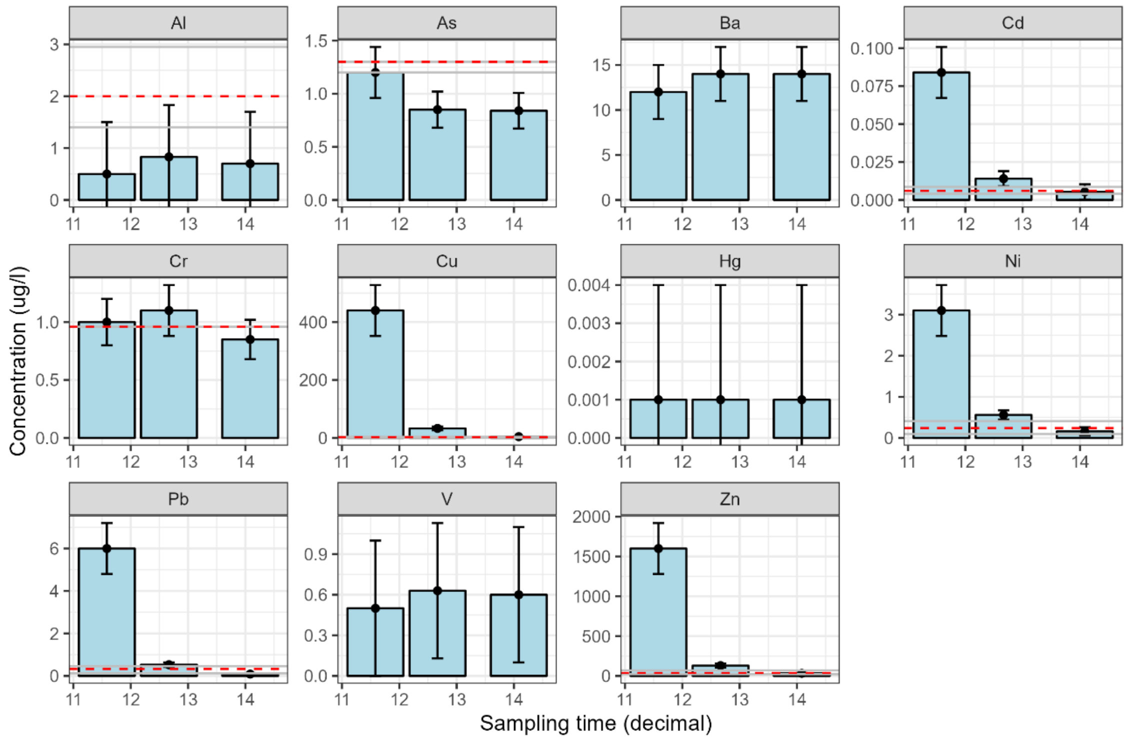
These plots can be used for the following comparisons between:

- the first, second, ant third samples – to assess the influence of pre-pumping on the concentration; note that the error bars should also be considered, thus if there is overlap between error bars for two samples, then the difference is not significantly different, i.e. the analytical uncertainty is larger than the difference between the concentrations.
- The results from this study and the long-term median and range – to assess if the first, second, and third samples are within the previously observed range. Similarly, the error bars should also be considered as well.

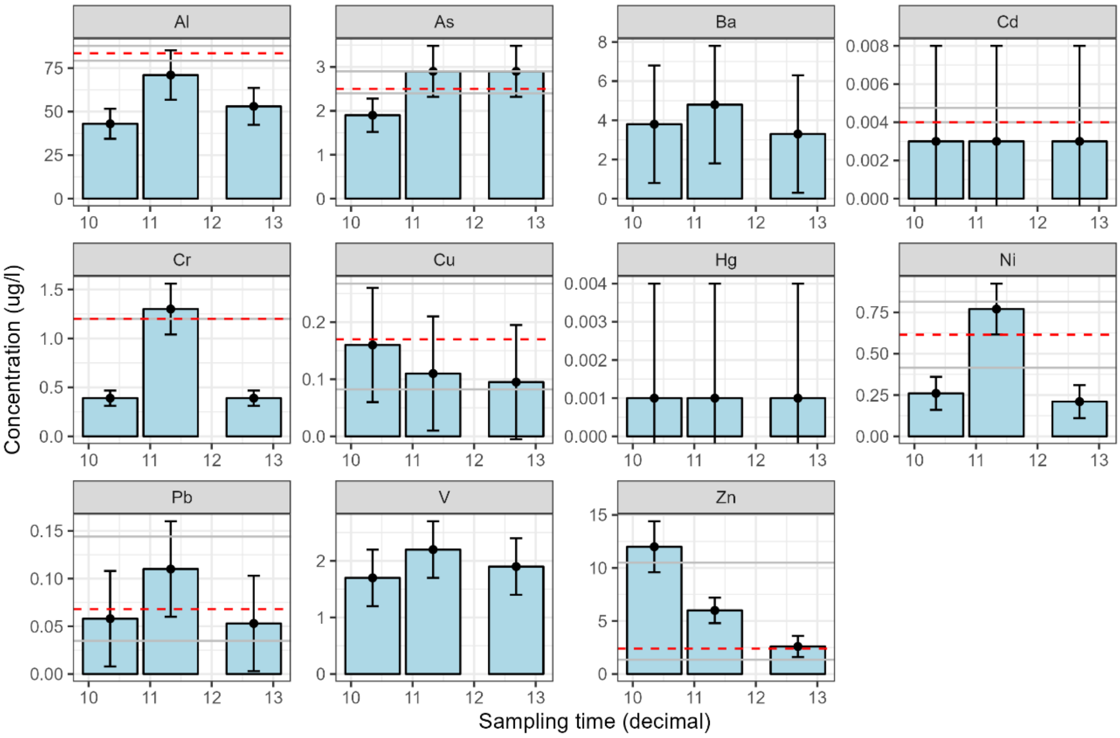
186. 843_1



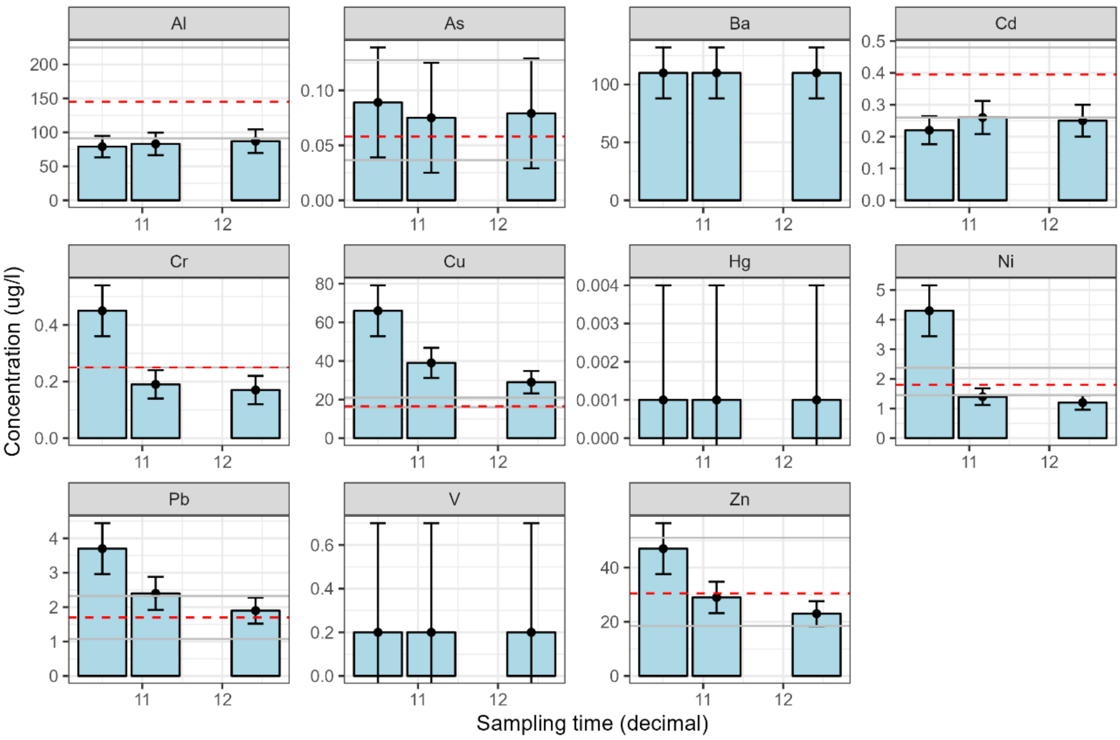
186. 844_1



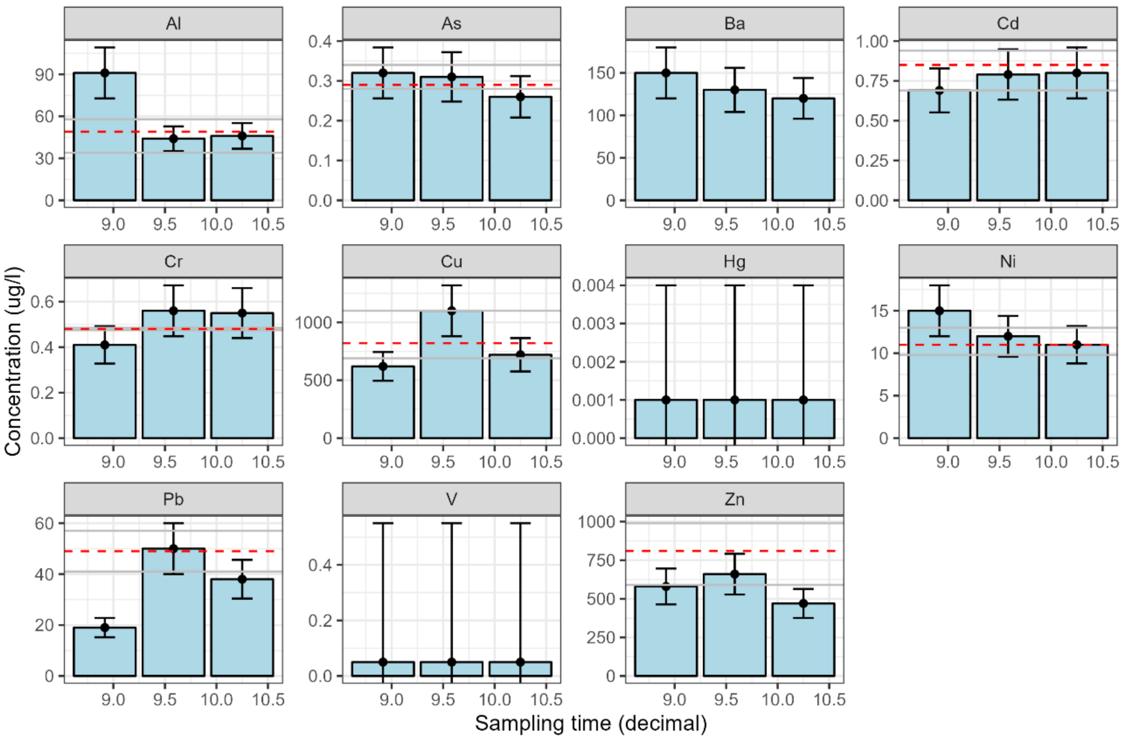
186. 846_1



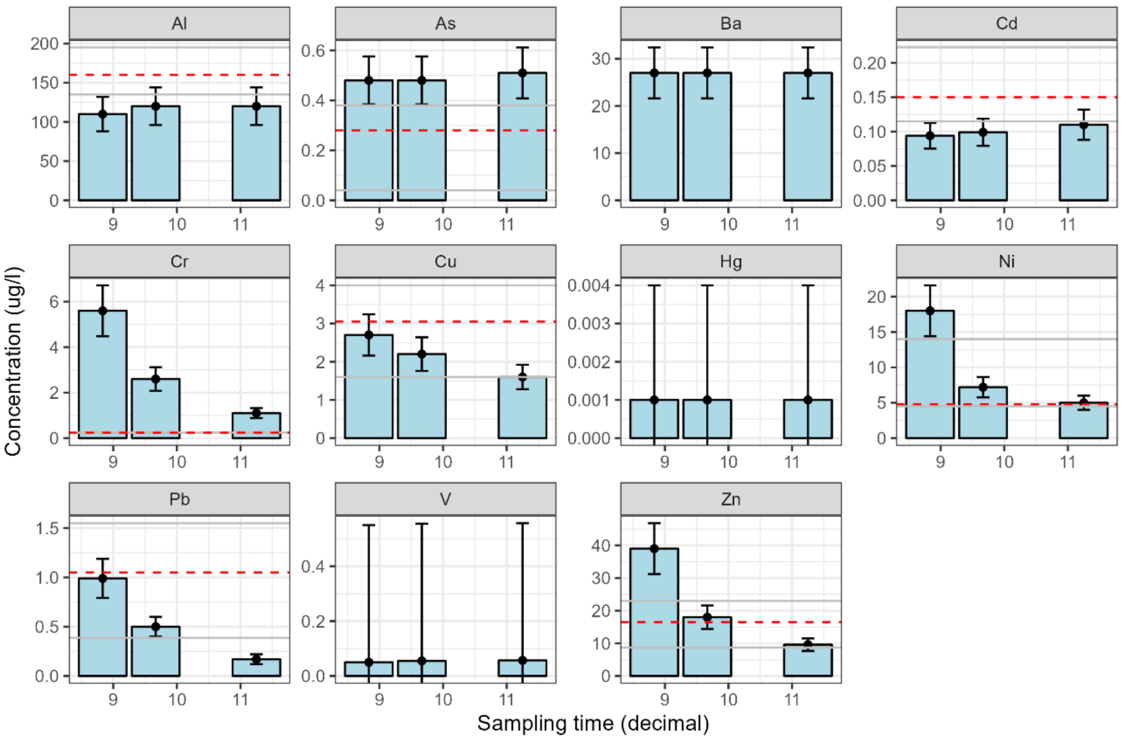
83. 1702_1



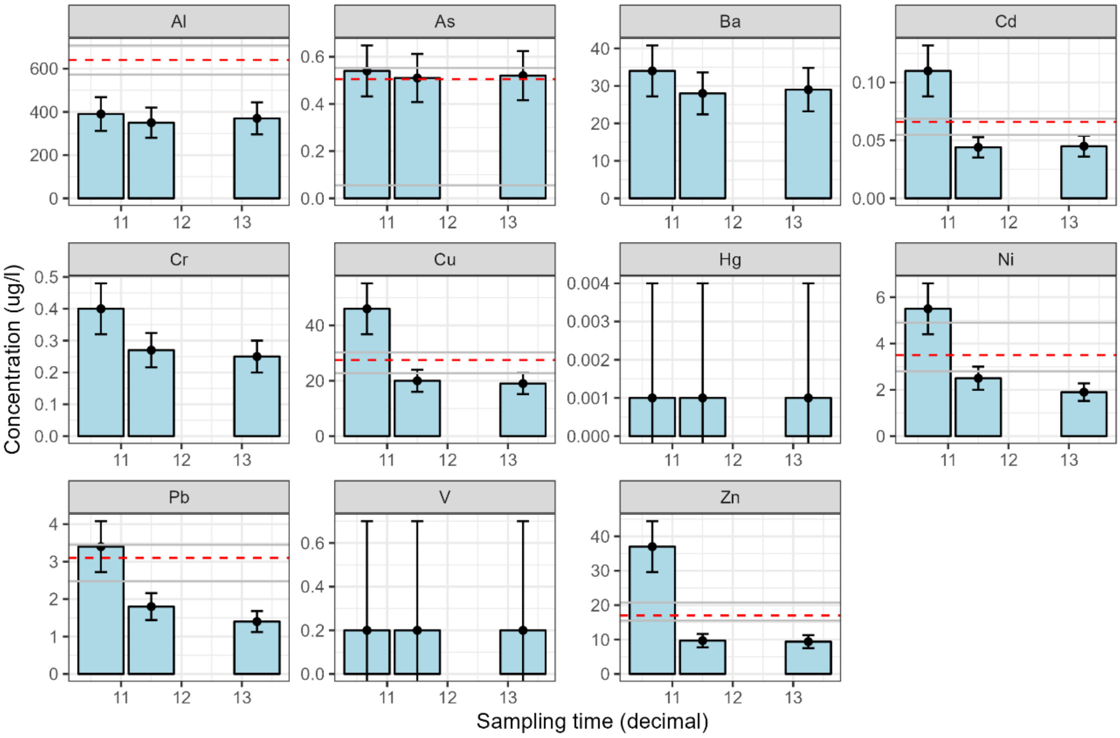
83. 1703_1



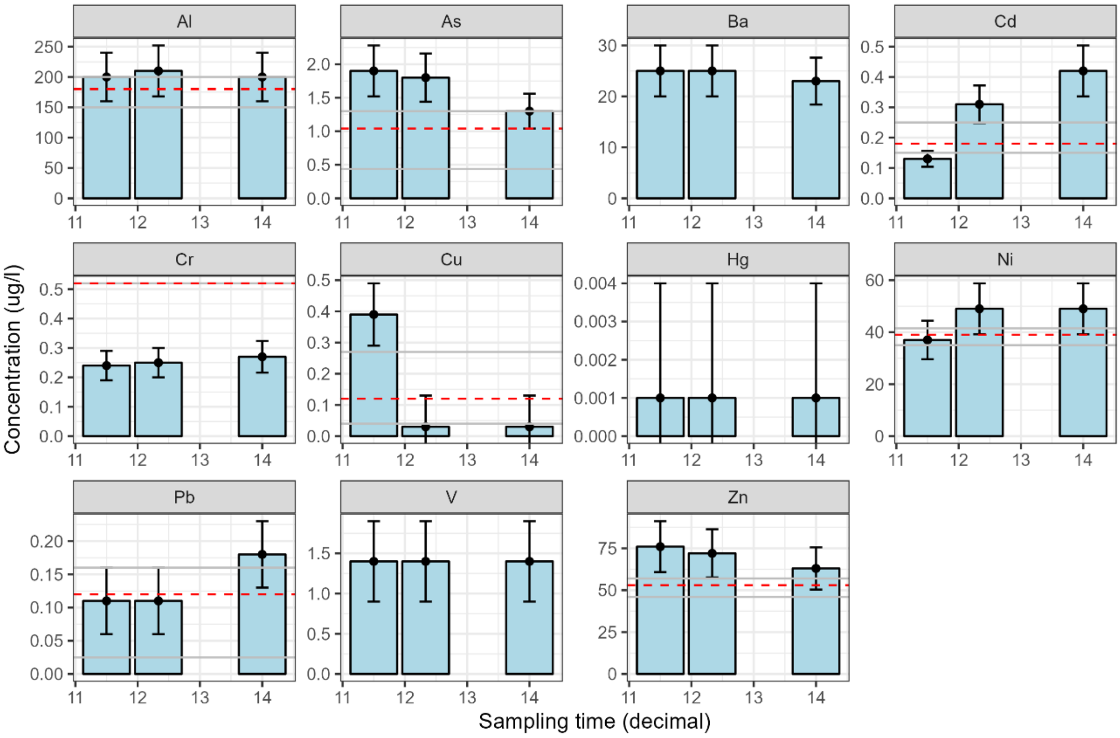
65. 1513_1



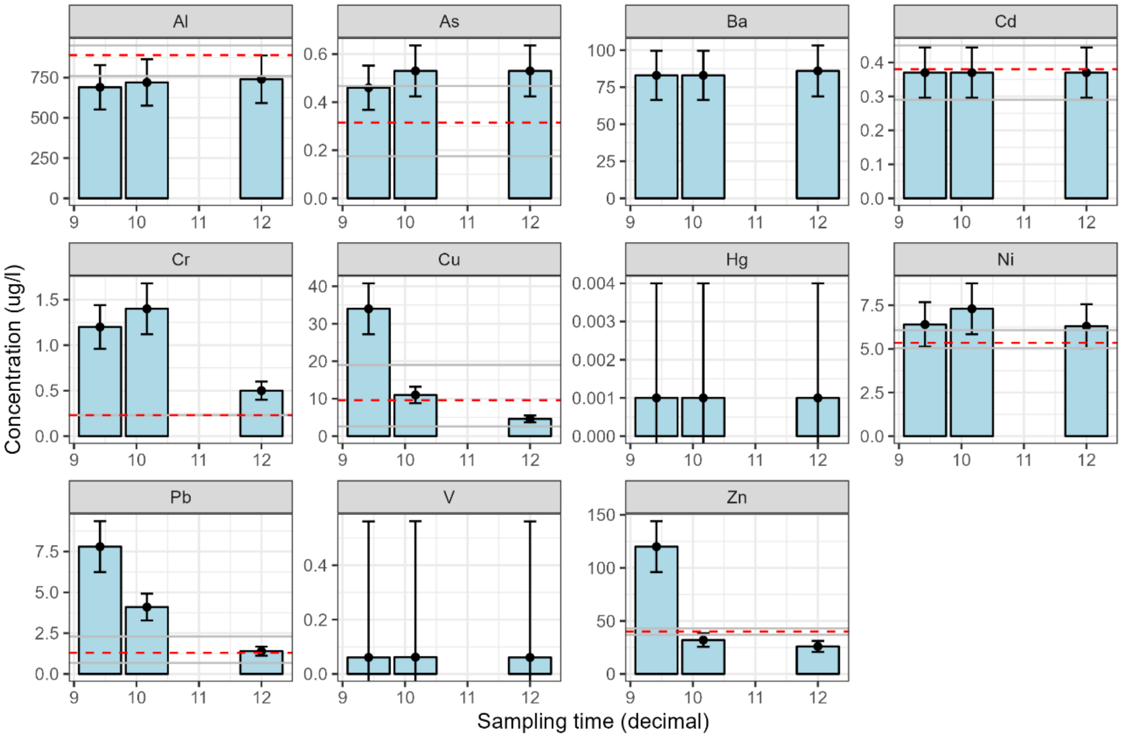
65. 1514_1



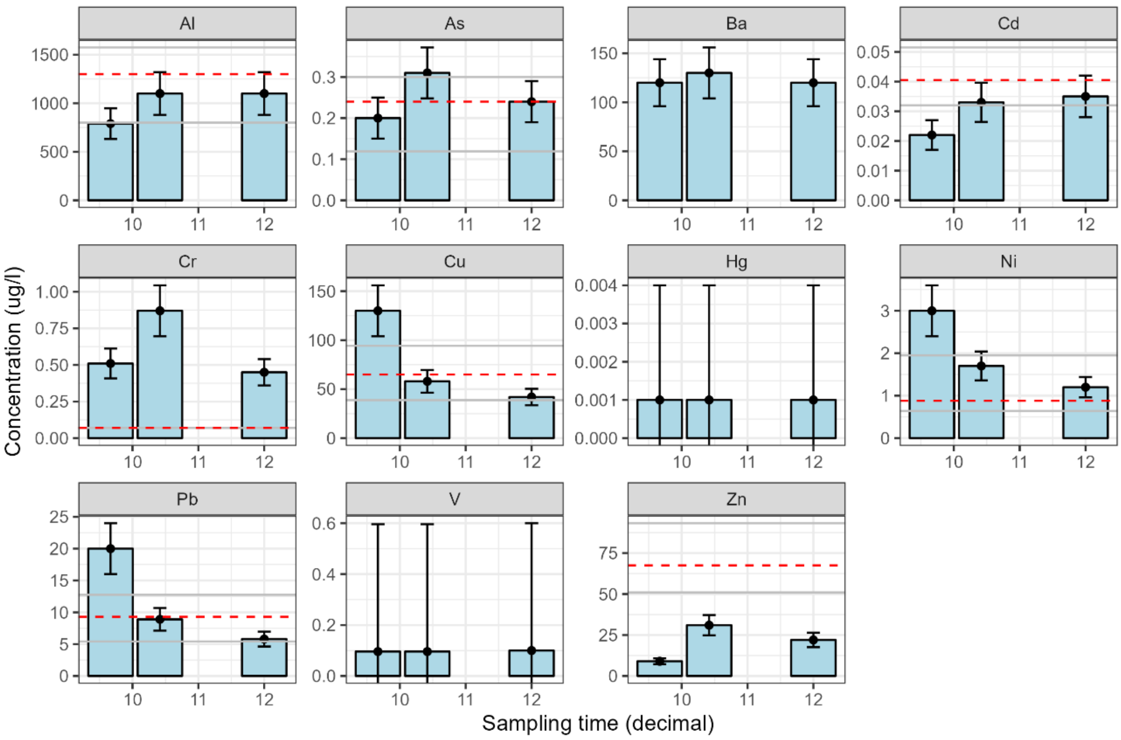
65. 1515_1

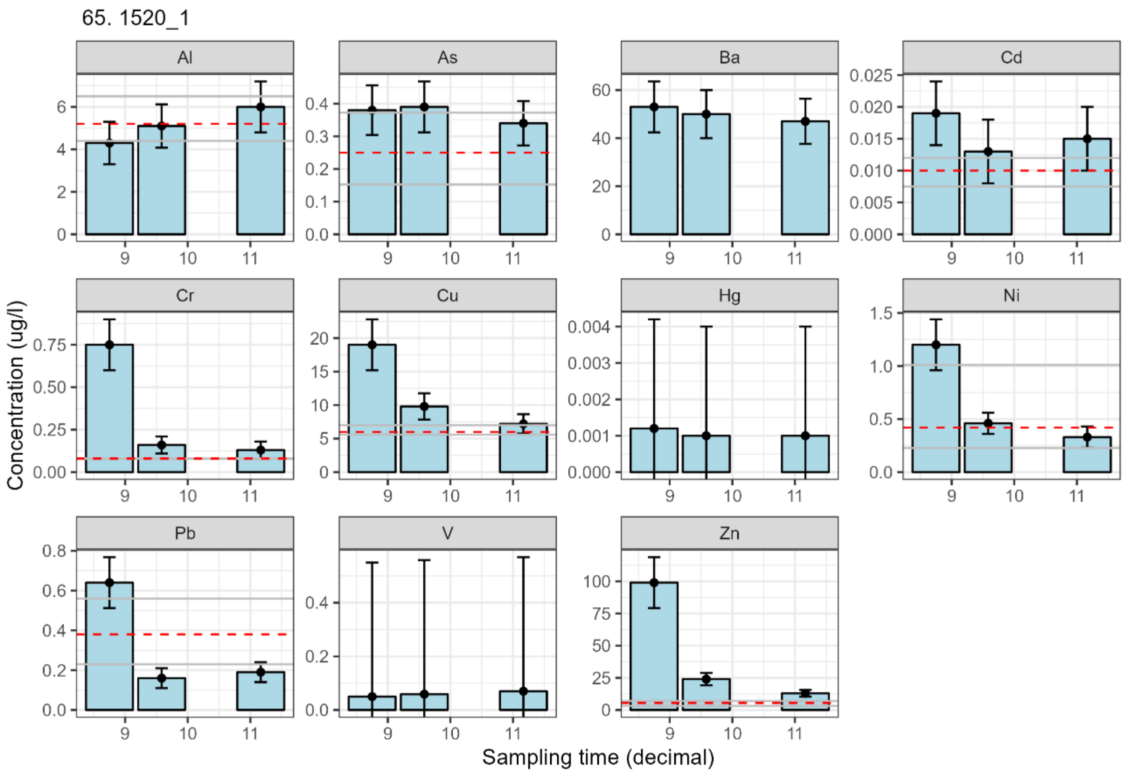


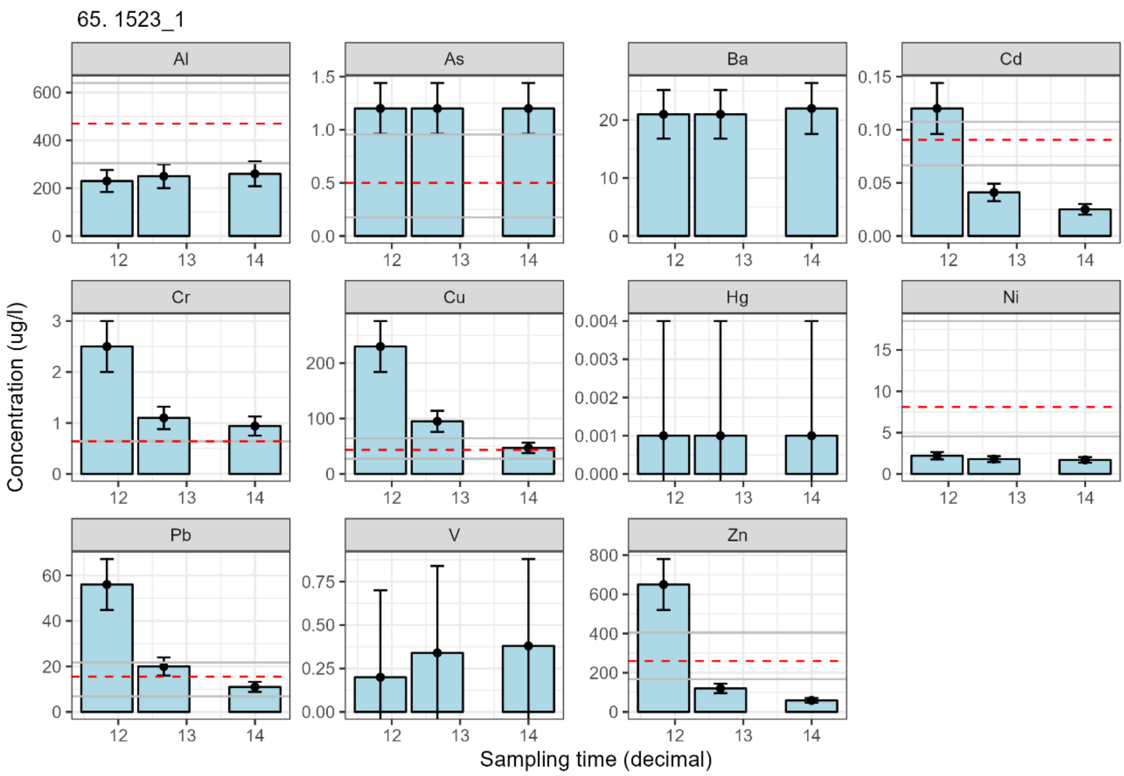
65. 1516_1



65. 1517_1







10.4 Summary and conclusions

This section presents a summary based on the individual plots from section 10.3.2. Table 10-10 provides overview on the parameters and well-screens for which there was a decrease in concentration between the first sample (without well-purging) and the following samples (with well-purging). The focus here was on the decrease in concentrations, as our hypothesis was that the longer residence times (longer contact between standing groundwater within the well and the well-screen material) would have resulted in a potential leaching from the well-screen, and once the well was purged, the concentrations should fall within the in-situ background levels.

*Table 10-10: Overview of parameters with decrease in concentration between the first sample (without well-purging) and the next two samples. For all these the concentration of the first sample was above the long-term usual range (Q25-Q75). (yes) is if the error bars were disregarded, yes – considering the error bars, * - the decrease was within the usual range Q25-Q75*

	Al	As	Ba	Cd	Cr	Cu	Hg	Ni	Pb	V	Zn
186.843_1				(yes)		yes		*	yes		yes
186.844_1				yes		yes		yes	yes		yes
186.846_1											(yes)
83.1702_1					yes	yes		yes	yes		*
83.1703_1	yes							(yes)			
65.1513_1					yes	*		yes	*		yes
65.1514_1				yes	yes	yes		(yes)	*		yes
65.1515_1						yes					
65.1516_1					yes	yes			yes		yes
65.1517_1						yes		yes	yes		
65.1520_1				(yes)	yes	yes		(yes)	(yes)		yes
65.1523_1				(yes)	yes	yes			yes		yes

The first samples (samples without well-purging) have higher concentrations for the following parameters:

- Area 186 (Asserbo):
  - for wells 186.843 and 186.844 for the parameters Cd, Cu, Ni, Pb, Zn. The concentration for Ni in 186.843 is within Q25-Q75, but still higher than other two samples.
  - all three wells are with Johnsons filters, but well 186.846 is not affected the same way as the other two. The reasons are currently unknown.
- Area 83 (Finderup):
  - for well 83.1702 for the parameters: Cr, Cu, Ni, Pb. The concentration of Zn decreases as well, but it is within Q25-Q75.
  - for well 83.1703 for Al and potentially Ni.
  - both wells are with Johnsons filters, but their concentration ranges and trends differ. The reasons are currently unknown.
- Area 65 (Haderup):
  - The following parameters, based on at least 3 wells: Cd, Cr, Cu, Ni, Pb, Zn

Irrespective of the well-screen (or area), no decrease in concentrations has been observed for As, Ba, Hg, and V. However, for Hg and V the concentration levels are low (the analytical uncertainty is too high), so it is possible that the laboratory method is not sensitive enough for this specific assessment.

It must be noted that for some of the well-screens (and some of the parameters) an increase in the concentrations between the first sample (without purging) and the next ones was also observed. Further analysis is needed to understand the processes governing these changes.

The overall conclusion is that: pre-pumping (well-purging) affects the concentrations of most of the studied parameters, however there are well-specific and parameter-specific differences. The effect on the time-series for these parameters is that differences in the pre-pumping would result in “noisy” data (data with high variability).

10.5 Data used for this analysis

Table 10-11: Data used in this assessment. Abbreviations: Attr. – attribute, indicating if the sample was below limit of detection; LOD – limit of detection; Urel – relative uncertainty; Uabs – absolute uncertainty, U – the largest of Urel and Uabs (Urel and Uabs are from "1.3 Kontrol/overvågning af grundvand" from BEK nr 811 af 19/06/2024 (https://www.retsinformation.dk/eli/lta/2024/811); note that the Sample time (numeric) and order were used for visualsation purposes (based on Prøve tid)

Stof	StanCode	DGUNR	Indtag	ID	Prøve			Attr	Value (ug/l)	LOD	Enhed	Sample		Analytical uncertainty		
					Dato	Tid	nr.					Time	Order	Urel (ug/l)	Uabs (ug/l)	U (ug/l)
Al	267	65. 1513	1	65. 1513_1	01-05-23	8:50:00 AM	97393/23		110	0.5	Midtjylland	8.83	1	22	1	22
Al	267	65. 1513	1	65. 1513_1	01-05-23	9:40:00 AM	97390/23		120	0.5	Midtjylland	9.67	2	24	1	24
Al	267	65. 1513	1	65. 1513_1	01-05-23	11:15:00 AM	97394/23		120	0.5	Midtjylland	11.25	3	24	1	24
Al	267	65. 1514	1	65. 1514_1	13-11-23	10:40:00 AM	265141/23		390	0.5	Midtjylland	10.67	1	78	1	78
Al	267	65. 1514	1	65. 1514_1	13-11-23	11:30:00 AM	265142/23		350	0.5	Midtjylland	11.50	2	70	1	70
Al	267	65. 1514	1	65. 1514_1	13-11-23	1:15:00 PM	265166/23		370	0.5	Midtjylland	13.25	3	74	1	74
Al	267	65. 1515	1	65. 1515_1	01-05-23	11:30:00 AM	97402/23		200	0.5	Midtjylland	11.50	1	40	1	40
Al	267	65. 1515	1	65. 1515_1	01-05-23	12:20:00 PM	97400/23		210	0.5	Midtjylland	12.33	2	42	1	42
Al	267	65. 1515	1	65. 1515_1	01-05-23	2:00:00 PM	97403/23		200	0.5	Midtjylland	14.00	3	40	1	40
Al	267	65. 1516	1	65. 1516_1	23-08-23	9:25:00 AM	191387/23		690	0.5	Midtjylland	9.42	1	138	1	138
Al	267	65. 1516	1	65. 1516_1	23-08-23	10:10:00 AM	191386/23		720	0.5	Midtjylland	10.17	2	144	1	144
Al	267	65. 1516	1	65. 1516_1	23-08-23	12:00:00 PM	191612/23		740	0.5	Midtjylland	12.00	3	148	1	148
Al	267	65. 1517	1	65. 1517_1	06-09-23	9:40:00 AM	203316/23		790	0.5	Midtjylland	9.67	1	158	1	158
Al	267	65. 1517	1	65. 1517_1	06-09-23	10:25:00 AM	203329/23		1100	0.5	Midtjylland	10.42	2	220	1	220
Al	267	65. 1517	1	65. 1517_1	06-09-23	12:00:00 PM	203516/23		1100	0.5	Midtjylland	12.00	3	220	1	220
Al	267	65. 1520	1	65. 1520_1	25-05-23	8:45:00 AM	123204/23		4.3	0.5	Midtjylland	8.75	1	0.86	1	1
Al	267	65. 1520	1	65. 1520_1	25-05-23	9:35:00 AM	123205/23		5.1	0.5	Midtjylland	9.58	2	1.02	1	1.02
Al	267	65. 1520	1	65. 1520_1	25-05-23	11:10:00 AM	123353/23		6	0.5	Midtjylland	11.17	3	1.2	1	1.2
Al	267	65. 1523	1	65. 1523_1	09-11-23	11:50:00 AM	262454/23		230	0.5	Midtjylland	11.83	1	46	1	46
Al	267	65. 1523	1	65. 1523_1	09-11-23	12:40:00 PM	262455/23		250	0.5	Midtjylland	12.67	2	50	1	50
Al	267	65. 1523	1	65. 1523_1	09-11-23	2:00:00 PM	262526/23		260	0.5	Midtjylland	14.00	3	52	1	52
Al	267	83. 1702	1	83. 1702_1	09-10-23	10:30:00 AM	233296/23		79	0.5	Midtjylland	10.50	1	15.8	1	15.8
Al	267	83. 1702	1	83. 1702_1	09-10-23	11:10:00 AM	233295/23		83	0.5	Midtjylland	11.17	2	16.6	1	16.6
Al	267	83. 1702	1	83. 1702_1	09-10-23	12:25:00 PM	233169/23		87	0.5	Midtjylland	12.42	3	17.4	1	17.4
Al	267	83. 1703	1	83. 1703_1	29-03-23	8:55:00 AM	69302/23		91	0.5	Midtjylland	8.92	1	18.2	1	18.2
Al	267	83. 1703	1	83. 1703_1	29-03-23	9:35:00 AM	69259/23		44	0.5	Midtjylland	9.58	2	8.8	1	8.8
Al	267	83. 1703	1	83. 1703_1	29-03-23	10:15:00 AM	69303/23		46	0.5	Midtjylland	10.25	3	9.2	1	9.2
Al	267	186. 843	1	186. 843_1	06-03-23	11:05:00 AM	49220/23		180	0.5	Sjælland	11.08	1	36	1	36
Al	267	186. 843	1	186. 843_1	06-03-23	12:15:00 PM	49218/23		210	0.5	Sjælland	12.25	2	42	1	42
Al	267	186. 843	1	186. 843_1	06-03-23	1:40:00 PM	49221/23		190	0.5	Sjælland	13.67	3	38	1	38
Al	267	186. 844	1	186. 844_1	08-03-23	11:35:00 AM	51152/23	<	0.5	0.5	Sjælland	11.58	1	0.1	1	1
Al	267	186. 844	1	186. 844_1	08-03-23	12:40:00 PM	51149/23		0.83	0.5	Sjælland	12.67	2	0.166	1	1
Al	267	186. 844	1	186. 844_1	08-03-23	2:05:00 PM	51155/23		0.7	0.5	Sjælland	14.08	3	0.14	1	1

Stof	StanCode	DGUNR	Indtag	ID	Prøve			Attr	Value (ug/l)	LOD	Enhed	Sample		Analytical uncertainty		
					Dato	Tid	nr.					Time	Order	Urel (ug/l)	Uabs (ug/l)	U (ug/l)
Al	267	186. 846	1	186. 846_1	07-09-23	10:21:00 AM	205364/23		43	0.5	Sjælland	10.35	1	8.6	1	8.6
Al	267	186. 846	1	186. 846_1	07-09-23	11:20:00 AM	205384/23		71	0.5	Sjælland	11.33	2	14.2	1	14.2
Al	267	186. 846	1	186. 846_1	07-09-23	12:41:00 PM	205385/23		53	0.5	Sjælland	12.68	3	10.6	1	10.6
As	270	65. 1513	1	65. 1513_1	01-05-23	8:50:00 AM	97393/23		0.48	0.03	Midtjylland	8.83	1	0.096	0.05	0.096
As	270	65. 1513	1	65. 1513_1	01-05-23	9:40:00 AM	97390/23		0.48	0.03	Midtjylland	9.67	2	0.096	0.05	0.096
As	270	65. 1513	1	65. 1513_1	01-05-23	11:15:00 AM	97394/23		0.51	0.03	Midtjylland	11.25	3	0.102	0.05	0.102
As	270	65. 1514	1	65. 1514_1	13-11-23	10:40:00 AM	265141/23		0.54	0.03	Midtjylland	10.67	1	0.108	0.05	0.108
As	270	65. 1514	1	65. 1514_1	13-11-23	11:30:00 AM	265142/23		0.51	0.03	Midtjylland	11.50	2	0.102	0.05	0.102
As	270	65. 1514	1	65. 1514_1	13-11-23	1:15:00 PM	265166/23		0.52	0.03	Midtjylland	13.25	3	0.104	0.05	0.104
As	270	65. 1515	1	65. 1515_1	01-05-23	11:30:00 AM	97402/23		1.9	0.03	Midtjylland	11.50	1	0.38	0.05	0.38
As	270	65. 1515	1	65. 1515_1	01-05-23	12:20:00 PM	97400/23		1.8	0.03	Midtjylland	12.33	2	0.36	0.05	0.36
As	270	65. 1515	1	65. 1515_1	01-05-23	2:00:00 PM	97403/23		1.3	0.03	Midtjylland	14.00	3	0.26	0.05	0.26
As	270	65. 1516	1	65. 1516_1	23-08-23	9:25:00 AM	191387/23		0.46	0.03	Midtjylland	9.42	1	0.092	0.05	0.092
As	270	65. 1516	1	65. 1516_1	23-08-23	10:10:00 AM	191386/23		0.53	0.03	Midtjylland	10.17	2	0.106	0.05	0.106
As	270	65. 1516	1	65. 1516_1	23-08-23	12:00:00 PM	191612/23		0.53	0.03	Midtjylland	12.00	3	0.106	0.05	0.106
As	270	65. 1517	1	65. 1517_1	06-09-23	9:40:00 AM	203316/23		0.2	0.03	Midtjylland	9.67	1	0.04	0.05	0.05
As	270	65. 1517	1	65. 1517_1	06-09-23	10:25:00 AM	203329/23		0.31	0.03	Midtjylland	10.42	2	0.062	0.05	0.062
As	270	65. 1517	1	65. 1517_1	06-09-23	12:00:00 PM	203516/23		0.24	0.03	Midtjylland	12.00	3	0.048	0.05	0.05
As	270	65. 1520	1	65. 1520_1	25-05-23	8:45:00 AM	123204/23		0.38	0.03	Midtjylland	8.75	1	0.076	0.05	0.076
As	270	65. 1520	1	65. 1520_1	25-05-23	9:35:00 AM	123205/23		0.39	0.03	Midtjylland	9.58	2	0.078	0.05	0.078
As	270	65. 1520	1	65. 1520_1	25-05-23	11:10:00 AM	123353/23		0.34	0.03	Midtjylland	11.17	3	0.068	0.05	0.068
As	270	65. 1523	1	65. 1523_1	09-11-23	11:50:00 AM	262454/23		1.2	0.03	Midtjylland	11.83	1	0.24	0.05	0.24
As	270	65. 1523	1	65. 1523_1	09-11-23	12:40:00 PM	262455/23		1.2	0.03	Midtjylland	12.67	2	0.24	0.05	0.24
As	270	65. 1523	1	65. 1523_1	09-11-23	2:00:00 PM	262526/23		1.2	0.03	Midtjylland	14.00	3	0.24	0.05	0.24
As	270	83. 1702	1	83. 1702_1	09-10-23	10:30:00 AM	233296/23		0.089	0.03	Midtjylland	10.50	1	0.0178	0.05	0.05
As	270	83. 1702	1	83. 1702_1	09-10-23	11:10:00 AM	233295/23		0.075	0.03	Midtjylland	11.17	2	0.015	0.05	0.05
As	270	83. 1702	1	83. 1702_1	09-10-23	12:25:00 PM	233169/23		0.079	0.03	Midtjylland	12.42	3	0.0158	0.05	0.05
As	270	83. 1703	1	83. 1703_1	29-03-23	8:55:00 AM	69302/23		0.32	0.03	Midtjylland	8.92	1	0.064	0.05	0.064
As	270	83. 1703	1	83. 1703_1	29-03-23	9:35:00 AM	69259/23		0.31	0.03	Midtjylland	9.58	2	0.062	0.05	0.062
As	270	83. 1703	1	83. 1703_1	29-03-23	10:15:00 AM	69303/23		0.26	0.03	Midtjylland	10.25	3	0.052	0.05	0.052
As	270	186. 843	1	186. 843_1	06-03-23	11:05:00 AM	49220/23		0.41	0.03	Sjælland	11.08	1	0.082	0.05	0.082
As	270	186. 843	1	186. 843_1	06-03-23	12:15:00 PM	49218/23		0.57	0.03	Sjælland	12.25	2	0.114	0.05	0.114
As	270	186. 843	1	186. 843_1	06-03-23	1:40:00 PM	49221/23		0.79	0.03	Sjælland	13.67	3	0.158	0.05	0.158
As	270	186. 844	1	186. 844_1	08-03-23	11:35:00 AM	51152/23		1.2	0.03	Sjælland	11.58	1	0.24	0.05	0.24
As	270	186. 844	1	186. 844_1	08-03-23	12:40:00 PM	51149/23		0.85	0.03	Sjælland	12.67	2	0.17	0.05	0.17
As	270	186. 844	1	186. 844_1	08-03-23	2:05:00 PM	51155/23		0.84	0.03	Sjælland	14.08	3	0.168	0.05	0.168
As	270	186. 846	1	186. 846_1	07-09-23	10:21:00 AM	205364/23		1.9	0.03	Sjælland	10.35	1	0.38	0.05	0.38
As	270	186. 846	1	186. 846_1	07-09-23	11:20:00 AM	205384/23		2.9	0.03	Sjælland	11.33	2	0.58	0.05	0.58
As	270	186. 846	1	186. 846_1	07-09-23	12:41:00 PM	205385/23		2.9	0.03	Sjælland	12.68	3	0.58	0.05	0.58
Ba	271	65. 1513	1	65. 1513_1	01-05-23	8:50:00 AM	97393/23		27	0.03	Midtjylland	8.83	1	5.4	3	5.4
Ba	271	65. 1513	1	65. 1513_1	01-05-23	9:40:00 AM	97390/23		27	0.03	Midtjylland	9.67	2	5.4	3	5.4
Ba	271	65. 1513	1	65. 1513_1	01-05-23	11:15:00 AM	97394/23		27	0.03	Midtjylland	11.25	3	5.4	3	5.4
Ba	271	65. 1514	1	65. 1514_1	13-11-23	10:40:00 AM	265141/23		34	0.03	Midtjylland	10.67	1	6.8	3	6.8
Ba	271	65. 1514	1	65. 1514_1	13-11-23	11:30:00 AM	265142/23		28	0.03	Midtjylland	11.50	2	5.6	3	5.6
Ba	271	65. 1514	1	65. 1514_1	13-11-23	1:15:00 PM	265166/23		29	0.03	Midtjylland	13.25	3	5.8	3	5.8

Stof	StanCode	DGUNR	Indtag	ID	Prøve			Attr	Value (ug/l)	LOD	Enhed	Sample		Analytical uncertainty		
					Dato	Tid	nr.					Time	Order	Urel (ug/l)	Uabs (ug/l)	U (ug/l)
Ba	271	65. 1515	1	65. 1515_1	01-05-23	11:30:00 AM	97402/23		25	0.03	Midtjylland	11.50	1	5	3	5
Ba	271	65. 1515	1	65. 1515_1	01-05-23	12:20:00 PM	97400/23		25	0.03	Midtjylland	12.33	2	5	3	5
Ba	271	65. 1515	1	65. 1515_1	01-05-23	2:00:00 PM	97403/23		23	0.03	Midtjylland	14.00	3	4.6	3	4.6
Ba	271	65. 1516	1	65. 1516_1	23-08-23	9:25:00 AM	191387/23		83	0.03	Midtjylland	9.42	1	16.6	3	16.6
Ba	271	65. 1516	1	65. 1516_1	23-08-23	10:10:00 AM	191386/23		83	0.03	Midtjylland	10.17	2	16.6	3	16.6
Ba	271	65. 1516	1	65. 1516_1	23-08-23	12:00:00 PM	191612/23		86	0.03	Midtjylland	12.00	3	17.2	3	17.2
Ba	271	65. 1517	1	65. 1517_1	06-09-23	9:40:00 AM	203316/23		120	0.03	Midtjylland	9.67	1	24	3	24
Ba	271	65. 1517	1	65. 1517_1	06-09-23	10:25:00 AM	203329/23		130	0.03	Midtjylland	10.42	2	26	3	26
Ba	271	65. 1517	1	65. 1517_1	06-09-23	12:00:00 PM	203516/23		120	0.03	Midtjylland	12.00	3	24	3	24
Ba	271	65. 1520	1	65. 1520_1	25-05-23	8:45:00 AM	123204/23		53	0.03	Midtjylland	8.75	1	10.6	3	10.6
Ba	271	65. 1520	1	65. 1520_1	25-05-23	9:35:00 AM	123205/23		50	0.03	Midtjylland	9.58	2	10	3	10
Ba	271	65. 1520	1	65. 1520_1	25-05-23	11:10:00 AM	123353/23		47	0.03	Midtjylland	11.17	3	9.4	3	9.4
Ba	271	65. 1523	1	65. 1523_1	09-11-23	11:50:00 AM	262454/23		21	0.03	Midtjylland	11.83	1	4.2	3	4.2
Ba	271	65. 1523	1	65. 1523_1	09-11-23	12:40:00 PM	262455/23		21	0.03	Midtjylland	12.67	2	4.2	3	4.2
Ba	271	65. 1523	1	65. 1523_1	09-11-23	2:00:00 PM	262526/23		22	0.03	Midtjylland	14.00	3	4.4	3	4.4
Ba	271	83. 1702	1	83. 1702_1	09-10-23	10:30:00 AM	233296/23		110	0.03	Midtjylland	10.50	1	22	3	22
Ba	271	83. 1702	1	83. 1702_1	09-10-23	11:10:00 AM	233295/23		110	0.03	Midtjylland	11.17	2	22	3	22
Ba	271	83. 1702	1	83. 1702_1	09-10-23	12:25:00 PM	233169/23		110	0.03	Midtjylland	12.42	3	22	3	22
Ba	271	83. 1703	1	83. 1703_1	29-03-23	8:55:00 AM	69302/23		150	0.03	Midtjylland	8.92	1	30	3	30
Ba	271	83. 1703	1	83. 1703_1	29-03-23	9:35:00 AM	69259/23		130	0.03	Midtjylland	9.58	2	26	3	26
Ba	271	83. 1703	1	83. 1703_1	29-03-23	10:15:00 AM	69303/23		120	0.03	Midtjylland	10.25	3	24	3	24
Ba	271	186. 843	1	186. 843_1	06-03-23	11:05:00 AM	49220/23		15	0.03	Sjælland	11.08	1	3	3	3
Ba	271	186. 843	1	186. 843_1	06-03-23	12:15:00 PM	49218/23		15	0.03	Sjælland	12.25	2	3	3	3
Ba	271	186. 843	1	186. 843_1	06-03-23	1:40:00 PM	49221/23		12	0.03	Sjælland	13.67	3	2.4	3	3
Ba	271	186. 844	1	186. 844_1	08-03-23	11:35:00 AM	51152/23		12	0.03	Sjælland	11.58	1	2.4	3	3
Ba	271	186. 844	1	186. 844_1	08-03-23	12:40:00 PM	51149/23		14	0.03	Sjælland	12.67	2	2.8	3	3
Ba	271	186. 844	1	186. 844_1	08-03-23	2:05:00 PM	51155/23		14	0.03	Sjælland	14.08	3	2.8	3	3
Ba	271	186. 846	1	186. 846_1	07-09-23	10:21:00 AM	205364/23		3.8	0.03	Sjælland	10.35	1	0.76	3	3
Ba	271	186. 846	1	186. 846_1	07-09-23	11:20:00 AM	205384/23		4.8	0.03	Sjælland	11.33	2	0.96	3	3
Ba	271	186. 846	1	186. 846_1	07-09-23	12:41:00 PM	205385/23		3.3	0.03	Sjælland	12.68	3	0.66	3	3
Cd	279	65. 1513	1	65. 1513_1	01-05-23	8:50:00 AM	97393/23		0.094	0.003	Midtjylland	8.83	1	0.0188	0.005	0.0188
Cd	279	65. 1513	1	65. 1513_1	01-05-23	9:40:00 AM	97390/23		0.099	0.003	Midtjylland	9.67	2	0.0198	0.005	0.0198
Cd	279	65. 1513	1	65. 1513_1	01-05-23	11:15:00 AM	97394/23		0.11	0.003	Midtjylland	11.25	3	0.022	0.005	0.022
Cd	279	65. 1514	1	65. 1514_1	13-11-23	10:40:00 AM	265141/23		0.11	0.003	Midtjylland	10.67	1	0.022	0.005	0.022
Cd	279	65. 1514	1	65. 1514_1	13-11-23	11:30:00 AM	265142/23		0.044	0.003	Midtjylland	11.50	2	0.0088	0.005	0.0088
Cd	279	65. 1514	1	65. 1514_1	13-11-23	1:15:00 PM	265166/23		0.045	0.003	Midtjylland	13.25	3	0.009	0.005	0.009
Cd	279	65. 1515	1	65. 1515_1	01-05-23	11:30:00 AM	97402/23		0.13	0.003	Midtjylland	11.50	1	0.026	0.005	0.026
Cd	279	65. 1515	1	65. 1515_1	01-05-23	12:20:00 PM	97400/23		0.31	0.003	Midtjylland	12.33	2	0.062	0.005	0.062
Cd	279	65. 1515	1	65. 1515_1	01-05-23	2:00:00 PM	97403/23		0.42	0.003	Midtjylland	14.00	3	0.084	0.005	0.084
Cd	279	65. 1516	1	65. 1516_1	23-08-23	9:25:00 AM	191387/23		0.37	0.003	Midtjylland	9.42	1	0.074	0.005	0.074
Cd	279	65. 1516	1	65. 1516_1	23-08-23	10:10:00 AM	191386/23		0.37	0.003	Midtjylland	10.17	2	0.074	0.005	0.074
Cd	279	65. 1516	1	65. 1516_1	23-08-23	12:00:00 PM	191612/23		0.37	0.003	Midtjylland	12.00	3	0.074	0.005	0.074
Cd	279	65. 1517	1	65. 1517_1	06-09-23	9:40:00 AM	203316/23		0.022	0.003	Midtjylland	9.67	1	0.0044	0.005	0.005
Cd	279	65. 1517	1	65. 1517_1	06-09-23	10:25:00 AM	203329/23		0.033	0.003	Midtjylland	10.42	2	0.0066	0.005	0.0066
Cd	279	65. 1517	1	65. 1517_1	06-09-23	12:00:00 PM	203516/23		0.035	0.003	Midtjylland	12.00	3	0.007	0.005	0.007

Stof	StanCode	DGUNR	Indtag	ID	Prøve			Attr	Value (ug/l)	LOD	Enhed	Sample		Analytical uncertainty		
					Dato	Tid	nr.					Time	Order	Urel (ug/l)	Uabs (ug/l)	U (ug/l)
Cd	279	65. 1520	1	65. 1520_1	25-05-23	8:45:00 AM	123204/23		0.019	0.003	Midtjylland	8.75	1	0.0038	0.005	0.005
Cd	279	65. 1520	1	65. 1520_1	25-05-23	9:35:00 AM	123205/23		0.013	0.003	Midtjylland	9.58	2	0.0026	0.005	0.005
Cd	279	65. 1520	1	65. 1520_1	25-05-23	11:10:00 AM	123353/23		0.015	0.003	Midtjylland	11.17	3	0.003	0.005	0.005
Cd	279	65. 1523	1	65. 1523_1	09-11-23	11:50:00 AM	262454/23		0.12	0.003	Midtjylland	11.83	1	0.024	0.005	0.024
Cd	279	65. 1523	1	65. 1523_1	09-11-23	12:40:00 PM	262455/23		0.041	0.003	Midtjylland	12.67	2	0.0082	0.005	0.0082
Cd	279	65. 1523	1	65. 1523_1	09-11-23	2:00:00 PM	262526/23		0.025	0.003	Midtjylland	14.00	3	0.005	0.005	0.005
Cd	279	83. 1702	1	83. 1702_1	09-10-23	10:30:00 AM	233296/23		0.22	0.003	Midtjylland	10.50	1	0.044	0.005	0.044
Cd	279	83. 1702	1	83. 1702_1	09-10-23	11:10:00 AM	233295/23		0.26	0.003	Midtjylland	11.17	2	0.052	0.005	0.052
Cd	279	83. 1702	1	83. 1702_1	09-10-23	12:25:00 PM	233169/23		0.25	0.003	Midtjylland	12.42	3	0.05	0.005	0.05
Cd	279	83. 1703	1	83. 1703_1	29-03-23	8:55:00 AM	69302/23		0.69	0.003	Midtjylland	8.92	1	0.138	0.005	0.138
Cd	279	83. 1703	1	83. 1703_1	29-03-23	9:35:00 AM	69259/23		0.79	0.003	Midtjylland	9.58	2	0.158	0.005	0.158
Cd	279	83. 1703	1	83. 1703_1	29-03-23	10:15:00 AM	69303/23		0.8	0.003	Midtjylland	10.25	3	0.16	0.005	0.16
Cd	279	186. 843	1	186. 843_1	06-03-23	11:05:00 AM	49220/23		0.0073	0.003	Sjælland	11.08	1	0.00146	0.005	0.005
Cd	279	186. 843	1	186. 843_1	06-03-23	12:15:00 PM	49218/23	<	0.003	0.003	Sjælland	12.25	2	0.0006	0.005	0.005
Cd	279	186. 843	1	186. 843_1	06-03-23	1:40:00 PM	49221/23	<	0.003	0.003	Sjælland	13.67	3	0.0006	0.005	0.005
Cd	279	186. 844	1	186. 844_1	08-03-23	11:35:00 AM	51152/23		0.084	0.003	Sjælland	11.58	1	0.0168	0.005	0.0168
Cd	279	186. 844	1	186. 844_1	08-03-23	12:40:00 PM	51149/23		0.014	0.003	Sjælland	12.67	2	0.0028	0.005	0.005
Cd	279	186. 844	1	186. 844_1	08-03-23	2:05:00 PM	51155/23		0.0053	0.003	Sjælland	14.08	3	0.00106	0.005	0.005
Cd	279	186. 846	1	186. 846_1	07-09-23	10:21:00 AM	205364/23	<	0.003	0.003	Sjælland	10.35	1	0.0006	0.005	0.005
Cd	279	186. 846	1	186. 846_1	07-09-23	11:20:00 AM	205384/23	<	0.003	0.003	Sjælland	11.33	2	0.0006	0.005	0.005
Cd	279	186. 846	1	186. 846_1	07-09-23	12:41:00 PM	205385/23	<	0.003	0.003	Sjælland	12.68	3	0.0006	0.005	0.005
Cr	300	65. 1513	1	65. 1513_1	01-05-23	8:50:00 AM	97393/23		5.6	0.01	Midtjylland	8.83	1	1.12	0.05	1.12
Cr	300	65. 1513	1	65. 1513_1	01-05-23	9:40:00 AM	97390/23		2.6	0.01	Midtjylland	9.67	2	0.52	0.05	0.52
Cr	300	65. 1513	1	65. 1513_1	01-05-23	11:15:00 AM	97394/23		1.1	0.01	Midtjylland	11.25	3	0.22	0.05	0.22
Cr	300	65. 1514	1	65. 1514_1	13-11-23	10:40:00 AM	265141/23		0.4	0.01	Midtjylland	10.67	1	0.08	0.05	0.08
Cr	300	65. 1514	1	65. 1514_1	13-11-23	11:30:00 AM	265142/23		0.27	0.01	Midtjylland	11.50	2	0.054	0.05	0.054
Cr	300	65. 1514	1	65. 1514_1	13-11-23	1:15:00 PM	265166/23		0.25	0.01	Midtjylland	13.25	3	0.05	0.05	0.05
Cr	300	65. 1515	1	65. 1515_1	01-05-23	11:30:00 AM	97402/23		0.24	0.01	Midtjylland	11.50	1	0.048	0.05	0.05
Cr	300	65. 1515	1	65. 1515_1	01-05-23	12:20:00 PM	97400/23		0.25	0.01	Midtjylland	12.33	2	0.05	0.05	0.05
Cr	300	65. 1515	1	65. 1515_1	01-05-23	2:00:00 PM	97403/23		0.27	0.01	Midtjylland	14.00	3	0.054	0.05	0.054
Cr	300	65. 1516	1	65. 1516_1	23-08-23	9:25:00 AM	191387/23		1.2	0.01	Midtjylland	9.42	1	0.24	0.05	0.24
Cr	300	65. 1516	1	65. 1516_1	23-08-23	10:10:00 AM	191386/23		1.4	0.01	Midtjylland	10.17	2	0.28	0.05	0.28
Cr	300	65. 1516	1	65. 1516_1	23-08-23	12:00:00 PM	191612/23		0.5	0.01	Midtjylland	12.00	3	0.1	0.05	0.1
Cr	300	65. 1517	1	65. 1517_1	06-09-23	9:40:00 AM	203316/23		0.51	0.01	Midtjylland	9.67	1	0.102	0.05	0.102
Cr	300	65. 1517	1	65. 1517_1	06-09-23	10:25:00 AM	203329/23		0.87	0.01	Midtjylland	10.42	2	0.174	0.05	0.174
Cr	300	65. 1517	1	65. 1517_1	06-09-23	12:00:00 PM	203516/23		0.45	0.01	Midtjylland	12.00	3	0.09	0.05	0.09
Cr	300	65. 1520	1	65. 1520_1	25-05-23	8:45:00 AM	123204/23		0.75	0.01	Midtjylland	8.75	1	0.15	0.05	0.15
Cr	300	65. 1520	1	65. 1520_1	25-05-23	9:35:00 AM	123205/23		0.16	0.01	Midtjylland	9.58	2	0.032	0.05	0.05
Cr	300	65. 1520	1	65. 1520_1	25-05-23	11:10:00 AM	123353/23		0.13	0.01	Midtjylland	11.17	3	0.026	0.05	0.05
Cr	300	65. 1523	1	65. 1523_1	09-11-23	11:50:00 AM	262454/23		2.5	0.01	Midtjylland	11.83	1	0.5	0.05	0.5
Cr	300	65. 1523	1	65. 1523_1	09-11-23	12:40:00 PM	262455/23		1.1	0.01	Midtjylland	12.67	2	0.22	0.05	0.22
Cr	300	65. 1523	1	65. 1523_1	09-11-23	2:00:00 PM	262526/23		0.94	0.01	Midtjylland	14.00	3	0.188	0.05	0.188
Cr	300	83. 1702	1	83. 1702_1	09-10-23	10:30:00 AM	233296/23		0.45	0.01	Midtjylland	10.50	1	0.09	0.05	0.09
Cr	300	83. 1702	1	83. 1702_1	09-10-23	11:10:00 AM	233295/23		0.19	0.01	Midtjylland	11.17	2	0.038	0.05	0.05
Cr	300	83. 1702	1	83. 1702_1	09-10-23	12:25:00 PM	233169/23		0.17	0.01	Midtjylland	12.42	3	0.034	0.05	0.05

Stof	StanCode	DGUNR	Indtag	ID	Prøve			Attr	Value (ug/l)	LOD	Enhed	Sample		Analytical uncertainty		
					Dato	Tid	nr.					Time	Order	Urel (ug/l)	Uabs (ug/l)	U (ug/l)
Cr	300	83. 1703	1	83. 1703_1	29-03-23	8:55:00 AM	69302/23		0.41	0.01	Midtjylland	8.92	1	0.082	0.05	0.082
Cr	300	83. 1703	1	83. 1703_1	29-03-23	9:35:00 AM	69259/23		0.56	0.01	Midtjylland	9.58	2	0.112	0.05	0.112
Cr	300	83. 1703	1	83. 1703_1	29-03-23	10:15:00 AM	69303/23		0.55	0.01	Midtjylland	10.25	3	0.11	0.05	0.11
Cr	300	186. 843	1	186. 843_1	06-03-23	11:05:00 AM	49220/23		2.3	0.01	Sjælland	11.08	1	0.46	0.05	0.46
Cr	300	186. 843	1	186. 843_1	06-03-23	12:15:00 PM	49218/23		3.1	0.01	Sjælland	12.25	2	0.62	0.05	0.62
Cr	300	186. 843	1	186. 843_1	06-03-23	1:40:00 PM	49221/23		2.5	0.01	Sjælland	13.67	3	0.5	0.05	0.5
Cr	300	186. 844	1	186. 844_1	08-03-23	11:35:00 AM	51152/23		1	0.01	Sjælland	11.58	1	0.2	0.05	0.2
Cr	300	186. 844	1	186. 844_1	08-03-23	12:40:00 PM	51149/23		1.1	0.01	Sjælland	12.67	2	0.22	0.05	0.22
Cr	300	186. 844	1	186. 844_1	08-03-23	2:05:00 PM	51155/23		0.85	0.01	Sjælland	14.08	3	0.17	0.05	0.17
Cr	300	186. 846	1	186. 846_1	07-09-23	10:21:00 AM	205364/23		0.39	0.01	Sjælland	10.35	1	0.078	0.05	0.078
Cr	300	186. 846	1	186. 846_1	07-09-23	11:20:00 AM	205384/23		1.3	0.01	Sjælland	11.33	2	0.26	0.05	0.26
Cr	300	186. 846	1	186. 846_1	07-09-23	12:41:00 PM	205385/23		0.39	0.01	Sjælland	12.68	3	0.078	0.05	0.078
Cu	318	65. 1513	1	65. 1513_1	01-05-23	8:50:00 AM	97393/23		2.7	0.03	Midtjylland	8.83	1	0.54	0.1	0.54
Cu	318	65. 1513	1	65. 1513_1	01-05-23	9:40:00 AM	97390/23		2.2	0.03	Midtjylland	9.67	2	0.44	0.1	0.44
Cu	318	65. 1513	1	65. 1513_1	01-05-23	11:15:00 AM	97394/23		1.6	0.03	Midtjylland	11.25	3	0.32	0.1	0.32
Cu	318	65. 1514	1	65. 1514_1	13-11-23	10:40:00 AM	265141/23		46	0.03	Midtjylland	10.67	1	9.2	0.1	9.2
Cu	318	65. 1514	1	65. 1514_1	13-11-23	11:30:00 AM	265142/23		20	0.03	Midtjylland	11.50	2	4	0.1	4
Cu	318	65. 1514	1	65. 1514_1	13-11-23	1:15:00 PM	265166/23		19	0.03	Midtjylland	13.25	3	3.8	0.1	3.8
Cu	318	65. 1515	1	65. 1515_1	01-05-23	11:30:00 AM	97402/23		0.39	0.03	Midtjylland	11.50	1	0.078	0.1	0.1
Cu	318	65. 1515	1	65. 1515_1	01-05-23	12:20:00 PM	97400/23	<	0.03	0.03	Midtjylland	12.33	2	0.006	0.1	0.1
Cu	318	65. 1515	1	65. 1515_1	01-05-23	2:00:00 PM	97403/23	<	0.03	0.03	Midtjylland	14.00	3	0.006	0.1	0.1
Cu	318	65. 1516	1	65. 1516_1	23-08-23	9:25:00 AM	191387/23		34	0.03	Midtjylland	9.42	1	6.8	0.1	6.8
Cu	318	65. 1516	1	65. 1516_1	23-08-23	10:10:00 AM	191386/23		11	0.03	Midtjylland	10.17	2	2.2	0.1	2.2
Cu	318	65. 1516	1	65. 1516_1	23-08-23	12:00:00 PM	191612/23		4.6	0.03	Midtjylland	12.00	3	0.92	0.1	0.92
Cu	318	65. 1517	1	65. 1517_1	06-09-23	9:40:00 AM	203316/23		130	0.03	Midtjylland	9.67	1	26	0.1	26
Cu	318	65. 1517	1	65. 1517_1	06-09-23	10:25:00 AM	203329/23		58	0.03	Midtjylland	10.42	2	11.6	0.1	11.6
Cu	318	65. 1517	1	65. 1517_1	06-09-23	12:00:00 PM	203516/23		42	0.03	Midtjylland	12.00	3	8.4	0.1	8.4
Cu	318	65. 1520	1	65. 1520_1	25-05-23	8:45:00 AM	123204/23		19	0.03	Midtjylland	8.75	1	3.8	0.1	3.8
Cu	318	65. 1520	1	65. 1520_1	25-05-23	9:35:00 AM	123205/23		9.8	0.03	Midtjylland	9.58	2	1.96	0.1	1.96
Cu	318	65. 1520	1	65. 1520_1	25-05-23	11:10:00 AM	123353/23		7.2	0.03	Midtjylland	11.17	3	1.44	0.1	1.44
Cu	318	65. 1523	1	65. 1523_1	09-11-23	11:50:00 AM	262454/23		230	0.03	Midtjylland	11.83	1	46	0.1	46
Cu	318	65. 1523	1	65. 1523_1	09-11-23	12:40:00 PM	262455/23		95	0.03	Midtjylland	12.67	2	19	0.1	19
Cu	318	65. 1523	1	65. 1523_1	09-11-23	2:00:00 PM	262526/23		47	0.03	Midtjylland	14.00	3	9.4	0.1	9.4
Cu	318	83. 1702	1	83. 1702_1	09-10-23	10:30:00 AM	233296/23		66	0.03	Midtjylland	10.50	1	13.2	0.1	13.2
Cu	318	83. 1702	1	83. 1702_1	09-10-23	11:10:00 AM	233295/23		39	0.03	Midtjylland	11.17	2	7.8	0.1	7.8
Cu	318	83. 1702	1	83. 1702_1	09-10-23	12:25:00 PM	233169/23		29	0.03	Midtjylland	12.42	3	5.8	0.1	5.8
Cu	318	83. 1703	1	83. 1703_1	29-03-23	8:55:00 AM	69302/23		620	0.03	Midtjylland	8.92	1	124	0.1	124
Cu	318	83. 1703	1	83. 1703_1	29-03-23	9:35:00 AM	69259/23		1100	0.03	Midtjylland	9.58	2	220	0.1	220
Cu	318	83. 1703	1	83. 1703_1	29-03-23	10:15:00 AM	69303/23		720	0.03	Midtjylland	10.25	3	144	0.1	144
Cu	318	186. 843	1	186. 843_1	06-03-23	11:05:00 AM	49220/23		41	0.03	Sjælland	11.08	1	8.2	0.1	8.2
Cu	318	186. 843	1	186. 843_1	06-03-23	12:15:00 PM	49218/23		1.4	0.03	Sjælland	12.25	2	0.28	0.1	0.28
Cu	318	186. 843	1	186. 843_1	06-03-23	1:40:00 PM	49221/23		1.2	0.03	Sjælland	13.67	3	0.24	0.1	0.24
Cu	318	186. 844	1	186. 844_1	08-03-23	11:35:00 AM	51152/23		440	0.03	Sjælland	11.58	1	88	0.1	88
Cu	318	186. 844	1	186. 844_1	08-03-23	12:40:00 PM	51149/23		33	0.03	Sjælland	12.67	2	6.6	0.1	6.6
Cu	318	186. 844	1	186. 844_1	08-03-23	2:05:00 PM	51155/23		4.4	0.03	Sjælland	14.08	3	0.88	0.1	0.88

Stof	StanCode	DGUNR	Indtag	ID	Prøve			Attr	Value (ug/l)	LOD	Enhed	Sample		Analytical uncertainty		
					Dato	Tid	nr.					Time	Order	Urel (ug/l)	Uabs (ug/l)	U (ug/l)
Cu	318	186. 846	1	186. 846_1	07-09-23	10:21:00 AM	205364/23		0.16	0.03	Sjælland	10.35	1	0.032	0.1	0.1
Cu	318	186. 846	1	186. 846_1	07-09-23	11:20:00 AM	205384/23		0.11	0.03	Sjælland	11.33	2	0.022	0.1	0.1
Cu	318	186. 846	1	186. 846_1	07-09-23	12:41:00 PM	205385/23		0.095	0.03	Sjælland	12.68	3	0.019	0.1	0.1
Hg	319	65. 1513	1	65. 1513_1	01-05-23	8:50:00 AM	97393/23	<	0.001	0.001	Midtjylland	8.83	1	0.0002	0.003	0.003
Hg	319	65. 1513	1	65. 1513_1	01-05-23	9:40:00 AM	97390/23	<	0.001	0.001	Midtjylland	9.67	2	0.0002	0.003	0.003
Hg	319	65. 1513	1	65. 1513_1	01-05-23	11:15:00 AM	97394/23	<	0.001	0.001	Midtjylland	11.25	3	0.0002	0.003	0.003
Hg	319	65. 1514	1	65. 1514_1	13-11-23	10:40:00 AM	265141/23	<	0.001	0.001	Midtjylland	10.67	1	0.0002	0.003	0.003
Hg	319	65. 1514	1	65. 1514_1	13-11-23	11:30:00 AM	265142/23	<	0.001	0.001	Midtjylland	11.50	2	0.0002	0.003	0.003
Hg	319	65. 1514	1	65. 1514_1	13-11-23	1:15:00 PM	265166/23	<	0.001	0.001	Midtjylland	13.25	3	0.0002	0.003	0.003
Hg	319	65. 1515	1	65. 1515_1	01-05-23	11:30:00 AM	97402/23	<	0.001	0.001	Midtjylland	11.50	1	0.0002	0.003	0.003
Hg	319	65. 1515	1	65. 1515_1	01-05-23	12:20:00 PM	97400/23	<	0.001	0.001	Midtjylland	12.33	2	0.0002	0.003	0.003
Hg	319	65. 1515	1	65. 1515_1	01-05-23	2:00:00 PM	97403/23	<	0.001	0.001	Midtjylland	14.00	3	0.0002	0.003	0.003
Hg	319	65. 1516	1	65. 1516_1	23-08-23	9:25:00 AM	191387/23	<	0.001	0.001	Midtjylland	9.42	1	0.0002	0.003	0.003
Hg	319	65. 1516	1	65. 1516_1	23-08-23	10:10:00 AM	191386/23	<	0.001	0.001	Midtjylland	10.17	2	0.0002	0.003	0.003
Hg	319	65. 1516	1	65. 1516_1	23-08-23	12:00:00 PM	191612/23	<	0.001	0.001	Midtjylland	12.00	3	0.0002	0.003	0.003
Hg	319	65. 1517	1	65. 1517_1	06-09-23	9:40:00 AM	203316/23	<	0.001	0.001	Midtjylland	9.67	1	0.0002	0.003	0.003
Hg	319	65. 1517	1	65. 1517_1	06-09-23	10:25:00 AM	203329/23	<	0.001	0.001	Midtjylland	10.42	2	0.0002	0.003	0.003
Hg	319	65. 1517	1	65. 1517_1	06-09-23	12:00:00 PM	203516/23	<	0.001	0.001	Midtjylland	12.00	3	0.0002	0.003	0.003
Hg	319	65. 1520	1	65. 1520_1	25-05-23	8:45:00 AM	123204/23		0.0012	0.001	Midtjylland	8.75	1	0.00024	0.003	0.003
Hg	319	65. 1520	1	65. 1520_1	25-05-23	9:35:00 AM	123205/23		0.001	0.001	Midtjylland	9.58	2	0.0002	0.003	0.003
Hg	319	65. 1520	1	65. 1520_1	25-05-23	11:10:00 AM	123353/23	<	0.001	0.001	Midtjylland	11.17	3	0.0002	0.003	0.003
Hg	319	65. 1523	1	65. 1523_1	09-11-23	11:50:00 AM	262454/23	<	0.001	0.001	Midtjylland	11.83	1	0.0002	0.003	0.003
Hg	319	65. 1523	1	65. 1523_1	09-11-23	12:40:00 PM	262455/23	<	0.001	0.001	Midtjylland	12.67	2	0.0002	0.003	0.003
Hg	319	65. 1523	1	65. 1523_1	09-11-23	2:00:00 PM	262526/23	<	0.001	0.001	Midtjylland	14.00	3	0.0002	0.003	0.003
Hg	319	83. 1702	1	83. 1702_1	09-10-23	10:30:00 AM	233296/23	<	0.001	0.001	Midtjylland	10.50	1	0.0002	0.003	0.003
Hg	319	83. 1702	1	83. 1702_1	09-10-23	11:10:00 AM	233295/23	<	0.001	0.001	Midtjylland	11.17	2	0.0002	0.003	0.003
Hg	319	83. 1702	1	83. 1702_1	09-10-23	12:25:00 PM	233169/23	<	0.001	0.001	Midtjylland	12.42	3	0.0002	0.003	0.003
Hg	319	83. 1703	1	83. 1703_1	29-03-23	8:55:00 AM	69302/23	<	0.001	0.001	Midtjylland	8.92	1	0.0002	0.003	0.003
Hg	319	83. 1703	1	83. 1703_1	29-03-23	9:35:00 AM	69259/23	<	0.001	0.001	Midtjylland	9.58	2	0.0002	0.003	0.003
Hg	319	83. 1703	1	83. 1703_1	29-03-23	10:15:00 AM	69303/23	<	0.001	0.001	Midtjylland	10.25	3	0.0002	0.003	0.003
Hg	319	186. 843	1	186. 843_1	06-03-23	11:05:00 AM	49220/23	<	0.001	0.001	Sjælland	11.08	1	0.0002	0.003	0.003
Hg	319	186. 843	1	186. 843_1	06-03-23	12:15:00 PM	49218/23		0.0013	0.001	Sjælland	12.25	2	0.00026	0.003	0.003
Hg	319	186. 843	1	186. 843_1	06-03-23	1:40:00 PM	49221/23	<	0.001	0.001	Sjælland	13.67	3	0.0002	0.003	0.003
Hg	319	186. 844	1	186. 844_1	08-03-23	11:35:00 AM	51152/23	<	0.001	0.001	Sjælland	11.58	1	0.0002	0.003	0.003
Hg	319	186. 844	1	186. 844_1	08-03-23	12:40:00 PM	51149/23	<	0.001	0.001	Sjælland	12.67	2	0.0002	0.003	0.003
Hg	319	186. 844	1	186. 844_1	08-03-23	2:05:00 PM	51155/23	<	0.001	0.001	Sjælland	14.08	3	0.0002	0.003	0.003
Hg	319	186. 846	1	186. 846_1	07-09-23	10:21:00 AM	205364/23	<	0.001	0.001	Sjælland	10.35	1	0.0002	0.003	0.003
Hg	319	186. 846	1	186. 846_1	07-09-23	11:20:00 AM	205384/23	<	0.001	0.001	Sjælland	11.33	2	0.0002	0.003	0.003
Hg	319	186. 846	1	186. 846_1	07-09-23	12:41:00 PM	205385/23	<	0.001	0.001	Sjælland	12.68	3	0.0002	0.003	0.003
Ni	326	65. 1513	1	65. 1513_1	01-05-23	8:50:00 AM	97393/23		18	0.03	Midtjylland	8.83	1	3.6	0.1	3.6
Ni	326	65. 1513	1	65. 1513_1	01-05-23	9:40:00 AM	97390/23		7.2	0.03	Midtjylland	9.67	2	1.44	0.1	1.44
Ni	326	65. 1513	1	65. 1513_1	01-05-23	11:15:00 AM	97394/23		5	0.03	Midtjylland	11.25	3	1	0.1	1
Ni	326	65. 1514	1	65. 1514_1	13-11-23	10:40:00 AM	265141/23		5.5	0.03	Midtjylland	10.67	1	1.1	0.1	1.1
Ni	326	65. 1514	1	65. 1514_1	13-11-23	11:30:00 AM	265142/23		2.5	0.03	Midtjylland	11.50	2	0.5	0.1	0.5
Ni	326	65. 1514	1	65. 1514_1	13-11-23	1:15:00 PM	265166/23		1.9	0.03	Midtjylland	13.25	3	0.38	0.1	0.38

Stof	StanCode	DGUNR	Indtag	ID	Prøve			Attr	Value (ug/l)	LOD	Enhed	Sample		Analytical uncertainty		
					Dato	Tid	nr.					Time	Order	Urel (ug/l)	Uabs (ug/l)	U (ug/l)
Ni	326	65. 1515	1	65. 1515_1	01-05-23	11:30:00 AM	97402/23		37	0.03	Midtjylland	11.50	1	7.4	0.1	7.4
Ni	326	65. 1515	1	65. 1515_1	01-05-23	12:20:00 PM	97400/23		49	0.03	Midtjylland	12.33	2	9.8	0.1	9.8
Ni	326	65. 1515	1	65. 1515_1	01-05-23	2:00:00 PM	97403/23		49	0.03	Midtjylland	14.00	3	9.8	0.1	9.8
Ni	326	65. 1516	1	65. 1516_1	23-08-23	9:25:00 AM	191387/23		6.4	0.03	Midtjylland	9.42	1	1.28	0.1	1.28
Ni	326	65. 1516	1	65. 1516_1	23-08-23	10:10:00 AM	191386/23		7.3	0.03	Midtjylland	10.17	2	1.46	0.1	1.46
Ni	326	65. 1516	1	65. 1516_1	23-08-23	12:00:00 PM	191612/23		6.3	0.03	Midtjylland	12.00	3	1.26	0.1	1.26
Ni	326	65. 1517	1	65. 1517_1	06-09-23	9:40:00 AM	203316/23		3	0.03	Midtjylland	9.67	1	0.6	0.1	0.6
Ni	326	65. 1517	1	65. 1517_1	06-09-23	10:25:00 AM	203329/23		1.7	0.03	Midtjylland	10.42	2	0.34	0.1	0.34
Ni	326	65. 1517	1	65. 1517_1	06-09-23	12:00:00 PM	203516/23		1.2	0.03	Midtjylland	12.00	3	0.24	0.1	0.24
Ni	326	65. 1520	1	65. 1520_1	25-05-23	8:45:00 AM	123204/23		1.2	0.03	Midtjylland	8.75	1	0.24	0.1	0.24
Ni	326	65. 1520	1	65. 1520_1	25-05-23	9:35:00 AM	123205/23		0.46	0.03	Midtjylland	9.58	2	0.092	0.1	0.1
Ni	326	65. 1520	1	65. 1520_1	25-05-23	11:10:00 AM	123353/23		0.33	0.03	Midtjylland	11.17	3	0.066	0.1	0.1
Ni	326	65. 1523	1	65. 1523_1	09-11-23	11:50:00 AM	262454/23		2.2	0.03	Midtjylland	11.83	1	0.44	0.1	0.44
Ni	326	65. 1523	1	65. 1523_1	09-11-23	12:40:00 PM	262455/23		1.8	0.03	Midtjylland	12.67	2	0.36	0.1	0.36
Ni	326	65. 1523	1	65. 1523_1	09-11-23	2:00:00 PM	262526/23		1.7	0.03	Midtjylland	14.00	3	0.34	0.1	0.34
Ni	326	83. 1702	1	83. 1702_1	09-10-23	10:30:00 AM	233296/23		4.3	0.03	Midtjylland	10.50	1	0.86	0.1	0.86
Ni	326	83. 1702	1	83. 1702_1	09-10-23	11:10:00 AM	233295/23		1.4	0.03	Midtjylland	11.17	2	0.28	0.1	0.28
Ni	326	83. 1702	1	83. 1702_1	09-10-23	12:25:00 PM	233169/23		1.2	0.03	Midtjylland	12.42	3	0.24	0.1	0.24
Ni	326	83. 1703	1	83. 1703_1	29-03-23	8:55:00 AM	69302/23		15	0.03	Midtjylland	8.92	1	3	0.1	3
Ni	326	83. 1703	1	83. 1703_1	29-03-23	9:35:00 AM	69259/23		12	0.03	Midtjylland	9.58	2	2.4	0.1	2.4
Ni	326	83. 1703	1	83. 1703_1	29-03-23	10:15:00 AM	69303/23		11	0.03	Midtjylland	10.25	3	2.2	0.1	2.2
Ni	326	186. 843	1	186. 843_1	06-03-23	11:05:00 AM	49220/23		0.48	0.03	Sjælland	11.08	1	0.096	0.1	0.1
Ni	326	186. 843	1	186. 843_1	06-03-23	12:15:00 PM	49218/23		0.35	0.03	Sjælland	12.25	2	0.07	0.1	0.1
Ni	326	186. 843	1	186. 843_1	06-03-23	1:40:00 PM	49221/23		0.16	0.03	Sjælland	13.67	3	0.032	0.1	0.1
Ni	326	186. 844	1	186. 844_1	08-03-23	11:35:00 AM	51152/23		3.1	0.03	Sjælland	11.58	1	0.62	0.1	0.62
Ni	326	186. 844	1	186. 844_1	08-03-23	12:40:00 PM	51149/23		0.56	0.03	Sjælland	12.67	2	0.112	0.1	0.112
Ni	326	186. 844	1	186. 844_1	08-03-23	2:05:00 PM	51155/23		0.16	0.03	Sjælland	14.08	3	0.032	0.1	0.1
Ni	326	186. 846	1	186. 846_1	07-09-23	10:21:00 AM	205364/23		0.26	0.03	Sjælland	10.35	1	0.052	0.1	0.1
Ni	326	186. 846	1	186. 846_1	07-09-23	11:20:00 AM	205384/23		0.77	0.03	Sjælland	11.33	2	0.154	0.1	0.154
Ni	326	186. 846	1	186. 846_1	07-09-23	12:41:00 PM	205385/23		0.21	0.03	Sjælland	12.68	3	0.042	0.1	0.1
Pb	274	65. 1513	1	65. 1513_1	01-05-23	8:50:00 AM	97393/23		0.99	0.025	Midtjylland	8.83	1	0.198	0.05	0.198
Pb	274	65. 1513	1	65. 1513_1	01-05-23	9:40:00 AM	97390/23		0.5	0.025	Midtjylland	9.67	2	0.1	0.05	0.1
Pb	274	65. 1513	1	65. 1513_1	01-05-23	11:15:00 AM	97394/23		0.17	0.025	Midtjylland	11.25	3	0.034	0.05	0.05
Pb	274	65. 1514	1	65. 1514_1	13-11-23	10:40:00 AM	265141/23		3.4	0.025	Midtjylland	10.67	1	0.68	0.05	0.68
Pb	274	65. 1514	1	65. 1514_1	13-11-23	11:30:00 AM	265142/23		1.8	0.025	Midtjylland	11.50	2	0.36	0.05	0.36
Pb	274	65. 1514	1	65. 1514_1	13-11-23	1:15:00 PM	265166/23		1.4	0.025	Midtjylland	13.25	3	0.28	0.05	0.28
Pb	274	65. 1515	1	65. 1515_1	01-05-23	11:30:00 AM	97402/23		0.11	0.025	Midtjylland	11.50	1	0.022	0.05	0.05
Pb	274	65. 1515	1	65. 1515_1	01-05-23	12:20:00 PM	97400/23		0.11	0.025	Midtjylland	12.33	2	0.022	0.05	0.05
Pb	274	65. 1515	1	65. 1515_1	01-05-23	2:00:00 PM	97403/23		0.18	0.025	Midtjylland	14.00	3	0.036	0.05	0.05
Pb	274	65. 1516	1	65. 1516_1	23-08-23	9:25:00 AM	191387/23		7.8	0.025	Midtjylland	9.42	1	1.56	0.05	1.56
Pb	274	65. 1516	1	65. 1516_1	23-08-23	10:10:00 AM	191386/23		4.1	0.025	Midtjylland	10.17	2	0.82	0.05	0.82
Pb	274	65. 1516	1	65. 1516_1	23-08-23	12:00:00 PM	191612/23		1.4	0.025	Midtjylland	12.00	3	0.28	0.05	0.28
Pb	274	65. 1517	1	65. 1517_1	06-09-23	9:40:00 AM	203316/23		20	0.025	Midtjylland	9.67	1	4	0.05	4
Pb	274	65. 1517	1	65. 1517_1	06-09-23	10:25:00 AM	203329/23		8.9	0.025	Midtjylland	10.42	2	1.78	0.05	1.78
Pb	274	65. 1517	1	65. 1517_1	06-09-23	12:00:00 PM	203516/23		5.8	0.025	Midtjylland	12.00	3	1.16	0.05	1.16

Stof	StanCode	DGUNR	Indtag	ID	Prøve			Attr	Value (ug/l)	LOD	Enhed	Sample		Analytical uncertainty		
					Dato	Tid	nr.					Time	Order	Urel (ug/l)	Uabs (ug/l)	U (ug/l)
Pb	274	65. 1520	1	65. 1520_1	25-05-23	8:45:00 AM	123204/23		0.64	0.025	Midtjylland	8.75	1	0.128	0.05	0.128
Pb	274	65. 1520	1	65. 1520_1	25-05-23	9:35:00 AM	123205/23		0.16	0.025	Midtjylland	9.58	2	0.032	0.05	0.05
Pb	274	65. 1520	1	65. 1520_1	25-05-23	11:10:00 AM	123353/23		0.19	0.025	Midtjylland	11.17	3	0.038	0.05	0.05
Pb	274	65. 1523	1	65. 1523_1	09-11-23	11:50:00 AM	262454/23		56	0.025	Midtjylland	11.83	1	11.2	0.05	11.2
Pb	274	65. 1523	1	65. 1523_1	09-11-23	12:40:00 PM	262455/23		20	0.025	Midtjylland	12.67	2	4	0.05	4
Pb	274	65. 1523	1	65. 1523_1	09-11-23	2:00:00 PM	262526/23		11	0.025	Midtjylland	14.00	3	2.2	0.05	2.2
Pb	274	83. 1702	1	83. 1702_1	09-10-23	10:30:00 AM	233296/23		3.7	0.025	Midtjylland	10.50	1	0.74	0.05	0.74
Pb	274	83. 1702	1	83. 1702_1	09-10-23	11:10:00 AM	233295/23		2.4	0.025	Midtjylland	11.17	2	0.48	0.05	0.48
Pb	274	83. 1702	1	83. 1702_1	09-10-23	12:25:00 PM	233169/23		1.9	0.025	Midtjylland	12.42	3	0.38	0.05	0.38
Pb	274	83. 1703	1	83. 1703_1	29-03-23	8:55:00 AM	69302/23		19	0.025	Midtjylland	8.92	1	3.8	0.05	3.8
Pb	274	83. 1703	1	83. 1703_1	29-03-23	9:35:00 AM	69259/23		50	0.025	Midtjylland	9.58	2	10	0.05	10
Pb	274	83. 1703	1	83. 1703_1	29-03-23	10:15:00 AM	69303/23		38	0.025	Midtjylland	10.25	3	7.6	0.05	7.6
Pb	274	186. 843	1	186. 843_1	06-03-23	11:05:00 AM	49220/23		5.1	0.025	Sjælland	11.08	1	1.02	0.05	1.02
Pb	274	186. 843	1	186. 843_1	06-03-23	12:15:00 PM	49218/23		0.25	0.025	Sjælland	12.25	2	0.05	0.05	0.05
Pb	274	186. 843	1	186. 843_1	06-03-23	1:40:00 PM	49221/23		0.18	0.025	Sjælland	13.67	3	0.036	0.05	0.05
Pb	274	186. 844	1	186. 844_1	08-03-23	11:35:00 AM	51152/23		6	0.025	Sjælland	11.58	1	1.2	0.05	1.2
Pb	274	186. 844	1	186. 844_1	08-03-23	12:40:00 PM	51149/23		0.53	0.025	Sjælland	12.67	2	0.106	0.05	0.106
Pb	274	186. 844	1	186. 844_1	08-03-23	2:05:00 PM	51155/23		0.088	0.025	Sjælland	14.08	3	0.0176	0.05	0.05
Pb	274	186. 846	1	186. 846_1	07-09-23	10:21:00 AM	205364/23		0.058	0.025	Sjælland	10.35	1	0.0116	0.05	0.05
Pb	274	186. 846	1	186. 846_1	07-09-23	11:20:00 AM	205384/23		0.11	0.025	Sjælland	11.33	2	0.022	0.05	0.05
Pb	274	186. 846	1	186. 846_1	07-09-23	12:41:00 PM	205385/23		0.053	0.025	Sjælland	12.68	3	0.0106	0.05	0.05
V	350	65. 1513	1	65. 1513_1	01-05-23	8:50:00 AM	97393/23	<	0.05	0.05	Midtjylland	8.83	1	0.01	0.5	0.5
V	350	65. 1513	1	65. 1513_1	01-05-23	9:40:00 AM	97390/23		0.055	0.05	Midtjylland	9.67	2	0.011	0.5	0.5
V	350	65. 1513	1	65. 1513_1	01-05-23	11:15:00 AM	97394/23		0.057	0.05	Midtjylland	11.25	3	0.0114	0.5	0.5
V	350	65. 1514	1	65. 1514_1	13-11-23	10:40:00 AM	265141/23	<	0.2	0.2	Midtjylland	10.67	1	0.04	0.5	0.5
V	350	65. 1514	1	65. 1514_1	13-11-23	11:30:00 AM	265142/23	<	0.2	0.2	Midtjylland	11.50	2	0.04	0.5	0.5
V	350	65. 1514	1	65. 1514_1	13-11-23	1:15:00 PM	265166/23	<	0.2	0.2	Midtjylland	13.25	3	0.04	0.5	0.5
V	350	65. 1515	1	65. 1515_1	01-05-23	11:30:00 AM	97402/23		1.4	0.05	Midtjylland	11.50	1	0.28	0.5	0.5
V	350	65. 1515	1	65. 1515_1	01-05-23	12:20:00 PM	97400/23		1.4	0.05	Midtjylland	12.33	2	0.28	0.5	0.5
V	350	65. 1515	1	65. 1515_1	01-05-23	2:00:00 PM	97403/23		1.4	0.05	Midtjylland	14.00	3	0.28	0.5	0.5
V	350	65. 1516	1	65. 1516_1	23-08-23	9:25:00 AM	191387/23		0.061	0.05	Midtjylland	9.42	1	0.0122	0.5	0.5
V	350	65. 1516	1	65. 1516_1	23-08-23	10:10:00 AM	191386/23		0.062	0.05	Midtjylland	10.17	2	0.0124	0.5	0.5
V	350	65. 1516	1	65. 1516_1	23-08-23	12:00:00 PM	191612/23		0.061	0.05	Midtjylland	12.00	3	0.0122	0.5	0.5
V	350	65. 1517	1	65. 1517_1	06-09-23	9:40:00 AM	203316/23		0.096	0.05	Midtjylland	9.67	1	0.0192	0.5	0.5
V	350	65. 1517	1	65. 1517_1	06-09-23	10:25:00 AM	203329/23		0.096	0.05	Midtjylland	10.42	2	0.0192	0.5	0.5
V	350	65. 1517	1	65. 1517_1	06-09-23	12:00:00 PM	203516/23		0.1	0.05	Midtjylland	12.00	3	0.02	0.5	0.5
V	350	65. 1520	1	65. 1520_1	25-05-23	8:45:00 AM	123204/23	<	0.05	0.05	Midtjylland	8.75	1	0.01	0.5	0.5
V	350	65. 1520	1	65. 1520_1	25-05-23	9:35:00 AM	123205/23		0.059	0.05	Midtjylland	9.58	2	0.0118	0.5	0.5
V	350	65. 1520	1	65. 1520_1	25-05-23	11:10:00 AM	123353/23		0.07	0.05	Midtjylland	11.17	3	0.014	0.5	0.5
V	350	65. 1523	1	65. 1523_1	09-11-23	11:50:00 AM	262454/23	<	0.2	0.2	Midtjylland	11.83	1	0.04	0.5	0.5
V	350	65. 1523	1	65. 1523_1	09-11-23	12:40:00 PM	262455/23		0.34	0.2	Midtjylland	12.67	2	0.068	0.5	0.5
V	350	65. 1523	1	65. 1523_1	09-11-23	2:00:00 PM	262526/23		0.38	0.2	Midtjylland	14.00	3	0.076	0.5	0.5
V	350	83. 1702	1	83. 1702_1	09-10-23	10:30:00 AM	233296/23	<	0.2	0.2	Midtjylland	10.50	1	0.04	0.5	0.5
V	350	83. 1702	1	83. 1702_1	09-10-23	11:10:00 AM	233295/23	<	0.2	0.2	Midtjylland	11.17	2	0.04	0.5	0.5
V	350	83. 1702	1	83. 1702_1	09-10-23	12:25:00 PM	233169/23	<	0.2	0.2	Midtjylland	12.42	3	0.04	0.5	0.5

Stof	StanCode	DGUNR	Indtag	ID	Prøve			Attr	Value (ug/l)	LOD	Enhed	Sample		Analytical uncertainty		
					Dato	Tid	nr.					Time	Order	Urel (ug/l)	Uabs (ug/l)	U (ug/l)
V	350	83. 1703	1	83. 1703_1	29-03-23	8:55:00 AM	69302/23	<	0.05	0.05	Midtjylland	8.92	1	0.01	0.5	0.5
V	350	83. 1703	1	83. 1703_1	29-03-23	9:35:00 AM	69259/23	<	0.05	0.05	Midtjylland	9.58	2	0.01	0.5	0.5
V	350	83. 1703	1	83. 1703_1	29-03-23	10:15:00 AM	69303/23	<	0.05	0.05	Midtjylland	10.25	3	0.01	0.5	0.5
V	350	186. 843	1	186. 843_1	06-03-23	11:05:00 AM	49220/23		14	0.05	Sjælland	11.08	1	2.8	0.5	2.8
V	350	186. 843	1	186. 843_1	06-03-23	12:15:00 PM	49218/23		19	0.05	Sjælland	12.25	2	3.8	0.5	3.8
V	350	186. 843	1	186. 843_1	06-03-23	1:40:00 PM	49221/23		18	0.05	Sjælland	13.67	3	3.6	0.5	3.6
V	350	186. 844	1	186. 844_1	08-03-23	11:35:00 AM	51152/23		0.5	0.05	Sjælland	11.58	1	0.1	0.5	0.5
V	350	186. 844	1	186. 844_1	08-03-23	12:40:00 PM	51149/23		0.63	0.05	Sjælland	12.67	2	0.126	0.5	0.5
V	350	186. 844	1	186. 844_1	08-03-23	2:05:00 PM	51155/23		0.6	0.05	Sjælland	14.08	3	0.12	0.5	0.5
V	350	186. 846	1	186. 846_1	07-09-23	10:21:00 AM	205364/23		1.7	0.05	Sjælland	10.35	1	0.34	0.5	0.5
V	350	186. 846	1	186. 846_1	07-09-23	11:20:00 AM	205384/23		2.2	0.05	Sjælland	11.33	2	0.44	0.5	0.5
V	350	186. 846	1	186. 846_1	07-09-23	12:41:00 PM	205385/23		1.9	0.05	Sjælland	12.68	3	0.38	0.5	0.5
Zn	353	65. 1513	1	65. 1513_1	01-05-23	8:50:00 AM	97393/23		39	0.3	Midtjylland	8.83	1	7.8	1	7.8
Zn	353	65. 1513	1	65. 1513_1	01-05-23	9:40:00 AM	97390/23		18	0.3	Midtjylland	9.67	2	3.6	1	3.6
Zn	353	65. 1513	1	65. 1513_1	01-05-23	11:15:00 AM	97394/23		9.6	0.3	Midtjylland	11.25	3	1.92	1	1.92
Zn	353	65. 1514	1	65. 1514_1	13-11-23	10:40:00 AM	265141/23		37	0.3	Midtjylland	10.67	1	7.4	1	7.4
Zn	353	65. 1514	1	65. 1514_1	13-11-23	11:30:00 AM	265142/23		9.7	0.3	Midtjylland	11.50	2	1.94	1	1.94
Zn	353	65. 1514	1	65. 1514_1	13-11-23	1:15:00 PM	265166/23		9.4	0.3	Midtjylland	13.25	3	1.88	1	1.88
Zn	353	65. 1515	1	65. 1515_1	01-05-23	11:30:00 AM	97402/23		76	0.3	Midtjylland	11.50	1	15.2	1	15.2
Zn	353	65. 1515	1	65. 1515_1	01-05-23	12:20:00 PM	97400/23		72	0.3	Midtjylland	12.33	2	14.4	1	14.4
Zn	353	65. 1515	1	65. 1515_1	01-05-23	2:00:00 PM	97403/23		63	0.3	Midtjylland	14.00	3	12.6	1	12.6
Zn	353	65. 1516	1	65. 1516_1	23-08-23	9:25:00 AM	191387/23		120	0.3	Midtjylland	9.42	1	24	1	24
Zn	353	65. 1516	1	65. 1516_1	23-08-23	10:10:00 AM	191386/23		32	0.3	Midtjylland	10.17	2	6.4	1	6.4
Zn	353	65. 1516	1	65. 1516_1	23-08-23	12:00:00 PM	191612/23		26	0.3	Midtjylland	12.00	3	5.2	1	5.2
Zn	353	65. 1517	1	65. 1517_1	06-09-23	9:40:00 AM	203316/23		9	0.3	Midtjylland	9.67	1	1.8	1	1.8
Zn	353	65. 1517	1	65. 1517_1	06-09-23	10:25:00 AM	203329/23		31	0.3	Midtjylland	10.42	2	6.2	1	6.2
Zn	353	65. 1517	1	65. 1517_1	06-09-23	12:00:00 PM	203516/23		22	0.3	Midtjylland	12.00	3	4.4	1	4.4
Zn	353	65. 1520	1	65. 1520_1	25-05-23	8:45:00 AM	123204/23		99	0.3	Midtjylland	8.75	1	19.8	1	19.8
Zn	353	65. 1520	1	65. 1520_1	25-05-23	9:35:00 AM	123205/23		24	0.3	Midtjylland	9.58	2	4.8	1	4.8
Zn	353	65. 1520	1	65. 1520_1	25-05-23	11:10:00 AM	123353/23		13	0.3	Midtjylland	11.17	3	2.6	1	2.6
Zn	353	65. 1523	1	65. 1523_1	09-11-23	11:50:00 AM	262454/23		650	0.3	Midtjylland	11.83	1	130	1	130
Zn	353	65. 1523	1	65. 1523_1	09-11-23	12:40:00 PM	262455/23		120	0.3	Midtjylland	12.67	2	24	1	24
Zn	353	65. 1523	1	65. 1523_1	09-11-23	2:00:00 PM	262526/23		59	0.3	Midtjylland	14.00	3	11.8	1	11.8
Zn	353	83. 1702	1	83. 1702_1	09-10-23	10:30:00 AM	233296/23		47	0.3	Midtjylland	10.50	1	9.4	1	9.4
Zn	353	83. 1702	1	83. 1702_1	09-10-23	11:10:00 AM	233295/23		29	0.3	Midtjylland	11.17	2	5.8	1	5.8
Zn	353	83. 1702	1	83. 1702_1	09-10-23	12:25:00 PM	233169/23		23	0.3	Midtjylland	12.42	3	4.6	1	4.6
Zn	353	83. 1703	1	83. 1703_1	29-03-23	8:55:00 AM	69302/23		580	0.3	Midtjylland	8.92	1	116	1	116
Zn	353	83. 1703	1	83. 1703_1	29-03-23	9:35:00 AM	69259/23		660	0.3	Midtjylland	9.58	2	132	1	132
Zn	353	83. 1703	1	83. 1703_1	29-03-23	10:15:00 AM	69303/23		470	0.3	Midtjylland	10.25	3	94	1	94
Zn	353	186. 843	1	186. 843_1	06-03-23	11:05:00 AM	49220/23		190	0.3	Sjælland	11.08	1	38	1	38
Zn	353	186. 843	1	186. 843_1	06-03-23	12:15:00 PM	49218/23		2.9	0.3	Sjælland	12.25	2	0.58	1	1
Zn	353	186. 843	1	186. 843_1	06-03-23	1:40:00 PM	49221/23		2.5	0.3	Sjælland	13.67	3	0.5	1	1
Zn	353	186. 844	1	186. 844_1	08-03-23	11:35:00 AM	51152/23		1600	0.3	Sjælland	11.58	1	320	1	320
Zn	353	186. 844	1	186. 844_1	08-03-23	12:40:00 PM	51149/23		130	0.3	Sjælland	12.67	2	26	1	26
Zn	353	186. 844	1	186. 844_1	08-03-23	2:05:00 PM	51155/23		33	0.3	Sjælland	14.08	3	6.6	1	6.6

Stof	StanCode	DGUNR	Indtag	ID	Prøve			Attr	Value (ug/l)	LOD	Enhed	Sample		Analytical uncertainty		
					Dato	Tid	nr.					Time	Order	Urel (ug/l)	Uabs (ug/l)	U (ug/l)
Zn	353	186. 846	1	186. 846_1	07-09-23	10:21:00 AM	205364/23		12	0.3	Sjælland	10.35	1	2.4	1	2.4
Zn	353	186. 846	1	186. 846_1	07-09-23	11:20:00 AM	205384/23		6	0.3	Sjælland	11.33	2	1.2	1	1.2
Zn	353	186. 846	1	186. 846_1	07-09-23	12:41:00 PM	205385/23		2.6	0.3	Sjælland	12.68	3	0.52	1	1