

**VERMILION
E N E R G Y**



Vermilion Energy Netherlands

NSL-01 Water Injectie

Jaarrapportage 2020

Versie 1

26 maart 2021

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Vergunning

Vermilion heeft op 10 juni 2015 op grond van de Wabo een aanvraag om een omgevingsvergunning ingediend voor de activiteit milieuneutraal veranderen. De aanvraag betreft inrichting Nijensleek-1. Op 23 juli 2015 heeft de Minister van Economische Zaken besloten de omgevingsvergunning te verlenen onder kenmerk DGETM-EM/15102502.

In de voorschriften behorende bij deze beschikking is opgenomen dat de meet en registratie verplichtingen jaarlijks worden geëvalueerd en in de vorm van een jaarrapportage worden ingediend. Dit rapport is een samenvatting van de activiteiten in kalenderjaar 2020.

Samenvatting

Gedurende het jaar 2020 is er 6072 m³ formatiewater geïnjecteerd in de put Nijnsleek-01 (NSL-01).

De maximaal te injecteren hoeveelheid productiewater volgens de beschikking bedraagt 350 m³/dag met een maximaal totaal van 240.000 m³. Tabel 1 is een lijst met de jaarlijkse hoeveelheid water injectie in NSL-01 sinds start water injectie in NSL-01.

Samen met het productie water wordt er Cortron RN-518 corrosie remmer geïnjecteerd (1 liter per 40 m³ productie water). Er zijn in 2020 geen andere additieven geïnjecteerd.

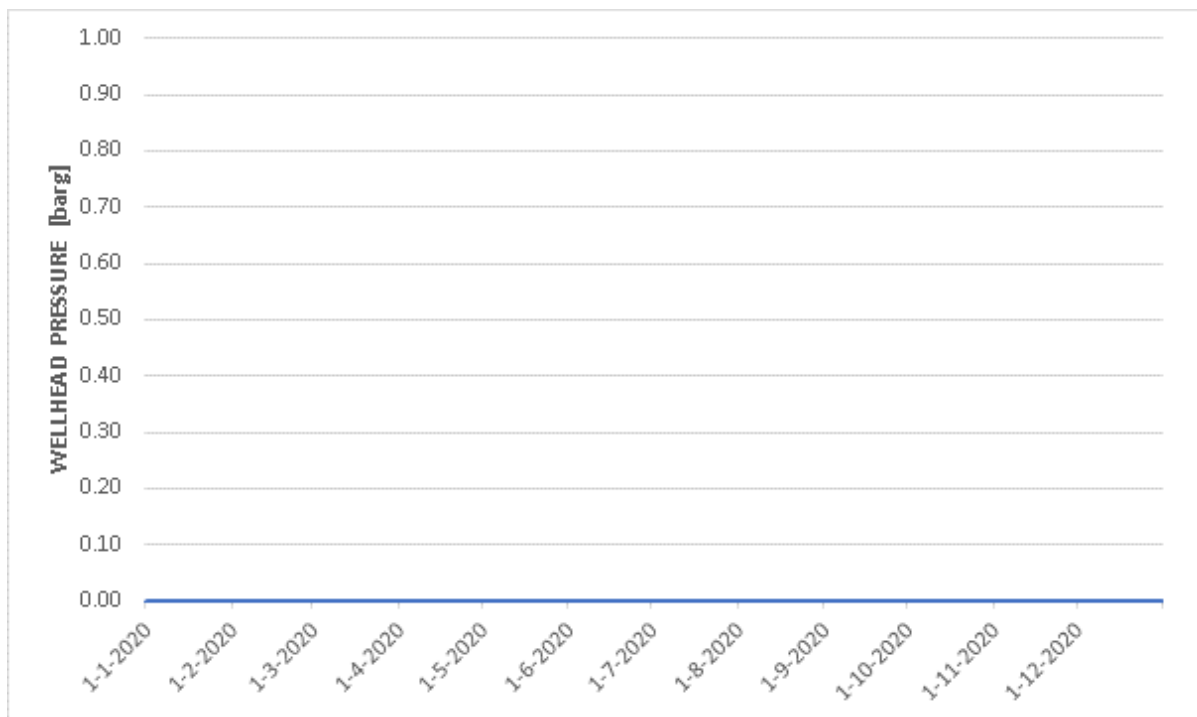
Tabel 1: Jaarlijks geïnjecteerde hoeveelheid water in NSL-01.

Jaar	Geïnjecteerd volume [in m³]
2011	13314
2012	3654
2013	2006
2014	7640
2015	12434
2016	5750
2017	1400
2018	0
2019	5035
2020	6072
Totaal	57305

Afwijkingen in injectiedrukken

De injectie druk wordt regelmatig genoteerd tijdens routine rondes. Figuur 1 laat de injectiedrukken van 2020 zien. De injectiedruk is zeer laag aangezien het water vanzelf door de druk van de hydrostatische kolom in het reservoir stroomt. Er zijn geen afwijkingen geconstateerd in 2020.

De maximaal toegestane injectiedruk is 32,6 bar.

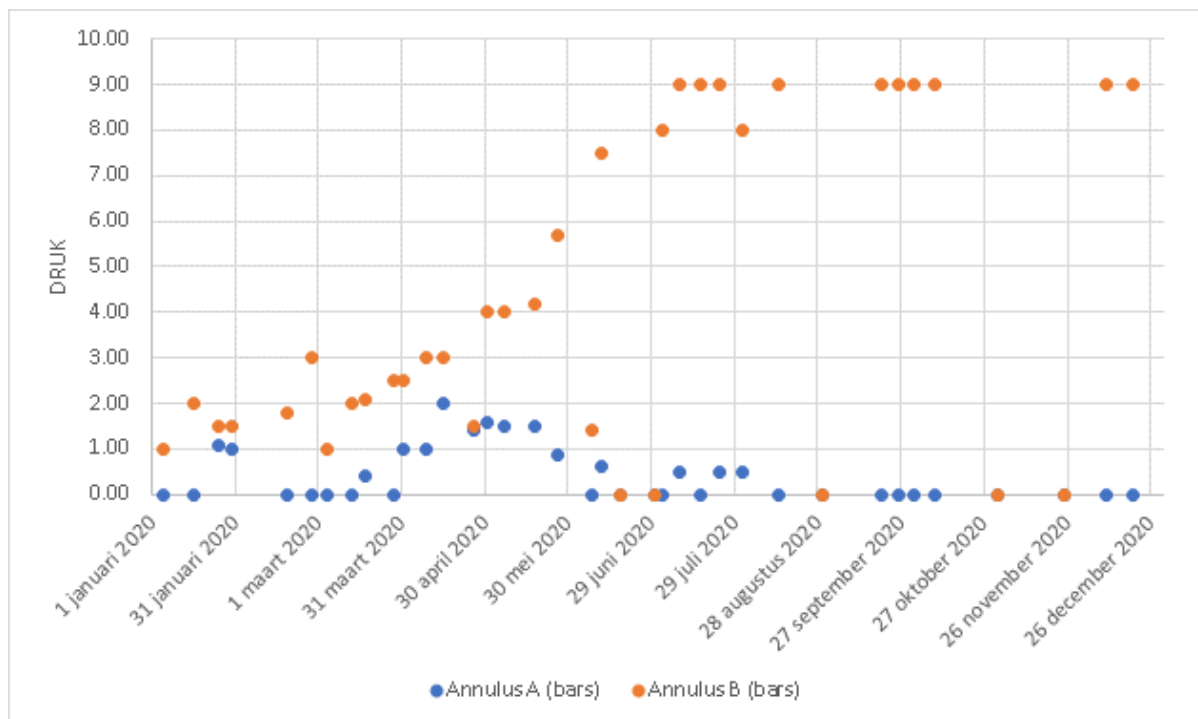


Figuur 1: NSL-01 injectiedrukken in 2020.

Afwijkingen in annulaire drukken

De annulaire druk wordt regelmatig genoteerd tijdens routine rondes. Alle waarnemingen uit 2020 zijn in Figuur 2 weergegeven.

Deze figuur laat zien dat de druk in de B-annulus is opgelopen van 0 bar naar 9 bar. Er is geen risico omdat het drukeffect stabiel en klein is.



Figuur 2: NSL-01 annulus drukken in 2020.

Mechanische zaken en onderhoud

De volgende werkzaamheden zijn uitgevoerd in 2020:

Datum	Omschrijving
8/mei/2020	Sloten vervangen door standaard sloten.
18/mei/2020	Jaarlijks preventief onderhoud.
25/jun/2020	Ring joint vervangen in de leiding.
12/okt/2020	Observatie dat A-annulus is op vacuüm. Vloeistof niveau in A-annulus op 27 m. Bijvullen met 750 liter vloeistof. Hierna staat niveau in A-annulus op 8 m.
14/okt/2020	A-annulus bijvullen met 900 liter vloeistof. Geen toename van de annulus druk.
20/okt/2020	A-annulus bijvullen met 6 m ³ vloeistof. Geen druk toename tijdens het pompen.
9-12/Nov/2020	Metten statische druk gradiënt in de put. Multi-finger caliper log van de TBG. Zet plug in tubing.
23/Dec/2020	Ring joint vervangen bij een blindflens.

Incidenten of lekkages

Water injectie is gestopt nadat bekend werd dat er communicatie was tussen de tubing en A-annulus.

Vermilion onderzoekt momenteel de mogelijkheden om de tubing te vervangen.

Vloeistof analyses

Bijgevoegd zijn een aantal water analyses van productie water wat geïnjecteerd is in NSL-01.



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ANALYTICAL REPORT SR-6004636.06.A01

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grade	PROCESWATER
sample 001	Sample received from client Sample packed in glass, quantity approx. 3 L Sample marked as TA-2360A (mix TID/ZDW/LGZ/MDB) 16-04-2020
date received	24.04.2020

ρ Density at 20°C, g/cm³ 1.0709
(ASTM D 4052)

pH at 20°C 6.30
(ASTM E 70)

Flash point, Pensky Martens closed cup, °C >80
(ASTM D 93 procedure A, modified)

Chloride as Cl⁻, mg/L 62100
(SGS SPI 158)

Ionchromatographic analysis
(SGS SPI 164)

- Sulphate as SO₄²⁻, mg/kg 130

Total Suspended Solids (>5um), mg/kg 52
(NEN 872)

Metals

(NEN6961/NEN 6966/C1)

- Arsene, µg/l	<10
- Cadmium, µg/l	1.5
- Chrome, µg/l	<5
- Copper, µg/l	<10
- Iron, µg/l	44000
- Lead, µg/l	14
- Nickel, µg/l	21
- Zinc, µg/l	530

Mercury, µg/L

0.95

(NEN EN 1483)

Bicarbonate as HCO₃, mg/L

170

(WAC/III/A/006)

Carbonate as CO₃, mg/L

<2.5

(WAC/III/A/006)

PAH, µg/L

<4.5

(SGS 12-01)

Volatile components

(ISO 15680)

- Benzene, µg/l	6200
- Ethylbenzene, µg/l	15
- Toluene, µg/l	570
- m,p Xylene, µg/l	35
- o-Xylene, µg/l	43
- sum of Xylenes, µg/l	78
- sum of BTEX, µg/l	6900
- Naphthalenes, µg/l	2.6

Hardness, mgCaCO₃/L

7450

(calculated from Ca/Mg)

Minerals Oil

(NEN-EN-ISO 9377-2)

- Fraction C10-C12, µg/l	480
- Fraction C12-C22, µg/l	540
- Fraction C22-C30, µg/l	<25
- Fraction C30-C40, µg/l	<25
-Total C10-C40, µg/l	1100

Sum of Arsene, + Mercury + Benzene, µg/L <6210
(Calculated)

Total Sulfide as S, mg/L <0.1
(WAC/III/C/040)

Gaschromatographic analysis
(SGS 2005-18)

- 1.2 Propyleenglycol, mg/l	<12
- 1.3 Propyleenglycol, mg/l	<25
- Dietyleenglycol, mg/l	140
- Monoethyleenglycol, mg/l	310
- Triethyleenglycol, mg/l	660

End of analytical results

Spijkenisse, the 8th May 2020
SGS Nederland B.V. - Oil, Gas and Chemicals



M. Audier
Laboratory Manager

The results shown in this test report specifically refer to the sample(s) tested as received unless otherwise stated. All tests have been performed using the latest revision of the methods indicated, unless specifically marked otherwise on the report. Precision parameters apply in the determination of the above results. Users of analytical results, when establishing conformance with commercial or regulatory requirements should note the full provisions of ASTM D3244, IP 367 and ISO 4259 in that context, the default confidence level of petroleum testing having been set at the 95% confidence level. Your attention is specifically drawn to Sections 7.3.6., 7.3.7 and 7.3.8 of ASTM D3244. SGS' sole responsibility is to its client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Warning: The sample(s) to which the findings recorded herein (the "Findings") relate was (were) drawn and / or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativeness of any goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted.



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ANALYTICAL REPORT SR-6004636.06.A02

P.1/3

grade	PROCESWATER
sample 002	Sample received from client Sample packed in glass, quantity approx. 3 L Sample marked as Brakel 17-04-2020
date received	24.04.2020

ρ Density at 20°C, g/cm³ 1.1196
(ASTM D 4052)

pH at 20°C 5.94
(ASTM E 70)

Flash point, Pensky Martens closed cup, °C >80
(ASTM D 93 procedure A, modified)

Chloride as Cl⁻, mg/L 106100
(SGS SPI 158)

Ionchromatographic analysis
(SGS SPI 164)

- Sulphate as SO₄²⁻, mg/kg 240

Total Suspended Solids (>5um), mg/kg 62
(NEN 872)

Metals

(NEN6961/NEN 6966/C1)

- Arsene, µg/l	15
- Cadmium, µg/l	<1
- Chrome, µg/l	<5
- Copper, µg/l	23
- Iron, µg/l	71
- Lead, µg/l	110
- Nickel, µg/l	23
- Zinc, µg/l	1800

Mercury, µg/L

0.26

(NEN EN 1483)

Bicarbonate as HCO₃, mg/L

120

(WAC/III/A/006)

Carbonate as CO₃, mg/L

<2.5

(WAC/III/A/006)

PAH, µg/L

<24

(SGS 12-01)

Volatile components

(ISO 15680)

- Benzene, µg/l	8900
- Ethylbenzene, µg/l	70
- Toluene, µg/l	1700
- m,p Xylene, µg/l	250
- o-Xylene, µg/l	170
- sum of Xylenes, µg/l	410
- sum of BTEX, µg/l	11000
- Naphthalenes, µg/l	22

Hardness, mgCaCO₃/L

28450

(calculated from Ca/Mg)

Minerals Oil

(NEN-EN-ISO 9377-2)

- Fraction C10-C12, µg/l	2400
- Fraction C12-C22, µg/l	1700
- Fraction C22-C30, µg/l	<25
- Fraction C30-C40, µg/l	<25
-Total C10-C40, µg/l	4200

Sum of Arsene, + Mercury + Benzene, µg/L <8916
(Calculated)

Total Sulfide as S, mg/L <0.1
(WAC/III/C/040)

Gaschromatographic analysis
(SGS 2005-18)

- 1.2 Propyleenglycol, mg/l	<12
- 1.3 Propyleenglycol, mg/l	<25
- Dietyleenglycol, mg/l	<12
- Monoethyleenglycol, mg/l	570
- Triethyleenglycol, mg/l	<12

End of analytical results

Spijkenisse, the 8th May 2020
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ANALYTICAL REPORT SR-6004636.01.A01

P.1/3

grade	PROCESWATER
sample 001	Sample received from client Sample packed in glass, quantity approx. 3 L Sample marked as ZDW, HTC Slugcatcher 01-04-2020
date received	02.04.2020

Density at 20°C, g/cm³
(ASTM D 4052) 1.0749

pH at 20°C
(ASTM E 70) 6.10

Flash point, Pensky Martens closed cup, °C
(ASTM D 93 procedure A, modified) >80

Chloride as Cl⁻, mg/L
(SGS SPI 158) 61000

Ionchromatographic analysis
(SGS SPI 164)

- Sulphate as SO₄²⁻, mg/kg 140

Total Suspended Solids (>5µm), mg/kg
(NEN 872) 162

Metals

(NEN6961/NEN 6966/C1)

- Arsene, µg/l	<10
- Cadmium, µg/l	<1
- Chrome, µg/l	5.2
- Copper, µg/l	23
- Lead, µg/l	<10
- Nickel, µg/l	15
- Strontium, µg/l	570000
- Zinc, µg/l	52

Mercury, µg/L

(NEN EN 1483)

2.3

PAH, µg/L

(SGS 12-01)

93

Volatile components

(ISO 15680)

- Benzene, µg/l	8700
- Ethylbenzene, µg/l	220
- Toluene, µg/l	2600
- m,p Xylene, µg/l	610
- o-Xylene, µg/l	500
- sum of Xylenes, µg/l	1110
- sum of BTEX, µg/l	12630
- Naphthalenes, µg/l	92

Minerals Oil

(NEN-EN-ISO 9377-2)

- Fraction C10-C12, µg/l	4400
- Fraction C12-C22, µg/l	4500
- Fraction C22-C30, µg/l	<25
- Fraction C30-C40, µg/l	<25
-Total C10-C40, µg/l	8900


Sum of Arsene, + Mercury + Benzene, µg/L <8713
 (Calculated)

Gaschromatographic analysis
 (SGS 2005-18)

- 1,2 Propyleenglycol, mg/L	<2.5
- 1,3 Propyleenglycol, mg/L	<2.5
- Ethyleenglycol, mg/L	74
- Diethyleenglycol, mg/L	<2.5
- Triethyleenglycol	<2.5
- Tripropyleenglycol	<2.5

Samples will be retained for 3 months unless instructed otherwise.
 End of analytical results

Spijkenisse, the 6th April 2020
SGS Nederland B.V. - Oil, Gas and Chemicals



M. Audier
 Laboratory Manager

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