Gør tanke til handling
VIA University College

Risiko for grundvandsforurening ved solcellepark

Kildeplads ved Vittarp

European Energy, Søborg
Revision 1: 18. marts, 2021

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1 Baggrund

I samarbejde med en lodsejer ønsker European Energy at etablere en grøn energiløsning bestående af en jordbaseret solcellepark på en mark ved Søvigbækvej og Randsigvej/Bahlvej, 1 km sydøst for Vittarp ved Varde. I samme område planlægger DIN Forsyning A/S at etablere en ny kildeplads med en række indvindingsboringer til drikkevandsforsyning. Det bemærkes, at kombinationen af solcelleparker på kildepladser kan tænkes fremover at være en løsning, der kan anvendes andre steder i Danmark.

1.1 Formål

Formålet med dette notat er at belyse risikoen for grundvandsforurening ved etablering, drift og afvikling af en solcellepark. Formålet opnås ved en blanding af skrivebordsarbejde, hvor litteratur om emnet undersøges og empiriske målinger, hvor der foretages analyse af udvalgte emner. Dette notat har ikke til formål at beskrive arbejdsmiljø, visuelle gener, lydgener eller andre miljøaspekter end grundvandsforurening.

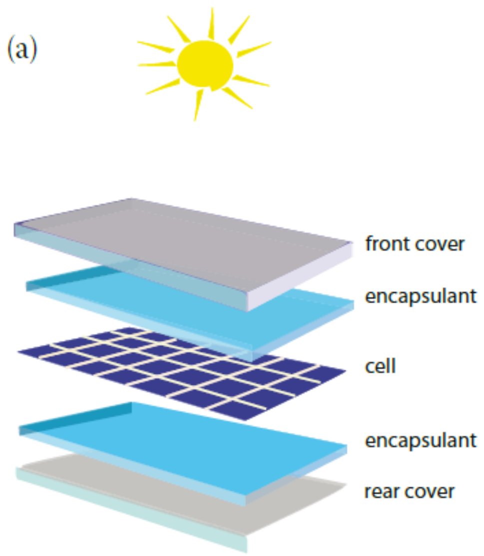
Fremgangsmåden ved denne belysning er at identificere potentielle risici for grundvandsforurening, vurdere de enkelte risicis niveau (grøn, gul, rød) og udføre empiriske målinger af relevante risici. De empiriske målinger udføres for at belyse en ”worst case” tilfælde. Hvis analyser afdække udvaskning af stoffer, der kan forurene grundvand, skal der først bagefter opstilles mere realistiske scenarier til en egentlig risikovurdering.

Udvaskningslitteraturen for solceller er tidligere beskrevet (Nain og Kumar, 2000; DHI 2019). Herudover er der også udført praktiske forsøg med udvaskning (Tammaro et al., 2016; Nover et al., 2017). Det understreges, at dette notat ikke omhandler solvarmeanlæg, hvor der er tale om en solvarmevæske, der cirkulerer gennem solfanger (Miljøministeriet, 2021).

1.2 Solcellepark ved Vittarp

En solcellepark er en samling af solpaneler, der består af fotovoltaiske celler. Cellerne producerer strøm, hvormed der skelnes mellem solcellepark og solvarmeanlæg, der producerer varmtvand. Solceller forbindes elektrisk i serie til den ønskede spænding, og i parallel til den ønskede strømstyrke. Ud over solceller består en solcellepark af vekselrettere (der omdanner jævnstrøm til vekselstrøm), kabler, og transformere (der omsættes vekselstrøm ved en lav spænding og høj strømstyrke, til vekselstrøm ved en højere spænding og lav strømstyrke). Da solcelleparker forbindes til elnettet, er der ikke tale om akkumulatorer.

Fotovoltaiske celler omdanner sollys til elektrisk strøm ved hjælp af halvledere (GreenMatch, 2020). Der opbygges spænding mellem elektroder i halvlederen, når den udsættes for lys. Spændingen medfører jævnstrøm, der kan omdannes til vekselstrøm og sendes ud i elnettet. Fotovoltaiske paneler opbygges af en sandwich (se Figur **1**) bestående øverst af glas med anti-refleksbehandling, i midten elektrisk forbundene celler med elektroder på begge sider samt og to stykker folie som limer strukturen sammen til en enhed, se Figur 1.



Figur 1 Opbygning af en solcelle (Peike, 2013).

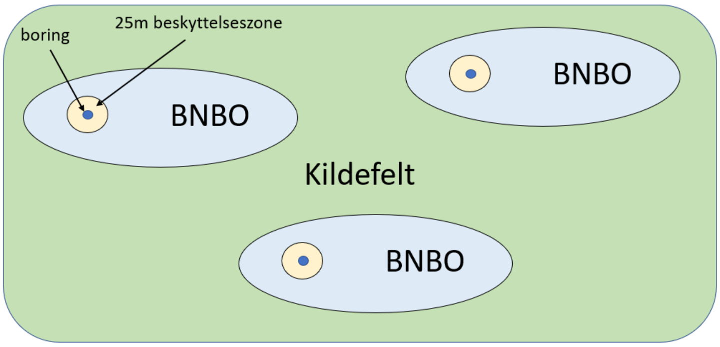
1.3 Det planlagte område ved Vittarp

I dag består området af landbrugsjord med syv eksisterende vindmøller. Søvigbæk samt en olietransmissionsledning gennemløber området og Nybro Gasbehandlingsanlæg ligger sydvest for området. Solcelleparken planlægges at udgøre ca. 160 hektar og planlægges at producere 125 MW, svarende til energiforbruget for ca. 30.200 husstande (Agri Nord, 2020). Der kan blive tale om paneler på faste stativer eller paneler monteret på stativer med tracker system.

Friarealet mellem solcellerækkerne henligger som udgangspunkt i græs, med klipning én gang om året. Langs parkens afgrænsning planlægges etablering af trådhegn og 3-rækket beplantningsbælte. Hermed formodes at hele området bliver taget ud af landbrugsdrift. Området omkring Søvigbæk planlægges frihold for solcellepaneler således at det kan fungere som faunapassage. Et areal indenfor området (matr.nr. 4p og 4s Orten, Varde Jorder) planlægges frihold for solcellepaneler bl.a. af hensyn til landbrugsdrift.

1.4 Områder ved et kildefelt

Der skelnes mellem forskellige områder i forbindelse med et kildefelt til et vandværk, se Figur 2.



Figur 2 Overblik over det konceptuelle forhold mellem kildefelt, BNBO og beskyttelseszone.

Kildefelt: Et kildefelt er et område med en gruppe af indvindingsboringer til en almene vandforsyning. Kildefeltet ved Vittarp forventes at bestå af ca. 10 indvindingsboringer. Kildefeltet er placeret ved en begravet dal (GEUS, 2018), med fin-mellemkornet smeltevandssand med tilfredsstillende ydelse i 105-130 m u.t. overlejret af en tyk sekvens af ler og silt. Hele kildefeltet er omfattet af en dyrkningsaftale mellem lodsejer og DIN forsyning, hvormed brug af pesticider i området ikke er tilladt.

Ved skrivende stund er udformningen af Vittarp Kildefelt ikke endelig fastlagt og indvindingsboringerne er endnu ikke udført. Der planlægges 10 indvindingsboringer med en årlig indvinding på 1,5 millioner m^3 grundvand (Ejsbøl, 2020). Boringerne placeres i en dobbelt række i en øst-vest tracé. Indvindingsoplandet er modelleret til at strække sig fra kildepladsen mod nordøst. Boringerne placeres så de enkelte BNBO’er overlapper ikke, men støder op mod hinanden eller har lidt areal mellem hver BNBO.

Boringsnære beskyttelsesområder (BNBO): Disse områder er defineret som fagligt og administrativt udpegede nærområder til boringer til almene vandforsyninger, hvor der er en særlig risiko for forurening af det grundvand, som bruges til drikkevand (Miljøstyrelsen, 2020). Det er den enkelte kommune, som har ansvaret for risikovurderingen af BNBO’er. Ved Vittarp forventes boringerne at være placeret så langt fra hinanden i kildefeltet, at BNBO’erne ikke overlapper.

25m zone: I en zone med 25 m radius omkring boringer, der indvinder vand til almen vandforsyning, må der ikke anvendes pesticider, dyrkes og gødes til erhvervsmæssige og offentlige formål (Miljø- og Fødevareministeriet, 2019a). Yderligere forhold omkring denne zone er beskrevet i en vejledning (Miljøstyrelsen, u.d.).

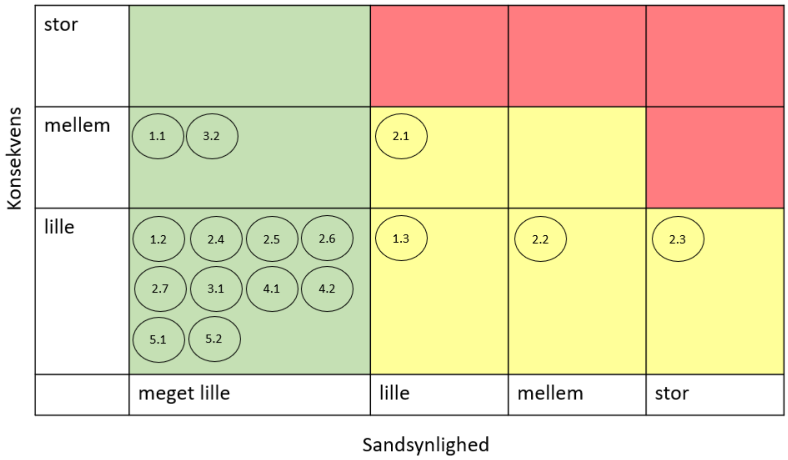
Indvindings- og grundvandsdannende oplande: Indvindingsoplandet til en kildeplads strækker sig typisk flere kilometer fra kildepladsen i opstrøms retning. Den del af indvindingsoplandet, hvor regnvandet siver fra jordoverfladen ned til grundvandsmagasinet og videre hen til indvindingsboringen kaldes for det grundvandsdannende opland (Karlsen og Sørensen, 2014).

2 Identifikation af grundvandsrisici

Risici for grundvandsforurening ved en solcellepark placeret ved en kildeplads kan belyses ved hjælp af Dokumenteret Drikkevandssikkerhed (DDS) (By- og Landskabsstyrelsen, 2004). DDS er vandbranchens system til styring af risici for drikkevandet og er et aktivt ledelsesværktøj frem for et kontrolværktøj. DDS er omtalt i lovgivningen for almene vandforsyningsanlæg, der leverer mere end 750.000 m^3 vand pr. år (Miljø- og Fødevareministeriet, 2013).

Til udarbejdelse af en DDS-plan, bliver hvert led i vandforsyningssystemet vurderet i forhold til, hvad der kan gå galt, og hvor kritisk det er. De kritiske forhold identificeres og prioriteres, og der opstilles en plan for forebyggelse ved styring af de fundne risici. Når kritiske risikofaktorer er identificeret, prioriteres de i en vurderingsmodel i form af matrix (se Figur 3) med tre risikoniveauer (grøn, gul og rød farver). Rød indikerer moderat til høj risiko, hvor risikoen skal håndteres aktivt ved styrende foranstaltninger. Gul indikerer lav risiko, hvor risikoen håndteres gennem et understøttende program. Grøn indikerer meget lille risiko, hvor der ikke er behov for aktiv styring.

Figur 3 viser en risikomatrix med forskellige risici fra dette afsnit placeret.



Konsekvens				
stor	🟩	🟥	🟥	🟥
mellem	🟩 1.1 3.2	🟨 2.1	🟨	🟥
lille	🟩 1.2 2.4 2.5 2.6 2.7 3.1 4.1 4.2 5.1 5.2	🟨 1.3	🟨 2.2	🟨 2.3
	meget lille	lille	mellem	stor

Sandsynlighed

Figur 3 Risikomatrix med tre niveauer (farver) på basis af sandsynligheden og konsekvensen af en hændelse. De identificerede risici er placeret i cirkler i matrixen.

I de følgende afsnit gennemgås relevante forhold ved en solcellepark og risici identificeres. Hver risici gives et nummer for at lette henvisninger. Efter hver risici angives sandsynligheden og konsekvensen af en evt. hændelse og den samlede risiko i forhold til Figur 3.

2.1 Etablering

Under etablering vil der være en række aktiviteter, der kun udføres én gang, men som potentielt udgør en risiko for forurening af grundvand.

1.1 **Transport:** Stativer, solcellepaneler, kabler, m.m. vil ankomme til grunden på lastbiler. Lastbilerne vil kunne holde udenfor BNBO’erne. Derefter vil emner bringes ind på området med hjælp af palleløftere.

Potentiel risiko: Lastbiler påkører en boring eller brændstof lækker fra en lastbil.
🟩 Sandsynlighed: meget lille; Konsekvens: mellem; Risiko: grøn

1.2 **Gravearbejde:** Kabler nedgraves ved hjælp af en gravemaskine, der formentlig bruger diesel som brændstof.

Potentiel risiko: Diesel lækker fra gravemaskinen.
🟩 Sandsynlighed: meget lille; Konsekvens: lille; Risiko: grøn

1.3 **Påfyldning af transformerolie:** Transformere beskrives i afsnit 2.2. Mens fordelingstransformere leveres med olie allerede påfyldt, skal effekttransformere påfyldes med olie i etableringsfasen.

Potentiel risiko: Håndtering af denne olie medfører spild. Evt. spild under påfyldning vil kunne opdages af tilsyn så afværgeforanstaltning straks kan iværksættes.
🟨 Sandsynlighed: lille; Konsekvens: lille; Risiko: gul

2.2 Anlæg

Solcelleanlægget består af en række komponenter, der står på en mark i en periode på flere årtier. Komponenterne udgør potentielt en risiko for grundvandsforurening.

2.1 **Transformerolie:** En transformer består af to magnetisk tæt-koblede spoler (ofte af kobber) samt en lamineret siliciumholdige stålkerne. Deres formål er at omsætte vekselstrøm ved én spænding og strømstyrke til en anden. Ved en solcellepark er der tale om to typer transformere: en række mindre step-up eller fordelingstransformere samt én eller to power/effekttransformere.

Alle transformer har også behov for isolering, kølning og dæmpning af lysbuer. Det gøres oftest ved hjælp af en væske. Det bemærkes, at de miljøskadelige stoffer PCB'er, som var den mest udbredte form for isoleringsvæske fra 1930 og 50 år frem er ikke længere i brug. I stedet anvendes oftest mineralolie, fx NytroLibra fra Nynas, Sverige. Transformerolie skal være stabil ved høje temperaturer og have gode køle- og elektrisk isolerende evner. Selv om mineralolie er mest udbredt i dag, findes der også alternativer. En nedbrydelige biobaseret olietype består af estere (Midel, 2020), fx Nytro Bio 300X. Transformere med esterolie er ca. 15% dyrere og bruger lidt større mængde olie. Mængden af olie i en transformer er i størrelsesorden ½-1½ m^3 for fordelingstransformer og 10 gange så meget til en effekttransformer. Til evt. lækager er transformere normalt udstyret med et olieopsamlingskar med mindst samme størrelse som olien. Transformere kan installeres med niveauføler og temperaturmåler, som er tilkoblet et alarmsystem. Krav til disse eller lignende foranstaltninger kan fx stilles i tilladelsen.

Transformerolie indeholder inhibitorer til at begrænse oxidationen af olien over tid. Disse inhibitorer kan forekomme i mindre mængder (ikke inhiberet) eller større mængde (inhiberet). De mest almindelige syntetiske inhibitorer er DBPC (2, 6-ditertiær-butyl para-cresol) også kendt som BHT (butylerede hydroxytoluen) og DBP (2, 6-ditertiær-butyl phenol). Naturlige inhibitorer inkluderer forskellige svovlforbindelser. BHT anses ikke som særlig toksisk, er immobil i jord (har en høj oktanol/vand-forhold) og en lav opløselighed (Fries & Püttmann, 2002). BHT og dets nedbrydningsprodukt er tidligere fundet i grundvand (Fries & Püttmann, 2004).

Der findes også tør transformere med epoxyharpiks kompositmateriale i stedet for olie. Disse transformere laves kun til fordelingstransformere og ikke til store effekttransformere. Tør transformere har den fordel, at de ikke brænder, men til gengæld har de en ringere effekt og de larmer lidt mere.

Potentiel risiko: lækage af transformerolie ud på jorden.
🟨 Sandsynlighed: lille; Konsekvens: mellem; Risiko: gul

2.2 **Paneler:** Disse består af en sandwich-konstruktion med forskellige komponenter, der oplistes nedenfor. Undtagen solpanelernes coating er de fleste komponenter beskyttet i konstruktionen og er dermed normalt ikke udsat for nedbør.

Halvleder: Solceller er baseret på halvledere. Mange forskellige materialer kan fungere som halvleder (Paranthaman, et al., 2018) herunder silicium, cadmium-tellurid, og kobber-indium-gallium-diselenid (CIGS), mens flere typer er under udvikling. Det understreges at den påtænkte solcelletype ved Vittarp er silicium (se Figur 1). Denne type fungerer ved at dope silicium med fosfor (for at skabe negative ladninger) og bor (for at skabe positive ladninger eller ”huller”).

Encapsulanter: Disse stoffer anvendes til at sikre god sammenhængskræft mellem delene af solcellens laminat. Der findes flere typer encapsulation materialer (Peike, et al., 2013). I flere årtier har materialet EVA (Ethylene Vinyl Acetate) domineret. Under produktion bliver materialet hærdet, hvorefter risikoen for opløsning er begrænset.

Panelets strømførende system - Busbars, tabbing/bus ribbons og lodninger: Strøm fra halvlederen samles i printet tråd, sendes via ledende ”bus bars”, som sættes i serie mellem cellerne via tabbing ribbons, ofte af kobber belagt med sølv. Flere metaller kan indgå i disse dele samt lodninger, herunder kobber, bly, sølv og tin (Zarmai, 2015). Ved hærværk eller vindstorm kan solcellepaneler evt. knuses. Krav til opsamling af evt. knuste paneler kan fx stilles i tilladelsen.

Potentiel risiko: Knusning af solcellepanelet, hvor stykkerne får lov til at ligge på jorden.
🟨 Sandsynlighed: mellem; Konsekvens: lille; Risiko: gul

2.3 **Solpanel coating:** Solpaneler coates for at mindske den optiske refleksion og fremme en selvrensende effekt. Coatingen har interesse for dette notat, da den udgør den største overflade i m^2, der kommer i kontakt med regnvand inden nedsivning til grundvandsmagasiner. Generelt er coatingsområdet under udvikling og der arbejdes med coatings med superhydrofobiske, superhydrofiliske og fotoaktive forbindelser (Mozumder, et al., 2019). For solpanelerne ved Vittarp-parken forventes coatingen at bestå af ren kvarts med en tykkelse på ca. 0,1 µm. For at sikre at coatingen har lige så lang en levetid som resten af panelet, hærdes den efter påføring så den brænder fast i overfladen (fx 700° C). Processen, hvor coatingen påføres glasset, sker ved brug af opløsningsmidler. Disse forventes dog ikke at kunne overleve opvarmningen. Til gengæld kan den færdige sandwich-konstruktion tørres af for at fjerne fingeraftryk på nye paneler inden de pakkes fra fabrikken. Der anvendes almindeligt glaspudsemiddel eller lignende til dette.

Potentiel risiko: Nedbør falder på panelerne, opløser dele af coatingen og drypper videre på jorden.
🟨 Sandsynlighed: stor; Konsekvens: lille; Risiko: gul

2.4 **Stativer og panelrammer:** Disse består oftest af galvaniseret stål med anti-korrosions overflade som fx Magnelis. Magnelis består af zink, aluminium og magnesium. Det bemærkes, at overfladen kan tørres over med olie eller E-passivation (ArcelorMittal, 2020). Panelrammer kan være aluprofiler.

Potentiel risiko: Opløsning af stativer/panelrammer i nedbøren.
🟩 Sandsynlighed: meget lille; Konsekvens: lille; Risiko: grøn

2.5 **Kabler:** AC-kabler forventes at bestå af aluminium, mens DC-kabler forventes at bestå af kobber. Alle kabler er beskyttet af PVC kapper. Kabler mellem panelrækker og transformer nedgraves.

Potentiel risiko: Kabler ældes og opløses af nedsivende regnvand.
🟩 Sandsynlighed: meget lille; Konsekvens: lille; Risiko: grøn

2.6 **Vekselrettere:** Dette elektronisk kredsløb konvertere jævnstrøm til vekselstrøm. Typisk hænger vekselrettere på bagsiden af nogle af solpanelerne.

Potentiel risiko: Regnvand trænger ind i vekselrettere og opløser metaldele.
🟩 Sandsynlighed: meget lille; Konsekvens: lille; Risiko: grøn

2.7 **Motorer:** Hvis der anvendes solpaneler monteret på stativer, som kan dreje sig efter solen (trackere) er der behov for brug af motorer.

Potentiel risiko: Regnvand trænger ind i motorer og opløser metaldele.
🟩 Sandsynlighed: meget lille; Konsekvens: lille; Risiko: grøn

2.3 Drift

3.1 **Rengøring:** Effekten af en solcelle nedsættes, hvis paneloverfladen er beskidt. Paneler kan blive beskidte særligt i støvede omgivelser. Udover støv kan pollen, fugleklatter samt vækst af lav også medføre udfordringer (Lopez-Garcia et al., 2016). Der er ikke tradition for rengøring af solpanelparker under danske forhold. Ved risikovurderingen antages at der i tilladelsen gives særlige regler, der forbyder brug af rengøringsmidler, der kan medføre grundvandsforurening.

Potentiel risiko: Rengøringsmidler drypper ned på jorden.
🟩 Sandsynlighed: meget lille; Konsekvens: lille; Risiko: grøn

3.2 **Pasning af bevoksning:** Der kan være behov for at holde bevoksningen omkring stativerne nede så bevoksningen ikke skygger for panelerne. I risikovurderingen antages at der stilles krav i tilladelsen, at der ikke må anvendes pesticider.

Potentiel risiko: Der anvendes pesticider til ukrudtsbekæmpelse.
🟩 Sandsynlighed: meget lille; Konsekvens: mellem; Risiko: grøn

2.4 Afvikling

4.1 **Nedtagning og genanvendelse af paneler:** Når anlægget i udtjent skal det fjernes. I risikovurderingen antages at der stilles krav i tilladelsen til nedtagning af panelerne.

Potentiel risiko: Udtjent anlæg fjernes ikke.
🟩 Sandsynlighed: meget lille; Konsekvens: lille; Risiko: grøn

4.2 **Opgravning af kabler:** Når anlægget er udtjent, skal kabler fjernes. Da kabler har værdi i forbindelse med genanvendelse, er der mindre risiko for, at disse bliver glemt. I risikovurdering antages at der stilles krav i tilladelsen til opgravning af kabler.

Potentiel risiko: Kabler opgraves ikke i forbindelse med afvikling af anlægget.
🟩 Sandsynlighed: meget lille; Konsekvens: lille; Risiko: grøn

2.5 Diverse hændelser

5.1 **Brand:** Der kan forekomme brand fra elektriske lysbue/markbrand/lynnedslag: Ufuldstændig forbrænding af PVC kan udvikle dioxin. Ved slukning af brand bruges ofte større mængder vand, der fremmer nedsivning til grundvandet.

Potentiel risiko: Der forekommer brand i anlægget.
🟩 Sandsynlighed: meget lille; Konsekvens: lille; Risiko: grøn

5.2 **Hærværk og misvedligehold:** Tab af indtægt er en stærk drivkraft for at vedligeholde en solcellepark. Der kan evt. stilles krav om jævnligt tilsyn samt en frist til udbedring af evt. uacceptable forhold. I risikovurderingen antages at der et eller andet form for tilsyn ved anlægget.

Potentiel risiko: Anlægget forfalder ved hærværk eller misvedligehold.
🟩 Sandsynlighed: meget lille; Konsekvens: lille; Risiko: grøn

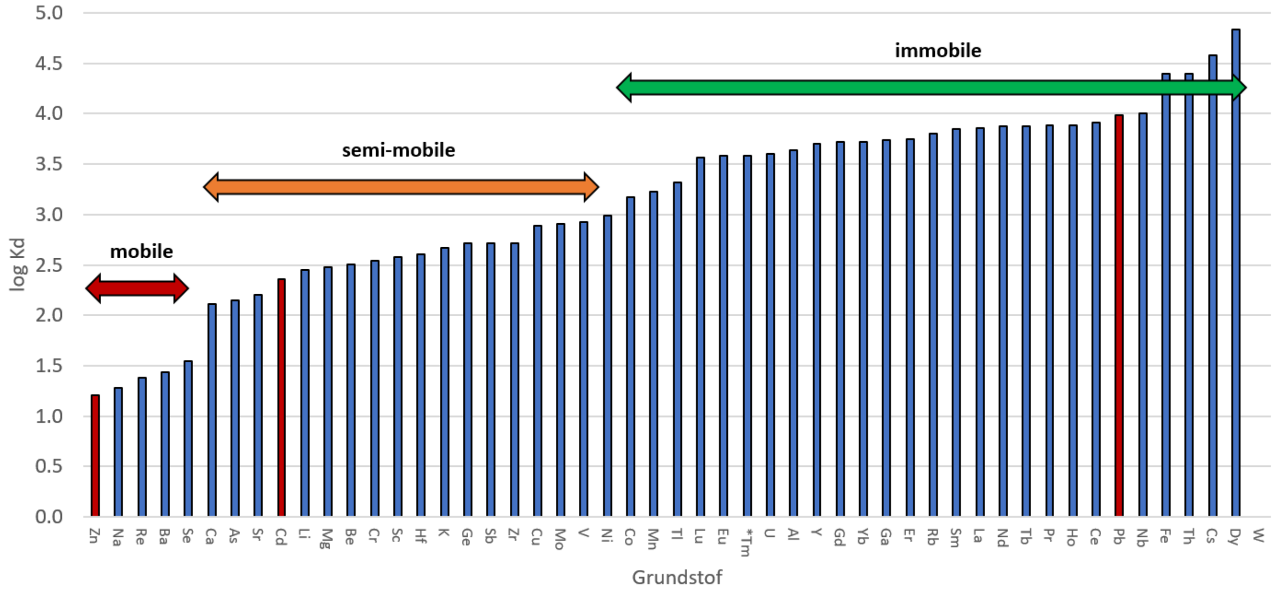
3 Kritiske stoffer og deres skæbne i miljøet

3.1 Mobilitet i jord og grundvand

Typiske jordforureninger sker i form af stoffer opløst i vand eller stoffer i en ”frifase”, dvs. en separat væske, der er ikke-blandbare med vand. Eksempler af disse former er opløste cadmium ioner og en frifase bestående af transformerolie. For at disse forureninger kan true et grundvandsmagasins kvalitet, skal de nedsive gennem porerne i den umættede zone og transporteres videre med grundvandet i den mættede zone (Maribo og Andersen, 2009).

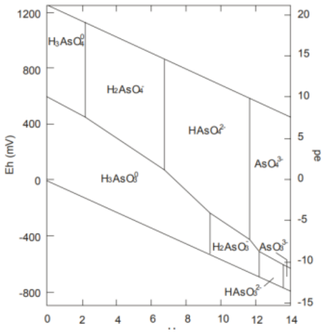
Undervejs bliver stofferne udsat for forskellige processer, der reducerer koncentrationerne. Nogle af de vigtigste af disse er sorption (uorganiske og organiske stoffer) samt nedbrydning (organiske stoffer). Hertil kommer processen dispersion, der spreder stoffet som følge af små variationer i vandets strømningshastighed og strømningsveje i jorden. I den umættede zone kan flygtige stoffer og stoffer med en høj Henrys konstant overføres i jordens poreluft for til sidst at blive nedbrudt eller frigivet til atmosfæren.

Tungmetaller: Tungmetallers skæbne i jord og grundvand bestemmes i høj grad af sorption og opløselighed. Sorption af tungmetaller er en fællesbetegnelse for processer, hvor stoffer hæfter sig til partiklerne i jorden. Jo større sorption, jo mindre risiko for at stoffet transporteres videre med grundvandet. Sorption kvantificeres ved fordelingskoefficienten, K_d, der beregnes som koncentrationen af stoffet i jorden delt med koncentrationen i vandet og har dermed enhederne L/kg. Foruden stoffet, afhænger K_d af jordens pH, lerindhold samt indhold af organisk stof. Figur 4 giver en indikation af grundstoffers mobilitet udtrykt som K_d på en logaritmisk skala.



Figur 4 Sorption af grundstoffer i udvalgte svenske jorde/sedimenter (Sheppard et al., 2009). Inddelingen i mobile (log Kd < 2), semi-mobile (log Kd = 2-3) og immobile (log Kd > 3) er arbitrært. Tungmetallerne zink, cadmium og bly er fremhævet i rød.

Opløselighed afhænger af hvilken forbindelse stoffet befinder sig i (stoffets tilstand) samt grundvandets sammensætning, hvor især vandets pH-værdi og redoxniveau er vigtige. Disse parametre kan visualiseres i form af et såkaldt tilstands- eller Pourbaixdiagram, se Figur 5. Her angives pH på x-aksen og redoxniveauet (ofte i mvolt) på y-aksen. Så inddeles området ind i felter, hvor forskellige forbindelser er stabile under den forudsætning, at ligevægt har indfundet sig. Når man kender forbindelsen fra tilstandsdiagrammet, kan man så fastlægge opløseligheden.



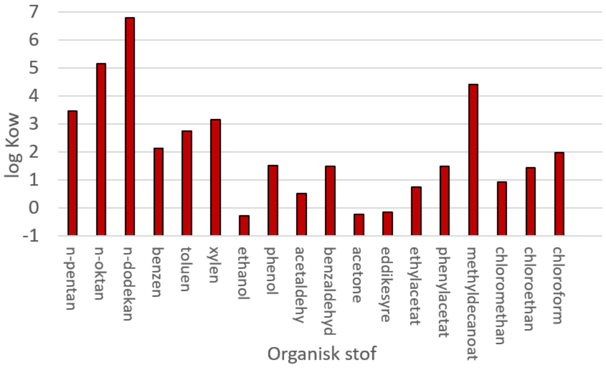
Figur 5 Simpelt tilstandsdiagram for arsen uden tilstedeværelse af andre ioner (Larsen & Kjøller, 2009).

Fastlæggelse af opløseligheden er dog endnu mere kompleks. For at udarbejde et tilstandsdiagram, skal man antage en række koncentrationer, både af stoffet selv og af diverse ioner i grundvandet, fx hydrogencarbonat og sulfat. Diagrammet er således kun gældende for de valgte koncentrationer.

Generelt adsorberer divalente ioner mere end monovalente ioner. Sulfid, der findes under stærkreducerede forhold, danner ofte ekstrem lavopløselige forbindelser.

Olie: Transformerolie har en densitet, der er mindre end vand. Afhængig af produktet kan det variere fra ca. 0,75 til 0,90 kg/L. Samtidig er opløseligheden i vand meget lav. Disse forhold betyder at olien optræder som en ikke-blandbare ”frifase”, der lægger sig ovenpå grundvandet. Kapillærkræfter i jorden er med til at løfte olien et stykke over vandspejlet og årsvariationer i vandspejlet spreder olien i en såkaldt ”smearzone”. Dybere forurening i et grundvandsmagasin skal derfor kun ske ved at den opløselig del af olien overføres fra frifasen til grundvandet.

Sorption af organiske stoffer kan estimeres ved den udbredt oktanol/vand-forholdet, ofte udtrykt i den logaritmiske form, log K_{ow} (Hermens, et al., 2013). Den udtrykker fordelingen af et stof mellem oktanol og vand (ikke-blandbare væsker). Jo højere tal, jo mere stoffet sorberer til jorden og jo mindre mobilt stoffet er i grundvandet. K_{ow} for udvalgte stoffer ses i Figur 6.



Figur 6 Oktanol/vand-fordelingskoefficient angivet som log K_{ow} (Sangster, 1989).

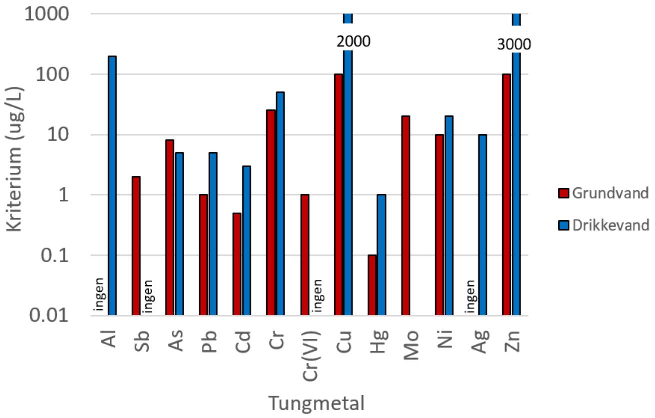
Som rettesnor kan man inddele stoffer i mobile ($K_{ow} < 2$), semimobile (K_{ow} = 2 til 5) og immobile ($K_{ow} > 5$). Det bemærkes, at sorptionen kan til en vist grad forudses ved at kigge på et stofs struktur, hvormed det hører under begrebet ”quantitative structure-activity relationships”, eller QSAR. Generelt er at større, apolære molekyler (fx mange oliestoffer) er immobile mens små, polære molekyler er mobile. Nedbrydningsstoffer er ofte mere mobile end moderstoffer.

Et organisk stofs nedbrydelighed er også vigtigt for vurdering af potentielle risiko for grundvandsforurening. Vanskeligt nedbrydelige stoffer kaldes persistente. I litteraturen ses udtrykket ”persistent organic pollutants” eller POP for disse stoffer. De fleste oliestoffer er let nedbrydelige, mens mange chlorerede opløsningsmidler og pesticider er persistente. Nedbrydning foregår ofte ved hjælp af mikroorganismer (biotisk) men kan også foregå abiotisk (Rambøll, 2010). I aerobt grundvand sker nedbrydning ofte hurtigere end i anaerobt grundvand.

3.2 Toksicitet og grænseværdier

Stoffers toksicitet varierer kraftig, både i grad (sammenhæng mellem dosis og virkningen) og i effekttypen. Ofte inddeler man toksiske effekter ind i akutte, kroniske og kræft.

Miljøstyrelsen har udarbejdet en liste over kvalitetskriterier for indhold af visse stoffer i grundvandet (Miljøstyrelsen, 2018). Desuden har den såkaldt ”Tilsynsbekendtgørelse” en liste over drikkevandskvalitetskriterier (Miljø- og Fødevareministeriet, 2019b). Figur 7 viser disse kriterier for udvalgte uorganiske stoffer. Som det ses, er der stor variation mellem kriterierne (over en faktor 10.000), hvilket er forventelige, da stoffernes toksicitet udviser stor variation. Det ses at kriterierne for grundvandet er ofte mere restriktiv end for drikkevandet.



Figur 7 Kvalitetskriterier for udvalgte tungmetaller (Miljøstyrelsen, 2018 & Miljø- og Fødevareministeriet, 2019b).

3.3 Identifikation af kritiske stoffer

For at identificere kritiske stoffer i forbindelse med etablering, drift og afvikling af et solcelleanlæg på et indvindingsområde for drikkevandsproduktion skal der både findes frem til de stoffer, der kan tænkes at slippe ud på jorden (Kapitel 2) og hvad deres skæbne i miljøet efter et udslip kunne være (Kapitel 3).

Risikoen for grundvand som følge af udslip af uorganiske stoffer til miljøet afhænger både af mobiliteten i jord og grundvand og stoffets toksicitet. Kritiske stoffer har en stor mobilitet og en stor toksicitet. Mobiliteten bestemmes af hvilken tilstand, et stof forekommer i, hvilken opløselighed stoffet har og hvilken sorption. Toksiciteten afspejler sig i kvalitetskriterier.

Ofte henregnes tungmetaller/halvmetaller som arsen, cadmium og kviksølv som uorganiske stoffer, der besidder både mobilitet og toksicitet. Andre stoffer besidder kun den ene eller den anden af disse egenskaber. For eksempel er bly toksisk men ikke særlig mobilt – og zink er mobilt, men ikke særlig toksisk.

Ved at følge denne tankegang, er metaller som cadmium det mest oplagte kandidater til kritiske uorganiske stoffer i forbindelse med etablering, drift og afvikling af solcelleanlæg på et indvindingsområde for drikkevandsproduktion.

Risikoen for grundvand som følge af udslip af uorganiske stoffer til miljøet afhænger stoffer, der samtidigt er persistente, mobile and toksiske, også kaldet PMT-stoffer i litteraturen (Rüdel, et al., 2020). Nedbrydelighed bestemmes oftest empirisk, mobilitet bestemmes af opløselighed og sorption udtrykt ved Kow, og toksiciteten afspejler sig i kvalitetskriterier.

Ofte henregnes visse chlorerede opløsningsmidler, monoaromatiske stoffer og pesticider som organiske stoffer, der besidder persistens, mobilitet og toksicitet. I mange tilfælde, er der ud over moderstoffer også tale om kritiske nedbrydningsprodukter. I visse tilfælde, et stoffer men forholdsvis lav toksicitet alligevel regnet som kritiske, blot fordi de er miljøfremmede og dermed uønsket i grundvand og drikkevand.

Ved at følge denne tankegang, er diverse tilsætningsstoffer i transformerolie (fx antioxidanter og deres nedbrydningsprodukter) de mest oplagte kandidater til kritiske organiske stoffer i forbindelse med etablering, drift og afvikling af solcelleanlæg på et indvindingsområde for drikkevandsproduktion.

4 Forsøg

4.1 Prøveforberedelse

Følgende prøver blev undersøgt ved ekstraktion og kemiske analyser.

Solcellepaneler
- Prøve 1: Flat group (kun frontglas med coating fra fabrik i Kina)
- Prøve 2: XYG (kun frontglas med coating fra fabrik i Kina)
- Prøve 3: CNBM (kun frontglas med coating fra fabrik i Kina)
- Prøve 4: Nedfaldent solcellepanel fra Risø-anlægget (hele celle, inkl. encapsulent, ribbons, lodninger, m.m.)

Figur 8 viser neddeling af prøverne. Prøve 1 og 2 var knust fra fabrikken og består af regulære ca. 5 mm stykker. Prøve 3 blev knust i en morter, hvilket gav aflange splinter med ca. 2-5 mm på den korte led. Prøve 4 kunne ikke knuses og skulle klippes i stykker på ca. 30 mm.

Figur 8 Neddeling af prøver af solcellepaneler.

Der blev modtaget to prøver af isolerende transformerolie fra det svenske firma Nynas. Oplysninger om produkterne findes i Bilag 1 i form af MSDS.

- Prøve 5: NYTRO Libra (traditionelt produkt baseret på oliedistillater)
- Prøve 6: NITRO BIO 300X (nyere bio-baserede esterprodukt konserveret med DBPC)

4.2 Ekstraktion

For at være en grundvandstrussel skal en evt. forurening opløses i vand. I det følgende beskrives metoder til ekstraktion af prøverne.

Der findes en række standardmetoder til ekstraktion af materialer. Disse metoder fastlægger vigtige parametre som ekstraktionsvæske (og hermed pH), emnets størrelse, ekstraktionstid, væske/stof (L/S)-forholdet og meget mere.

Blandt standardmetoderne med deres ekstraktionsvæske findes:

- DS/EN 12457-3: destilleret vand (Dansk Standard, 2002)
- USEPA metode 1311: Toxicity Characteristic Leaching Procedure (TCLP): eddikesyre og natriumhydroxid (USEPA, 1992)
- California Waste Extraction Test (WET): natriumcitrat (DTSC, 2005)

Ekstraktion af paneler: Solcellepaneler antages at komme i kontakt med regnvand som falder på paneloverfladerne, drypper på jorden og siver ned til den mættede zone. Hermed giver det mening at ekstrahere med kunstigt regnvand og at ekstraktionen fremskyndes ved at benytte et højt forhold mellem materialets overfladeareal (ved at knuse/klippe panelet) og vandfasen samt at forlænge kontakttiden ud over de få sekunder, der vil ske på en solcellepark i regnvejr. Undersøgelser med ekstraktion af knuste solcellepaneler viser, at forsøgsbetingelser som størrelsen af det nedknuste materiale, pH og ekstraktionstid har stor betydning for de opnåede resultater (Collins & Anctil, 2015). Det bemærkes at knusning/klipning forøger overfladearealet af cellen, men ikke af den del af glasset, der er overfladebehandlet.

Til ekstraktionen blev der valgt et L/S-forhold på 10:1 samt en ekstraktionstid på 24 t. Efter knusning/klipning blev mindst 50 g afvejet og placeret i en 500 mL plastflaske fyldt med kunstigt regnvand med et minimum af headspace og sat til ende-over-ende rotation (ca. 60 gange pr. minut). De aktuelle afvejninger var som følger:

Prøve 1: 76 g
Prøve 2: 55 g
Prøve 3: 86 g
Prøve 4: 200 g

Kunstigt regnvand blev fremstillet af demineraliseret vand med 0,2 mM NaCl, og 0,1 mM $NaHCO_3$, justeret til pH ca. 7,0 med fortyndet HCl.

Ekstraktion af olie: Olien antages at læke ud af transformerstationen og sive ned til grundvandsspejlet som en frifase, hvorefter det kommer i kontakt med grundvandet og delvis opløses. Hermed giver det mening af ekstrahere med kunstigt grundvand.

Til ekstraktion af transformerolien blev en 200 mL prøve placeret i en 2 L bluecap glasflaske fyldt med kunstigt grundvand og sat på hovedet på et rystebord så frifasen ikke er i berøring med låget.

Kunstigt grundvand blev fremstillet af 1 mM $CaCl_2$ og 1 mM $NaHCO_3$, justeret til pH ca. 7,0 med fortyndet HCl.

4.3 Kemiske analyser

Analyse af paneler: Ekstrakterne fra prøver af frontglas med coating (Prøve 1-3) og fra prøven af solcellepanelet (Prøve 4) blev screenet af Eurofins, Brørup ved ICP-MS for nedenstående parametre. Prøverne blev ikke filtrerede.

Ag, Al, As, B, Ba, Be, Bi, Br, Ca, Cd, Ce, Co, Cr, Cs, Cu, Dy, Er, Eu, Fe, Ga, Ga, Hf, Ho, I, K, Li, Lu, Mn, Mo, Nb, Nd, Ni, Os, Pb, Pd, Pt, Pr, Re, Rh, Rb, Ru, Sb, Se, Sm, Sn, Sr, Ta, Tb, Te, Th, Ti, Tl, Tm, V, W, Y, Yb, Zn, Zr

Desuden blev prøven fra solcellepanelet (Prøver 4) screenet for organiske stoffer ved metoden GC-FID.

Analyse af transformerolie: Ekstrakterne fra transformerolie (Prøve 5 og 6) blev screenet af Eurofins, Brørup. Her blev de vandige ekstrakter ekstraheret med pentan. Derefter blev de organiske ekstrakter analyseret ved metoderne GC-FID og GC-MS. Ved disse metoder kan stoffer som aromater, PCB'er, BHT identificeres.

4.4 Analyseresultater

Analyseblanketter fra laboratoriet for alle de udførte kemiske analyser findes i Bilag 2.

Afsmitning af uorganiske stoffer fra solpaneler:
Resultater (se Tabel 1) for de fire knuste solpanelprøver (se afsnit 4.1) viste store forskelle i ekstraktion af uorganiske stoffer. Prøve 1 og 2 (hhv. Flat group og XYG frontglas) udvist begrænset udvaskning, hvor de dominerende stoffer er aluminium og antimon. Prøve 3 (CNBM frontglas) udvist lidt større udvaskning (med zink, aluminium, bor, barium over 100 µg/L). Ikke overraskende var Prøve 4 (nedfaldet Risø panel med hele sandwich, ikke kun frontglas) præget ikke kun af glas og coating men også af ribbons og lodninger. Følgende stoffer fandtes i koncentrationer over 100 µg/L: bly, aluminium, kobber, tin, jern, barium, zink. Der blev også fundet sølv på 94 µg/L.

For at vurdere om de fundne stoffer i de fundne koncentrationer kan have betydning for grundvandskvaliteten skal der tages hensyn til stoffernes mobilitet (udtrykt ved sorption, se afsnit 3.1) samt toksicitet (udtrykt ved kvalitetskriterier, hvor disse findes, se afsnit 3.2). Det bemærkes, at der ikke blev fundet cadmium over detektionsgrænsen i nogen af prøverne. Cadmium blev på forhånd udpeget som potentielt problematisk på grund af høj mobilitet og toksicitet.

Det mest relevante kvalitetskriterier i den aktuelle situation er grundvandskvalitetskriterier (Miljøstyrelsen 2018). Af de 12 stoffer med kriterier er worst-case målinger udvist højere værdier i ekstraktionsvandet for stofferne antimon, bly, bor, kobber, sølv og zink. Af disse, er antimon, bor og zink mobile og dermed kandidater for grundvandsforurening. Af stoffer uden grundvandskvalitetskriterier er der ikke umiddelbart nogen med høje koncentrationer, der både er toksiske og mobile.

Antimon er et metal, der er nabo til arsen i det periodiske system. På samme måde som arsen, kan antimon forekomme i +III og +V oxidationstrin. Det formodes, at den pentavalent oxoanion, $Sb(OH_6)^-$, er den form, der forekommer ved frigivelse fra metaller (WHO, 2003a). Denne form er mindst toksisk, men også mobil. Antimon er ikke essentiel for mennesker.

Bor i det vandige miljø findes ofte som ikke-dissocieret borsyre, $B(OH)_3$, men kan også danne polyborationer, da bors kemi ligner den af silicium (WHO, 2003b). Betydelige koncentrationer af bor (ca. 4.500 µg/L) findes i havvand. Bor er essentiel for planter og har en række funktioner i mennesker, hvorfor der findes bor i visse kosttilskud.

Zink er et essentielt stof og zinkmangel er påvist i en række lande (WHO, 2003c). I vandmiljøet, forekommer zink ofte som hydreret +II formen. In hanevand, zinkkoncentrationen kan være meget høj som følge af afsmitning fra rør og fittings i vandbanen. Zink er særlig toksisk overfor visse akvatiske organismer (DCE, 2018).

Tabel 1 Analyseresultater for uorganiske stoffer efter ekstraktion af de fire knuste solpanelprøver (DG = detektionsgrænse). Røde tal er højere end GVKK, orange tal er højere end et alternativt kvalitetskriterium. Alle tal er i µg/L.

Stof	Symbol	DG	GVKK[1]	BEK[2]	WHO[3]	1	2	3	4
Zirkonium	Zr	1				1.8	4.4	4.3	
Aluminium	Al	30		200	100	**290**	**210**	**860**	**3900**
Antimon	Sb	100	2	5	20	**100**	**68**	**87**	**13**
Arsen	As	1	8	5	10	1.9	<	<	<
Barium	Ba	1			700	<	<	370	200
Beryllium	Be	5			x		<	<	<
Bismuth	Bi	0.1				0.33	<	0.14	6.2
Bly	Pb	1	1	5	10	**2.7**	<	**5.9**	**5700**
Bor	B	50	300	1000	2400	<	<	**800**	58
Brom	Br	100				<	<	<	<
Cadmium	Cd	0.1	0.5	3	3	<	<	<	<
Cerium	Ce	0.1				0.30	<	0.24	0.66
Cesium	Cs	0.1				<	<	1.7	0.10
Chrom	Cr total	1	25	50		<	<	<	<
Chrom VI	Cr(VI)	ej målt	1			<	<	<	<
Dysprosium	Dy	0.1				<	<	<	<
Erbium	Er	0.1				<	<	<	<
Europium	Eu	0.1				<	<	0.13	<
Gadolinium	Gd	0.1				<	<	<	<
Gallium	Ga	0.1				0.21	<	76	41
Hafnium	Hf	0.1				<	<	<	<
Holmium	Ho	0.1				<	<	<	<
Iod	I	1				<	<	<	<
Jern	Fe	10		200		12	<	28	**220**
Kobber	Cu	3	100	2000	2000	<	<	<	**1700**
Kobolt	Co	1				<	<	<	<
Kviksølv	Hg	0.1	0.1	1	6	<	<	<	<
Lithium	Li	10				<	<	49	<
Lutetium	Lu	0.1				<	<	<	<
Mangan	Mn	5		50		<	<	6.6	<
Molybdæn	Mo	1	20			<	<	<	<
Neodymium	Nd	0.1				<	<	<	0.10
Nikkel	Ni	1	10	20	70	<	<	<	8.1
Niobium	Nb	1				<	<	<	<
Osmium	Os	0.1				<	<	<	<
Palladium	Pd	0.1				<	<	<	<
Platin	Pt	0.1				<	<	<	<
Praseodym	Pr	0.1				<	<	<	<
Rhenium	Re	0.1				<	<	<	<
Rhodium	Rh	0.1				<	<	<	0.23
Rubidium	Rb	10				<	<	12	<
Rutenium	Ru	0.1				<	<	<	<
Samarium	Sm	0.1				<	<	<	<
Selen	Se	1		10	40	<	<	<	<
Sølv	Ag	1		10		5.2	1.3	9.1	**94**
Strontium	Sr	10				<	<	<	18
Tantal	Ta	0.1				<	<	<	<
Tellur	Te	0.1				<	<	<	12
Terbium	Tb	0.1				<	<	<	<
Thallium	Tl	0.1				<	<	<	0.44
Thorium	Th	0.1				<	<	<	<
Thulium	Tm	0.1				<	<	<	<
Tin	Sn	1				2.0	<	1.4	920
Uran	U	0.1			30	<	<	0.19	<
Vanadium	V	5				<	<	<	<
Wolfram	W	1				<	<	<	2.9
Ytterbium	Yb	0.1				<	<	<	<
Yttrium	Y	1				<	<	<	<
Zink	Zn	5	100	3000		<	<	**1200**	**130**

1 Miljø- og Fødevareministeriet, 2018. Liste over kvalitetskriterier i relation til forurenet jord.
2 Miljø- og Fødevareministeriet, 2019. Bekendtgørelse om vandkvalitet og tilsyn med vandforsyningsanlæg, nr. 524 af 1/5/2019.
3 WHO, 2011. Guideline for Drinking-water Quality, 4th edition.

Afsmitning af organiske stoffer fra solpaneler:
Screening med CG/FID viste følgende resultater for Prøve 4:

Flygtige kulbrinter, C_6-C_{10}	3,7 µg/L
Lette kulbrinter, C_{10}-C_{25}	500 µg/L
Tunge kulbrinter, C_{25}-C_{35}	220 µg/L

GC/MS-analyse af disse screeningsfund identificerede at de dominerende stoffer er 1-ethyl-1 hexanol, oktadecenamid samt decanedioic acid, bis(2,2,6,6-tetramethyl-4-piperidinyl) ester. De funktionelle grupper i disse stoffer medfører alle polaritet, hvilket forklarer at disse stoffer opløses frem for oliens upolære kulbrinter.

Jordkvalitetskriterier for disse grupper ligger på 25 mg/kg eller derover (Miljøstyrelsen, 2018). For drikkevand findes der kun et kvalitetskriterium for benzen (en flygtig kulbrinte) på 1 µg/L (Miljø- og Fødevareministeriet, 2019b).

Transformerolie:
To prøver af transformerolie (Prøve 5 og 6, se afsnit 4.1) blev screenet ved GC/FID.

Stofgruppe	Prøve 5	Prøve 6
Flygtige kulbrinter, C_6-C_{10}	<2 µg/L	<2 µg/L
Lette kulbrinter, C_{10}-C_{25}	490 µg/L	520 µg/L
Tunge kulbrinter, C_{25}-C_{35}	<9 µg/L	<9 µg/L

Hermed ses, at der findes ganske lidt opløselige lette kulbrinter. GC/MS-analyse af disse screeningsfund identificerede kun konserveringsmidlet BHT (butylated hydroxytoluene) i Prøve 6.

5 Konklusioner

Dette notat undersøger potentielle risici for grundvandsforurening fra en planlagt solcellepark ved en kildeplads til drikkevandsproduktion ved Vittarp. Notatet identificerer og beskriver 16 risici, som er inddelt efter, om de kan opstå ved etablering, anlæg, drift eller afvikling af anlægget eller ved diverse hændelse. Af de 16 risici er 12 vurderet til at have en meget lille risiko, der ikke kræver aktiv styring. Fire risici er vurderet til at have en lav risiko, der kan håndteres gennem et understøttende program. Ingen af risiciene er vurderet til at have en moderate til høje risiko, der ville kræve aktiv håndtering ved styrende foranstaltninger. Det bemærkes, at yderligere potentielle risici kan være kritiske (fx anvendelse af ukrudtsmidler i BNBO). Disse blev ikke medtaget, da det blev forudsat, fx at anvendelse af ukrudtsmidler ikke er tilladt.

De fire forhold med lav risiko omhandler udslip af transformerolie eller afsmitning fra hele/knuste solcellepaneler. De nævnte fire risici er undersøgt nærmere med empiriske målinger.

Risiko 1.3 Spild af transformerolie under påfyldning. Empiriske målinger har vist at de opløselige komponenter i transformerolie er på et niveau, der ikke vurderes at give anledning til væsentlig grundvandsforurening under praktiske forhold. Desuden vil spild ved etablering kunne opdages af tilsynet så afværgeforanstaltninger straks kan iværksættes.

Risiko 2.1 Lækage af transformerolie fra anlægget. Risikoen for lækage kan minimeres betydeligt fx ved at stille krav i forbindelse med anlæggets godkendelsesproces til at transformerne er udstyret med et olieopsamlingskar med mindst samme størrelse som olien. Desuden kan der stilles krav til, at evt. fyldte opsamlingskar straks tømmes samt at evt. lækage straks graves op.

Risiko 2.2 Knuste solcellepaneler. Der er risiko for, at solcellepaneler knuses fx ved hærværk eller vindstorm. Under worst-case laboratoriebetingelser har knuste paneler vist udvaskning af aluminium, antimon, bor, barium og zink fra frontglas og yderligere bly, kobber, tin og jern fra solceller med strømførende system. Kombinationen af koncentration, toksicitet og mobilitet er mest uheldig for stoffet antimon. De øvrige stoffer er på et niveau, der ikke vurderes at give anledning til væsentlig grundvandsforurening under praktiske forhold. Risikoen kan håndteres fx ved at stille krav i forbindelse med anlæggets godkendelsesproces til, at evt. knuste solcellepaneller straks samles op samt at anlægget fjernes når det er udtjent.

Antimon er et grundstof med halvmetal-egenskaber og en række anvendelser, blandt andet i visse flammehæmmere og blybatterier. Stoffet bruges i glas til at forbedre stabiliteten når glasset udsættes for sollys (Europa Kommissionen, 2016). Den største observerede koncentration under worst-case laboratorieforhold er omkring 50 gange højere end grundvandskvalitetskriteriet på 2 μg/L. I dette forsøg blev der målt på det første ekstrakt af friskknuste glas med et L/S-forhold på 10:1 samt en ekstraktionstid på 24 t med ende-over-ende rotation. Hermed er det usandsynligt, at en solcellepark vil forurene et underliggende grundvandsmagasin med antimon under realistiske forhold.

Risiko 2.3 Afsmitning fra hele solcellepaneler. En vis udvaskning af antimon fra hele solcellepaneler kan også forekomme ved almindelig drift. Udvaskning af antimon er fx set fra glaskugler anvendt i vejbyggeri for at fremme lysrefleksion i markeringsstriber (Sandhu, et al., 2013). I forbindelse med hele solcellepaneler er kontakttiden med regn så kort, at afsmitningen vurderes at være begrænset under praktiske forhold. Hverken afsmitning fra hele solcellepaneler eller evt. udvikling af afsmitning over tid er undersøgt empirisk i forbindelse med dette notat.

Såfremt anlægsejer imødekommer gængse tiltag til beskyttelse af BNBO som fx ingen brug af gødning, pesticider eller biocider, se Vejledning nr. 45 (Miljøstyrelsen, 2020), samt håndterer de identificerede risici (Risiko 1.3, 2.1, 2,2 og 2.3) som beskrevet ovenfor, vurderes den planlagte solcellepark ikke at medføre nogen væsentlig risiko for grundvandsforurening.

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BILAG 1

MSDS Nynas transformerolier

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by Commission Regulation (EU) 2015/830

NYTRO® LIBRA

SAFETY DATA SHEET

Date of printing	2019-10-21
Date of issue/ Date of revision	2019-10-21
Date of previous issue	2018-11-07
Version	5

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name	NYTRO® LIBRA
Product description	Insulating oil
Product type	Liquid.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses
Distribution of substance - Industrial Formulation and (re)packing of substances and mixtures - Industrial Use in functional fluids - Industrial Use in functional fluids - Professional

Uses advised against	**Reason**
This product must not be used in applications other than those recommended in Section 1, without first seeking the advice of the supplier.	-

1.3 Details of the supplier of the safety data sheet

Supplier/Manufacturer

Head office:
Nynas AB
P.O. Box 10700
SE-121 29 Stockholm
SWEDEN
+46 8 602 12 00 (Office hours 8 am - 4.30 pm (CET))
www.nynas.com

e-mail address of person responsible for this SDS: ProductHSE@nynas.com

1.4 Emergency telephone number

Telephone number	+44 (0) 1235 239 670
Hours of operation	24 hour service

National advisory body/Poison Centre

Telephone number 020 - 99 60 00 (Kemiakuten, 24h service)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition: Mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Asp. Tox. 1, H304

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

SECTION 2: Hazards identification

2.2 Label elements

Hazard pictograms	
Signal word	Danger
Hazard statements	H304 - May be fatal if swallowed and enters airways.
Precautionary statements	
Prevention	Not applicable.
Response	P301 + P310 + P331 - IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting.
Storage	P405 - Store locked up.
Disposal	P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.
Supplemental label elements	Not applicable.
Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles	Not applicable.

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII	This mixture does not contain any substances that are assessed to be a PBT or a vPvB.
Other hazards which do not result in classification	Prolonged or repeated contact may dry skin and cause irritation.

SECTION 3: Composition/information on ingredients

3.2 Mixtures Mixture

Product/ingredient name	Identifiers	%	Regulation (EC) No. 1272/2008 [CLP]	Type
Distillates (petroleum), hydrotreated light naphthenic	REACH #: 01-2119480375-34 EC: 265-156-6 CAS: 64742-53-6 Index: 649-466-00-2	50 - 70	Asp. Tox. 1, H304	[1] [2]
Distillates (petroleum), hydrotreated light paraffinic	REACH #: 01-2119487077-29 EC: 265-158-7 CAS: 64742-55-8	0 - 50	Asp. Tox. 1, H304	[1] [2]
Distillates (petroleum), hydrotreated heavy paraffinic	REACH #: 01-2119484627-25 EC: 265-157-1 CAS: 64742-54-7 Index: 649-467-00-8	0 - 50	Not classified.	[2]
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	REACH #: 01-2119474878-16 EC: 276-737-9 CAS: 72623-86-0 Index: 649-482-00-X	0 - 50	Asp. Tox. 1, H304	[1] [2]
Distillates (petroleum), solvent-refined heavy naphthenic	REACH #: 01-2119483621-38	0 - 5	Not classified.	[2]

SECTION 3: Composition/information on ingredients

	EC: 265-097-6 CAS: 64741-96-4 Index: 649-457-00-3		**See Section 16 for the full text of the H statements declared above.**	

Regulation (EC) No. 1272/2008 [CLP] Annex VI Nota L applies to the base oil(s) in this product. Nota L - The classification as a carcinogen need not apply if it can be shown that the substance contains less than 3 % DMSO extract as measured by IP 346.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit
[3] Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII
[4] Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII
[5] Substance of equivalent concern
[6] Additional disclosure due to company policy

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation, blurred vision or swelling occurs and persists, obtain medical advice from a specialist.
Inhalation	If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. If casualty is unconscious and: If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Get medical attention if adverse health effects persist or are severe. Maintain an open airway.
Skin contact	Wash with soap and water. Remove contaminated clothing and shoes. Handle with care and dispose of in a safe manner. Seek medical attention if skin irritation, swelling or redness develops and persists. Accidental high pressure injection through the skin requires immediate medical attention. Do not wait for symptoms to develop.
Ingestion	Always assume that aspiration has occurred. Do not induce vomiting. Can enter lungs and cause damage. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Seek professional medical attention or send the casualty to a hospital. Do not wait for symptoms to develop. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
Protection of first-aiders	No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Before attempting to rescue casualties, isolate area from all potential sources of ignition including disconnecting electrical supply. Ensure adequate ventilation and check that a safe, breathable atmosphere is present before entry into confined spaces.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact	Slight irritant

SECTION 4: First aid measures

Inhalation	Inhalation of oil mist or vapours at elevated temperatures may cause respiratory irritation.
Skin contact	Adverse symptoms may include the following: irritation dryness cracking
Ingestion	Adverse symptoms may include the following: Nausea or vomiting. diarrhoea

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician	Due to low viscosity there is a risk of aspiration if the product enters the lungs. Treat symptomatically.
Specific treatments	Always assume that aspiration has occurred.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media	Use dry chemical, CO_2, water spray (fog) or foam.
Unsuitable extinguishing media	Do not use direct water jets on the burning product; they could cause splattering and spread the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture	In a fire or if heated, a pressure increase will occur and the container may burst. This substance will float and can be reignited on surface water.
Hazardous combustion products	Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates, gases, including carbon monoxide, H2S, SOx (sulfur oxides) or sulfuric acid and unidentified organic and inorganic compounds.

5.3 Advice for firefighters

Special precautions for fire-fighters	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
Special protective equipment for fire-fighters	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	Avoid breathing vapour or mist. Keep non-involved personnel away from the area of spillage. Alert emergency personnel. Except in case of small spillages, the feasibility of any actions should always be assessed and advised, if possible, by a trained, competent person in charge of managing the emergency. Stop leak if safe to do so. Avoid direct contact with the product. Stay upwind/keep distance from source. In case of large spillages, alert occupants in downwind areas. Eliminate all ignition sources if safe to do so. Spillages of limited amounts of product, especially in the open air when vapours will be usually quickly dispersed, are dynamic situations, which will presumably limit the exposure to dangerous concentrations. Note : recommended measures are based on the most likely spillage scenarios for this material; however, local conditions (wind, air temperature, wave/current direction and speed) may significantly influence the choice of appropriate actions. For this

SECTION 6: Accidental release measures

reason, local experts should be consulted when necessary. Local regulations may also prescribe or limit actions to be taken.

For emergency responders	Small spillages: normal antistatic working clothes are usually adequate. Large spillages: full body suit of chemically resistant and thermal resistant material should be used. Work gloves providing adequate chemical resistance, specifically to aromatic hydrocarbons. Note : gloves made of PVA are not water-resistant, and are not suitable for emergency use. Safety helmet, antistatic non-skid safety shoes or boots. Goggles and /or face shield, if splashes or contact with eyes is possible or anticipated. Respiratory protection : A half or full-face respirator with filter(s) for organic vapours (and when applicable for H2S) a Self Contained Breathing Apparatus (SCBA) can be used according to the extent of spill and predictable amount of exposure. If the situation cannot be completely assessed, or if an oxygen deficiency is possible, only SCBA's should be used.
6.2 Environmental precautions	Prevent product from entering sewers, rivers or other bodies of water. If necessary dike the product with dry earth, sand or similar non-combustible materials. In case of soil contamination, remove contaminated soil and treat in accordance with local regulations. In case of small spillages in closed waters (i.e. ports), contain product with floating barriers or other equipment. Collect spilled product by absorbing with specific floating absorbents. If possible, large spillages in open waters should be contained with floating barriers or other mechanical means. If this is not possible, control the spreading of the spillage, and collect the product by skimming or other suitable mechanical means. The use of dispersants should be advised by an expert, and, if required, approved by local authorities.
6.3 Methods and material for containment and cleaning up	
Small spill	Stop leak if without risk. Absorb spilled product with suitable non-combustible materials.
Large spill	Large spillages may be cautiously covered with foam, if available, to limit vapour cloud formation. Do not use water jet. When inside buildings or confined spaces, ensure adequate ventilation. Transfer collected product and other contaminated materials to suitable containers for recovery or safe disposal. Approach the release from upwind. Contaminated absorbent material may pose the same hazard as the spilt product.
6.4 Reference to other sections	See Section 1 for emergency contact information. See Section 8 for information on appropriate personal protective equipment. See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

General information	Obtain special instructions before use. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Use and store only outdoors or in a well-ventilated area. Hazard of slipping on spilt product. Avoid release to the environment.
7.1 Precautions for safe handling	
Protective measures	Do not ingest. Do not breathe dust/fume/gas/mist/vapours/spray. Avoid contact with eyes, skin and clothing. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Prevent the risk of slipping. Take precautionary measures against static discharge. Avoid splash filling of bulk volumes when handling hot liquid product. Empty containers retain product residue and can be hazardous.

SECTION 7: Handling and storage

	Nota : See Section 8 for information on appropriate personal protective equipment. See section 13 for waste disposal information.
Advice on general occupational hygiene	Ensure that proper housekeeping measures are in place. Contaminated materials should not be allowed to accumulate in the workplaces and should never be kept inside the pockets. Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Wash hands thoroughly after handling. Change contaminated clothes at the end of working shift. See also Section 8 for additional information on hygiene measures.
7.2 Conditions for safe storage, including any incompatibilities	Storage area layout, tank design, equipment and operating procedures must comply with the relevant regional, national or local legislation. Storage installations should be designed with adequate bunds in case of leaks or spills. Cleaning, inspection and maintenance of internal structure of storage tanks must be done only by properly equipped and qualified personnel as defined by national, local or company regulations. Store separately from oxidising agents. Recommended materials for containers, or container linings use mild steel, stainless steel. Not suitable : Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Compatibility should be checked with the manufacturer. Keep only in the original container or in a suitable container for this kind of product. Keep container tightly closed and sealed until ready for use. Do not store in unlabelled containers. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Empty containers may contain harmful, flammable/combustible or explosive residue or vapours. Do not cut, grind, drill, weld, reuse or dispose of containers unless adequate precautions are taken against these hazards. Store locked up. Protect from sunlight.
7.3 Specific end use(s)	
Recommendations	Not available.
Industrial sector specific solutions	Not available.

SECTION 8: Exposure controls/personal protection

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	**Exposure limit values**
Distillates (petroleum), hydrotreated light naphthenic	**Work environment authority Regulation 2018:1 (Sweden, 2/2018).** TWA: 1 mg/m³ 8 hours. Form: mist and fume STEL: 3 mg/m³ 15 minutes. Form: mist and fume
Distillates (petroleum), hydrotreated light paraffinic	**Work environment authority Regulation 2018:1 (Sweden, 2/2018).** TWA: 1 mg/m³ 8 hours. Form: mist and fume STEL: 3 mg/m³ 15 minutes. Form: mist and fume
Distillates (petroleum), hydrotreated heavy paraffinic	**Work environment authority Regulation 2018:1 (Sweden, 2/2018).** TWA: 1 mg/m³ 8 hours. Form: mist and fume STEL: 3 mg/m³ 15 minutes. Form: mist and fume
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	**Work environment authority Regulation 2018:1 (Sweden, 2/2018).**

	TWA: 1 mg/m^3 8 hours. Form: mist and fume STEL: 3 mg/m^3 15 minutes. Form: mist and fume
Distillates (petroleum), solvent-refined heavy naphthenic	**Work environment authority Regulation 2018:1 (Sweden, 2/2018).** TWA: 1 mg/m^3 8 hours. Form: mist and fume STEL: 3 mg/m^3 15 minutes. Form: mist and fume
Oil mist	***[Air contaminant]*** **Work environment authority Regulation 2018:1 (Sweden, 2/2018).** TWA: 1 mg/m^3 8 hours. Form: mist and fume STEL: 3 mg/m^3 15 minutes. Form: mist and fume

Recommended monitoring procedures	If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	**Type**	**Exposure**	**Value**	**Population**	**Effects**
Distillate (petroleum), hydrotreated light naphthenic	DNEL	Long term Inhalation	5,58 mg/m^3	Workers	Local
Distillates (petroleum), hydrotreated light paraffinic	DNEL	Long term Inhalation	5,58 mg/m^3	Workers	Local
Distillate (petroleum), hydrotreated heavy paraffinic	DNEL	Long term Inhalation	5,58 mg/m^3	Workers	Local
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	DNEL	Long term Inhalation	5,58 mg/m^3	Workers	Local

PNECs

No PNECs available

PNEC Summary	Hydrocarbon Block Method (Petrorisk)

8.2 Exposure controls

Appropriate engineering controls	Mechanical ventilation and local exhaust will reduce exposure via the air. Use oil resistant material in construction of handling equipment. Store under recommended conditions and if heated, temperature control equipment should be used to avoid overheating.

Individual protection measures

Hygiene measures	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Wash contaminated clothing before reuse.
Eye/face protection	Recommended: Safety glasses with side shields.

Skin protection

Hand protection	4 - 8 hours (breakthrough time): nitrile rubber
Body protection	Wear protective clothing if there is a risk of skin contact. Change contaminated clothes at the end of working shift.
Other skin protection	Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

SECTION 8: Exposure controls/personal protection

Respiratory protection	Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary.
Environmental exposure controls	Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	
Physical state	Liquid.
Colour	Light yellow
Odour	Odourless/Light petroleum.
Odour threshold	Not available.
pH	Not applicable.
Melting point/freezing point	-51°C
Initial boiling point and boiling range	Not available.
Flash point	Closed cup: >140°C [Pensky-Martens.]
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	Not available.
Vapour pressure (Calculated)	<0,01 kPa [room temperature]
Density	0,88 g/cm³ [15°C]
Solubility(ies)	Insoluble in water.
Partition coefficient: n-octanol/ water	Not available.
Auto-ignition temperature	>200°C
Decomposition temperature	>280°C
Viscosity	Kinematic (40°C): 0,096 cm^2/s (9,6 cSt)
Explosive properties	Not available.
Oxidising properties	Not available.
DMSO extractable compounds for base oil substance(s) according to IP346	< 3%

SECTION 10: Stability and reactivity

10.1 Reactivity	No specific test data related to reactivity available for this product or its ingredients.
10.2 Chemical stability	Stable under normal conditions.
10.3 Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
10.4 Conditions to avoid	Keep away from extreme heat and oxidizing agents. Take precautionary measures against static discharge.
10.5 Incompatible materials	Oxidizing agent

SECTION 10: Stability and reactivity

10.6 Hazardous decomposition products	Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates, gases, including carbon monoxide, H2S, SOx (sulfur oxides) or sulfuric acid and unidentified organic and inorganic compounds.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure	Remarks
Distillates (petroleum), hydrotreated light naphthenic	LC50 Inhalation Dusts and mists	Rat	>5,53 mg/l	4 hours	EMBSI 1988 (similar material)
	LD50 Dermal	Rabbit	>5000 mg/kg	-	API 1982 (similar material)
	LD50 Oral	Rat	>5000 mg/kg	-	API 1982(similar material)
Distillates (petroleum), hydrotreated light paraffinic	LC50 Inhalation Dusts and mists	Rat	>5,53 mg/l	4 hours	EMBSI 1988 (similar material)
	LD50 Dermal	Rabbit	>5000 mg/kg	-	API 1982 (similar material)
	LD50 Oral	Rat	>5000 mg/kg	-	API 1982(similar material)
Distillates (petroleum), hydrotreated heavy paraffinic	LC50 Inhalation Dusts and mists	Rat	>5,53 mg/l	4 hours	EMBSI 1988 (similar material)
	LD50 Dermal	Rabbit	>5000 mg/kg	-	API 1982 (similar material)
	LD50 Oral	Rat	>5000 mg/kg	-	API 1982 (similar material)
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	LC50 Inhalation Dusts and mists	Rat - Male, Female	>5,53 mg/l	4 hours	EMBSI 1988 (similar material)
	LD50 Dermal	Rabbit	>5000 mg/kg	-	API 1982 (similar material)
	LD50 Oral	Rat	>5000 mg/kg	-	API 1982(similar material)

Conclusion/Summary	Based on available data, the classification criteria are not met.

Acute toxicity estimates

N/A

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Observation	Remarks
Distillates (petroleum), hydrotreated light naphthenic	Skin - Non-irritant to skin.	Rabbit	0 to 1	24 to 72 hours	API 1982(similar material)
	Eyes - Non-irritating to the eyes.	Rabbit	0 to 0,11	24 to 72 hours	API 1982(similar material)
Distillates (petroleum), hydrotreated light paraffinic	Skin - Non-irritant to skin.	Rabbit	0 to 1	24 to 72 hours	API 1982(similar material)
	Eyes - Non-irritating to the eyes.	Rabbit	0 to 0,11	24 to 72 hours	API 1982(similar material)
Distillates (petroleum), hydrotreated heavy paraffinic	Skin - Non-irritant to skin.	Rabbit	0 to 1	24 to 72 hours	API 1982 (similar material)
	Eyes - Non-irritating to the	Rabbit	0 to 0,11	24 to 72	API 1982 (similar

	eyes.			hours	material)
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	Skin - Non-irritant to skin.	Rabbit	0 to 1	24 to 72 hours	API 1982 (similar material)
	Eyes - Non-irritating to the eyes.	Rabbit	0 to 0,11	24 to 72 hours	API 1982(similar material)

Skin	Based on available data, the classification criteria are not met.
Eyes	Based on available data, the classification criteria are not met.
Respiratory	Based on available data, the classification criteria are not met.

Sensitisation

Product/ingredient name	Route of exposure	Species	Result	Remarks
Distillates (petroleum), hydrotreated light naphthenic	skin	Guinea pig	Not sensitizing	API 1982(similar material)
Distillates (petroleum), hydrotreated light paraffinic	skin	Guinea pig	Not sensitizing	API 1982(similar material)
Distillates (petroleum), hydrotreated heavy paraffinic	skin	Guinea pig	Not sensitizing	API 1982 (similar material)
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	skin	Guinea pig	Not sensitizing	UBTL 1984j,k,l (similar material)

Skin	Based on available data, the classification criteria are not met.
Respiratory	Based on available data, the classification criteria are not met.

Mutagenicity

Conclusion/Summary	Based on available data, the classification criteria are not met.

Carcinogenicity

Conclusion/Summary	The base oil(s) in this product is based on an severely hydrotreated distillate. The product should not be regarded as a carcinogen.

Reproductive toxicity

Conclusion/Summary	Based on available data, the classification criteria are not met.

Teratogenicity

Conclusion/Summary	Based on available data, the classification criteria are not met.

Aspiration hazard

Product/ingredient name	Result
Distillates (petroleum), hydrotreated light naphthenic	ASPIRATION HAZARD - Category 1
Distillates (petroleum), hydrotreated light paraffinic	ASPIRATION HAZARD - Category 1
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	ASPIRATION HAZARD - Category 1

Potential chronic health effects

Product/ingredient name	Result	Species	Dose	Exposure
Distillate (petroleum), hydrotreated light naphthenic	Sub-chronic LOAEL Oral	Rat	125 mg/kg	-
	Sub-chronic NOAEL Dermal	Rat	>2000 mg/kg	-
	Sub-acute NOEL Inhalation Dusts and mists	Rat	220 mg/m³	6 hours; 5 days per week
Distillates (petroleum), hydrotreated light paraffinic	Sub-chronic LOAEL Oral	Rat	125 mg/kg	-
	Sub-chronic NOAEL Dermal	Rat	>2000 mg/kg	-
	Sub-acute NOEL Inhalation Dusts and mists	Rat	220 mg/m³	6 hours; 5 days per week

SECTION 11: Toxicological information

Distillate (petroleum), hydrotreated heavy paraffinic	Sub-chronic LOAEL Oral	Rat	125 mg/kg	-
	Sub-chronic NOAEL Dermal	Rat	>2000 mg/kg	-
	Sub-acute NOEL Inhalation Dusts and mists	Rat	220 mg/m^3	6 hours; 5 days per week
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	Sub-chronic LOAEL Oral	Rabbit	125 mg/kg	-
	Sub-chronic NOAEL Dermal	Rat	>2000 mg/kg	-
	Sub-chronic NOEL Inhalation Dusts and mists	Rat	220 mg/m^3	6 hours; 5 days per week

<u>Specific hazard</u>

Aspiration hazard
Aspiration means the entry of a liquid substance directly into the trachea and lower respiratory tract.
Aspiration of hydrocarbon substances can result in in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death.
This property relates to the potential for low viscosity material to spread quickly into the deep lung and cause severe pulmonary tissue damage.
Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	**Result**	**Species**	**Exposure**
Distillates (petroleum), hydrotreated light naphthenic	Acute EL50 >10000 mg/l	Daphnia	48 hours
	Acute LL50 >100 mg/l	Fish	96 hours
	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l Fresh water	Daphnia	21 days
Distillates (petroleum), hydrotreated light paraffinic	Acute EL50 >10000 mg/l	Daphnia	48 hours
	Acute LL50 >100 mg/l	Fish	96 hours
	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l Fresh water	Daphnia	21 days
Distillates (petroleum), hydrotreated heavy paraffinic	Acute EL50 >1000 mg/l	Daphnia	48 hours
	Acute LL50 >100 mg/l	Fish	96 hours
	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l Fresh water	Daphnia	21 days
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	Acute EL50 >10000 mg/l	Daphnia	48 hours
	Acute LL50 >100 mg/l	Fish	96 hours
	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l Fresh water	Daphnia	21 days

Conclusion/Summary: Based on available data, the classification criteria are not met.

12.2 Persistence and degradability

Product/ingredient name	**Aquatic half-life**	**Photolysis**	**Biodegradability**
Distillates (petroleum), hydrotreated light naphthenic	-	-	Inherent
Distillates (petroleum), hydrotreated light paraffinic	-	-	Inherent
Distillates (petroleum), hydrotreated heavy paraffinic	-	-	Inherent
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	-	-	Inherent

Conclusion/Summary: Inherently biodegradable.

SECTION 12: Ecological information

12.3 Bioaccumulative potential

Product/ingredient name	**$LogP_{ow}$**	**BCF**	**Potential**
Distillates (petroleum), hydrotreated light naphthenic	2 to 6	<500	low
Distillates (petroleum), hydrotreated light paraffinic	2 to 6	<500	low
Distillates (petroleum), hydrotreated heavy paraffinic	2 to 6	<500	low
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	2 to 6	<500	low

Conclusion/Summary	The product has a potential to bioaccumulate.

12.4 Mobility in soil

Mobility	High mobility in soil predicted, based on log Kow > 3.0.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects	Insoluble in water. Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

13.1 Waste treatment methods

Product

Methods of disposal	Where possible (e.g. in the absence of relevant contamination), recycling of used substance is feasible and recommended. This substance can be burned or incinerated, subject to national/local authorizations, relevant contamination limits, safety regulations and air quality legislation. Contaminated or waste substance (not directly recyclable): Disposal can be carried out directly, or by delivery to qualified waste handlers. National legislation may identify a specific organization, and/or prescribe composition limits and methods for recovery or disposal.
Hazardous waste	Yes.

European waste catalogue (EWC)

Waste code	**Waste designation**
13 03 07*	mineral-based non-chlorinated insulating and heat transmission oils

Packaging

Methods of disposal	The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

SECTION 14: Transport information

International transport regulations

SECTION 14: Transport information

	ADR/RID	**ADN**	**IMO/IMDG Classification**	**ICAO/IATA Classification**
14.1 UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	-	-	-	-
14.3 Transport hazard class(es)	-	-	-	-
14.4 Packing group	-	-	-	-
14.5 Environmental hazards	No.	No.	No.	No.

14.6 Special precautions for user	**Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.
14.7 MARPOL Annex 1	Oils

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XIV - List of substances subject to authorisation

None of the components are listed.

Substances of very high concern

None of the components are listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles	Not applicable.

Other EU regulations

Industrial emissions (integrated pollution prevention and control) - Air	Not listed
Industrial emissions (integrated pollution prevention and control) - Water	Not listed

Ozone depleting substances (1005/2009/EU)

Not listed.

Prior Informed Consent (PIC) (649/2012/EU)

Not listed.

Seveso Directive

This product is not controlled under the Seveso Directive.

National inventory

Australia	All components are listed or exempted.
Canada	All components are listed or exempted.

SECTION 15: Regulatory information

China	All components are listed or exempted.
Japan	**Japan inventory (ENCS)**: Not determined. **Japan inventory (ISHL)**: All components are listed or exempted.
New Zealand	All components are listed or exempted.
Philippines	All components are listed or exempted.
Republic of Korea	All components are listed or exempted.
Taiwan	All components are listed or exempted.
United States	All components are listed or exempted.
Thailand	Not determined.
Turkey	All components are listed or exempted.
Viet Nam	Not determined.

15.2 Chemical safety assessment	Complete.

SECTION 16: Other information

Revision comments: Not available.

◤ Indicates information that has changed from previously issued version.

Abbreviations and acronyms
ATE = Acute Toxicity Estimate
CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Classification	Justification
Asp. Tox. 1, H304	Calculation method

Sweden

Full text of abbreviated H statements	H304	May be fatal if swallowed and enters airways.
Full text of classifications [CLP/GHS]	Asp. Tox. 1, H304	ASPIRATION HAZARD - Category 1
Date of printing	2019-10-21	
Date of issue/ Date of revision	2019-10-21	
Date of previous issue	2018-11-07	
Version	5	

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Section 1 - Title

Short title of the exposure scenario	Distribution of substance - Industrial
List of use descriptors	**Identified use name:** Distribution of substance - Industrial **Process Category:** PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, PROC09, PROC15 **Subsequent service life relevant for that use:** No. **Environmental Release Category:** ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC07, ESVOC SpERC 1.1b.v1
Environmental contributing scenarios	**Use of non-reactive processing aid at industrial site (no inclusion into or onto article) -** ERC04 **Use of reactive processing aid at industrial site (no inclusion into or onto article) -** ERC06b **Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article) -** ERC06c **Use of reactive process regulators in polymerisation processes at industrial site (inclusion or not into/onto article) -** ERC06d **Use of functional fluid at industrial site -** ERC07 **Use of intermediate -** ERC06a **Use at industrial site leading to inclusion into/onto article -** ERC05
Health Contributing scenarios	**General exposures (open systems) -** PROC04 **General exposures (closed systems) -** PROC01, PROC02, PROC03 **With sample collection -** PROC03 **Laboratory activities -** PROC15 **Bulk transfers -** PROC08b **Drum and small package filling -** PROC09 **Clean-down and maintenance of equipment -** PROC08a **Storage -** PROC01, PROC02

Industry Association	Concawe - 2017
Processes and activities covered by the exposure scenario	Bulk loading (including marine vessel/barge, rail/road car and IBC loading) of substance within closed or contained systems, including incidental exposures during its sampling, storage, unloading, maintenance and associated laboratory activities.

Section 2 - Exposure controls

2.1 Control of environmental exposure

Amounts used	Annual site tonnage (tonnes/year)28 Maximum daily site tonnage (kg/day) 1400
Frequency and duration of use	Continuous release Emission days (days per year) 20
Other conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM) 0.0001 Release fraction to wastewater from process (initial release prior to RMM) 1.0E-7 Release fraction to soil from process (initial release prior to RMM) 1.0E-5
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	Prevent discharge of undissolved substance to or recover from onsite wastewater. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Risk management measures - Air	Treat air emissions. (%) 90
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sewage sludge should be incinerated, contained or reclaimed.

Section 2 - Exposure controls

Conditions and measures related to sewage treatment plant	Estimated substance removal from wastewater via domestic sewage treatment (%) 94,2 Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs (%) 94,2 Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/day) 45000 Assumed on-site sewage treatment plant flow (m^3/d) 2000

2.2 Control of worker exposure

General measures applicable to all activities

Concentration of substance in mixture or article	Covers percentage substance in the product up to 100 %.
Frequency and duration of use	Covers daily exposures up to 8 hours
Other conditions affecting workers exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes use at not more than 20°C above ambient temperature. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

Risk management measures (RMM)

Clean-down and maintenance of equipment - PROC 8a
Drain down system prior to equipment break-in or maintenance.

Storage - PROC 1 & 2
Store substance within a closed system.

Section 3 - Exposure estimation and reference to its source

3.1 Environment

Exposure assessment (environment):	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model. Risk Characterisation Ratio (RCR) air 0.009 Risk Characterisation Ratio (RCR) water 0.077

3.2 Workers

Exposure assessment (human):	Qualitative approach used to conclude safe use.
Exposure estimation and reference to its source	A DNEL (derived no effect levels) cannot be derived. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

Section 1 - Title

Short title of the exposure scenario	Formulation and (re)packing of substances and mixtures - Industrial
List of use descriptors	**Identified use name:** Formulation and (re)packing of substances and mixtures - Industrial **Process Category:** PROC01, PROC02, PROC03, PROC04, PROC05, PROC08a, PROC08b, PROC09, PROC14, PROC15 **Subsequent service life relevant for that use:** No. **Environmental Release Category:** ERC02, ESVOC SpERC 2.2.v1
Environmental contributing scenarios	**Formulation into mixture -** ERC02
Health Contributing scenarios	**General exposures (open systems) -** PROC04 **General exposures (closed systems) -** PROC01, PROC02, PROC03 **Batch processes at elevated temperatures -** PROC03 **With sample collection -** PROC03 **Laboratory activities -** PROC15 **Bulk transfers -** PROC08b **Mixing operations (open systems) -** PROC05 **Transfer from/pouring from containers -** PROC08a **Drum/batch transfers -** PROC08b **Tabletting, compression, extrusion or pelletisation -** PROC14 **Drum and small package filling -** PROC09 **Clean-down and maintenance of equipment -** PROC08a **Storage -** PROC01, PROC02

Industry Association	Concawe - 2017
Processes and activities covered by the exposure scenario	Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tabletting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities.

Section 2 - Exposure controls

2.1 Control of environmental exposure

Amounts used	Annual site tonnage (tonnes/year) 13000 Maximum daily site tonnage (kg/day)42000
Frequency and duration of use	Continuous release Emission days (days per year) 300
Other conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM) 0.0025 Release fraction to wastewater from process (initial release prior to RMM) 5.0E-6 Release fraction to soil from process (initial release prior to RMM) 0.0001
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	Prevent discharge of undissolved substance to or recover from onsite wastewater. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Risk management measures - Water	Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%) 85,7
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sewage sludge should be incinerated, contained or reclaimed.

Section 2 - Exposure controls

Conditions and measures related to sewage treatment plant	Estimated substance removal from wastewater via domestic sewage treatment (%) 94,2 Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs (%) 94,2 Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/day) 67000 Assumed on-site sewage treatment plant flow (m^3/d) 2000

2.2 Control of worker exposure

General measures applicable to all activities

Concentration of substance in mixture or article	Covers percentage substance in the product up to 100 %.
Frequency and duration of use	Covers daily exposures up to 8 hours
Other conditions affecting workers exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes use at not more than 20°C above ambient temperature. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

Risk management measures (RMM)

Clean-down and maintenance of equipment - PROC 8a
Drain down system prior to equipment break-in or maintenance.

Storage - PROC 1 & 2
Store substance within a closed system.

Section 3 - Exposure estimation and reference to its source

3.1 Environment

Exposure assessment (environment):	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model. Risk Characterisation Ratio (RCR) air 0.11 Risk Characterisation Ratio (RCR) water 0.87

3.2 Workers

Exposure assessment (human):	Qualitative approach used to conclude safe use.
Exposure estimation and reference to its source	A DNEL (derived no effect levels) cannot be derived. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

Section 1 - Title

Short title of the exposure scenario	Use in functional fluids - Industrial
List of use descriptors	**Identified use name:** Use in functional fluids - Industrial **Process Category:** PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, PROC09 **Subsequent service life relevant for that use:** No. **Environmental Release Category:** ERC07
Environmental contributing scenarios	**Use of functional fluid at industrial site -** ERC07
Health Contributing scenarios	**General exposures (closed systems) -** PROC02 **Bulk transfers -** PROC01, PROC02, PROC03 **Storage -** PROC01, PROC02 **Drum/batch transfers -** PROC08b **Filling of articles/equipment -** PROC09 **Filling of equipment from drums or containers -** PROC08a **General exposures (open systems) -** PROC04 **Remanufacture of reject articles -** PROC09

Industry Association	Concawe - 2017
Processes and activities covered by the exposure scenario	Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers.

Section 2 - Exposure controls

2.1 Control of environmental exposure

Amounts used	Annual site tonnage (tonnes/year) 10 Maximum daily site tonnage (kg/day) 500
Frequency and duration of use	Continuous release Emission days (days per year) 20
Other conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM) 0.0005 Release fraction to wastewater from process (initial release prior to RMM) 1.0E-6 Release fraction to soil from process (initial release prior to RMM) 0.001
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	Prevent discharge of undissolved substance to or recover from onsite wastewater. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sewage sludge should be incinerated, contained or reclaimed.
Conditions and measures related to sewage treatment plant	Estimated substance removal from wastewater via domestic sewage treatment (%) 94,2 Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs (%) 94,2 Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/day) 8100 Assumed on-site sewage treatment plant flow (m^3/d) 2000

2.2 Control of worker exposure

General measures applicable to all activities

Frequency and duration of use	Covers daily exposures up to 8 hours

Section 2 - Exposure controls

Other conditions affecting workers exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes use at not more than 20°C above ambient temperature. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

Risk management measures (RMM)

General exposures (open systems), Elevated temperature - PROC 04
Restrict area of openings to equipment. Provide extract ventilation to points where emissions occur. Local exhaust ventilation - efficiency of at least 90 %.

Clean-down and maintenance of equipment - PROC 8a
Drain down system prior to equipment break-in or maintenance.

Storage - PROC 1, 2
Store substance within a closed system.

Section 3 - Exposure estimation and reference to its source

3.1 Environment

Exposure assessment (environment):	Not available.

3.2 Workers

Exposure assessment (human):	Qualitative approach used to conclude safe use.
Exposure estimation and reference to its source	A DNEL (derived no effect levels) cannot be derived. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

Section 1 - Title

Short title of the exposure scenario	Use in functional fluids - Professional
List of use descriptors	**Identified use name:** Use in functional fluids - Professional **Process Category:** PROC01, PROC02, PROC03, PROC08a, PROC09, PROC20 **Subsequent service life relevant for that use:** No. **Environmental Release Category:** ERC09a, ERC09b, ESVOC SpERC 9.13b.v1
Environmental contributing scenarios	**Widespread use of functional fluid (outdoor) -** ERC09b **Widespread use of functional fluid (indoor) -** ERC09a
Health Contributing scenarios	**Drum/batch transfers -** PROC08a **Transfer from/pouring from containers -** PROC09 **Operation of equipment containing engine oils and similar -** PROC01, PROC02, PROC03, PROC20 **Remanufacture of reject articles -** PROC09 **Equipment cleaning and maintenance -** PROC08a **Storage -** PROC01, PROC02
Industry Association	Concawe - 2017
Processes and activities covered by the exposure scenario	Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers.

Section 2 - Exposure controls

2.1 Control of environmental exposure

Amounts used	Annual site tonnage (tonnes/year)0,016 Maximum daily site tonnage (kg/day)0,044
Frequency and duration of use	Continuous release Emission days (days per year) 365
Other conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM) 0.05 Release fraction to wastewater from process (initial release prior to RMM) 0.013 Release fraction to soil from process (initial release prior to RMM) 0.025
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Risk management measures - Water	Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%) 38,5

2.2 Control of worker exposure

General measures applicable to all activities

Concentration of substance in mixture or article	Covers percentage substance in the product up to 100 %.
Frequency and duration of use	Covers daily exposures up to 8 hours
Other conditions affecting workers exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes use at not more than 20°C above ambient temperature. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

Risk management measures (RMM)

Section 2 - Exposure controls

Drum/batch transfers - PROC 8a
Use drum pumps.

Clean-down and maintenance of equipment - PROC 8a
Drain down system prior to equipment break-in or maintenance.

Storage - PROC 1, 2
Store substance within a closed system.

Section 3 - Exposure estimation and reference to its source

3.1 Environment

Exposure assessment (environment):	Not available.

3.2 Workers

Exposure assessment (human):	Qualitative approach used to conclude safe use.
Exposure estimation and reference to its source	A DNEL (derived no effect levels) cannot be derived. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by Commission Regulation (EU) 2015/830

NYTRO® BIO 300X

SAFETY DATA SHEET

Date of printing	2020-06-05
Date of issue/ Date of revision	2020-05-29
Date of previous issue	2020-01-16
Version	4

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name	NYTRO® BIO 300X
Product description	Insulating oil
Product type	Liquid.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses
Use in functional fluids - Industrial Use in functional fluids - Professional

Uses advised against	Reason
This product must not be used in applications other than those recommended in Section 1, without first seeking the advice of the supplier.	-

1.3 Details of the supplier of the safety data sheet

Supplier/Manufacturer	Head office: Nynas AB P.O. Box 10700 SE-121 29 Stockholm SWEDEN +46 8 602 12 00 (Office hours 8 am - 4.30 pm (CET)) www.nynas.com
e-mail address of person responsible for this SDS	ProductHSE@nynas.com

1.4 Emergency telephone number

Telephone number	+44 (0) 1235 239 670
Hours of operation	24 hour service

National advisory body/Poison Centre

Telephone number 020 - 99 60 00 (Kemiakuten, 24h service)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition: Mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Asp. Tox. 1, H304

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

SECTION 2: Hazards identification

Hazard pictograms

Signal word	Danger
Hazard statements	H304 - May be fatal if swallowed and enters airways.
Precautionary statements	
Prevention	Not applicable.
Response	P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor. P331 - Do NOT induce vomiting.
Storage	Not applicable.
Disposal	P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.
Supplemental label elements	Repeated exposure may cause skin dryness or cracking.
Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles	Not applicable.

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII	This mixture does not contain any substances that are assessed to be a PBT or a vPvB.
Other hazards which do not result in classification	Prolonged or repeated contact may dry skin and cause irritation. Inhalation of oil mist or vapours at elevated temperatures may cause respiratory irritation.

SECTION 3: Composition/information on ingredients

3.2 Mixtures Mixture

Product/ingredient name	Identifiers	%	Regulation (EC) No. 1272/2008 [CLP]	Type
Hydrocarbons, C16-C18, isoalkanes, <2% aromatics	REACH #: 01-2120789575-35 EC: 948-766-3 CAS: 2145099-01-8	>99	Asp. Tox. 1, H304 EUH066	[1]
2,6-di-tert-butyl-p-cresol	REACH #: 01-2119555270-46 EC: 204-881-4 CAS: 128-37-0	<0.24	Aquatic Acute 1, H400 (M=1) Aquatic Chronic 1, H410 (M=1) **See Section 16 for the full text of the H statements declared above.**	[1]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

SECTION 3: Composition/information on ingredients

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit
[3] Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII
[4] Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII
[5] Substance of equivalent concern
[6] Additional disclosure due to company policy

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact	Get medical attention. Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Inhalation	If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. If casualty is unconscious and: If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Get medical attention if adverse health effects persist or are severe. Maintain an open airway.
Skin contact	Wash skin thoroughly with soap and water or use recognised skin cleanser. Remove contaminated clothing and shoes. Handle with care and dispose of in a safe manner. Seek medical attention if skin irritation, swelling or redness develops and persists. Accidental high pressure injection through the skin requires immediate medical attention. Do not wait for symptoms to develop.
Ingestion	Always assume that aspiration has occurred. Do not induce vomiting. Can enter lungs and cause damage. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Seek professional medical attention or send the casualty to a hospital. Do not wait for symptoms to develop. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
Protection of first-aiders	No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Before attempting to rescue casualties, isolate area from all potential sources of ignition including disconnecting electrical supply. Ensure adequate ventilation and check that a safe, breathable atmosphere is present before entry into confined spaces.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact	Slight irritant
Inhalation	Inhalation of oil mist or vapours at elevated temperatures may cause respiratory irritation.
Skin contact	Adverse symptoms may include the following: irritation dryness cracking
Ingestion	Adverse symptoms may include the following: Nausea or vomiting. diarrhoea

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician	Due to low viscosity there is a risk of aspiration if the product enters the lungs. Treat symptomatically.
Specific treatments	Always assume that aspiration has occurred.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media	Use dry chemical, CO_2, water spray (fog) or foam.
Unsuitable extinguishing media	Do not use direct water jets on the burning product; they could cause splattering and spread the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture	In a fire or if heated, a pressure increase will occur and the container may burst. This substance will float and can be reignited on surface water.
Hazardous combustion products	Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates, gases, including carbon monoxide, H2S, SOx (sulfur oxides) or sulfuric acid and unidentified organic and inorganic compounds.

5.3 Advice for firefighters

Special precautions for fire-fighters	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Cool closed containers exposed to fire with water.
Special protective equipment for fire-fighters	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	Avoid breathing vapour or mist. Keep non-involved personnel away from the area of spillage. Alert emergency personnel. Except in case of small spillages, the feasibility of any actions should always be assessed and advised, if possible, by a trained, competent person in charge of managing the emergency. Stop leak if safe to do so. Avoid direct contact with the product. Stay upwind/keep distance from source. In case of large spillages, alert occupants in downwind areas. Eliminate all ignition sources if safe to do so. Spillages of limited amounts of product, especially in the open air when vapours will be usually quickly dispersed, are dynamic situations, which will presumably limit the exposure to dangerous concentrations. Note : recommended measures are based on the most likely spillage scenarios for this material; however, local conditions (wind, air temperature, wave/current direction and speed) may significantly influence the choice of appropriate actions. For this reason, local experts should be consulted when necessary. Local regulations may also prescribe or limit actions to be taken.
For emergency responders	Small spillages: normal antistatic working clothes are usually adequate. Large spillages: full body suit of chemically resistant and thermal resistant material should be used. Work gloves providing adequate chemical resistance, specifically to aromatic hydrocarbons. Note : gloves made of PVA are not water-resistant, and are not suitable for emergency use. Safety helmet, antistatic non-skid safety shoes or boots. Goggles and /or face shield, if splashes or contact with eyes is possible or anticipated. Respiratory protection : A half or full-face respirator with filter(s) for organic vapours (and when applicable for H2S) a Self Contained Breathing Apparatus (SCBA) can be used according to the extent of spill and predictable amount of exposure. If the situation cannot be completely assessed, or if an oxygen deficiency is possible, only SCBA's should be used.

SECTION 6: Accidental release measures

6.2 Environmental precautions	Prevent product from entering sewers, rivers or other bodies of water. If necessary dike the product with dry earth, sand or similar non-combustible materials. In case of soil contamination, remove contaminated soil and treat in accordance with local regulations. In case of small spillages in closed waters (i.e. ports), contain product with floating barriers or other equipment. Collect spilled product by absorbing with specific floating absorbents. If possible, large spillages in open waters should be contained with floating barriers or other mechanical means. If this is not possible, control the spreading of the spillage, and collect the product by skimming or other suitable mechanical means. The use of dispersants should be advised by an expert, and, if required, approved by local authorities.
6.3 Methods and material for containment and cleaning up	
Small spill	Stop leak if without risk. Absorb spilled product with suitable non-combustible materials.
Large spill	Large spillages may be cautiously covered with foam, if available, to limit vapour cloud formation. Do not use water jet. When inside buildings or confined spaces, ensure adequate ventilation. Transfer collected product and other contaminated materials to suitable containers for recovery or safe disposal. Approach the release from upwind. Contaminated absorbent material may pose the same hazard as the spilt product.
6.4 Reference to other sections	See Section 1 for emergency contact information. See Section 8 for information on appropriate personal protective equipment. See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

General information	Obtain special instructions before use. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Use and store only outdoors or in a well-ventilated area. Hazard of slipping on spilt product. Avoid release to the environment.
7.1 Precautions for safe handling	
Protective measures	Do not ingest. Do not breathe dust/fume/gas/mist/vapours/spray. Avoid contact with eyes, skin and clothing. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Prevent the risk of slipping. Take precautionary measures against static discharge. Avoid splash filling of bulk volumes when handling hot liquid product. Empty containers retain product residue and can be hazardous. Nota : See Section 8 for information on appropriate personal protective equipment. See section 13 for waste disposal information.
Advice on general occupational hygiene	Ensure that proper housekeeping measures are in place. Contaminated materials should not be allowed to accumulate in the workplaces and should never be kept inside the pockets. Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Wash hands thoroughly after handling. Change contaminated clothes at the end of working shift. See also Section 8 for additional information on hygiene measures.

SECTION 7: Handling and storage

7.2 Conditions for safe storage, including any incompatibilities	Storage area layout, tank design, equipment and operating procedures must comply with the relevant regional, national or local legislation. Storage installations should be designed with adequate bunds in case of leaks or spills. Cleaning, inspection and maintenance of internal structure of storage tanks must be done only by properly equipped and qualified personnel as defined by national, local or company regulations. Store separately from oxidising agents. Recommended materials for containers, or container linings use mild steel, stainless steel. Not suitable : Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Compatibility should be checked with the manufacturer. Keep only in the original container or in a suitable container for this kind of product. Keep container tightly closed and sealed until ready for use. Do not store in unlabelled containers. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Empty containers may contain harmful, flammable/combustible or explosive residue or vapours. Do not cut, grind, drill, weld, reuse or dispose of containers unless adequate precautions are taken against these hazards. Store locked up. Protect from sunlight.
7.3 Specific end use(s)	
Recommendations	Not available.
Industrial sector specific solutions	Not available.

SECTION 8: Exposure controls/personal protection

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

8.1 Control parameters

Occupational exposure limits

No exposure limit value known.

Recommended monitoring procedures	If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
Hydrocarbons, C16-C18, isoalkanes, <2% aromatics	DNEL	Long term Inhalation	147 mg/m³	Workers	Systemic
	DNEL	Long term Dermal	42 mg/kg bw/day	Workers	Systemic
2,6-Di-tert-butyl-p-cresol	DNEL	Long term Inhalation	5,8 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	1,74 mg/m³	General population [Consumers]	Systemic

SECTION 8: Exposure controls/personal protection

	DMEL	Long term Dermal	8,3 mg/kg bw/day	Workers	Systemic
	DMEL	Long term Dermal	5 mg/kg bw/day	General population [Consumers]	Systemic

PNECs

Product/ingredient name	**Compartment Detail**	**Value**	**Method Detail**
2,6-Di-tert-butyl-p-cresol	Soil	1,04 mg/kg wwt	Equilibrium Partitioning
	Sewage Treatment Plant	100 mg/l	Assessment Factors
	Sediment	1,29 mg/kg wwt	Equilibrium Partitioning
	Secondary Poisoning	16,7 mg/kg	Assessment Factors
	Marine water	0,4 µg/l	Assessment Factors
	Fresh water	4 µg/l	Assessment Factors

PNEC Summary	Not available.

8.2 Exposure controls

Appropriate engineering controls	Mechanical ventilation and local exhaust will reduce exposure via the air. Use oil resistant material in construction of handling equipment. Store under recommended conditions and if heated, temperature control equipment should be used to avoid overheating.

Individual protection measures

Hygiene measures	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Wash contaminated clothing before reuse.
Eye/face protection	Recommended: Tightly-fitting goggles
Skin protection	
Hand protection	4 - 8 hours (breakthrough time): nitrile rubber, neoprene rubber, polyvinyl chloride (PVC). Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Wear suitable gloves tested to EN374.
Body protection	Wear protective clothing if there is a risk of skin contact. Change contaminated clothes at the end of working shift. When there is a risk of ignition from static electricity, wear anti-static protective clothing.
Other skin protection	Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing.
Respiratory protection	Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Recommended: Filtering device / half-face mask Type A2/ P2
Environmental exposure controls	Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state	Liquid.
Colour	Clear.
Odour	Mild.
Odour threshold	Not available.

SECTION 9: Physical and chemical properties

pH	Not available.
Melting point/freezing point	<-40°C
Initial boiling point and boiling range	>275°C
Flash point	Closed cup: >140°C [Pensky-Martens.]
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	Not available.
Vapour pressure (Calculated)	Not available.
Density	0,785 g/cm^3 [20°C]
Solubility(ies)	Insoluble in water.
Partition coefficient: n-octanol/ water	Not available.
Auto-ignition temperature	200°C
Decomposition temperature	Not available.
Viscosity	Kinematic (40°C): 0,037 cm^2/s (3,7 cSt)
Explosive properties	Not available.
Oxidising properties	Not available.

SECTION 10: Stability and reactivity

10.1 Reactivity	No specific test data related to reactivity available for this product or its ingredients.
10.2 Chemical stability	Stable under normal conditions.
10.3 Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
10.4 Conditions to avoid	Keep away from extreme heat and oxidizing agents. Take precautionary measures against static discharge. Keep away from heat, sparks and flame.
10.5 Incompatible materials	Oxidising agent
10.6 Hazardous decomposition products	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	**Result**	**Species**	**Dose**	**Exposure**	**Remarks**
Hydrocarbons, C16-C18, isoalkanes, <2% aromatics	LD50 Dermal	Rat	>5000 mg/kg	-	Supplier's information
	LD50 Oral	Rat	>5000 mg/kg	-	Supplier's information
2,6-di-tert-butyl-p-cresol	LD50 Dermal	Rat	>5000 mg/kg	-	Supplier's information
	LD50 Oral	Rat	>5000 mg/kg	-	Supplier's information

Conclusion/Summary	Based on available data, the classification criteria are not met.

Acute toxicity estimates

N/A

SECTION 11: Toxicological information

Irritation/Corrosion

Product/ingredient name	**Result**	**Species**	**Score**	**Observation**	**Remarks**
2,6-di-tert-butyl-p-cresol	Eyes - Redness of the conjunctivae	Rabbit	0,5	-	Supplier's information
	Eyes - Iris lesion	Rabbit	0	-	Supplier's information
	Eyes - Oedema of the conjunctivae	Rabbit	0,1	-	Supplier's information
	Eyes - Cornea opacity	Rabbit	0	-	Supplier's information

Skin	Based on available data, the classification criteria are not met.
Eyes	Based on available data, the classification criteria are not met.
Respiratory	Based on available data, the classification criteria are not met.

Sensitisation

Product/ingredient name	**Route of exposure**	**Species**	**Result**	**Remarks**
2,6-di-tert-butyl-p-cresol	skin	Human	Not sensitizing	Supplier's information

Skin	Based on available data, the classification criteria are not met.
Respiratory	Based on available data, the classification criteria are not met.

Mutagenicity

Product/ingredient name	**Test**	**Experiment**	**Result**	**Remarks**
2,6-di-tert-butyl-p-cresol	OECD 471 471 Bacterial Reverse Mutation Test	Experiment: In vitro Subject: Bacteria	Negative	-
	476 In vitro Mammalian Cell Gene Mutation Test	Experiment: In vitro Subject: Mammalian-Animal	Negative	-
	473 In vitro Mammalian Chromosomal Aberration Test	Experiment: In vitro Subject: Mammalian-Animal	Negative	-

Conclusion/Summary — Based on available data, the classification criteria are not met.

Carcinogenicity

Conclusion/Summary — Based on available data, the classification criteria are not met.

Reproductive toxicity

Conclusion/Summary — Based on available data, the classification criteria are not met.

Teratogenicity

Conclusion/Summary — Based on available data, the classification criteria are not met.

Aspiration hazard

Product/ingredient name	**Result**
NYTRO BIO 300X	ASPIRATION HAZARD - Category 1
Hydrocarbons, C16-C18, isoalkanes, <2% aromatics	ASPIRATION HAZARD - Category 1

Potential chronic health effects

SECTION 11: Toxicological information

Product/ingredient name	**Result**	**Species**	**Dose**	**Exposure**
2,6-Di-tert-butyl-p-cresol	Sub-acute NOAEL Oral	Rat	25 mg/kg	28 days; 7 days per week

Specific hazard

Aspiration hazard
Aspiration means the entry of a liquid substance directly into the trachea and lower respiratory tract.
Aspiration of hydrocarbon substances can result in in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death.
This property relates to the potential for low viscosity material to spread quickly into the deep lung and cause severe pulmonary tissue damage.
Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	**Result**	**Species**	**Exposure**
2,6-di-tert-butyl-p-cresol	Acute EC50 0,61 mg/l	Daphnia - Magna	48 hours
	Acute IC50 >0,4 mg/l	Algae - Desmodesmus Subspicatus	72 hours
	Acute LC50 >0,57 mg/l	Fish - Danio-rerio	96 hours
	Chronic NOEC 0,316 mg/l	Daphnia - Magna	21 days

Conclusion/Summary: Based on available data, the classification criteria are not met.

12.2 Persistence and degradability

Product/ingredient name	**Test**	**Result**	**Dose**	**Inoculum**
NYTRO BIO 300X	OECD 301F 301F Ready Biodegradability - Manometric Respirometry Test	>60 % - Readily - 28 days	-	-
Hydrocarbons, C16-C18, isoalkanes, <2% aromatics	OECD 301F Ready Biodegradability - Manometric Respirometry Test	>60 % - Readily - 28 days	-	-
2,6-di-tert-butyl-p-cresol	OECD 301C 301C Ready Biodegradability - Modified MITI Test (I)	4,5 % - 28 days	-	-

Product/ingredient name	**Aquatic half-life**	**Photolysis**	**Biodegradability**
NYTRO BIO 300X	-	-	Readily
Hydrocarbons, C16-C18, isoalkanes, <2% aromatics	-	-	Readily
2,6-di-tert-butyl-p-cresol	-	-	Not readily

Conclusion/Summary: Readily biodegradable

12.3 Bioaccumulative potential

Product/ingredient name	**LogP$_{ow}$**	**BCF**	**Potential**
2,6-di-tert-butyl-p-cresol	5,1	-	high

Conclusion/Summary: The product has a potential to bioaccumulate.

SECTION 12: Ecological information

12.4 Mobility in soil

Mobility	High mobility in soil predicted, based on log Kow > 3.0.

12.5 Results of PBT and vPvB assessment

Product/ingredient name	PBT	P	B	T	vPvB	vP	vB
This mixture does not contain any substances that are assessed to be a PBT or a vPvB.							

12.6 Other adverse effects	Insoluble in water. Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

13.1 Waste treatment methods

Product

Methods of disposal	Where possible (e.g. in the absence of relevant contamination), recycling of used substance is feasible and recommended. This substance can be burned or incinerated, subject to national/local authorizations, relevant contamination limits, safety regulations and air quality legislation. Contaminated or waste substance (not directly recyclable): Disposal can be carried out directly, or by delivery to qualified waste handlers. National legislation may identify a specific organization, and/or prescribe composition limits and methods for recovery or disposal.
Hazardous waste	Yes.

Packaging

Methods of disposal	The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

SECTION 14: Transport information

International transport regulations

	ADR/RID	**ADN**	**IMO/IMDG Classification**	**ICAO/IATA Classification**
14.1 UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	-	-	-	-
14.3 Transport hazard class(es)	-	-	-	-
14.4 Packing group	-	-	-	-
14.5 Environmental hazards	No.	No.	No.	No.

14.6 Special precautions for user	**Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

SECTION 14: Transport information

14.7 Transport in bulk according to IMO instruments	Not applicable
14.7 MARPOL Annex 1	Not applicable

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XIV - List of substances subject to authorisation

None of the components are listed.

Substances of very high concern

None of the components are listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles	Not applicable.

Other EU regulations

Industrial emissions (integrated pollution prevention and control) - Air	Not listed
Industrial emissions (integrated pollution prevention and control) - Water	Not listed

Ozone depleting substances (1005/2009/EU)

Not listed.

Prior Informed Consent (PIC) (649/2012/EU)

Not listed.

Seveso Directive

This product is not controlled under the Seveso Directive.

National inventory

Australia	At least one component is not listed.
Canada	At least one component is not listed.
China	At least one component is not listed.
Japan	**Japan inventory (ENCS)**: All components are listed or exempted. **Japan inventory (ISHL)**: All components are listed or exempted.
New Zealand	At least one component is not listed.
Philippines	At least one component is not listed.
Republic of Korea	At least one component is not listed.
Taiwan	At least one component is not listed.
United States	All components are active or exempted.
Thailand	Not determined.
Turkey	All components are listed or exempted.
Viet Nam	At least one component is not listed.

15.2 Chemical safety assessment	Chemical Safety Assessments for all substances in this product are either Complete or Not applicable.

SECTION 16: Other information

Revision comments	Not available.

◤ Indicates information that has changed from previously issued version.

Abbreviations and acronyms

ATE = Acute Toxicity Estimate
CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Classification	Justification
Asp. Tox. 1, H304	Expert judgment

Sweden

Full text of abbreviated H statements	H304	May be fatal if swallowed and enters airways.
	H400	Very toxic to aquatic life.
	H410	Very toxic to aquatic life with long lasting effects.
	EUH066	Repeated exposure may cause skin dryness or cracking.
Full text of classifications [CLP/GHS]	Aquatic Acute 1	SHORT-TERM (ACUTE) AQUATIC HAZARD - Category 1
	Aquatic Chronic 1	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 1
	Asp. Tox. 1	ASPIRATION HAZARD - Category 1

Date of printing	2020-06-05
Date of issue/ Date of revision	2020-05-29
Date of previous issue	2020-01-16
Version	4

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.
The information provided herein does not in any way constitute a product warranty, product specification, agreement on quality or similar.

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Section 1 - Title

Short title of the exposure scenario	Use in functional fluids - Industrial
List of use descriptors	**Identified use name:** Use in functional fluids - Industrial **Process Category:** PROC01, PROC02, PROC08b, PROC09 **Subsequent service life relevant for that use:** No. **Environmental Release Category:** ERC07
Environmental contributing scenarios	**Use of functional fluid at industrial site -** ERC07
Health Contributing scenarios	**General exposures (closed systems) -** PROC02 **Bulk transfers -** PROC01, PROC02 **Storage -** PROC01, PROC02 **Drum/batch transfers -** PROC08b **Filling of articles/equipment -** PROC09 **Remanufacture of reject articles -** PROC09
Processes and activities covered by the exposure scenario	Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers.

Section 2 - Exposure controls

2.1 Control of environmental exposure

Amounts used	Annual site tonnage (tonnes/year) 10 Maximum daily site tonnage (kg/day) 500
Frequency and duration of use	Continuous release Emission days (days per year) 20
Other conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM) 0.0005 Release fraction to wastewater from process (initial release prior to RMM) 1.0E-6 Release fraction to soil from process (initial release prior to RMM) 0.001
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	Prevent discharge of undissolved substance to or recover from onsite wastewater. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Risk management measures - Air	Treat air emissions. >= 70%.
Risk management measures - Water	Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of 36,6 %.
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sewage sludge should be incinerated, contained or reclaimed.
Conditions and measures related to sewage treatment plant	Estimated substance removal from wastewater via domestic sewage treatment (%) 95.1 Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs (%) 95.1 Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/day) 6400 Assumed on-site sewage treatment plant flow (m^3/d) 2000

2.2 Control of worker exposure

General measures applicable to all activities

Frequency and duration of use	Covers daily exposures up to 8 hours

Section 2 - Exposure controls

Other conditions affecting workers exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes use at not more than 20°C above ambient temperature. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

Section 3 - Exposure estimation and reference to its source

3.1 Environment

Exposure assessment (environment):	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model. Risk Characterisation Ratio (RCR) air 0.009 Risk Characterisation Ratio (RCR) water 0.078

3.2 Workers

Exposure assessment (human):	Qualitative approach used to conclude safe use.
Exposure estimation and reference to its source	A DNEL (derived no effect levels) cannot be derived. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

Section 1 - Title

Short title of the exposure scenario	Use in functional fluids - Professional
List of use descriptors	**Identified use name:** Use in functional fluids - Professional **Process Category:** PROC01, PROC02, PROC08a, PROC20 **Subsequent service life relevant for that use:** No. **Environmental Release Category:** ERC09a, ERC09b
Environmental contributing scenarios	**Widespread use of functional fluid (outdoor) -** ERC09b **Widespread use of functional fluid (indoor) -** ERC09a
Health Contributing scenarios	**Drum/batch transfers -** PROC08a **Operation of equipment containing engine oils and similar -** PROC01, PROC02, PROC20 **Equipment cleaning and maintenance -** PROC08a **Storage -** PROC01, PROC02
Processes and activities covered by the exposure scenario	Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers.

Section 2 - Exposure controls

2.1 Control of environmental exposure

Amounts used	Annual site tonnage (tonnes/year) 0,016 Maximum daily site tonnage (kg/day) 0,044
Frequency and duration of use	Continuous release Emission days (days per year) 365
Other conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM) 0.0005 Release fraction to wastewater from process (initial release prior to RMM) 0.005 Release fraction to soil from process (initial release prior to RMM) <=0.001

2.2 Control of worker exposure

General measures applicable to all activities

Concentration of substance in mixture or article	Covers percentage substance in the product up to 100 %.
Frequency and duration of use	Covers daily exposures up to 8 hours
Other conditions affecting workers exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes use at not more than 20°C above ambient temperature. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

Section 3 - Exposure estimation and reference to its source

3.1 Environment

Exposure assessment (environment):	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model. Risk Characterisation Ratio (RCR) air 0.040 Risk Characterisation Ratio (RCR) water 0.453

3.2 Workers

Section 3 - Exposure estimation and reference to its source

Exposure assessment (human):	Qualitative approach used to conclude safe use.
Exposure estimation and reference to its source	A DNEL (derived no effect levels) cannot be derived. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

BILAG 2

Analyserapport, Eurofins

Eurofins Miljø A/S
Ladelundvej 85
6600 Vejen
Danmark
Telefon: 7022 4266
CVR/VAT: DK-2884 8196

DANAK
TEST Reg.No. 168

VIA University College Campus Horsens
Chr. M. Østergaards Vej 4
8700 Horsens
Att.: Loren Ramsay

Rapportnr.: AR-21-CA-21003890-01
Batchnr.: EUDKVE-21003890
Kundenr.: CA0011185
Modt. dato: 13.01.2021

Analyserapport

Sagsnr.: 200 003
Sagsnavn: 607595 VIA Loren Ramsay
Prøvetype: Grundvand
Prøvetager: Rekvirenten
Prøveudtagning:
Analyseperiode: 13.01.2021 - 12.02.2021

Prøvemærke: 1

Lab prøvenr:	**835-2021-00389001**	**Enhed**	**DL**	**Metode**	**Urel (%)**
Prøve ID:	Ekstrakt 2				
Metaller					
Cesium (Cs)	< 0.1	µg/l	0.1	* ICP-MS	40
Arsen (As)	1.9	µg/l	1	* ICP-MS	40
Barium (Ba)	< 1	µg/l	1	* ICP-MS	40
Bly (Pb)	2.7	µg/l	1	* ICP-MS	40
Brom (Br)	< 100	µg/l	100	* ICP-MS	40
Chrom (Cr)	< 1	µg/l	1	* ICP-MS	40
Lithium (Li)	< 10	µg/l	10	* ICP-MS	40
Nikkel (Ni)	< 1	µg/l	1	* ICP-MS	40
Vanadium (V)	< 5	µg/l	5	* ICP-MS	40
Antimon (Sb)	100	µg/l	0.1	* ICP-MS	40
Bor (B)	< 50	µg/l	50	* ICP-MS	40
Cadmium (Cd)	< 0.1	µg/l	0.1	* ICP-MS	40
Kobolt (Co)	< 1	µg/l	1	* ICP-MS	40
Gallium (Ga)	0.21	µg/l	0.1	* ICP-MS	40
Kviksølv (Hg)	< 0.1	µg/l	0.1	* ICP-MS	40
Molybdæn (Mo)	< 1	µg/l	1	* ICP-MS	40
Rubidium (Rb)	< 10	µg/l	10	* ICP-MS	40
Selen (Se)	< 1	µg/l	1	* ICP-MS	40
Sølv (Ag)	5.2	µg/l	1	* ICP-MS	40
Strontium (Sr)	< 10	µg/l	10	* ICP-MS	40
Tin (Sn)	2.0	µg/l	1	* ICP-MS	40
Aluminium (Al)	290	µg/l	30	* ICP-MS	40
Beryllium (Be)	< 5	µg/l	5	* ICP-MS	40
Cerium (Ce)	0.30	µg/l	0.1	* ICP-MS	40
Dysprosium (Dy)	< 0.1	µg/l	0.1	* ICP-MS	40
Erbium (Er)	< 0.1	µg/l	0.1	* ICP-MS	40
Europium (Eu)	< 0.1	µg/l	0.1	* ICP-MS	40
Gadolinium (Gd)	< 0.1	µg/l	0.1	* ICP-MS	40
Holmium (Ho)	< 0.1	µg/l	0.1	* ICP-MS	40
Iod (I)	< 1	µg/l	1	* ICP-MS	40
Jern (Fe)	12	µg/l	10	* ICP-MS	40
Kobber (Cu)	< 3	µg/l	3	* ICP-MS	40
Mangan (Mn)	< 5	µg/l	5	* ICP-MS	40

Tegnforklaring:

<: mindre end
>: større end
#: ingen parametre er påvist
DL: Detektionsgrænse

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i.p.: ikke påvist
i.m.: ikke målelig

Urel (%): Ekspanderede relative måleusikkerhed med dækningsfaktor 2. For resultater på detektionsgrænseniveau kan usikkerheden være større end oplyst på rapporten.
$^{\sigma}$): Usikkerheder på mikrobiologiske parametre angives som logaritmeret standardafvigelse

Prøvningsresultaterne gælder udelukkende for de(n) undersøgte prøve(r).
Rapporten må ikke gengives, undtagen i sin helhed, uden prøvningslaboratoriets skriftlige godkendelse.

VIA University College Campus Horsens
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8700 Horsens
Att.: Loren Ramsay

Rapportnr.:	AR-21-CA-21003890-01
Batchnr.:	EUDKVE-21003890
Kundenr.:	CA0011185
Modt. dato:	13.01.2021

Analyserapport

Sagsnr.:	200 003
Sagsnavn:	607595 VIA Loren Ramsay
Prøvetype:	Grundvand
Prøvetager:	Rekvirenten
Prøveudtagning:	
Analyseperiode:	13.01.2021 - 12.02.2021
Prøvemærke:	1

Lab prøvenr:	**835-2021-00389001**	**Enhed**	**DL**	**Metode**	**Urel (%)**
Prøve ID:	Ekstrakt 2				
Neodymium (Nd)	< 0.1	µg/l	0.1	* ICP-MS	40
Niobium (Nb)	< 1	µg/l	1	* ICP-MS	40
Palladium (Pd)	< 0.1	µg/l	0.1	* ICP-MS	40
Praseodym (Pr)	< 0.1	µg/l	0.1	* ICP-MS	40
Rhodium (Rh)	< 0.1	µg/l	0.1	* ICP-MS	40
Rutenium (Ru)	< 0.1	µg/l	0.1	* ICP-MS	40
Samarium (Sm)	< 0.1	µg/l	0.1	* ICP-MS	40
Tellur (Te)	< 0.1	µg/l	0.1	* ICP-MS	40
Terbium (Tb)	< 0.1	µg/l	0.1	* ICP-MS	40
Yttrium (Y)	< 1	µg/l	1	* ICP-MS	40
Zink (Zn)	< 5	µg/l	5	* ICP-MS	40
Zirkonium (Zr)	1.8	µg/l	1	* ICP-MS	40
Bismuth (Bi)	0.33	µg/l	0.1	* ICP-MS	40
Hafnium (Hf)	< 0.1	µg/l	0.1	* ICP-MS	40
Lutetium (Lu)	< 0.1	µg/l	0.1	* ICP-MS	40
Osmium (Os)	< 0.1	µg/l	0.1	* ICP-MS	40
Platin (Pt)	< 0.1	µg/l	0.1	* ICP-MS	40
Rhenium (Re)	< 0.1	µg/l	0.1	* ICP-MS	40
Tantal (Ta)	< 0.1	µg/l	0.1	* ICP-MS	40
Thallium (Tl)	< 0.1	µg/l	0.1	* ICP-MS	40
Thorium (Th)	< 0.1	µg/l	0.1	* ICP-MS	40
Thulium (Tm)	< 0.1	µg/l	0.1	* ICP-MS	40
Uran (U)	< 0.1	µg/l	0.1	* ICP-MS	40
Wolfram (W)	< 1	µg/l	1	* ICP-MS	40
Ytterbium (Yb)	< 0.1	µg/l	0.1	* ICP-MS	40

Batchkommentar:
Prøverne er filtreret i laboratoriet før analyse for metaller.
Der er vedhæftet en rapport for screening af vandprøver.

12.02.2021

Hanne Jen

Kundecenter
Tlf: 70224267
G30@eurofins.dk

Hanne Jensen
Kunderådgiver

Tegnforklaring:

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$^{\sigma}$): Usikkerheder på mikrobiologiske parametre angives som logaritmeret standardafvigelse

Prøvningsresultaterne gælder udelukkende for de(n) undersøgte prøve(r).
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Analyserapport

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Prøvetager:	Rekvirenten
Prøveudtagning:	
Analyseperiode:	13.01.2021 - 12.02.2021
Prøvemærke:	2

Lab prøvenr:	**835-2021-00389002**	**Enhed**	**DL**	**Metode**	**Urel (%)**
Prøve ID:	Ekstrakt 2				
Metaller					
Cesium (Cs)	< 0.1	µg/l	0.1	* ICP-MS	40
Arsen (As)	< 1	µg/l	1	* ICP-MS	40
Barium (Ba)	< 1	µg/l	1	* ICP-MS	40
Bly (Pb)	< 1	µg/l	1	* ICP-MS	40
Brom (Br)	< 100	µg/l	100	* ICP-MS	40
Chrom (Cr)	< 1	µg/l	1	* ICP-MS	40
Lithium (Li)	< 10	µg/l	10	* ICP-MS	40
Nikkel (Ni)	< 1	µg/l	1	* ICP-MS	40
Vanadium (V)	< 5	µg/l	5	* ICP-MS	40
Antimon (Sb)	68	µg/l	0.1	* ICP-MS	40
Bor (B)	< 50	µg/l	50	* ICP-MS	40
Cadmium (Cd)	< 0.1	µg/l	0.1	* ICP-MS	40
Kobolt (Co)	< 1	µg/l	1	* ICP-MS	40
Gallium (Ga)	< 0.1	µg/l	0.1	* ICP-MS	40
Kviksølv (Hg)	< 0.1	µg/l	0.1	* ICP-MS	40
Molybdæn (Mo)	< 1	µg/l	1	* ICP-MS	40
Rubidium (Rb)	< 10	µg/l	10	* ICP-MS	40
Selen (Se)	< 1	µg/l	1	* ICP-MS	40
Sølv (Ag)	1.3	µg/l	1	* ICP-MS	40
Strontium (Sr)	< 10	µg/l	10	* ICP-MS	40
Tin (Sn)	< 1	µg/l	1	* ICP-MS	40
Aluminium (Al)	210	µg/l	30	* ICP-MS	40
Beryllium (Be)	< 5	µg/l	5	* ICP-MS	40
Cerium (Ce)	< 0.1	µg/l	0.1	* ICP-MS	40
Dysprosium (Dy)	< 0.1	µg/l	0.1	* ICP-MS	40
Erbium (Er)	< 0.1	µg/l	0.1	* ICP-MS	40
Europium (Eu)	< 0.1	µg/l	0.1	* ICP-MS	40
Gadolinium (Gd)	< 0.1	µg/l	0.1	* ICP-MS	40
Holmium (Ho)	< 0.1	µg/l	0.1	* ICP-MS	40
Iod (I)	< 1	µg/l	1	* ICP-MS	40
Jern (Fe)	< 10	µg/l	10	* ICP-MS	40
Kobber (Cu)	< 3	µg/l	3	* ICP-MS	40
Mangan (Mn)	< 5	µg/l	5	* ICP-MS	40

Tegnforklaring:

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#: ingen parametre er påvist
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$^{\sigma}$): Usikkerheder på mikrobiologiske parametre angives som logaritmeret standardafvigelse

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Analyserapport

Sagsnr.: 200 003
Sagsnavn: 607595 VIA Loren Ramsay
Prøvetype: Grundvand
Prøvetager: Rekvirenten
Prøveudtagning:
Analyseperiode: 13.01.2021 - 12.02.2021

Prøvemærke: 2

Lab prøvenr:	**835-2021-00389002**	**Enhed**	**DL**	**Metode**	**Urel (%)**
Prøve ID:	Ekstrakt 2				
Neodymium (Nd)	< 0.1	µg/l	0.1	* ICP-MS	40
Niobium (Nb)	< 1	µg/l	1	* ICP-MS	40
Palladium (Pd)	< 0.1	µg/l	0.1	* ICP-MS	40
Praseodym (Pr)	< 0.1	µg/l	0.1	* ICP-MS	40
Rhodium (Rh)	< 0.1	µg/l	0.1	* ICP-MS	40
Rutenium (Ru)	< 0.1	µg/l	0.1	* ICP-MS	40
Samarium (Sm)	< 0.1	µg/l	0.1	* ICP-MS	40
Tellur (Te)	< 0.1	µg/l	0.1	* ICP-MS	40
Terbium (Tb)	< 0.1	µg/l	0.1	* ICP-MS	40
Yttrium (Y)	< 1	µg/l	1	* ICP-MS	40
Zink (Zn)	< 5	µg/l	5	* ICP-MS	40
Zirkonium (Zr)	4.4	µg/l	1	* ICP-MS	40
Bismuth (Bi)	< 0.1	µg/l	0.1	* ICP-MS	40
Hafnium (Hf)	< 0.1	µg/l	0.1	* ICP-MS	40
Lutetium (Lu)	< 0.1	µg/l	0.1	* ICP-MS	40
Osmium (Os)	< 0.1	µg/l	0.1	* ICP-MS	40
Platin (Pt)	< 0.1	µg/l	0.1	* ICP-MS	40
Rhenium (Re)	< 0.1	µg/l	0.1	* ICP-MS	40
Tantal (Ta)	< 0.1	µg/l	0.1	* ICP-MS	40
Thallium (Tl)	< 0.1	µg/l	0.1	* ICP-MS	40
Thorium (Th)	< 0.1	µg/l	0.1	* ICP-MS	40
Thulium (Tm)	< 0.1	µg/l	0.1	* ICP-MS	40
Uran (U)	< 0.1	µg/l	0.1	* ICP-MS	40
Wolfram (W)	< 1	µg/l	1	* ICP-MS	40
Ytterbium (Yb)	< 0.1	µg/l	0.1	* ICP-MS	40

Batchkommentar:
Prøverne er filtreret i laboratoriet før analyse for metaller.
Der er vedhæftet en rapport for screening af vandprøver.

12.02.2021

Hanne Jensen
Hanne Jensen
Kunderådgiver

Kundecenter
Tlf: 70224267
G30@eurofins.dk

Tegnforklaring:

<: mindre end
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#: ingen parametre er påvist
DL: Detektionsgrænse

*): Ikke omfattet af akkrediteringen
i.p.: ikke påvist
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Urel (%): Ekspanderede relative måleusikkerhed med dækningsfaktor 2. For resultater på detektionsgrænseniveau kan usikkerheden være større end oplyst på rapporten.
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Prøvningsresultaterne gælder udelukkende for de(n) undersøgte prøve(r).
Rapporten må ikke gengives, undtagen i sin helhed, uden prøvningslaboratoriets skriftlige godkendelse.

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Kundenr.: CA0011185
Modt. dato: 13.01.2021

Analyserapport

Sagsnr.:	200 003
Sagsnavn:	607595 VIA Loren Ramsay
Prøvetype:	Grundvand
Prøvetager:	Rekvirenten
Prøveudtagning:	
Analyseperiode:	13.01.2021 - 12.02.2021
Prøvemærke:	3

Lab prøvenr:	**835-2021-00389003**	**Enhed**	**DL**	**Metode**	**Urel (%)**
Prøve ID:	Ekstrakt 2				
Metaller					
Cesium (Cs)	1.7	µg/l	0.1	* ICP-MS	40
Arsen (As)	< 1	µg/l	1	* ICP-MS	40
Barium (Ba)	370	µg/l	1	* ICP-MS	40
Bly (Pb)	5.9	µg/l	1	* ICP-MS	40
Brom (Br)	< 100	µg/l	100	* ICP-MS	40
Chrom (Cr)	< 1	µg/l	1	* ICP-MS	40
Lithium (Li)	49	µg/l	10	* ICP-MS	40
Nikkel (Ni)	< 1	µg/l	1	* ICP-MS	40
Vanadium (V)	< 5	µg/l	5	* ICP-MS	40
Antimon (Sb)	87	µg/l	0.1	* ICP-MS	40
Bor (B)	800	µg/l	50	* ICP-MS	40
Cadmium (Cd)	< 0.1	µg/l	0.1	* ICP-MS	40
Kobolt (Co)	< 1	µg/l	1	* ICP-MS	40
Gallium (Ga)	76	µg/l	0.1	* ICP-MS	40
Kviksølv (Hg)	< 0.1	µg/l	0.1	* ICP-MS	40
Molybdæn (Mo)	< 1	µg/l	1	* ICP-MS	40
Rubidium (Rb)	12	µg/l	10	* ICP-MS	40
Selen (Se)	< 1	µg/l	1	* ICP-MS	40
Sølv (Ag)	9.1	µg/l	1	* ICP-MS	40
Strontium (Sr)	< 10	µg/l	10	* ICP-MS	40
Tin (Sn)	1.4	µg/l	1	* ICP-MS	40
Aluminium (Al)	860	µg/l	30	* ICP-MS	40
Beryllium (Be)	< 5	µg/l	5	* ICP-MS	40
Cerium (Ce)	0.24	µg/l	0.1	* ICP-MS	40
Dysprosium (Dy)	< 0.1	µg/l	0.1	* ICP-MS	40
Erbium (Er)	< 0.1	µg/l	0.1	* ICP-MS	40
Europium (Eu)	0.13	µg/l	0.1	* ICP-MS	40
Gadolinium (Gd)	< 0.1	µg/l	0.1	* ICP-MS	40
Holmium (Ho)	< 0.1	µg/l	0.1	* ICP-MS	40
Iod (I)	< 1	µg/l	1	* ICP-MS	40
Jern (Fe)	28	µg/l	10	* ICP-MS	40
Kobber (Cu)	< 3	µg/l	3	* ICP-MS	40
Mangan (Mn)	6.6	µg/l	5	* ICP-MS	40

Tegnforklaring:

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$^{\sigma}$): Usikkerheder på mikrobiologiske parametre angives som logaritmeret standardafvigelse

VIA University College Campus Horsens
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8700 Horsens
Att.: Loren Ramsay

Rapportnr.: AR-21-CA-21003890-01
Batchnr.: EUDKVE-21003890
Kundenr.: CA0011185
Modt. dato: 13.01.2021

Analyserapport

Sagsnr.: 200 003
Sagsnavn: 607595 VIA Loren Ramsay
Prøvetype: Grundvand
Prøvetager: Rekvirenten
Prøveudtagning:
Analyseperiode: 13.01.2021 - 12.02.2021

Prøvemærke: 3

Lab prøvenr:	**835-2021-00389003**	**Enhed**	**DL**	**Metode**	**Urel (%)**
Prøve ID:	Ekstrakt 2				
Neodymium (Nd)	< 0.1	µg/l	0.1	* ICP-MS	40
Niobium (Nb)	< 1	µg/l	1	* ICP-MS	40
Palladium (Pd)	< 0.1	µg/l	0.1	* ICP-MS	40
Praseodym (Pr)	< 0.1	µg/l	0.1	* ICP-MS	40
Rhodium (Rh)	< 0.1	µg/l	0.1	* ICP-MS	40
Rutenium (Ru)	< 0.1	µg/l	0.1	* ICP-MS	40
Samarium (Sm)	< 0.1	µg/l	0.1	* ICP-MS	40
Tellur (Te)	< 0.1	µg/l	0.1	* ICP-MS	40
Terbium (Tb)	< 0.1	µg/l	0.1	* ICP-MS	40
Yttrium (Y)	< 1	µg/l	1	* ICP-MS	40
Zink (Zn)	1200	µg/l	5	* ICP-MS	40
Zirkonium (Zr)	4.3	µg/l	1	* ICP-MS	40
Bismuth (Bi)	0.14	µg/l	0.1	* ICP-MS	40
Hafnium (Hf)	< 0.1	µg/l	0.1	* ICP-MS	40
Lutetium (Lu)	< 0.1	µg/l	0.1	* ICP-MS	40
Osmium (Os)	< 0.1	µg/l	0.1	* ICP-MS	40
Platin (Pt)	< 0.1	µg/l	0.1	* ICP-MS	40
Rhenium (Re)	< 0.1	µg/l	0.1	* ICP-MS	40
Tantal (Ta)	< 0.1	µg/l	0.1	* ICP-MS	40
Thallium (Tl)	< 0.1	µg/l	0.1	* ICP-MS	40
Thorium (Th)	< 0.1	µg/l	0.1	* ICP-MS	40
Thulium (Tm)	< 0.1	µg/l	0.1	* ICP-MS	40
Uran (U)	0.19	µg/l	0.1	* ICP-MS	40
Wolfram (W)	< 1	µg/l	1	* ICP-MS	40
Ytterbium (Yb)	< 0.1	µg/l	0.1	* ICP-MS	40

Batchkommentar:
Prøverne er filtreret i laboratoriet før analyse for metaller.
Der er vedhæftet en rapport for screening af vandprøver.

12.02.2021

Kundecenter
Tlf: 70224267
G30@eurofins.dk

Hanne Jen
Hanne Jensen
Kunderådgiver

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Prøvningsresultaterne gælder udelukkende for de(n) undersøgte prøve(r).
Rapporten må ikke gengives, undtagen i sin helhed, uden prøvningslaboratoriets skriftlige godkendelse.

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Analyserapport

Sagsnr.: 200 003
Sagsnavn: 607595 VIA Loren Ramsay
Prøvetype: Grundvand
Prøvetager: Rekvirenten
Prøveudtagning:
Analyseperiode: 13.01.2021 - 12.02.2021

Prøvemærke: 4

Lab prøvenr:	**835-2021-00389004**	**Enhed**	**DL**	**Metode**	**Urel (%)**
Prøve ID:	Ekstrakt 2				
Metaller					
Cesium (Cs)	0.10	µg/l	0.1	* ICP-MS	40
Arsen (As)	< 1	µg/l	1	* ICP-MS	40
Barium (Ba)	200	µg/l	1	* ICP-MS	40
Bly (Pb)	5700	µg/l	1	* ICP-MS	40
Brom (Br)	< 100	µg/l	100	* ICP-MS	40
Chrom (Cr)	< 1	µg/l	1	* ICP-MS	40
Lithium (Li)	< 10	µg/l	10	* ICP-MS	40
Nikkel (Ni)	8.1	µg/l	1	* ICP-MS	40
Vanadium (V)	< 5	µg/l	5	* ICP-MS	40
Antimon (Sb)	13	µg/l	0.1	* ICP-MS	40
Bor (B)	58	µg/l	50	* ICP-MS	40
Cadmium (Cd)	< 0.1	µg/l	0.1	* ICP-MS	40
Kobolt (Co)	< 1	µg/l	1	* ICP-MS	40
Gallium (Ga)	41	µg/l	0.1	* ICP-MS	40
Kviksølv (Hg)	< 0.1	µg/l	0.1	* ICP-MS	40
Molybdæn (Mo)	< 1	µg/l	1	* ICP-MS	40
Rubidium (Rb)	< 10	µg/l	10	* ICP-MS	40
Selen (Se)	< 1	µg/l	1	* ICP-MS	40
Sølv (Ag)	94	µg/l	1	* ICP-MS	40
Strontium (Sr)	18	µg/l	10	* ICP-MS	40
Tin (Sn)	920	µg/l	1	* ICP-MS	40
Aluminium (Al)	3900	µg/l	30	* ICP-MS	40
Beryllium (Be)	< 5	µg/l	5	* ICP-MS	40
Cerium (Ce)	0.66	µg/l	0.1	* ICP-MS	40
Dysprosium (Dy)	< 0.1	µg/l	0.1	* ICP-MS	40
Erbium (Er)	< 0.1	µg/l	0.1	* ICP-MS	40
Europium (Eu)	< 0.1	µg/l	0.1	* ICP-MS	40
Gadolinium (Gd)	< 0.1	µg/l	0.1	* ICP-MS	40
Holmium (Ho)	< 0.1	µg/l	0.1	* ICP-MS	40
Iod (I)	< 1	µg/l	1	* ICP-MS	40
Jern (Fe)	220	µg/l	10	* ICP-MS	40
Kobber (Cu)	1700	µg/l	3	* ICP-MS	40
Mangan (Mn)	< 5	µg/l	5	* ICP-MS	40

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Prøvningsresultaterne gælder udelukkende for de(n) undersøgte prøve(r).
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Analyserapport

Sagsnr.: 200 003
Sagsnavn: 607595 VIA Loren Ramsay
Prøvetype: Grundvand
Prøvetager: Rekvirenten
Prøveudtagning:
Analyseperiode: 13.01.2021 - 12.02.2021

Prøvemærke: 4

Lab prøvenr: **Prøve ID:**	**835-2021-00389004** Ekstrakt 2	**Enhed**	**DL**	**Metode**	**Urel (%)**
Neodymium (Nd)	0.10	µg/l	0.1	* ICP-MS	40
Niobium (Nb)	< 1	µg/l	1	* ICP-MS	40
Palladium (Pd)	< 0.1	µg/l	0.1	* ICP-MS	40
Praseodym (Pr)	< 0.1	µg/l	0.1	* ICP-MS	40
Rhodium (Rh)	0.23	µg/l	0.1	* ICP-MS	40
Rutenium (Ru)	< 0.1	µg/l	0.1	* ICP-MS	40
Samarium (Sm)	< 0.1	µg/l	0.1	* ICP-MS	40
Tellur (Te)	12	µg/l	0.1	* ICP-MS	40
Terbium (Tb)	< 0.1	µg/l	0.1	* ICP-MS	40
Yttrium (Y)	< 1	µg/l	1	* ICP-MS	40
Zink (Zn)	130	µg/l	5	* ICP-MS	40
Zirkonium (Zr)	< 1	µg/l	1	* ICP-MS	40
Bismuth (Bi)	6.2	µg/l	0.1	* ICP-MS	40
Hafnium (Hf)	< 0.1	µg/l	0.1	* ICP-MS	40
Lutetium (Lu)	< 0.1	µg/l	0.1	* ICP-MS	40
Osmium (Os)	< 0.1	µg/l	0.1	* ICP-MS	40
Platin (Pt)	< 0.1	µg/l	0.1	* ICP-MS	40
Rhenium (Re)	< 0.1	µg/l	0.1	* ICP-MS	40
Tantal (Ta)	< 0.1	µg/l	0.1	* ICP-MS	40
Thallium (Tl)	0.44	µg/l	0.1	* ICP-MS	40
Thorium (Th)	< 0.1	µg/l	0.1	* ICP-MS	40
Thulium (Tm)	< 0.1	µg/l	0.1	* ICP-MS	40
Uran (U)	< 0.1	µg/l	0.1	* ICP-MS	40
Wolfram (W)	2.9	µg/l	1	* ICP-MS	40
Ytterbium (Yb)	< 0.1	µg/l	0.1	* ICP-MS	40
Kulbrinter (pentan-ekstraherbare)					
C6H6-C10	3.7	µg/l	2	ISO 9377-2 mod. GC-FID	40
C10-C25	500	µg/l	8	ISO 9377-2 mod. GC-FID	50
C25-C35	220	µg/l	9	ISO 9377-2 mod. GC-FID	50
Sum (C6H6-C35)	720	µg/l	9	ISO 9377-2 mod. GC-FID	30

835-2021-00389004 **Prøvekommentar:**

Som standardrutine bliver alle prøver til totalkulbrinter på FID og/eller kulbrinter på GC-MS dekanteret inden analyse.

Kromatogrammet viser indhold af uidentificerede komponenter med et kogepunktsinterval mellem 120 °C og 490°C.

Tegnforklaring:

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Prøvningsresultaterne gælder udelukkende for de(n) undersøgte prøve(r).
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8700 Horsens
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Kundenr.:	CA0011185
Modt. dato:	13.01.2021

Analyserapport

Sagsnr.:	200 003
Sagsnavn:	607595 VIA Loren Ramsay
Prøvetype:	Grundvand
Prøvetager:	Rekvirenten
Prøveudtagning:	
Analyseperiode:	13.01.2021 - 12.02.2021
Prøvemærke:	4

Lab prøvenr:	**835-2021-00389004**	**Enhed**	**DL**	**Metode**	**Urel (%)**
Prøve ID:	Ekstrakt 2				

Batchkommentar:
Prøverne er filtreret i laboratoriet før analyse for metaller.
Der er vedhæftet en rapport for screening af vandprøver.

12.02.2021

Kundecenter
Tlf: 70224267
G30@eurofins.dk

Hanne Jen

Hanne Jensen
Kunderådgiver

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Eurofins Miljø A/S
Ladelundvej 85
6600 Vejen
Danmark
Telefon: 7022 4266
CVR/VAT: DK-2884 8196

VIA University College Campus Horsens
Chr. M. Østergaards Vej 4
8700 Horsens
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Prøveudtagning:	
Analyseperiode:	13.01.2021 - 12.02.2021

Prøvemærke:	5

Lab prøvenr:	**835-2021-00389005**	**Enhed**	**DL**	**Metode**	**Urel (%)**
Prøve ID:	Ekstrakt 1				
Kulbrinter (pentan-ekstraherbare)					
C6H6-C10	< 2	µg/l	2	ISO 9377-2 mod. GC-FID	40
C10-C25	490	µg/l	8	ISO 9377-2 mod. GC-FID	50
C25-C35	< 9	µg/l	9	ISO 9377-2 mod. GC-FID	50
Sum (C6H6-C35)	490	µg/l	9	ISO 9377-2 mod. GC-FID	30
Se kommentar	-			*	

835-2021-00389005 **Prøvekommentar:**

Som standardrutine bliver alle prøver til totalkulbrinter på FID og/eller kulbrinter på GC-MS dekanteret inden analyse.

Kromatogrammet viser indhold af uidentificerede komponenter med et kogepunktsinterval mellem 210 °C og 450°C.

Batchkommentar:

Prøverne er filtreret i laboratoriet før analyse for metaller.
Der er vedhæftet en rapport for screening af vandprøver.

12.02.2021

Kundecenter
Tlf: 70224267
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Hanne Jen

Hanne Jensen
Kunderådgiver

Tegnforklaring:

<:	mindre end
>:	større end
#:	ingen parametre er påvist
DL:	Detektionsgrænse
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i.p.:	ikke påvist
i.m.:	ikke målelig

Urel (%): Ekspanderede relative måleusikkerhed med dækningsfaktor 2. For resultater på detektionsgrænseniveau kan usikkerheden være større end oplyst på rapporten.
$^{\sigma}$): Usikkerheder på mikrobiologiske parametre angives som logaritmeret standardafvigelse

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ilac-MRA DANAK
TEST Reg.No. 168

Eurofins Miljø A/S
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CVR/VAT: DK-2884 8196

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Prøveudtagning:	
Analyseperiode:	13.01.2021 - 12.02.2021
Prøvemærke:	6

Lab prøvenr:	**835-2021-00389006**	**Enhed**	**DL**	**Metode**	**Urel (%)**
Prøve ID:	Ekstrakt 1				
Kulbrinter (pentan-ekstraherbare)					
C6H6-C10	< 2	µg/l	2	ISO 9377-2 mod. GC-FID	40
C10-C25	520	µg/l	8	ISO 9377-2 mod. GC-FID	50
C25-C35	< 9	µg/l	9	ISO 9377-2 mod. GC-FID	50
Sum (C6H6-C35)	520	µg/l	9	ISO 9377-2 mod. GC-FID	30
Se kommentar	-			*	

835-2021-00389006 **Prøvekommentar:**
Som standardrutine bliver alle prøver til totalkulbrinter på FID og/eller kulbrinter på GC-MS dekanteret inden analyse.

Kromatogrammet viser indhold af uidentificerede komponenter med et kogepunktsinterval mellem 270 °C og 450°C.

Batchkommentar:
Prøverne er filtreret i laboratoriet før analyse for metaller.
Der er vedhæftet en rapport for screening af vandprøver.

12.02.2021

Kundecenter
Tlf: 70224267
G30@eurofins.dk

Hanne Jensen
Hanne Jensen
Kunderådgiver

Tegnforklaring:

<: mindre end
>: større end
#: ingen parametre er påvist
DL: Detektionsgrænse

*): Ikke omfattet af akkrediteringen
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Prøvningsresultaterne gælder udelukkende for de(n) undersøgte prøve(r).
Rapporten må ikke gengives, undtagen i sin helhed, uden prøvningslaboratoriets skriftlige godkendelse.

VIA University College

Att. Loren Ramsay

Dato
12. februar 2021
Deres ref.
Vores ref. V21003890

Analyse af vandprøver

Laboratoriet har den 10. januar 2021 modtaget 3 vandige ekstrakter mærket således:

Eurofins prøvenummer	Prøvemærke
V2100389004	4 – Ekstrakt 2
V2100389005	5 – Ekstrakt 1
V2100389006	6 – Ekstrakt 1

Pentanekstrakter af prøven er analyseret gaskromatografisk med flammeionisationsdetektion (GC-FID) for indhold af totalkulbrinter i området fra benzen til C35-alkan, svarende til kogepunktsområdet 80 til 490 °C. Indholdet af kulbrinter i prøverne fremgår af den tilhørende analyserapport og nedenstående skema.

Prøvemærke	Totalkulbrinter µg/l
4 – Ekstrakt 2	720
5 – Ekstrakt 1	490
6 – Ekstrakt 1	520

Pentanekstrakterne er efterfølgende analyseret gaskromatografisk med massespektrometrisk scan detektion med henblik på at identificere enkeltstoffer i ekstrakterne. Identifikationen er foretaget ved opslag i database og er ikke verificeret overfor standardstoffer da laboratoriet ikke er i besiddelse af standardstoffer for de fundne komponenter. Koncentrationen af de fundne komponenter er af samme grund beregnet overfor en alkanstandard og må derfor kun betragtes som semikvantitative.

Komponenterne ved rt. 3,7 og 7,1 er henholdsvis brombenzen og o-terphenyl som er tilsat den anvendte pentan som interne standarder.

Følgende enkeltkomponenter er identificeret og kvantificeret:

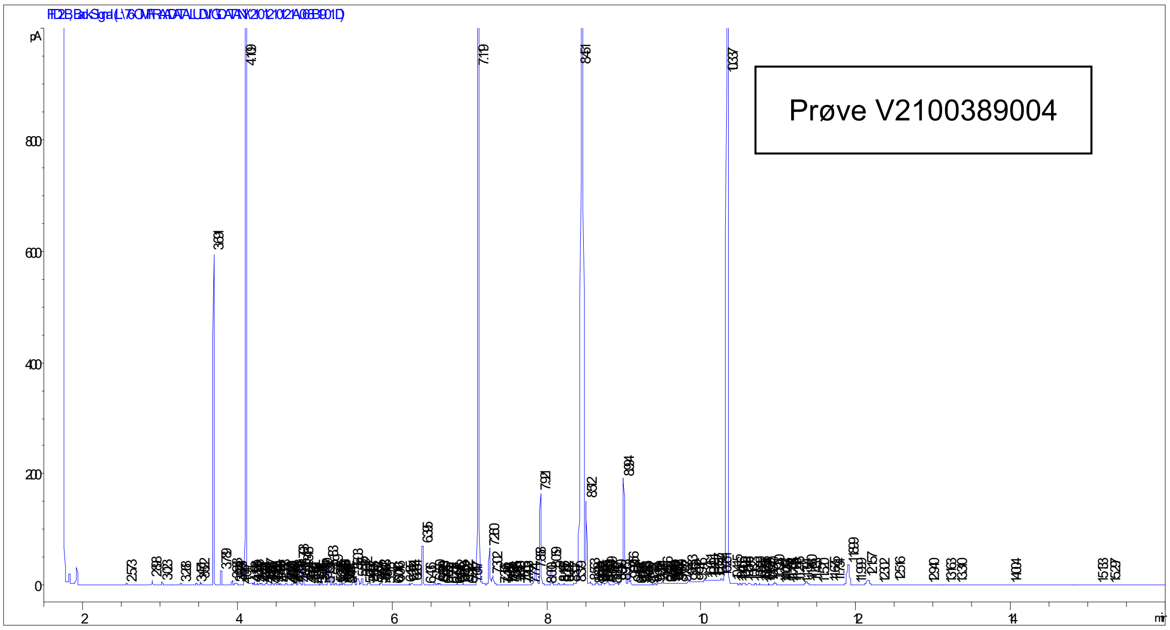
Prøve	Rt. min.	Komponent	CAS nr.	Koncentration µg/l
4 – Ekstrakt 2	4,10	2-ethyl-1-hexanol	104-76-7	310
	7,92	Hexadecanamid	629-54-9	14
	8,45+8,99	Oktadecenamid	301-02-0	250
	10,34	Decanedioic acid, bis(2,2,6,6-tetramethyl-4-piperidinyl) ester	52829-07-9	220
5 – Ekstrakt 1		Ingen enkeltkomponenter identificeret		
6 – Ekstrakt 1	5.85	Butylated Hydroxytoluene (BHT)	128-37-0	14

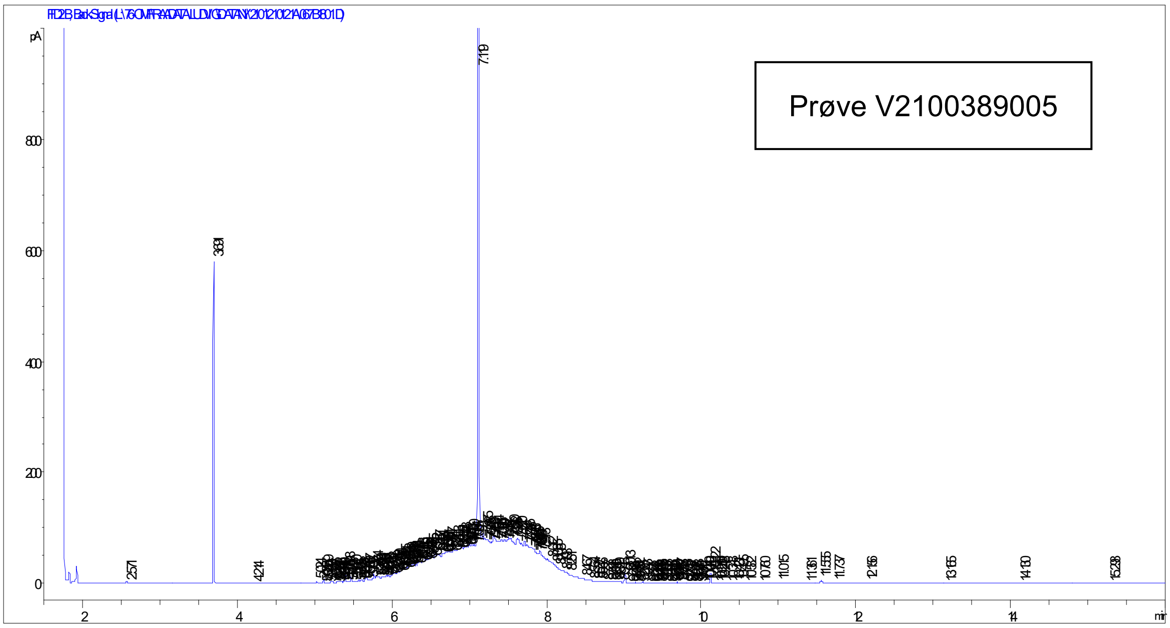
Laboratoriet står gerne til rådighed for yderligere oplysninger på telefon 70 22 42 66.

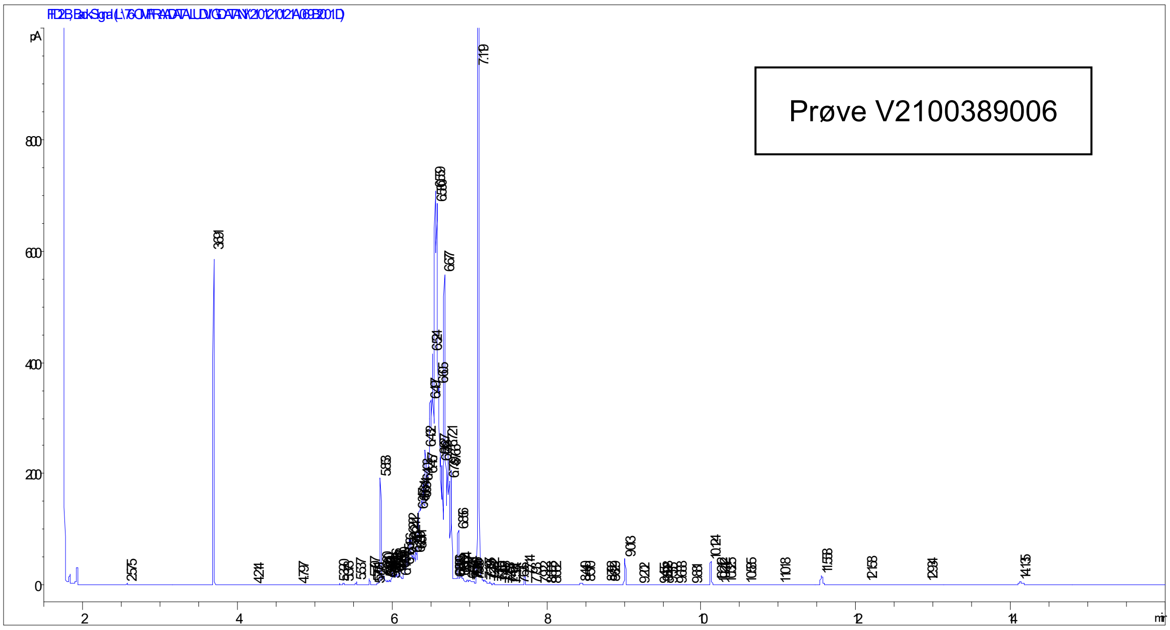
Med venlig hilsen

Eurofins Miljø A/S

Peter Rerup


Prøve V2100389004


Prøve V2100389005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