Seismicity Response Protocol
Zoetermeer II - VDB-GT-07 / VDB-GT-08

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Table of Contents

SEISMICITY RESPONSE PROTOCOL ***4***

Seismic Risk Coordination Team and Crisis Team **4**

Response and communication protocol **5**

Scenario 1: Correlation of baseline seismic activity and well activity 5

Scenario 2: Seismic event of M < 1,5 in the vicinity of the mining site 5

Scenario 3: Seismic event of M ≥ 1,5 in the vicinity of the mining site or > 1 event per year 5

Scenario 4: Noticeable seismic event in the vicinity of the mining site 5

Contact List **7**

References ***8***

SEISMICITY RESPONSE PROTOCOL

This purpose of document is to outline the seismicity response organization and its key responsibilities. Two teams with specific tasks are responsible for the implementation of the Seismicity Response Protocol: the Seismic Risk Coordination Team (SRCT) and the Crisis Team (CT). How and when the environment is informed is described in the Response and Communication Protocol below, depends on four scenarios. The scenarios are determined by the analyses of the Seismic Monitoring Plan (Tullip Energy, 2023a) and Seismic Risk management Plan (Tullip Energy, 2023b).

Seismic Risk Coordination Team and Crisis Team

As part of the seismic risk management plan, the Seismic *Risk Coordination Team* (SRCT) has been formed. The SRCT consists of representatives of the operator and is responsible for daily seismic risk management and mitigation (see Table 1 for SRCT contact details). The SRCT is the first point of contact for all matters of seismicity. The SRCT is responsible for the processing, analysis, documentation, reporting, and communication of the recorded seismic activity near the mining site as described in the Seismic *Monitoring Plan* (Tullip Energy, 2023a).

Table 1 Contact details Seismic Risk Coordination Team

Name	Organization	Job title	Contact details
[redacted]	Tullip Energy	Subsurface manager	[redacted]@tullipenergy.com +31[redacted]
[redacted]	IPS Geothermal Energy	Plant manager	[redacted]@tullipenergy.com +31[redacted]
[redacted]	Tullip Energy	Geologist	[redacted]@tullipenergy.com +31[redacted]

In case of a significant seismic event in the vicinity of the mining site (see *Seismic Monitoring Plan* for the determination of vicinity), the SRCT is assisted by the Crisis Team (CT) (Table 2). The CT is responsible for general crisis management and communication in the region as described by Tullip Energy Crisis Communication Plan (Tullip Energy, 2023c). If the unlikely scenarios that emergencies arise from a significant seismic event, the Emergency Response Team (ERT) is activated to ensure that resources and emergency management support are provided as described in the Tullip Energy Emergency Response Plan (Tullip Energy, 2023d).

Table 2 Contact details Crisis Team

Name	Organization	Job title	Contact details
[redacted]	Tullip Energy	Director	[redacted]@tullipenergy.com +31[redacted]
[redacted]	Tullip Energy	Health Safety and Environmental manager	[redacted]@tullipenergy.com +31[redacted]

Response and communication protocol

The response and communication protocol depends on the results of the *Seismic Monitoring Plan.* During *normal operations*, as described in the *Seismic Monitoring Plan, seismic* activity is monitored, analyzed, and documented. The SRCT meets once a quarter for the evaluation of the overall *Seismic Risk Management Plan.*

The response and communication protocol takes effect at the following three scenario's:

Scenario 1: Correlation of baseline seismic activity and well activity

When analysis shows there is a clear correlation between an increase in observed seismic activity in the region (see Seismic Monitoring Plan, determination of region) and the well activity of the geothermal system, the SRCT will share these analyses directly with State Supervision of Mines *(Staatstoezicht op de Mijnen).*

Scenario 2: Seismic event of M < 1,5 in the vicinity of the mining site

Directly after publication of a M < 1,5 seismic event, in the *vicinity* of the mining site (see *Seismic Monitoring Plan* for the determination of vicinity) by the KNMI, the following actions are taken:

- The SRCT meets for a further analysis of the seismic event of seismic activity in space, time and magnitude relative to the location, the geological subsurface model, well location and faults.
- The SRCT re-evaluates seismicity risk assessment
- The SRCT will contact the KNMI to discuss the interpretation of the registered event in more detail.
- The SRCT evaluates possible correlation with well activity or potential interference with future geothermal exploitation activities and in such a case contacts State Supervision of Mines (*Staatstoezicht op de Mijnen*).

Scenario 3: Seismic event of M ≥ 1,5 in the vicinity of the mining site or > 1 event per year

Immediately after the publication of a M ≥ 1,5 seismic event in the *vicinity* of the mining site (see *Seismic Monitoring Plan* for the determination of the environment) or the publication of a second event in the same year by the KNMI, the following actions are taken:

- The SRCT meets for a further analysis of the seismic event of seismic activity in space, time and magnitude relative to the location, the geological subsurface model, well location and faults.
- The SRCT re-evaluates seismicity risk assessment
- The SRCT consults with SodM and with their agreement orders shut down of geothermal operations.
- The SRCT evaluates possible correlation with well activity or potential interference with future geothermal exploitation activities and in such a case contacts State Supervision of Mines (*Staatstoezicht op de Mijnen*).

Scenario 4: Noticeable seismic event in the vicinity of the mining site

Immediately after the publication of a noticeable seismic event in the *vicinity* of the mining site (see *Seismic Monitoring Plan* for the determination of the environment) by the KNMI, the following actions are taken:

- The SRCT informs the CT of the situation.
- The SRCT and CT meet together, with the SRCT presenting the situation.

- The SRCT calls the KNMI to discuss the interpretation and details (*e.g.*, *shakemaps*) of the registered event.
- The CT calls the Rotterdam-Rijnmond Safety Region (*Veiligheidsregio Rotterdam-Rijnmond*) for coordination of crisis management.
- The SRCT calls State Supervision of Mines (*Staatstoezicht op de Mijnen*) about the seismic event and discusses the production measures.
- The SRCT calls the contact persons of the surrounding mining activities to inform them about the seismic event.
- The CT calls the municipalities of Lansingerland.
- The CT creates a team with the capacity to properly handle damage reports, subject to the actual cause of the seismic event.
- The CT informs local residents about the registration of the seismic event, including a reference to the location where damage reports can be submitted.

On the first working day after the publication of a noticeable seismic event in the vicinity of the mining site by the KNMI, the following actions are taken:

- The CT shall draw up a further specific communication plan, and adopt further actions in accordance with the SRCT and authorities (*bevoegd gezag*).
- The SRCT informs the Ministry of Economic Affairs and Climate, the province of South Holland, and the Water Board of Hoogheemraadschap van Delfland and Schieland en Krimpenerwaard
- The SRCT informs IPS, 85 degrees and Tullip management.
- The CT starts investigating any damage claims through independent damage experts to be appointed (*e.g.*, Commissie Mijnbouwschade) subject to the actual cause of the seismic event.
- The CT places a press release on the webpage of the geothermal operation, including reference to the location damage reports submittal.
- The SRCT calls *Geothermie Nederland* for coordination of internal and external communication from the geothermal sector.
- The SRCT analyzes the seismic event relative to the location, the geological subsurface model, well location and faults. This is done in consultation with the KNMI and State Supervision of Mines (*Staatstoezicht op de Mijnen*) and possibly an independent expert (*e.g.*, TNO).
- The SRCT evaluates possible correlation with well activity or potential interference with future geothermal exploitation activities and in such a case contacts and State Supervision of Mines (*Staatstoezicht op de Mijnen*) to discuss production measures.
- The SRCT will review the assumptions in the geological and geomechanical model as well as the seismic risk analysis (SRA) and contact Supervision of Mines (*Staatstoezicht op de Mijnen*) to discuss further steps.
- The SRCT will offer the opportunity to explain the seismic event to local residents via a walk-in session.

Contact List

Table 3 shows the contact list for the follow-up of a seismic event in the vicinity of the mining site. The list indicates which persons/organisations (including contact details) are contacted, and who is responsible.

Table 3. Contact list for the follow-up of a seismic event in the area. TO BE UPDATED IN NEXT REVISION

Organization	Contact	Contact details	Responsible party
KNMI		@knmi.nl	SRCT
Veiligheidsregio Rotterdam-Rijnmond	Incident phone number	Emergencies: 112 Urgent, non-emergency: 0900-0904	CT
Staatstoezicht op de Mijnen	Incident phone number	+31	SRCT
NAM	General	@shell.com	SRCT
Duijvesteijn Energie B.V.	General	+31 @duijvestijntomaten.nl	SRCT
Wayland Energy B.V.	General	@wayland.nl	SRCT
Gemeente Lansingerland	General		CT
Ministerie van EZK	-	xxx@minezk.nl – TO BE UPDATED	CT
Provincie Zuid Holland	Switch board		CT
Hoogheemraadschap Schieland en Krimpenerwaard	General	@hhsk.nl	CT
Hoogheemraadschap van Delfland	General	@hhdelfland.nl	CT
Geothermie Nederland	General	@geothermie.nl – TO BE UPDATED	SRCT
A+G Van den Bosch B.V.		@vleestomaat.nl	CT
External stakeholders	Heat consumers and local residents	List of heat consumers and local residents	CT

References

Tullip Energy 2023a. Seismicity Monitoring Plan, Zoetermeer II, VDB-GT-07 / VDB-GT-08 – Version 01.

Tullip Energy 2023b. Seismic Risk Management Plan, Zoetermeer II, VDB-GT-07 / VDB-GT-08 – Version 01.

Tullip Energy 2023c. Crisis Communication Plan – Version 01.

Tullip Energy 2023d. Emergency Response Plan – Version 01.