Zero Carbon Lithium™

Non-Technical Summary (NTS)

PREPARED FOR

Vulcan Energy Resources Ltd

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Zero Carbon Lithium™

Non-Technical Summary (NTS)

0699805

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Every effort has been made to ensure the quality of the translation is technically correct. However, where discrepancies between the various translated texts occur, the English version is to be relied upon as the original and formal version.

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
AF	Associated Facilities
AoI	Area of Influence
AQIA	Air Quality Impact Assessment
AQS	Air Quality Standards
CGM	Community Grievance Mechanism
CH	Cultural Heritage
CHA	Critical Habitat Assessment
CLP	Central Lithium Plant
E&S	Environmental and Social
ECAs	Export Credit Agencies
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EP4	The Equator Principles 4th Edition
EPRP	Emergency Preparedness and Response Plan
ERM	Environmental Resource Management
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
EU	European Union
GIP	Good International Practice
GLEP	Geothermal Lithium Production Plant
GM	Grievance Mechanism
HLNUG	Hessian State Office for the Nature Protection, Environment and Geology
IA	Impact Assessment
IAP	Invasive Alien Plants
ICPP	Interconnecting Pipeline and Power
IFC	International Finance Corporation
IFC PS	International Finance Corporation Performance Standards
LEP	Lithium Extraction Plant
LiOH	Lithium Hydroxide
NTS	Non-Technical Summary
OHS	Occupational Health and Safety

Acronyms	Description
ORC	Organic Rankine Cycle
PA	Protected Area
PAP	Project-Affected-Persons
RCIA	Rapid Cumulative Impact Assessment
RoW	Right of Way
RRI	Regional Readiness Index
SEP	Stakeholder Engagement Plan
TSO	Transmission System Operators
VEC	Valued Environmental Components

1. INTRODUCTION

Vulcan Energy Resources Limited (hereinafter called "Vulcan") owns the largest combined geothermal energy and lithium resource in Europe (Upper Rhine Valley, Germany and France). They have identified a local demand for the expansion of their products:

- A need for increased sources of renewable energy, namely via heat and electricity to the Upper Rhine Valley, especially alongside Germany's current major energy transition; and
- Sustainable lithium given the rapidly increasing demand for batteries for electric vehicles and other uses in the energy transition. The EU wants to obtain a significant proportion of the required lithium volume for batteries from domestic sources. [1]

Vulcan aspires to create and expand local sources of sustainable lithium and geothermal energy for Europe using a stringent carbon neutral strategy. Vulcan produces both renewable energy and lithium from the same sub-surface brine source. By utilizing existing technology for efficient lithium production from sub-surface geothermal brine, Vulcan aims to create a local source of sustainable lithium battery chemicals and renewable energy with a carbon neutral strategy: strictly limiting the usage of fossil fuels and recycled water usage during the process. Vulcan additionally aims to create significant added value to the area with the provision of renewable electricity and heat to local communities.

Vulcan's Phase One Zero Carbon Lithium™ Project (hereinafter called "the Project") would ultimately supply approximately 24,000 tons per annum of lithium hydroxide monohydrate (LHM), enough for production of ca. 500,000 Electric Vehicles (EVs) per annum, as well as approximately up to 560 GWh of renewable heat per year and up to 275 GWh of electricity. On the renewable energy side, considering average per capita heat consumption in Germany[2] , the Project will positively affect ca. 90,000 people. Beneficiaries will mostly be within the nearby municipalities and districts.

Vulcan is seeking financing for the investment costs of the Project by debt and equity under a Project Finance structure involving international banks as well as Export Credit Agencies (ECAs) (together hereinafter called the 'Lenders"). In accordance with international Lenders' requirements, an Environmental and Social Impact Assessment (ESIA) is required to identify the potential Environmental and Social (E&S) impacts of the Project and define how the potential impacts will be mitigated, managed, and monitored throughout the design, construction, and operation phases.

Vulcan has/is already proceeding with iterative, stepwise German permitting requirements in line with applicable laws in Germany. Since this Project is a large-scale geothermal Project, involving sub-surface drilling and resource production, most of the national requirements pertaining to assessing environmental effects and permitting processes are determined by national mining laws and procedures. Various environmental assessments[3] are carried out prior to the actual permitting process in Germany; the final environmental assessments must be submitted with actual permit applications to the relevant authorities. However, it is critical to note that this ESIA process is being carried out prior to the regulatory EIA (as per German

[1] Winkelmann, M., 2023. Nachschub aus dem Untergrund. Greenpeace Magazine (Greenpeace Magazin | Nachschub aus dem Untergrund (greenpeace-magazin.de))
[2] Average per capita heat consumption in Germany of 6,200 kWh (https://www.destatis.de/)
[3] These refer to the Environmental Impact Assessment, Plan Approval Procedures, and Environmental Construction Supervision.

National Requirements) in order to facilitate public participation in the Project design and planning.

Table 1-1 below presents the main Project components and explains their most important details.

TABLE 1-1 KEY PROJECT COMPONENTS

Component	Detail(s)
Well Sites	4 existing wells will be utilized, and 24 new wells will be drilled and at 2 existing and 5 new locations: • Insheim power plant and well site (existing) • Landau well site (existing) • Schleidberg Well Site • Trappelberg Well Site • 40 Morgen Well Site • Hasenberg Well Area[4] • Spreissgraben Well Area[4] New well sites are selected based on their geological suitability, ensuring they meet the necessary technical requirements for drilling and extraction. The overall layout and functional design of each site are standardized, with only minor variations to accommodate local conditions, such as specific access and exit routes. The main difference between the sites lies in the number of production and injection wells, which may vary depending on the specific needs or conditions of each location. Water for drilling will be sourced from nearby groundwater wells, and the required permits for this have already been submitted and approved by the relevant German authorities.
Interconnecting Pipeline & Power (ICPP)	• An interconnecting (sub-surface) pipeline & power system will be installed connecting all the well sites to the new G-LEP facility and provides the upstream project with three key functions including transport of power & control, brine, and industrial water. • The pipeline route alignment will mainly follow the existing access parcel boundaries and agricultural management, and there will be railway, highway, and small access road crossings. • A four-pipe system will be installed with two pipelines being thermal brine (one rich in lithium and one depleted in lithium) pipelines and two industrial water (one hot water and one cool water) pipelines. The transport of geothermal energy requires that the planned industrial water pipeline is filled with water of sufficient quality. For this purpose, a well for the abstraction and use of fresh groundwater is planned on the site of the GLEP. Since the industrial water is cycled between well sites and the geothermal plant, there is no need to continuously extract ground water to produce industrial water. Rather, the amount needed is defined by the volume of the two pipelines plus all auxiliary components, and then it circulates in a "closed loop", circular system. Based on the system planned, Vulcan expects a minor amount of groundwater during production to make up for losses in the system. To achieve the required industrial water quality, the groundwater needs to be desalinated and/or softened by means of a mobile water treatment unit.
Geothermal Lithium Extraction Plant (GLEP)	• A combined plant where brine and industrial water are processed separately. • Required for production of heat, power and lithium chloride from industrial water and brine respectively.

[4] The Hasenberg and Spreissgraben wells are being referred to as "areas" rather than sites because they are still in the exploration stage. This means that the exact plot of landed used for the site is still being determined for the Hasenberg and Spreissgraben wells. The land required for the other three well sites has already been determined.

Component	Detail(s)
Insheim Geothermal Plant[5]	• Combined heat and powerplant, already owned and operated by Vulcan.
Landau Geothermal well site[6]	• Owned and operated by geox GmbH. • Pipeline will connect the Landau Geothermal well site to Vulcan's GLEP site.
Central Lithium Plant (CLP) Hoechst	• Plant used for the production or refinement of lithium hydroxide monohydrate (LHM). • Infraserv will provide utilities and services for construction, operation and maintenance of the plant.
Ancillary Services/Facilities	These will include access roads, workers' camps and electrical infrastructure. In case there are other ancillary services identified upon completion of the final design, Vulcan will ensure that the environmental and/or social risks and impacts arising from these facilities are managed and mitigated in accordance with German legislation, Good International Practice (GIP) and the objectives of IFC PSs.

To meet international project finance requirements, Vulcan appointed Environmental Resources Management (ERM), an independent international consultant, to conduct Environmental and Social Impact Assessment (ESIA) studies. These studies are aligned with the requirements of lenders, including the International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability, as well as the Equator Principles 4th Edition (EP4).

ESIA studies have been completed by ERM in and the findings of the studies including embedded and mitigation measures have been compiled in ESIA report and its Annexes.

1.1 WHAT IS THIS DOCUMENT?

This document is the Non-Technical Summary (NTS) for Phase One of Vulcan's Zero Carbon Lithium™ Project ("the Project"). The NTS summarizes the key findings from the Project's ESIA conducted by ERM for Vulcan. It is intended to be a digestible consolidation of the information provided in the full ESIA for the public and Project-specific stakeholders to use to understand:

- The Project background, Project description and its main components;
- The ESIA process (including stakeholder engagement and relevant grievance mechanism(s)) (including a sample grievance form attached in the appendix); and
- The potential (positive and/or adverse) environmental and social impacts, and the mitigation measures to avoid or reduce potential impacts.

The full ESIA, NTS, and Stakeholder Engagement Plan (SEP) are being published for public disclosure on the 16th of September 2024 in order to meet the financing requirements of the European Investment Bank (EIB).

1.2 WHERE TO GET MORE INFORMATION?

Vulcan intends to make it easy for the public to properly understand both Vulcan's general and Project-specific intentions, activities, and desired outcomes. Vulcan invites the public and

[5] Also known as Natürlich Insheim GmbH.
[6] Landau Geothermal Power Plant is an existing facility owned and operated by third-party company - Geox GMBH. Since Landau Geothermal Power Plant will not be a part of components to be financed by the Lenders, the facility will be treated as brine supplier to Landau GLEP.

relevant stakeholders to engage with and share any comments, suggestions, questions, or complaints about the ESIA process or Phase One of the Project.

Further information can be accessed online at Vulcan's general website, https://v-er.eu/, and their page specifically related to the overarching Project, https://v-er.eu/zero-carbon-lithium/. Users can reach Vulcan online, in person, or over the phone with the following contact information:

- Address: Amalienbadstraße 41, Bau 54, 76227
  Karlsruhe, Germany
- E-mail address: info@v-er.eu
- Phone number:+61 8 6331 6156

Individuals and groups are also welcome to visit Vulcan's Information Center (Figure 1-1 below) in Landau at:

- Address: Industriestraße 2, 76829 Landau in der Pfalz
- Phone number: +49 634 1681 3220

FIGURE 1-1 VULCAN INFORMATION CENTRE, LANDAU

2. PROJECT DESCRIPTION

Figure 2-1 below provides an overview of the Project. It presents the various Project components and their connection to one another.

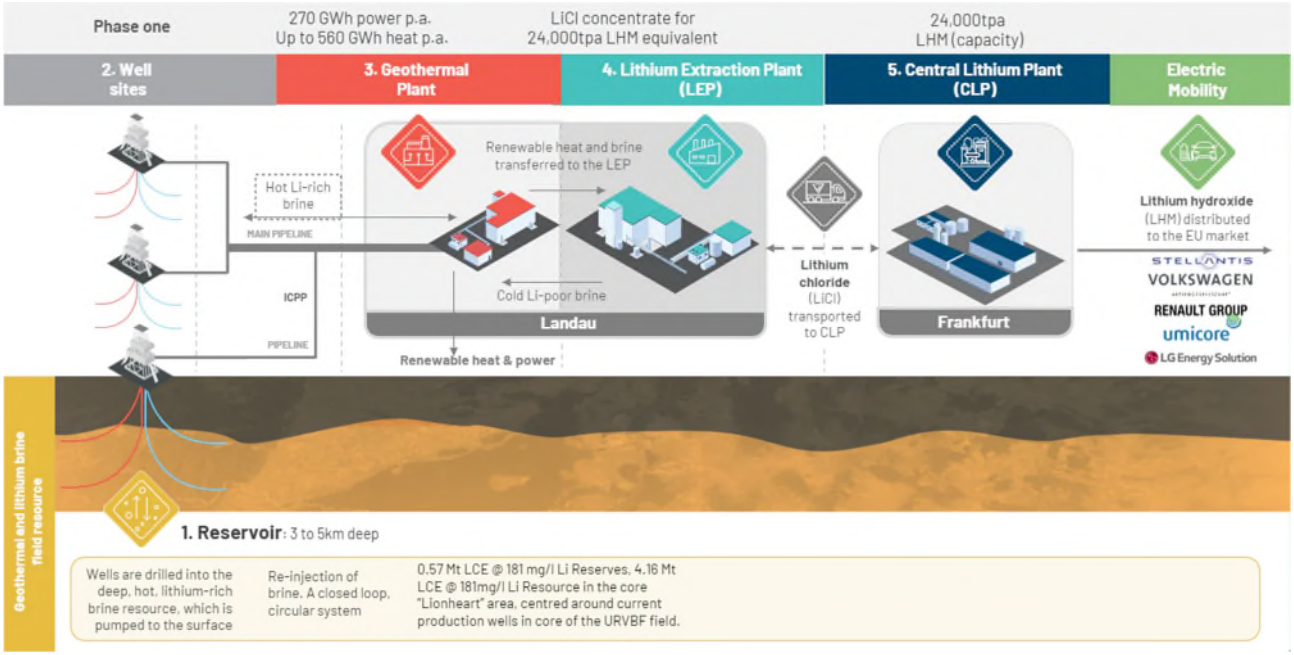


FIGURE 2-1 PROJECT STRUCTURE

Source: Vulcan, 2024

Process

The following processes will take place during operation:

1. Hot brine is pumped from out of the ground (sub-surface) through production wells at well sites and cooled with a heat exchanger to optimal lithium extraction temperature, and the heat from the hot brine is transferred to an industrial water cycle which is used to produce geothermal energy. The cooled brine is then transported to the Lithium Extraction Plant (LEP) (part of GLEP) where the lithium is produced from the brine and the spent brine is sent back to the well-site to be re-injected into the ground via injection wells.
2. At the new geothermal plant (part of the GLEP) the industrial water cycle coming from the different well sites contain the thermal energy that has been transferred from the brine via the well site heat exchanger, and is used for providing heat and generating electricity.
3. At the GLEP lithium chloride will also be produced from the brine, concentrated, and transported to the Central Lithium Plant (CLP) at Frankfurt Höchst. At this industrial park (owned by Infraserv) the lithium will be converted to lithium hydroxide for future distribution.[7]
4. Well-sites, the existing Geothermal Power Plant Landau (owned and operated by geox GmbH), and Vulcan's Geothermal Power Plant Insheim are all connected to the GLEP plant with an interconnecting pipeline and power (ICPP) system.

It is important to note that the injection rate (across all injection wells) will equal the production rate (across all production wells) as there will be no storage facility at surface, so the whole

[7] Lithium hydroxide is essential for lithium-ion batteries, specialty chemicals, greases etc.

system operates in a closed, circular loop. The maximum injection rate for each well will be maintained below the frack pressure to prevent fracturing of the formation.

Well Construction

The target formation for the brine production and injection is the Buntsandstein Formation, which is at depths of between approximately 2,500 m and 4,000 m below ground level.

The geothermal wells will be constructed with telescopic steel casing which will be concreted in place. The innermost steel casing will be constructed with an anti-corrosion casing, (Figure 2-2). These measures will isolate the overlying formations, preventing migration of fluid between formations and aquifer

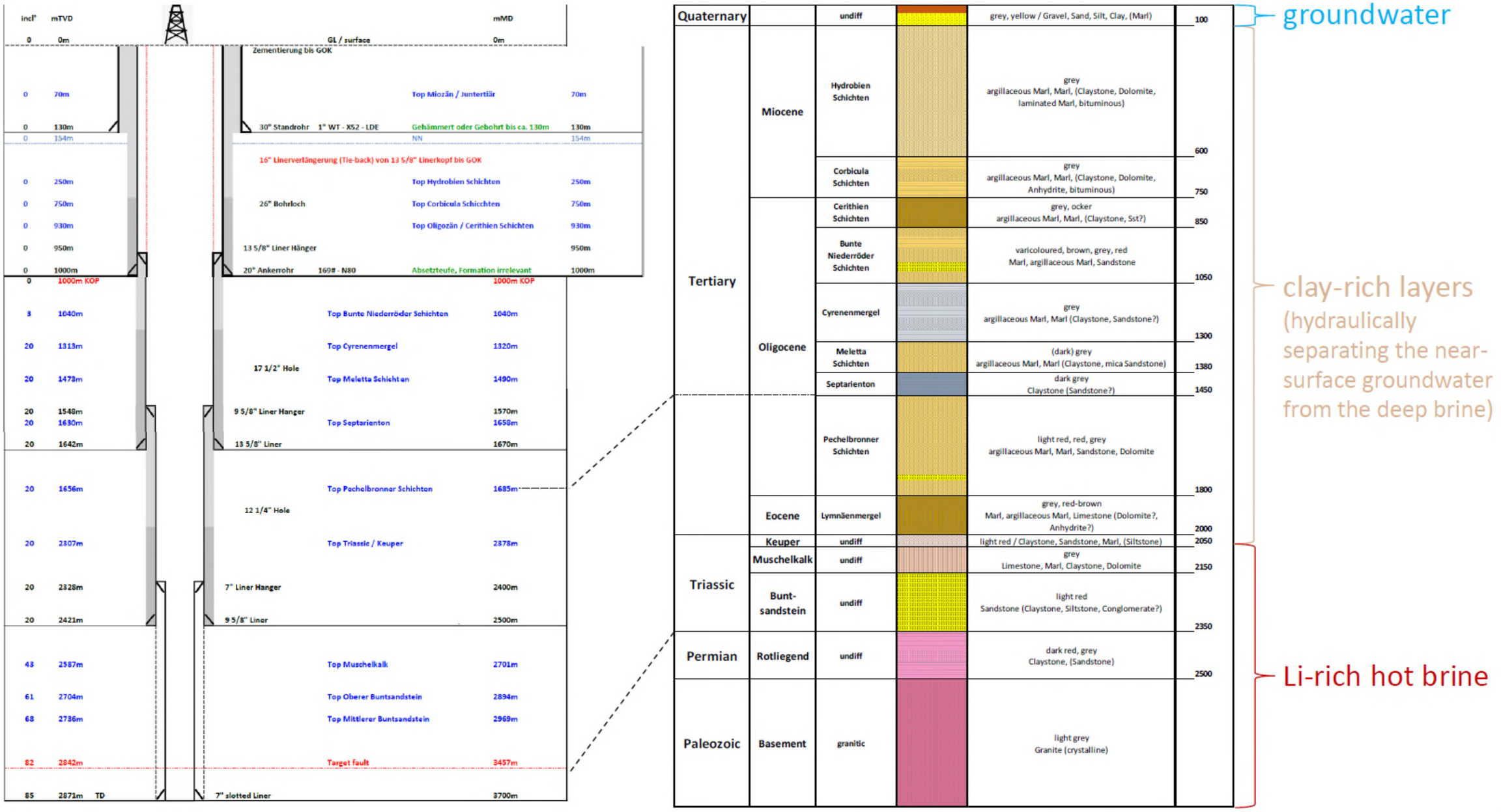


FIGURE 2-2 WELL STRUCTURE

2.1 PROJECT LOCATION AND LAYOUT

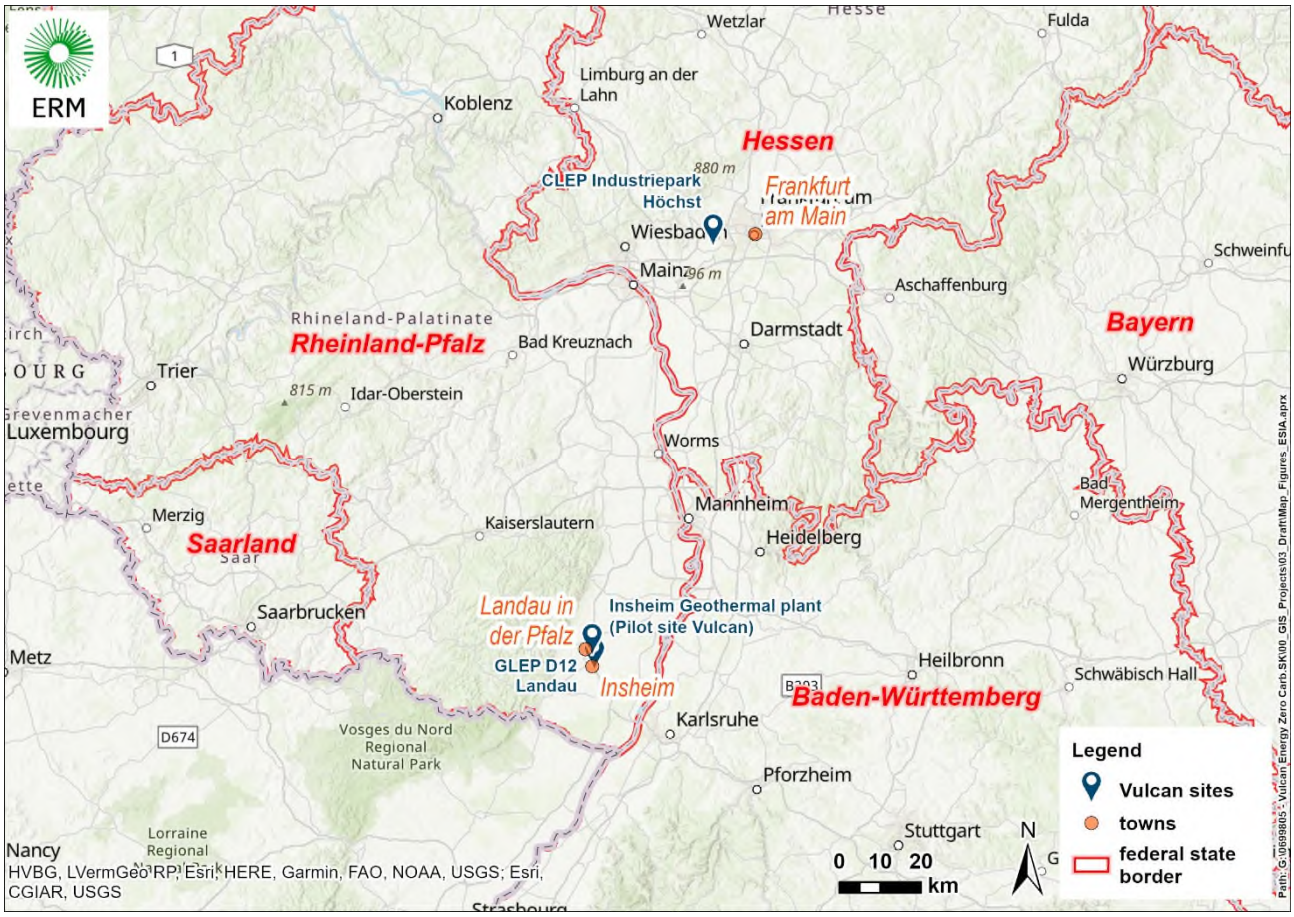


FIGURE 2-3 GENERAL OVERVIEW OF PROJECT REGION

Figure 2-3 provides a general overview of where the Project is situated in Germany. It is located in the Upper-Rhine Valley of Germany and is divided into two main areas: most sites and works will be located in the Landau area compared to only the CLP being located within the Frankfurt Höchst Industrial Park[8]. Figure 2-4 shows the Project area within the Landau area and Figure 2-5 shows the Höchst Project area.

A preliminary pipeline route has been assessed during the ESIA studies; however, the pipeline route alignment is still under review and has not been finalized as discussions and agreements with the landowners and land leaseholders are ongoing. As the Project progresses, further deviations and changes may be necessary. Any adjustments to the route will be carefully evaluated to ensure optimal design and feasibility. Once the final pipeline route design is confirmed, it will undergo a thorough assessment through the Design Change Management procedure to ensure compliance with all relevant standards and Project requirements with all appropriate mitigation measures implemented. Corresponding documentation will be prepared to supplement the ESIA, and, depending on the type and location of the impact, the relevant studies and documentation will be disclosed with stakeholders.

[8] The land in Frankfurt Höchst is reserved for Vulcan but is not leased yet.

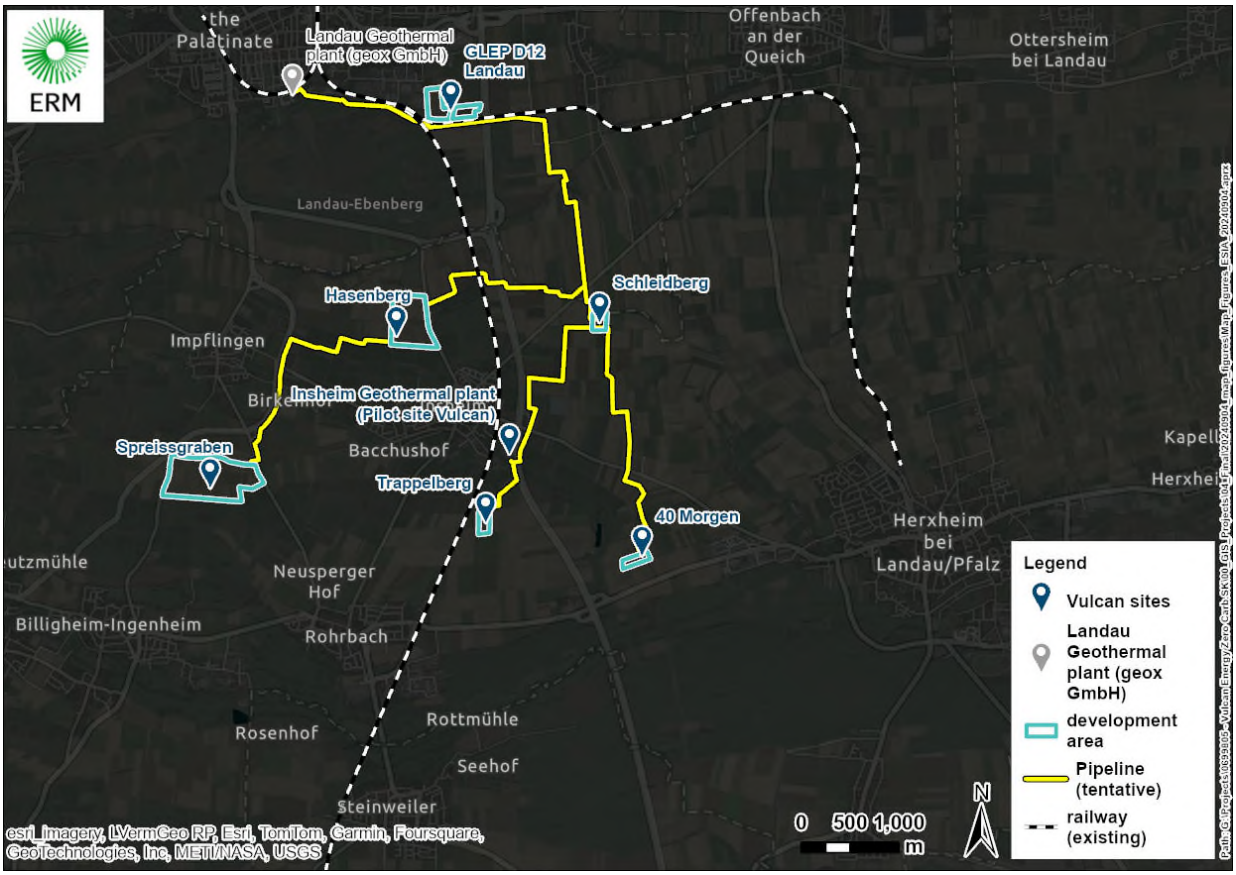


FIGURE 2-4 OVERVIEW OF PROJECT AREA (LANDAU)

FIGURE 2-5 OVERVIEW OF PROJECT AREA (FRANKFURT HÖCHST)

2.2 OVERVIEW OF PROJECT PHASES

The main Project phases include pre-construction, construction, operation and decommissioning.

2.2.1 PRE-CONSTRUCTION

During pre-construction any outstanding planning requirements, contracts and materials will be met and gathered. This includes some pre-EIA and acquiring approvals (under German national law), any land and licensing requirements, building permits, and further planning and approval activities necessary for well operations and pipeline installation (e.g. main and special operating plans). This process will then continue iteratively during construction phase as Vulcan execute at further sites relating to its Phase one project.

2.2.2 CONSTRUCTION

Well construction activities, pipeline construction activities and other general construction activities for the G-LEP and CLP sites. Pipeline construction activities include (but are not limited to) surveying and preparing the Right of Way (RoW), excavating the trenches, backfilling with subsoil, pressure testing etc. Construction of other structures and systems will include (but are not limited to) drill site testing, drill rig installation and drilling, and additional improvements to access roads.

2.2.3 OPERATION

During operation the Landau Geothermal Power Plant (owned by geox GmbH) will provide the brine to the G-LEP. The Insheim Geothermal Plant will also be providing brine to the G-LEP in addition to directly supplying around 8,000 households with electricity and 600-800 households with heat. The G-LEP will produce renewable heat and power from the industrial water circuit and supplying it to households in the region. Considering average per capita heat consumption in Germany, the Project will provide heat for ca. 90,000 people. The G-LEP will also be extracting lithium chloride from the brine and transporting the concentrated solution to the CLP in Höchst. Finally, Vulcan will manage and oversee the conversion of lithium chloride to battery-grade lithium hydroxide monohydrate.

A high-level schedule is provided in Section 2.4.

2.2.4 DECOMISSIONING

Decommissioning refers to the deconstruction or removal of the Project components and termination of the Project. The decommissioning process for the Project will involve several key steps and processes designed to ensure safety and environmental protection, described below:

Pre-closure

- Regulatory Compliance and Planning – Vulcan will secure necessary permits and create a decommissioning plan.
- Site Assessment – Each well site will be evaluated for current conditions and environmental concerns.
- Community Engagement- Vulcan will continue ongoing communication with local communities to address concerns and provide updates on the process.

Closure

- Well Decommissioning – removal of pumps, instrumentation and electrical cables from the brine production wells
- Well Plugging and Abandonment - Each well site will be sealed with cement or other appropriate materials to prevent fluid migration and remove well equipment.
- Removal of Surface Equipment and Infrastructure – Involving dismantling and properly disposing of or recycling of surface facilities such as pipelines, power supply/conveyance, enclosures and storage tanks.
- Site Restoration – Land will be restored through soil remediation and revegetation and clean up any remaining debris.
- Environmental Monitoring – Groundwater monitoring wells at each of the well sites will remain in place and fitted with secure lockable caps to allow regular on-going monitoring.
- Vulcan will implement monitoring measures to ensure no adverse effects from the decommissioning process.

Post Closure Monitoring

A closure water monitoring network and program will be confirmed prior to decommissioning.

At present, there are no fixed plans for the closure or rehabilitation of the Project components, although cost provisions for potential decommissioning works have been estimated as part of Vulcan's CAPEX. It is anticipated that periodic upgrades and rehabilitation will be conducted in response to wear and tear of the components, adhering to German technical standards and environmental and social (E&S) regulations.

As the Project progresses toward closure, dismantling will be conducted in strict accordance with the E&S laws and regulations in force at that time. This will include the implementation of measures to ensure minimal environmental impact and adherence to best practices in recycling and material reuse. Importantly, even after lithium production has ceased, the wells may still be leveraged for renewable energy production, thus maintaining the site's utility as a renewable energy asset.

2.3 PROJECT SCHEDULE AND WORKFORCE

A high-level Project schedule with key milestones is shown below (Figure 2-6):

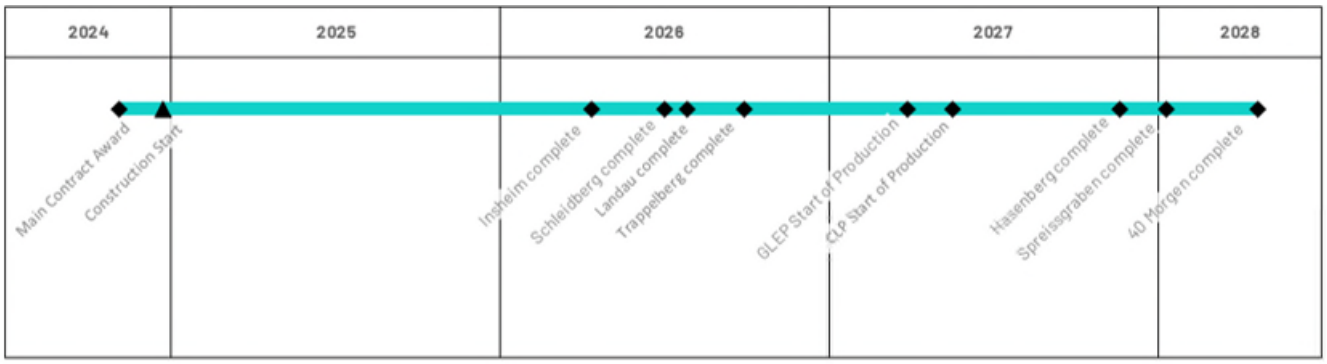


FIGURE 2-6 PROJECT SCHEDULE

No parallel work will be conducted on-site during drilling operations. The Vulcan team estimates that 250 people will be employed before the first plants are in operation in 2026; this refers to personnel required for pre-construction, construction, and for operation. Most employees are mainly technical experts (commissioning managers, project managers, project service managers) and engineers (electrical, process, mechanical, civil).

VERCANA GmbH is the company hired for drilling, and they have already agreed on a contract with Vulcan are a 100% subsidiary of Vulcan. 24-40 people will work on drill rigs in two 12-hour shifts, depending on the workload. Each drill rig will have approximately 30 container crew camps on a separate land plot close by. The containers are two stories and will sleep about two people per room with a shared kitchen facility and shared lounge area. The kitchen and common area will be in 2 or 3 separate 20 ft containers connected to the sleeping rooms. Sleeping containers have a small bed per person, a wet room, small seating area and cupboards for personal storage. Nearby toilets will also be available for those residing in containers.

3. PROJECT BENEFITS AND VALUE CREATION

Benefits of the Project align with the broader goals of reducing carbon emissions and mitigating environmental impact in the production of lithium (see Figure 3-1); a crucial component in batteries for electric vehicles and renewable energy storage.:

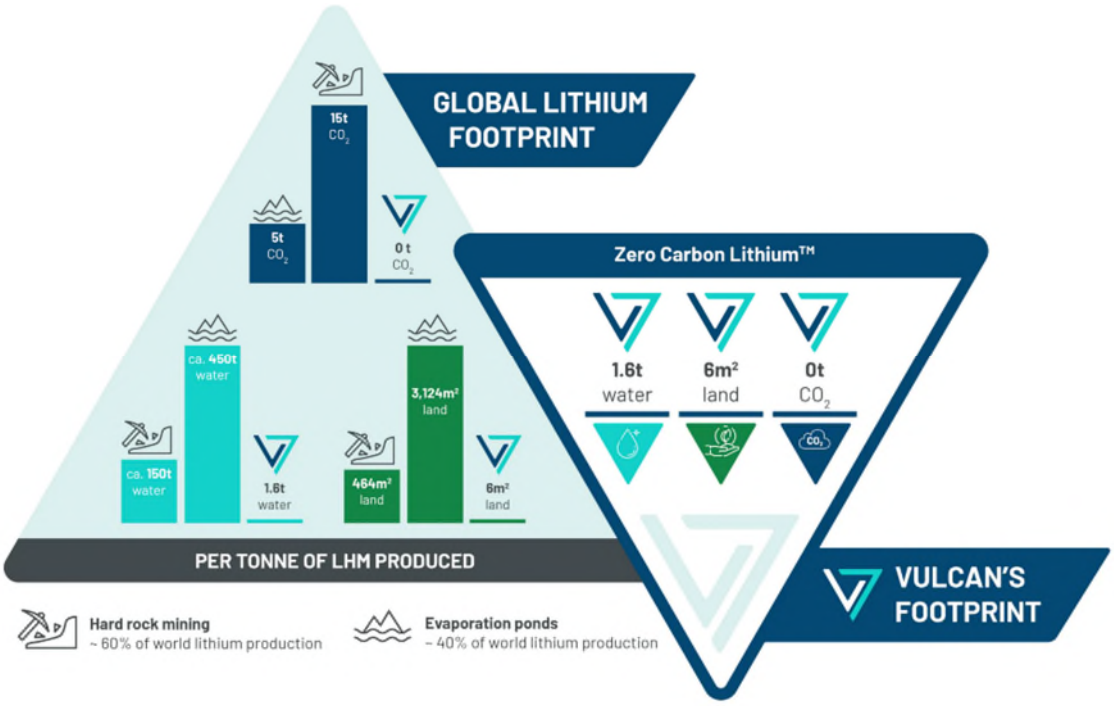


FIGURE 3-1 PROJECT BENEFITS

Source: Vulcan

Some positive outcomes of the Project include:

1. **Renewable source of heating for local communities**: The Project will generate a new source of heating and electricity supply, which energy suppliers will then be able to distribute to households to augment the existing infrastructure. The Project would ultimately supply approximately up to 560 GWh of heat per year and up to 275 GWh of electricity. Considering average per capita heat consumption in Germany, the Project will positively affect about 90,000 people. This positive impact will be created during operation and its success may act as a blueprint for the expansion of similar Projects throughout other areas.
2. **Creation of jobs and financial contribution to local economy:** Vulcan estimates that between 790 to 1400 employees will be hired during drilling, construction and operation, most of which are highly skilled or technical workers such as drilling staff, operators, maintenance, and project engineers. It will contribute to employees work experience and skills, especially after they undergo additional training required for their respective positions. This may lead to further employment and additional upskilling, especially in the renewable energy and geothermal sector, which are rapidly expanding in Germany. From construction phase through to operation, Vulcan estimates thousands more direct and indirect jobs will be created, linked to the energy transition, decarbonization and electrification of transport. Additionally, the Project, will generate financial benefit to regional municipalities, through

the contribution of corporate taxes to support the investment in public services and infrastructure in local communities.

3. **Reduced carbon footprint:** Over its lifetime, the Project will minimize greenhouse gas emissions associated with lithium production production and contribute to decarbonizing the grid and local heating network. This will contribute to Germany's overall efforts to combat climate change and achieve carbon neutrality.
4. **Innovation and research:** The Project will involve innovative technology and research, thus guiding advancement in green technologies.
5. **Increasing local and regional supply of critical minerals:** This Project will help fortify and begin expanding a central source of sustainable lithium within Germany –Vulcan currently owns the largest combined geothermal energy and lithium resource in Europe and the Upper Rhine Valley is rich in lithium resources. Given the rapidly increasing regional demand for batteries, the European Union (EU) wants to obtain 80 % of the required lithium volume for batteries from domestic sources in the medium to long term.[9] Vulcan estimates that their lithium production processes produce net zero emissions of CO_2 per ton of lithium produced using the LCA method,, which is significantly less than other methods of producing lithium hydroxide – thus, even Phase One alone has the potential to avoid millions of tons of CO_2 emissions for lithium and renewable energy production
6. **Enabling the e-mobility transition**: By supplying battery-grade lithium for Electric Vehicle manufacturers.

[9] Winkelmann, M., 2023. Nachschub aus dem Untergrund. Greenpeace Magazine (Greenpeace Magazin | Nachschub aus dem Untergrund (greenpeace-magazin.de))

4. HOW WAS THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT CONDUCTED?

4.1 ESIA PROCESS

Firstly, an Area of Influence (AoI) was determined relative to Project or site borders. AoI refers to the spatial scope of the Project and defines relevant boundaries to properly assess and manage the Project's environmental and social risks and impacts.[10] The AoI can also typically extend well beyond a Project's physical footprint, to account for not only direct impact but also indirect impacts and even induced impacts in some cases.

Generally, the AoI for the Project has been defined using a composite buffer of 250m for pipeline and 500m for other Project components, (based on distances for noise and dust nuisances mainly from literature review) to encompass:

- The primary Project site and associated infrastructure (pipeline corridor, infrastructure development sites, drill sites and pads);
- Related facilities (including access roads, stockpile areas, dump sites, worker camps, material storage and equipment laydown areas);
- Associated facilities whose viability and existence depend exclusively on the Project;
- Areas potentially impacted by the extraction of raw materials or where construction materials or products may be produced;
- Areas potentially affected by impacts from unplanned but predictable impacts caused by the Project; and
- Areas potentially impacted by cumulative impacts from further planned development of the Project.

Importantly, the Area of Influence (AoI) for the ESIA study often differs for the environmental and social aspects of projects, due to the distinct nature of the individual receptors. Consequently, the AoI of this Project is defined separately for each of these topics in the ESIA report to appropriately address the specific impacts on both environmental and social factors.

[10] The AoI can extend beyond a Project's physical footprint to ensure that both direct and indirect impacts are considered.

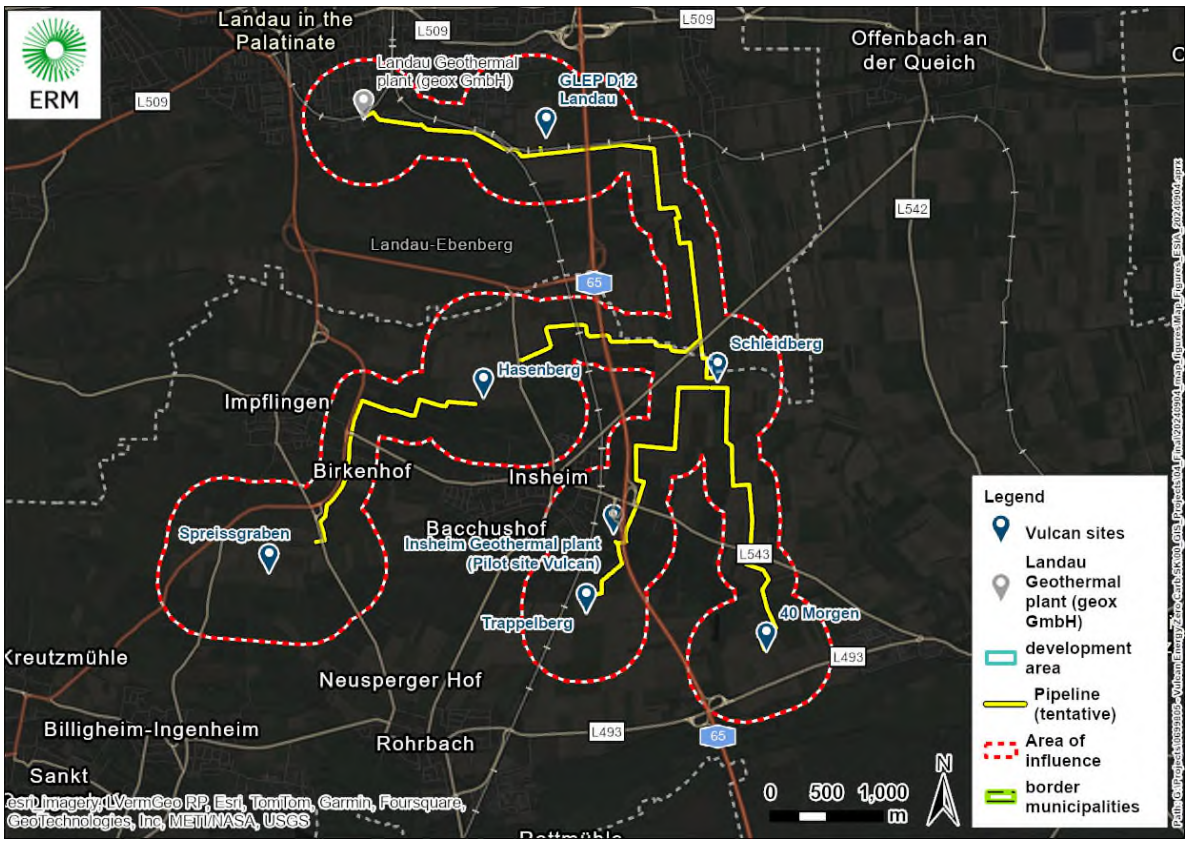


FIGURE 4-1 AREA OF INFLUENCE FOR PROJECT COMPONENTS IN LANDAU (NOISE & DUST)

FIGURE 4-2 AREA OF INFLUENCE FOR PROJECT COMPONENT IN FRANKFURT HÖCHST (NOISE & DUST)

The baseline descriptions of the natural (physical and biodiversity) and social environment were defined to describe the Project area and receptors before Project development begins. The baseline data helped to screen the severity of certain risks before the impact assessment and preliminarily determine whether some potential impacts can be scoped out or should be fully assessed in the ESIA. Then, the impact assessment predicted and described both positive and negative effects of the Project activities, operation, and overall development.

The assessment of impacts and recommendation of mitigation measures was informed by the site-specific ecological concerns arising from the field surveys completed by third parties (separate to ERM), ERMs brief site visit and desktop-assessment, and ERMs working knowledge and experience with similar development projects. The assessment of impacts was also informed by the assessment of baseline conditions concerning ecosystems, habitats and species in the Project area at the time of the assessment, in combination with information provided by Vulcan – which is deemed to be true and correct at the time of the impact assessment.

Based on this assessment an appropriate set of actions or "mitigation measures" were then established to avoid or help minimize negative impacts. Then monitoring and evaluation protocols are implemented to evaluate the efficacy of the proposed mitigation measures – this is described in the Environmental and Social Management Plan (ESMP).

4.2 IDENTIFICATION OF MITIGATION MEASURES

Appropriate impact mitigation and management measures are recommended to reduce the magnitude of impacts – based on aspects that include the scale, probability and intensity of impact – and thereby reduce the significance of the impact consequence to an environmentally and socially acceptable level as much as possible. The core principle of impact mitigation contained in the IFC PS is the mitigation hierarchy shown in Figure 4-3 below. The first preference for mitigation is to avoid/prevent an impact entirely in the first place, followed by preferences to minimize the adverse effects of the impact. If negative consequences to the physical or social environment are unavoidable then appropriate restoration and compensation shall follow.

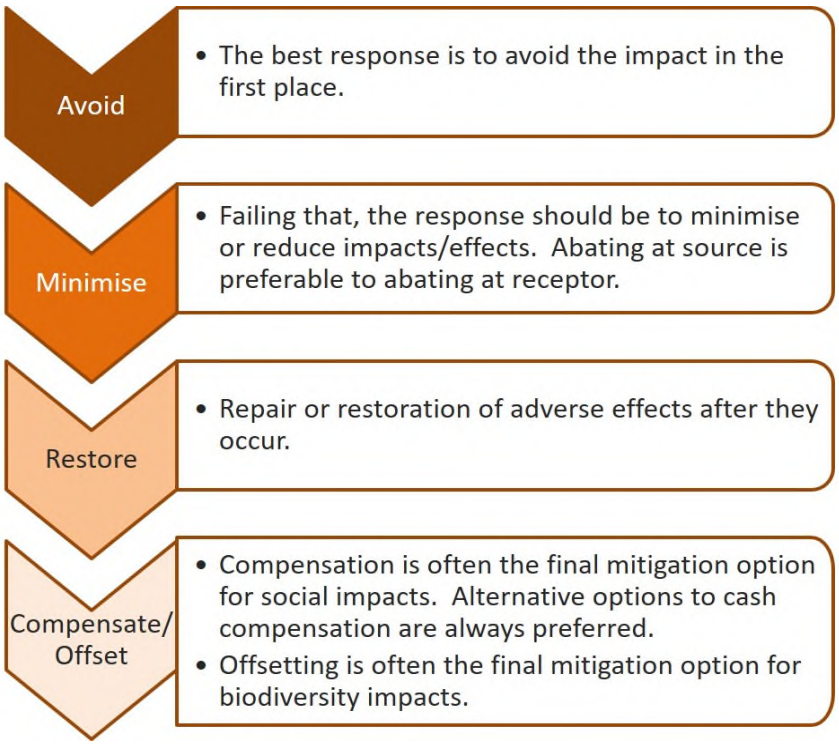


FIGURE 4-3 MITIGATION HIERARCHY

Impacts were assessed assuming that the mitigation measures that form part of the Project design (**embedded measures**) are implemented prior to the implementation of any additional measures. Embedded measures include:

- Design measures that seek to avoid or minimize impacts explored during the Project design phase;
- Alternatives considered already;
- Vulcan's policies or standard practices for construction/operation;
- Existing environmental permit / authorization conditions and/or legal requirements required by the German legislation around impact mitigation;
- Requirements to mitigate impacts as per an existing feasibility, technical or local EIA study that has been completed and accepted.

While ERM conducted the Impact Assessment(s) they considered the application current and previous implementation of mitigation hierarchy controls in terms of the embedded measures. This was undertaken to determine whether additional measures may be advised to align with the IFC Performance Standards, IFC Environmental Health and Safety (EHS) Guidelines, and other available and/or emerging guidance on international good practice.

4.3 ASSUMPTIONS AND LIMITATIONS

The following assumptions, limitations and information/data gaps apply to the assessment of impacts and baseline data collection informing the ESIA:

- The baseline assessment completed to inform the ESIA deals exclusively with a defined area (the Project AoI) and the extent and nature of receptors present in this focal area of study.
- Limited baseline surveys have been conducted as part of this study and most of the data has been collected through publicly available databases and information provided by Vulcan.
- ERM has used the latest available global and national spatial information and data for biodiversity, based on the status of these datasets and databases at the time of the assessment. The status of these datasets and databases may however change in future with improved data. Note also that data and information obtained from published articles, reference books, field guides, official databases or any other official published or electronic sources are assumed to be correct, and no review of such data or information was undertaken by ERM.
- The supplementary assessment of the potential occurrence of fauna/flora using IBAT data was informed by the known/modelled distribution of species from the IUCN database of threatened species and ERMs interpretation of the suitability of habitat in the AoI to support these species based on their documented habitat requirements/preferences. The habitat condition / integrity was therefore used as a surrogate indicator of the likelihood of a particular species being present.
- The assessment of impacts and recommendation of mitigation measures was informed by the site-specific ecological concerns arising from the field surveys completed by third parties (separate to ERM); ERM's brief site visit and desktop-assessment and based on ERMs working knowledge and experience with similar development projects. The assessment of impacts was also informed by the assessment of baseline conditions concerning ecosystems, habitats and species in the Project AoI at the time of the assessment, in combination with information provided by Vulcan which is deemed to be true and correct at the time of the impact assessment. Any changes to the Project design, layout and activities could potentially result in a change in impact ratings, and these should be reviewed in such instances.
- ERM's assessment has included embedded mitigation (i.e. mitigation measures embedded into Project design and through national level assessments and surveys). ERM has not scrutinized these measures but ensured that additional mitigation listed by ERM aligns with these measures or supports/enhances these and avoids any conflict that implementing mitigation for the various impact topics.
- Measures to mitigate and manage impacts are based on ERM's project-level experience in addressing similar development scenarios, are intended to be site-specific enough to address the nature of the resources and receptors reflected in the baseline, and are informed by good international industry practice (GIIP) as far as possible.

5. WHAT STAKEHOLDER ENGAGEMENT HAS TAKEN PLACE?

5.1 GENERAL APPROACH

'Stakeholders' are individuals or groups who may have an interest(s) in the Project or have the potential to influence decision-making related to Project development. This includes project-affected-persons (PAPs), residents, public institutions, non-government/civil-society organizations (NGOs), private organizations, government officials and authoritative bodies etc.

The main entities identified for this Project are residents of select municipalities within Landau in the Palatinate and Südliche Weinstraße, departments or agencies at national, district and local levels, private companies, non-government/civil-society organisations (NGOs), community-based organizations, and user groups and people directly affected by the Project, such as goods and services providers.

Residents of the municipalities Landau, Billiheim-Ingenheim, Rohrbach, Insheim, Impflingen, Herxheim by Landau (Palatinate) are nearest to the boundaries of the Project area and will most likely be the main receptors of Project impacts, especially positive benefits (renewable heat and power).

Stakeholder engagement is a crucial part of the ESIA process and project development to ensure that the interests, perspectives, and concerns of all relevant parties are considered, addressed, and integrated into Project development as much as possible throughout the entire project lifecycle. Vulcan and their Project development team(s) will inform the stakeholders regarding Project description and background, timelines, potential opportunities, as well as the potential risks and impacts (positive and negative). It is a two-way process and is most effective when initiated at the early stages of Project development.

IFC PS1 and EP4 emphasize that grievance mechanisms should be in place and be properly scaled to the risks and impacts of the Project. The Project should provide access to remedy by informing local communities and the Project workforce about their rights to submit grievances and raise concerns without retaliation. Grievance mechanisms should not impede access to judicial or administrative remedies.[11]

Vulcan's general approach to stakeholder engagement follows Figure 5-1 below.

[11] Source: Equator Principles, The Equator Principles EP4, July 2020, retrieved from: https://equator-principles.com/app/uploads/The-Equator-Principles_EP4_July2020.pdf, accessed in August 2023; International Finance Corporation, Performance Standard 1, 2012, retrieved from: https://www.ifc.org/content/dam/ifc/doc/2010/2012-ifc-performance-standard-1-en.pdf, accessed in August 2023.

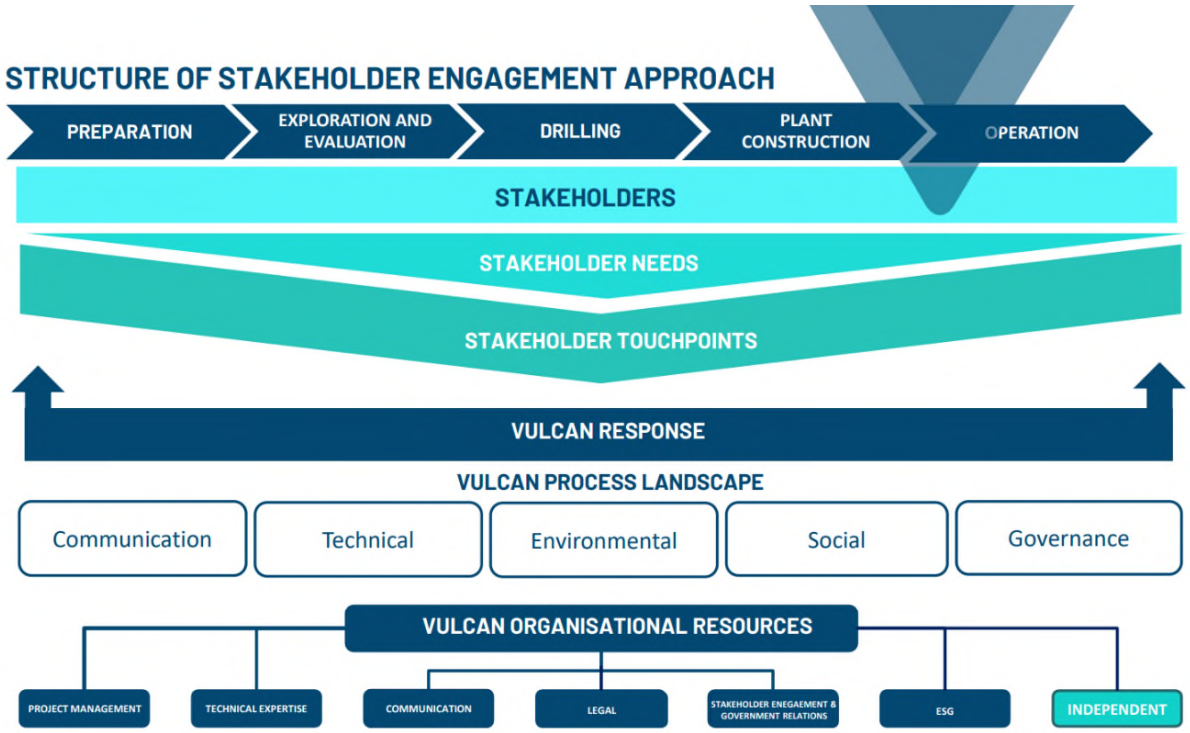


FIGURE 5-1 VULCAN'S APPROACH TO STAKEHOLDER ENGAGEMENT

Similarly, ERM has prepared a Stakeholder Engagement Plan (SEP) within the ESIA package. The SEP includes a Grievance Mechanism to ensure that meaningful stakeholder engagement is carried out entire Project life cycle.

5.2 KEY STAKEHOLDER ISSUES AND PUBLIC PERCEPTIONS

The main issues raised by the stakeholders are as follows:

- Differentiation between Vulcan's activities compared to other geothermal Projects;
- Questions surrounding seismicity and related adverse impacts;
- Potential concerns due to misinformation;
- Fears of increased noise during Project construction and operation;
- And overall understanding of Project components, activities, and outcomes.

Based on news articles, preliminary engagement efforts with politicians and local community members: journalistic resources, public scrutiny and opposition mostly comes from a lack of understanding of discrepancies between types of geothermal operation and what the actual Project risks vs value added are/may be. Vulcan concludes that stakeholder engagement efforts thus far, have resulted in mostly positive perceptions of the Project. In particular, the Vulcan team emphasizes to stakeholders the local added value that will result from this Project - the provision of local and renewable heat, and lithium for the auto industry. Their frequent stakeholder engagement at this stage is also mostly centered around information and knowledge sharing and managing public expectations.

Vulcan has begun and will continue to manage community and stakeholder expectations, especially emphasizing local value creation relative to potentially adverse environmental and social impact. Further stakeholder engagement/meaningful consultations and proper

management of the grievance mechanism (as per the SEP) will continue to make the Project's projected impacts and planned mitigation measures transparent to interested parties.

5.3 STAKEHOLDER ENGAGEMENT TO DATE

In line with Vulcan policies, Vulcan values engagement with their stakeholders and has an open-door policy, in which anyone is welcome to call, email, or arrange an in-person meeting to ask questions, tour sites, and share concerns.

The Vulcan team has also initiated numerous stakeholder engagement efforts to date and emphasize that prior to individual steps or phases in Project development, communication measures are typically intensified in local communities, main public areas (marketplaces), and on social media platforms (Figure 5-2).

FIGURE 5-2 VULCAN STAKEHOLDER ENGAGMENT EVENTS (1)

Vulcan's stakeholder engagement efforts have been frequent, even early in the development phase to avoid unexpected risks, opposition, or conflict with stakeholders later on. Moreover, engagement efforts are targeted at managing expectations, reconciling misinformation and misunderstandings about the Project's actual processes and de factor risks and impacts, and creating overall transparency regarding their planned endeavors related to the Project and future ambitions. Their planning and execution are structured and documented.

Table 5-1 below provides an overview of their stakeholder engagement efforts.

TABLE 5-1 OVERVIEW OF STAKEHOLDER ENGAGEMENT TO-DATE

Mode of Engagement	Engagement Activity(s)	Engagement Summary	Date(s)
Public Information Disclosure	Online/digital media information sharing	Relaunched company/regional websites, social media posts, press releases	January 2022- present
	Print Media Information Publications	Advertisements, large billposting, flyers, construction site signs/information boards, newsletters, technical information and info sheets, specific material for political authorities	January 2022- present
Direct Community/Public Engagement	Information Trucks	Designated truck that opens to provide interactive information on the entire company and on-going projects. Various roadshows (9) were held in Landau, Offenbach, Herxheim, Billigheim-Ingenheim, Rohrbach, Insheim, Bad Dürkheim, and Impflingen to hear about Vulcan's plans for phase one and gain information pertaining to geothermal energy, seismic surveys, and overall Project.	April- present
	Information Centre	Centre for local population to visit and gather information and materials regarding Vulcan´s endeavors. Visitors can arrange a meeting time or drop in and also have the opportunities to ask questions and discuss questions/concerns with Vulcan representatives.	June 2022- present

Mode of Engagement	Engagement Activity(s)	Engagement Summary	Date(s)
	Participatory and dialogue-based events with community stakeholders	Citizen dialogue and information events, consultation hours at Info Center, citizen phone/chat-line, information trips to Insheim, citizen surveys, kick-off events with stakeholders per project phase, technical discussions with target groups, roundtable	April 2022- present
Political Engagement	Political Visits	Various meetings and visits from local government officials to the project site(s) to provide first-hand insight into Project Lionheart, Vulcan's headquarters, and to discuss the potentials of geothermal energy and renewable lithium production in the region.	July 2022-August 2024

Prior to Vulcan's ESIA process Vulcan's stakeholder engagement was mainly conducted on a regional basis, led by the regional communications team and regional managers. Engagement efforts have mainly been tailored to population consultation/engagement and political stakeholders.

Vulcan also utilizes information trucks and information centers, which operate independently of projects and on an on-going basis and are used to share information and answer questions about company mission, values, and on-going and future projects. At the Insheim Geothermal Plant there is also a visitors' center in which local stakeholders are encouraged to come visit the plant and learn about carbon neutral lithium production. The information centers are open on most weekdays and any person or group is welcome to stop in and visit, coordinate a meeting time, or call and ask questions. Furthermore, Vulcan has been utilizing a Qualitative Stakeholder Management system to document past discussions with various stakeholders and effectively track engagement activities while also staying attuned to the evolving needs and perspectives of the stakeholders (Figure 5-3).

FIGURE 5-3 VULCAN STAKEHOLDER ENGAGEMENT EVENTS (2)

5.4 STAKEHOLDER ENGAGEMENT PLAN

The SEP is a complementary document to the ESIA that describes the mechanisms in which PAPs, stakeholders and other individuals and groups involved or with interests in the Project will be informed about the Project and how they can provide their feedback or inputs to Project development. The SEP describes engagement that has already taken place and planned engagement throughout the remainder of the Project life cycle. In line with current international best practice, the SEP aims to ensure that engagement with stakeholders is free of interference and intimidation; engagement should also be relevant, understandable, and provide accessible information in a culturally appropriate way.

The SEP is a "living document" meaning that it will be regularly reviewed and updated as the Project progress and changes are needed. For instance, new stakeholders may be identified, responsibilities for implementation may change, or impacts may be more severe than anticipated and require changes to certain engagement or consultation efforts.

A key aspect of the SEP is the implementation of a Grievance Mechanism (GM), which acts as an easy way for PAPs and other stakeholder to report incidents, complaints, concerns, or questions to Project developers. The SEP explains the general external grievance mechanism for all external stakeholders and a separate workers grievance mechanism (this will namely be used by construction crew(s), contractors, and subcontractors).

A general overview of the SEP includes the following:

1. International and National Regulatory Standards
2. Stakeholder Mapping, Identification and Analysis
3. Vulnerability Assessment
4. Grievance Mechanism and access to remedy
5. Monitoring, Management and Documentation
6. Reporting
7. Roles and Responsibilities
8. Stakeholder Engagement Action Plan

The comprehensive SEP will also be made available to stakeholders.

5.5 FUTURE STAKEHOLDER ENGAGEMENT

5.5.1 ESIA DISCLOSURE

The last stage of the ESIA process is known as the "Disclosure" phase, in which a draft version of the latest ESIA is publicly shared or disclosed. The entire package of reports will include:

- The comprehensive draft of the impact assessment report;
- This NTS;
- The ESMP; and
- The SEP.

This will be accessible on Vulcan's website.

All comments, questions, and other input will be documented and kept amongst other stakeholder engagement documentation materials. They will be considered by the Vulcan team

and integrated where relevant or feasible. These changes will be reflected in revisions to the Project as appropriate, and the revised final ESIA Report.

5.5.2 POST-ESIA STAKEHOLDER ENGAGEMENT

Stakeholder engagement will be on-going throughout the Project life cycle and the Vulcan team is responsible for continuously sharing information, understanding stakeholder issues, and responding to questions and concerns. Engagement will be carried out in line with the contents of the SEP.

Though most impacts have been assessed as minor during ESIA studies, Vulcan's Project team will pay additional attention to stakeholder concerns during the construction phase as that is the main phase having potential for impacts to nearby social receptors.

During operation, engagement will primarily be focused on the maintenance of facilities and overall satisfaction with Vulcan's benefits to the community. Other consultations and engagement will take place on an ad-hoc basis. Post-ESIA engagement will also consist of maintaining and adjusting the grievance mechanism(s) as needed based on received feedback/concerns from users. Reporting of key trends, findings, and other relevant findings (especially changes in adverse risks/impacts) shall be readily communicated to the relevant stakeholders.

The SEP will generally be updated at least every six months; during construction it will be reviewed and updated as needed at least every three months. Stakeholder feedback will determine if reviews and updates should be more frequent.

A comprehensive stakeholder engagement action plan and timelines are included in the full SEP.

5.5.3 GRIEVANCE MANAGEMENT

The SEP includes measures for implementing and maintaining two distinct Grievance Mechanisms: a Community Grievance Mechanism (CGM) and a workforce Grievance Mechanism. This will allow both internal and external stakeholders (i.e. community members, employees, and other parties who are affected by the Project) to formally submit any concerns and receive remediation, as needed. Proper grievance management ensures that Vulcan can hear and respond to Project-related concerns in an *appropriate, systematic, fair, and transparent manner*. It will also allow for both positive and negative feedback to be incorporated into Project developments and plans to effectively manage risks and impacts over time.

For the sake of this Project (and as per the SEP), a grievance refers to any concern, complaint, request for information (RFI), question, or suggestion that a stakeholder, especially local community members, wish to raise to the Vulcan team. Grievances may be specific to incidents, injuries, impacts, or overall project feedback and concerns, but can even be commitments that Vulcan and their constituents have not properly fulfilled or honored.

Grievances will be filed and responded to differently and within distinct time-frames depending on the nature and severity of the issue at hand. The use of these mechanisms will not replace judicial or administrative remedies, will be open to all stakeholder groups, and respect confidentiality of concerns that are raised.

The full processes for how to access and use the grievance mechanisms are included in the full SEP, and will be disclosed to relevant stakeholders prior to Project construction.

6. SUMMARY OF THE IMPACT ASSESSMENT

For each relevant topic, the ESIA Report provides a description of the baseline conditions and details of the Project's potential impacts on that environment; it also identifies the measures that will be used to prevent, reduce, remedy or offset significant adverse environmental and social impacts (i.e. mitigation measures). Any impacts that may still remain after implementing the mitigation measures are then reported as the remaining "residual impacts" of the Project.

The mitigation measures are then also separately elaborated in the Environmental and Social Management Plan (ESMP), as a result of the ESIA study that spells out exactly which further actions must be taken by Vulcan Energy (and the Contractors) for avoidance and mitigation of potential impacts of Project construction and operations. Vulcan Energy is committed to undertake the planned measures, and independent consultants will monitor the implementation and the progress toward achieving the mitigation goals.

As with the development of most infrastructure projects, many of the negative environmental and social impacts are likely to occur during the construction phase. However, such impacts are temporary and can be managed, controlled or mitigated to prevent, reduce or offset them. The ESMP includes construction management measures and plans to mitigate most significantly adverse environmental and social impacts during construction.

The Zero Carbon Lithium™ ESIA study results indicated that there are no major or moderate level of impacts envisaged, based on the assumption that the embedded measures by German laws and best international practices defined in the ESIA and ESMP are implemented.

Table 6-1 below provides a summary of potential impacts and significance before the mitigation measures are in place, and after the mitigation measures are implemented.

TABLE 6-1 SUMMARY OF THE KEY IMPACTS IDENTIFIED IN THE ESIA

Identified Impact	Construction Phase		Operation Phase		Decomissioning Phase	
	Pre-mitigation significance	Post-mitigation significance	Pre-mitigation significance	Post-mitigation significance	Pre-mitigation significance	Post-mitigation significance
Physical Environment						
Geology, Soils and Geohazards	Moderate	Minor	Minor	Insignificant	Minor	Insignificant
Noise	Major	Minor	Moderate	Minor	Moderate	Minor
Air quality	Minor to Moderate	Minor to Insignificant	Insignificant	Insignificant	Minor to Moderate	Minor to Insignificant
Surface Water	Minor	Insignificant	Minor	Insignificant	Minor	Insignificant
Groundwater	Moderate	Minor	Moderate	Minor	Minor	Insignificant
Waste and Wastewater	Moderate	Minor	Minor	Insignificant	Moderate	Minor
Biological Environment						
Loss of Fauna	Minor to Moderate	Insignificant	Insignificant	Insignificant	Minor	Insignificant
Disturbance to Fauna (light, noise, vibrations, dust)	Moderate	Minor	Minor	Insignificant	Moderate	Minor
Barriers to Faunal Species Movement	Minor	Insignificant	Minor	Insignificant	N/A	N/A
Pollution of Surface Watercourses	Minor	Insignificant	Minor	Insignificant	Minor	Insignificant
Introduction/Spread of Invasive Alien Plants	Minor to Moderate	Insignificant	N/A	N/A	Minor	Insignificant
Social Environment						
Energy Provision	N/A	N/A	Positive	Positive	N/A	N/A
Employment Opportunities	N/A	N/A	Positive	Positive	N/A	N/A
Land Use and Visual Impacts	Minor	Insignificant	Insignificant	Insignificant	Minor	Insignificant
Traffic and Land Access	Minor to Moderate	Insignificant	Insignificant	Insignificant	Minor to Moderate	Insignificant
Security	Minor	Insignificant	Insignificant	Insignificant	Minor	Insignificant
Occupational Health and Safety	Moderate	Minor	Minor	Insignificant	Minor	Insignificant
Cultural Heritage	Moderate	Minor	Insignificant	Insignificant	Minor	Insignificant

6.1 WHAT ARE THE KEY IMPACTS IDENTIFIED DURING THE ESIA STUDY?

Some key topics identified during the ESIA study that could concern various stakeholders are elaborated upon in the following sub-sections. Please note that this chapter does not include all topics assessed in the ESIA study but rather focuses on summarizing some key aspects.

The key potential impacts evaluated throughout the comprehensive ESIA report are:

- Impacts related to climate change;
- Impacts related to geohazards (induced seismicity)
- Impacts related to groundwater;
- Impacts related to noise;
- Impacts related to disturbance on fauna;
- Impacts related to traffic and transport;
- Impacts related to dust;
- Cumulative impacts; and
- Transboundary impacts.

6.1.1 IMPACTS RELATED TO CLIMATE CHANGE

Baseline Conditions

In the following Table 6-2 and Table 6-3 relevant climate hazards currently present in the Project region (Rhineland Palatinate and South Hesse) are outlined and ranked according to risk thresholds based on the chance of a risk materiality (from very low, to high).

TABLE 6-2 CLIMATE HAZARDS IN RHINELAND PALATINATE

Hazard	Hazard Level Valuation
Water scarcity	Medium
Extreme heat	Medium
Urban floods	Low

Source: ThinkHazard.org (2023).

TABLE 6-3 CLIMATE HAZARDS IN SOUTH HESSE

Hazard	Hazard Level Valuation
Water scarcity	Medium
Urban floods	Medium
Extreme heat	Low

Source: ThinkHazard.org (2023).

The baseline assessment has shown that the relevant climate hazards at and around the Project components near Landau and the CLP in Höchst include water scarcity, extreme heat, and to some extent also urban floods.

Potential Impacts

Overall, the Project will have positive impacts on climate change , i.e. will help to reduce greenhouse gas emissions. Unlike traditional lithium mining, Vulcan's process harnesses the Earth's natural heat to produce lithium, avoiding the effects associated with traditional mining methods. By providing a cleaner and more sustainable source of lithium, the Project is actively reducing the carbon footprint of the electric vehicle industry, which plays a crucial role in transitioning away from fossil fuels. This approach aligns with the goals of mitigating climate change and fostering a more sustainable future.

6.1.2 IMPACTS RELATED TO GEOHAZARDS (INDUCED SEISMICITY)

Baseline Conditions

Regarding seismicity, the development is within a natural area of seismicity with thousands of naturally occurring events, and only a handful of small seismic events thought to be induced by human activity were recorded in the last decades within the Project area, all within the "green zone" as defined by the authorities, and usually well below the threshold at which they be felt in the vicinity. In August and September of 2009, seismicity of 2.7 magnitude and 2.4 magnitude occurred in Landau. In December 2010 a seismicity event of 2.0 magnitude occurred. Further seismicity was reported in Insheim in May 2009 (2.0 und 2.1 magnitude), April 2010 (2.2. and 2.4 magnitude), February 2013 (2.0 magnitude) and October 2013 (2.1 magnitude).[12]

Potential Impacts and Mitigation Measures

Potential geohazard impacts of the Project relate to induced seismicity which are seismic events that are caused by human activity. Managing natural and induced seismicity is part of the normal operation of any geothermal project around the world.

For Vulcan's operations, the injection rate across all injection wells will match the production rate across all production wells, as there will be no surface storage facility, ensuring stable pressure throughout the system. To prevent formation damage and avoid induced seismicity, the injection rate for each well will be kept below the fracture pressure. The target formation for both brine production and injection are the Buntsandstein Formation, located at depths of approximately 2,500 to 4,000 meters below ground level, rather than the deeper granitic "basement" formation. By producing from the sandstone instead of the granite, the risk of seismicity is significantly reduced, in line with industry best practices and regional and international experience.

The geothermal wells will be designed with a telescopic steel casing, which will be concreted in place for structural stability and safety. The innermost steel casing will have anti-corrosion material for added protection (see Figure 2-2). These design features aim to isolate the overlying formations, preventing fluid migration between formations and aquifers, ensuring environmental safety. Additionally, Vulcan will operate multiple wells within its system, allowing for increased safety by adjusting production levels across the system to maintain operational stability.

In addition, Vulcan has taken the following measures to prevent risks of induced seismicity:

- Conducted several pre-execution studies such as 3D seismic studies, a geomechanical analysis as well as a seismic risk analysis;

[12] Landesamt für Geologie und Bergbau, 2023. Karte der vom LER registrierten Erdbebenereignisse.

- Adopted a "traffic light system" for seismicity risk mitigation linked to measurement values and specific actions (see Table 6-1) based on DIN 4150, which specifies mandatory methods for measuring and assessing the effects of vibrations on structures:

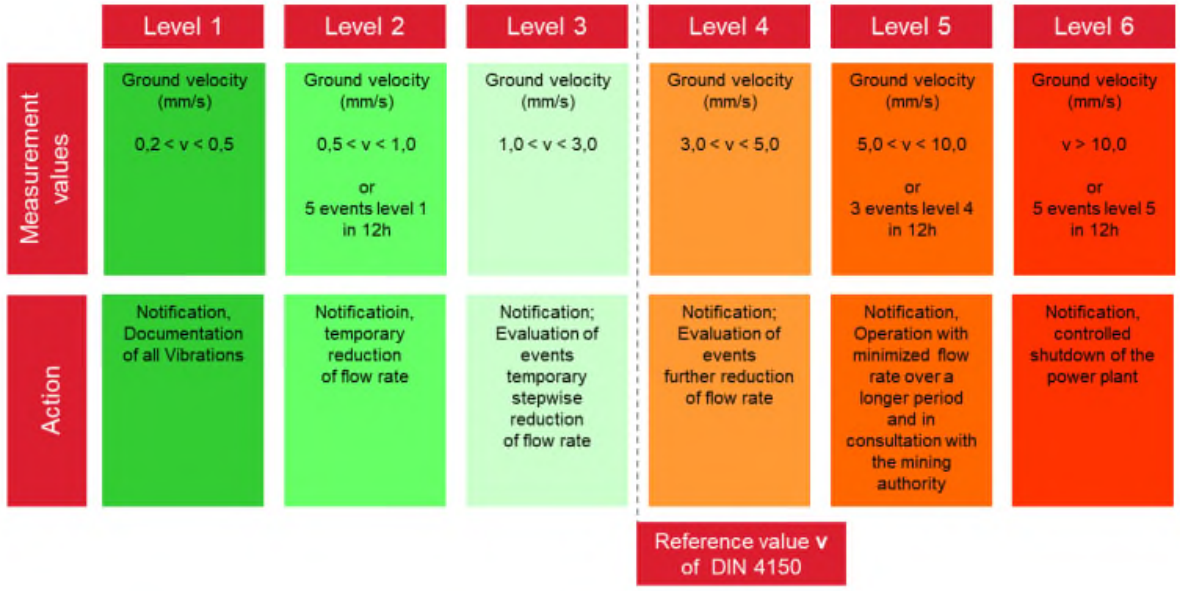


FIGURE 6-1 SEISMICITY RISK MITIGATION OF VULCAN

Source: Vulcan

Vulcan also pays special attention to public concerns related to possible seismic events due to the Project by actively engaging with local communities, providing clear information about the measures in place to minimize seismic risks, and implementing strict safety protocols.

6.1.3 IMPACTS RELATED TO NOISE

Baseline Conditions

Generally, the Project components are located near built up, industrial and rural areas. There are noise sensitive receptors such as residential buildings, farms, commercial buildings, a wastewater plant, and some areas with mixed usage. The proximity of the sensitive receptors to the Project components ranges between 30 m to 780 m. These may be affected by the Project due to noise both during construction and operation stages.

Figure 6-2 and Figure 6-3 show the daytime and nighttime traffic noise from major roads for Project component near Landau:

- The ICCP will be built on agricultural land. In some instances, the ICCP will run along existing roads and railway tracks. Therefore, baseline noise emissions from traffic are expected.
- As figures indicate, daytime baseline noise emissions from traffic are highest (>65 to 70 dB(A)) where the pipeline is planned to cross the A65 motorway.
- Additionally, for the GLEP, the motorway A65 (250 m east) as well as surrounding businesses from the commercial areas D9 (50 m west) and D10 (150 m north) are the main sources of noise emission and represent considerable baseline noise emissions.

Figure 6-4 and Figure 6-5 indicate the baseline noise emissions from industrial activities (daytime and nighttime) near the CLP in Höchst:

- The industrial noise mapping at the CLP in Höchst from the Hessian State Office for the Nature Protection, Environment and Geology (HLNUG) shows very high baseline noise conditions reaching daytime noise levels of >70 to 74 dB(A). These levels exceed the daytime noise thresholds from the TA Lärm and IFC for industrial areas which are at 70 dB(A). Measures for protection against industrial noise are necessary due to the exceedance of the threshold values. However, as shown in Figure 6-5 the nighttime noise levels at the CLP in Höchst do not exceed 69 dB(A).

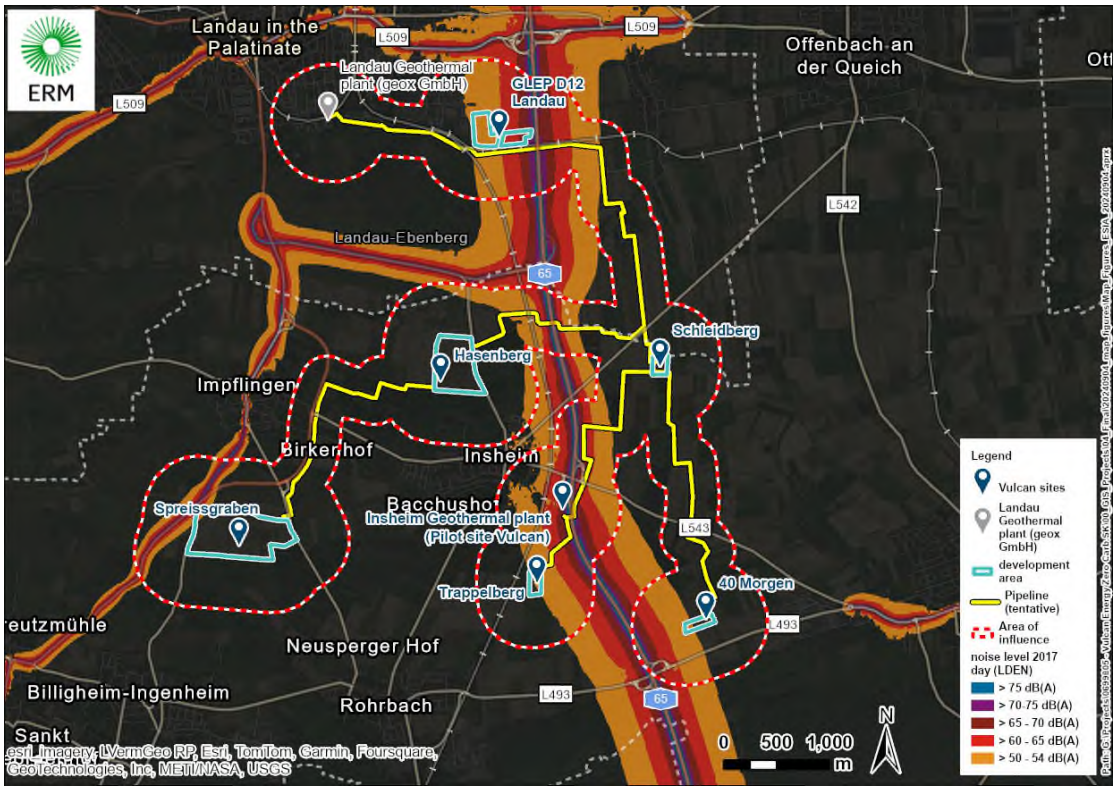


FIGURE 6-2 DAYTIME TRAFFIC NOISE EMISSIONS IN THE LANDAU AREA

Source: Data from the State Office for the Environment Rhineland Palatinate, 2022

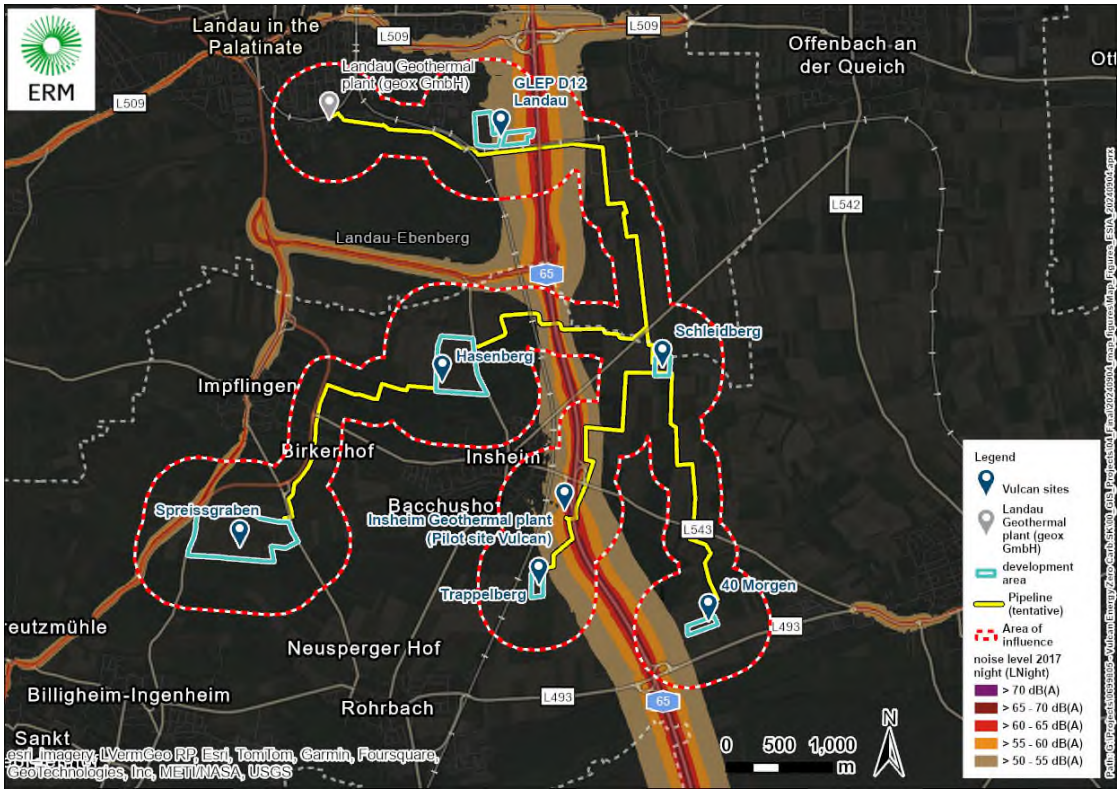


FIGURE 6-3 NIGHTTIME TRAFFIC NOISE EMISSIONS IN THE LANDAU AREA

Source: Data from the State Office for the Environment Rhineland Palatinate, 2022

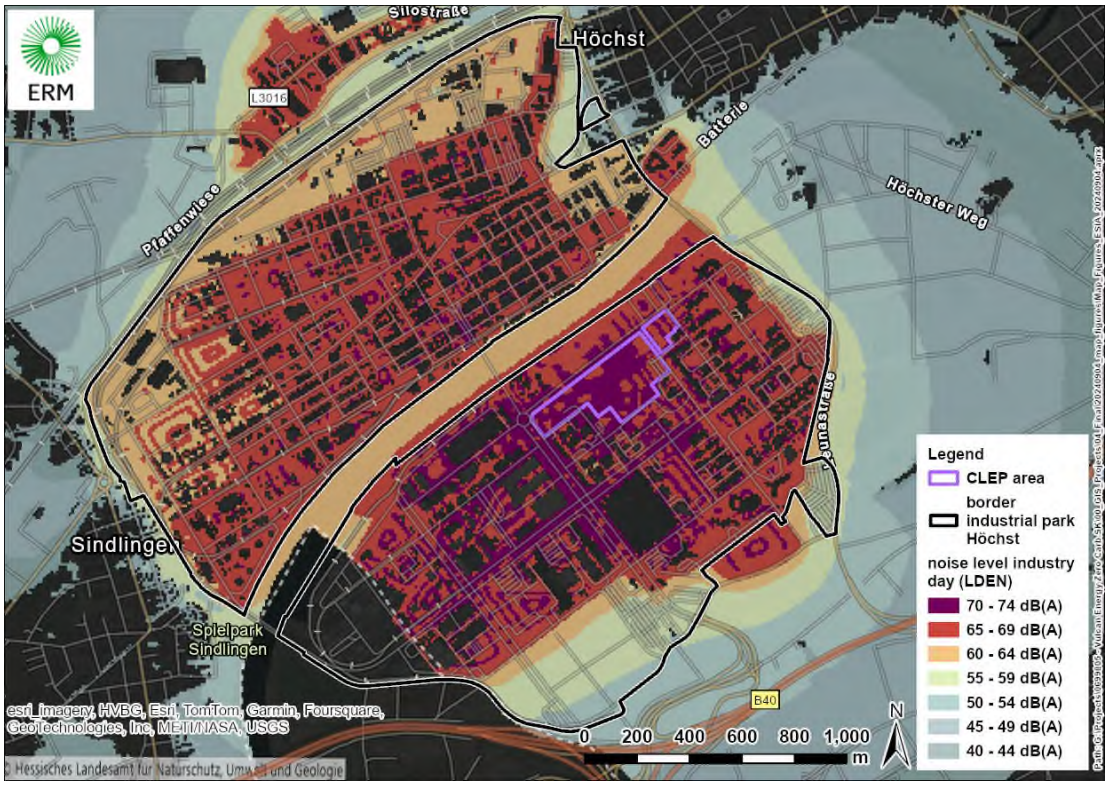


FIGURE 6-4 DAYTIME INDUSTRIAL NOISE AT THE CLP IN HÖCHST

Source: Data from the Hessian State Office for the Nature Protection, Environment and Geology, 2022

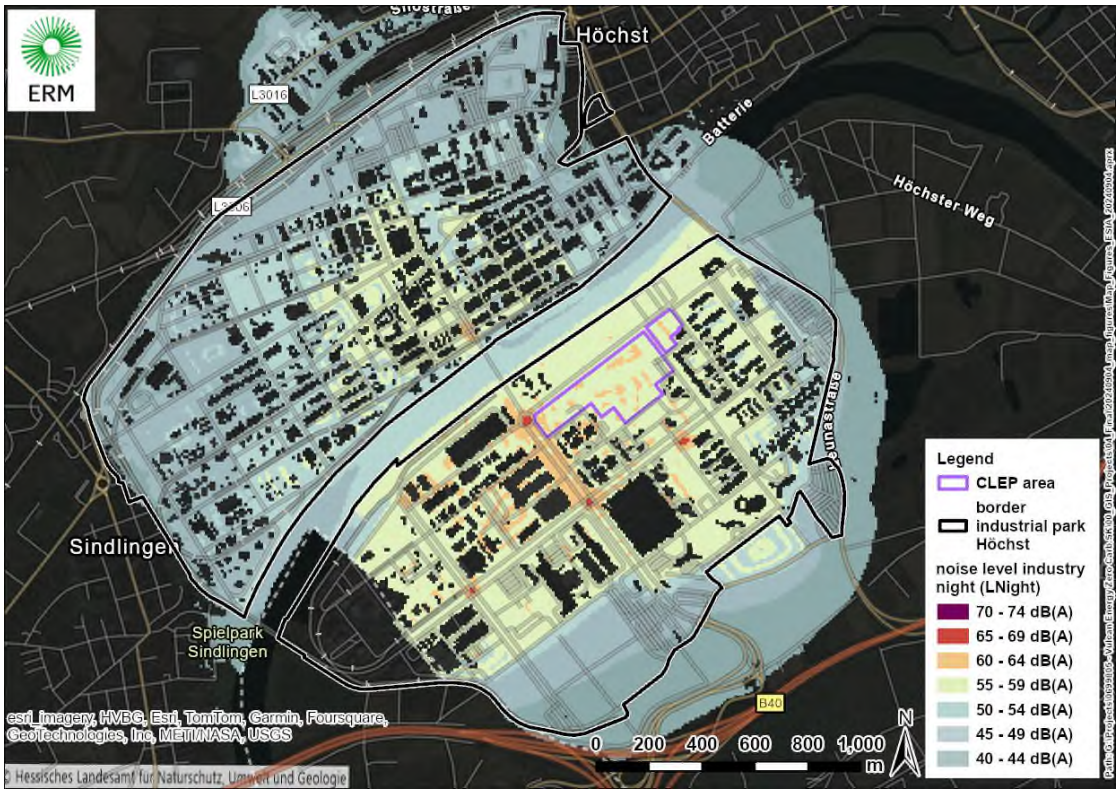


FIGURE 6-5 NIGHTTIME INDUSTRIAL NOISE AT THE CLP IN HÖCHST

Source: Data from the Hessian State Office for the Nature Protection, Environment and Geology, 2022

Potential Impacts and Mitigation Measures

Construction Phase

Each construction activity will use different types and amounts of equipment. The determination of the total sound power level of each construction activity is based on the noise emission characteristics and sound power levels of the equipment type, the maximum number of equipment, and the duration of each equipment being active at one location.

Also, the impact magnitude will also depend on the distance of each receptor from the various activities. As an example, receptors located within 50 meters from the construction boundaries will typically have a major impact due to earthworks, however receptors located at a distance greater than 160 meters from the construction boundaries, will not have any significant impact due to earthworks.

The noise impact assessment indicated that construction noise level for earthworks, roadworks and structures at the nearest receptors are within negligible impact magnitude except the receptors near the pipeline, the Hasenberg Well site and the CLP. The noise impact during construction of the pipeline is expected to be small for the Schützenhaus Diana, general mitigation measures need to be adopted. Only for the Archery Club near the Hasenberg Well site, the temporary noise impact is expected to be significant and the receptor sensitivity moderate since the Archery Club is classified as a sports club. Therefore, specific mitigation measures for the Hasenberg Site will need to be adopted in consultation with the archery club.

For the CLP Site it needs to be emphasized that the baseline noise levels are above 70 dB(A) which is above the German Noise Level Guidelines. Whilst the magnitude of the noise impact is expected to be medium during construction the receptor sensitivity is low as the background noise level is already high (since the Sanofi Office is located within the Industrial Park Höchst).

To mitigate such impacts, Vulcan will (*inter alia*):

- Develop a Noise Management Plan for the Hasenberg Well site including a monitoring program in order to ensure that noise levels at sensitive receptors meet the applicable standards;
- Use only state-of-the-art machinery is used for the construction work;
- Implement speed limits (e.g., 30 km/h) for trucks while travelling to and from construction sites (as well as within buildings and on village roads of poor condition);
- Project traffic routing through community areas will be reduced wherever possible;
- Dedicated site access roads that avoid routing through villages will be used;
- If necessary, to avoid narrow areas near receptors, construction of a new access road will be considered; and
- Conduct Noise monitoring during construction/drilling through a survey at the archery club using a hand-held noise monitor to inform if any further specific noise reduction is required; and
- Limit hours of operation for specific equipment or operations (e.g., trucks or machines operating in or passing through community areas).

Operational Phase

During operation noise emissions can be expected from the well sites, the GLEP, the currently existing Insheim Geothermal Plant and the CLP in Höchst. Noise modeling assessments indicate that levels at the 40 Morgen and Trappelberg Well sites are within the German Noise Level Guidelines. Since similar distances to the nearest receptors apply for the Schleidberg and Spreissgraben Well sites it is expected that these Well sites are also in line with the German Noise Level Guidelines. For Hasenberg, however, mitigation measures need to be adopted because noise levels are expected to be above the German Noise Level Guidelines.

Regarding the CLP it is expected that the noise levels during operation are within the Noise Level Regulations for Industrial Parks which are 70 dB(A).

6.1.4 IMPACTS RELATED TO DUST

Potential Impacts and Mitigation Measures

Air quality impacts during the construction and drilling activities linked to the air and dust emissions from the use of construction machinery and equipment. The pipeline will be situated below the ground, which is why no sources of potential air emissions are expected. The other permanent sites (GLEP, CLP, Well sites) will be sealed therefore, no sources of dust are likely.

Construction Phase

The baseline dust content of the air in the AoI is below the national air quality threshold. This suggests that dust impacts from construction works may become a nuisance for Insheim and southern Landau since these residential areas are located in close proximity to where construction of pipelines and infrastructure will occur, including temporary access roads where needed. In some areas though, rows of trees and shrubs form vegetated screens to protect residential areas from dust, especially closer to the settlements themselves.

At the Well sites access roads will be lined with gravel to avoid dust turbulence.[13]

Operational Phase

There are no significant air pollutants or dust emissions expected from the Project components during operation.

Given that the impacts are generally of only insignificant to minor significance, specific mitigation measures are not deemed necessary beyond the application of standard good practices for construction activities to minimize exhaust and dust emissions. Vulcan is committed to implementing a range of best practices, such as:

- Regular air quality monitoring especially during construction activities (especially dust fallout and NOx/COx);
- Limiting earthworks activities during particularly dry and windy periods;
- Switching off machinery and vehicles when not in use;
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;

[13] Vulcan, 2022. Stellungnahme zur allgemeinen Umweltverträglichkeits-Vorprüfung (UVP-V) – Schleidberg Süd.

- Remove materials that have the potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site necessary mitigation measures will be taken;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;
- Minimize drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Moistening of dusty surfaces and storage piles during dry weather conditions;
- Sheeting of truck loads; And
- Cleaning of truck wheels when leaving the construction site.

6.1.5 IMPACTS RELATED TO BIODIVERSITY

Baseline conditions

The Project is situated in the 'Western European Broadleaf Forests' ecoregion, which covers Western Europe and was once dominated by ancient mountain beech forests that stretched across a significant part of the continent. The main threats to biodiversity in the region include historical habitat destruction and transformation, intensified agricultural land use, reduced habitat quality, alterations to natural watercourses and climate change.

Project components located near Landau

- Historical land transformation has led to extensive urban, industrial, and agricultural development in the region.
- The once predominant dense broad-leaved forest and grassland mosaic has significantly diminished, with remaining natural habitats primarily found within legally Protected Areas (PAs) (Natura 2000 sites).
- Remaining semi-intact / natural habitats are restricted to the network of Protected Areas (Natura 2000), which will not be directly affected by the Project. These include grassland and wooded habitats (woodland, forest patches) associated with the Natura 2000 sites near Landau ('Standortübungsplatz Landau' and 'Erlenbach und Klingbach') located within the Project AoI.
- The Project does not fall within Protected Areas, but some infrastructure will be in proximity, warranting consideration of potential indirect interactions with these areas and their biodiversity values.
- Within the AoI of the Project, there are no aquatic ecosystems associated with surface water features such as rivers, streams, wetlands or freshwater lakes or manmade reservoirs. The nearest large river system is the Rhine River, which is located roughly 14 km east of the Project.

CLP at Industrial Park Höchst:

- The CLP will be situated within the pre-existing Industrial Park Höchst on leased land that has undergone prior infilling and modifications.

- The leased plot now consists of infrastructure, hardened surfaces, gravel areas, and secondary vegetation primarily comprising grasses and weeds, classifying these regions as modified habitats with low or negligible biodiversity value.
- The site is notably distant from formally protected areas (Natura 2000 sites), ensuring avoidance of direct and indirect interactions with these areas and their biodiversity.
- The 'Main' River main channel is located to the north of the site to be developed for the CLP, with the Industrial Park Höchst located on both sides of the Main River, which flows in a general westerly direction towards its confluence with the Rhine River. The Main River has been assessed as being in an 'unsatisfactory' ecological condition, which suggests that a significant level of modification to the river ecosystem and ecology has already taken place.

Importantly, the requirements of IFC PS6 (in terms of assessment and management of impacts on biodiversity and ecosystems) apply only to "those areas of modified habitat that include significant biodiversity value". In ERMs opinion, the modified habitats are considered to be of little to no biodiversity value or importance. Potential Impacts and Mitigation Measures

Biodiversity impacts identified for the Project are defined in terms of construction and operational (including maintenance) project phases, and include direct, indirect, and induced impacts. Pathways of effect are used to understand how biodiversity may be impacted (e.g., direct habitat loss, indirect habitat loss due to disturbance, increased hunting pressure, etc.).

Impacts associated with the Project are considered to be both 'area based' and 'linear' in nature, and relate to the construction and operation of the drill sites, thermal water pipelines, geothermal power plant and lithium production plant, the planned electricity distribution network (transmission line), as well as temporary worker camps and equipment laydown areas:

- Biodiversity impacts appear most intimately linked with direct and indirect impacts to species of conservation importance rather than habitat, which is largely modified (under cultivation/pasture);
- Construction-phase impacts will be more temporary in nature (e.g., temporary areas, noise, vibrations, and emissions) and therefore considerably less significant in the long-term; and
- There are likely to be a range of permanent operational impacts of lower significance associated with the installation and operation of the geothermal power plant, associated water transfer pipelines and lithium production plant.

To mitigate such impacts on biological receptors, Vulcan has committed to (*inter alia*):

- Restrict all activities to modified agricultural land only and avoid any and all activities from occurring within wooded habitats;
- Only the vegetation that is necessary to be removed for construction purposes will be cleared, and where possible cut vegetation to ground level instead of stripping areas entirely;
- Install appropriate wildlife fencing along the project perimeter where site infrastructure (i.e., the planned pipeline) will be located near to the Natura 2000 site 'Standortübungsplatz Landau' to prevent small mammals and reptiles from entering into the active construction zone and focused on guiding animals to safe points;
- Investigate opportunities to conserve, better manage or create suitable alternative habitats or enhancement of existing ones to support displaced species where applicable. This will be informed by operational phase monitoring of species;

- Undertake progressive rehabilitation in accordance with a land/habitat rehabilitation and restoration plan; and
- Develop and implement a suitable 'Mine Decommissioning and Closure Plan' for the discontinuation of the operation (in German: 'Betriebsplan für die Einstellung des Betriebes, Betriebschronik' in accordance with the German mining law (The Federal Mining Act or "Bundesberggesetz" BBergG), and importantly this plan may be subject to amendment or supplementation in terms of the Federal Mining Act and should therefore be considered a 'living document'. The plan needs to take into consideration the final land use upon closure and implement relevant land and/or habitat restoration measures as necessary.

6.1.6 IMPACTS RELATED TO GROUNDWATER

Baseline conditions

The Tertiary syn-rift and Mesozoic to Paleozoic pre-rift sedimentary rocks, along with the recent Quaternary sediments within the Upper Rhine Graben, form a sequence of alternating layers of high to moderate permeability units (aquifers) and low permeability units (aquitards). The presence of these low permeability layers limits the hydraulic connection between the various aquifers, effectively compartmentalizing them. The high to moderate permeability Quaternary sediments, which extend to depths of approximately 200 meters below ground level (as shown in Figure 6-6), represent a significant groundwater resource in the Upper Rhine Graben. These aquifers play an important role in groundwater availability and management in the region.

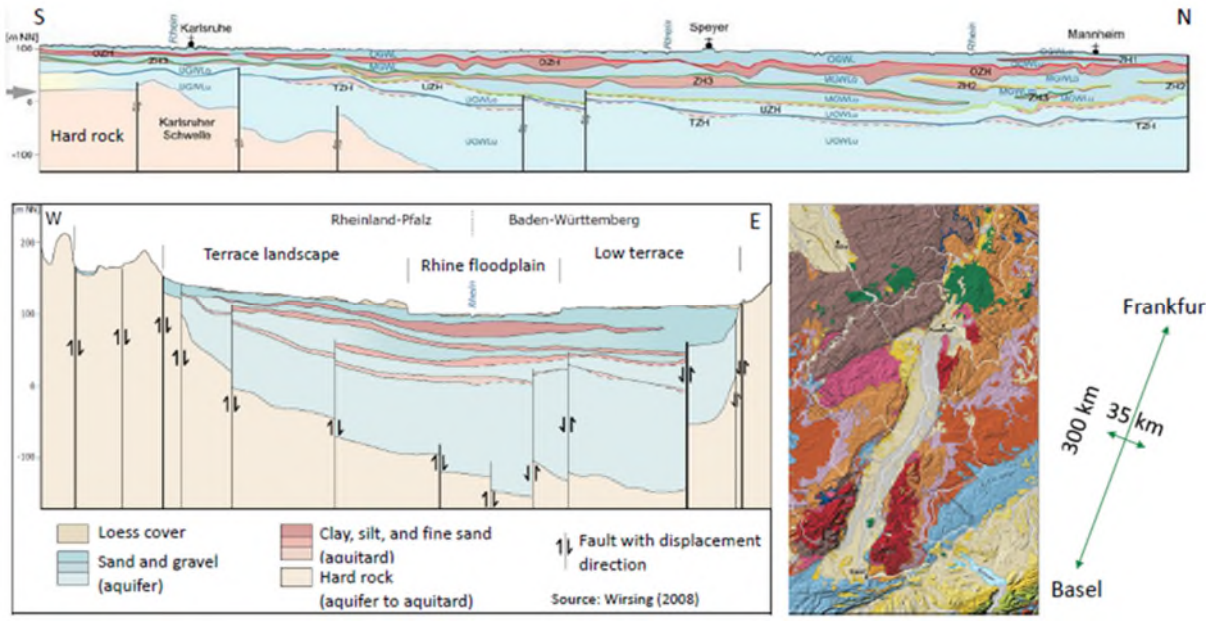


FIGURE 6-6 GEOLOGICAL CROSS-SECTION ILLUSTRATING THE HYDROGEOLOGY OF THE QUATERNARY SEDIMENTS IN THE UPPER RHINE GRABEN

In 2022, Vulcan carried out a preliminary environmental impact assessment (EIA) at the Schleidberg Well site. The assessment identified the following hydrogeological layers in the project area: Lower Aquifer (lower and upper parts), Deep Intermediate Horizon, Lower Intermediate Horizon, Middle Aquifer, Upper Intermediate Horizon, and Upper Aquifer. However, the Middle Aquifer isn't present across the entire area, as the Lower Intermediate Horizon wasn't found during drilling at Schleidberg.

Shallow Groundwater Aquifer

Pumping tests were conducted on the existing groundwater service wells at the Schleidberg site, showing they can provide a yield of about 10 m³/hour. Additional tests will be done to confirm the maximum sustainable yield of these wells. Groundwater levels in the region show that the upper aquifer in the Quaternary deposits ranges from 1 to 25 meters below ground level in the Landau area. At the CLP in Höchst, the groundwater table is around 6 to 7 meters below ground level in the quaternary sand and gravel deposits.

Regional groundwater flow, according to hydrogeological mapping (1983-1998), generally moves eastward in the Upper Aquifer of the project area, with flow at Schleidberg specifically heading southeast. The Middle Aquifer shows a similar flow direction.

In Rhineland-Palatinate, over 90% of the drinking water supply comes from groundwater. However, past decades of land and soil use have led to noticeable impacts on groundwater quality, such as diffuse pollution from nitrogen, phosphates, and pesticides. It is crucial to protect these groundwater resources from further pollution to avoid the need for more expensive treatment processes or, in the worst case, the creation of "drinking water factories" in the future.

Deeper Brine Aquifer

The Project's target brine source is found in the fractured sandstones of the Buntsandstein Formation, at depths between 2,500 m and 4,000 m below ground. Thick clay-rich layers in the Tertiary sediments, along with the clay-rich top of the Mesozoic pre-rift sediments (Keuper), create a hydraulic barrier separating the shallow groundwater system from the deep brine system (see Figure 2-2), meaning that there is no risk of groundwater contamination. The brine aquifer is currently being used for renewable energy production at Insheim and Landau.

Potential Impacts and Mitigation Measures

Construction Phase

During drilling, 7,000 to 10,000 m³ of water will be needed per well, with 23 wells planned, totalling about 230,000 m³ of water. This is just 0.0001% of the 1,717.2 million m³ of groundwater abstracted in Rhineland-Palatinate's non-public sector in 2019. Each well will take around 3 months to drill, so groundwater use will be short-term. Dewatering of shallow groundwater may be needed during pipeline construction and will also be temporary.

Groundwater will be used to fill the industrial pipeline system once (about 4,500 m³), with minimal water needed later for system maintenance. Proper handling of diesel and lubricants will prevent potential contamination during construction, and appropriate measures will avoid impacts from drilling interactions with deeper aquifers. Although construction will reduce infiltration areas due to surface sealing, the soil’s existing permeability is already low. Overall, the impact on shallow groundwater is localized, temporary, and small.

Operational Phase

During operation, the abstraction and re-injection of geothermal fluids will affect the deep brine system. Preliminary dynamic flow modelling has predicted that changes in pressure, temperature, and lithium concentrations will largely remain within Vulcan’s licensed area. Re-injection will occur at a rate similar to abstraction and at pressures below fracture levels, allowing the deep brine system to recover once operations cease.

Potential impacts on shallow groundwater could arise from hydraulic connections between aquifers of different qualities, but current geological and water data show no such connection due to low permeability layers. Proper well construction, as outlined in section 2, will prevent any unwanted hydraulic connections.

Brine and industrial water will be transferred through pipelines between wells and plants, with potential risks to shallow groundwater from leaks. These pipelines will be built according to regulations, and a comprehensive maintenance and monitoring system will be in place to detect leaks. A shallow groundwater service well at GLEP will address small water losses in the industrial system, but these losses and groundwater abstractions are expected to be minimal. Overall, the operational impact on shallow groundwater will be negligible.

Vulcan has prepared a Special Operating Plan (Sonderbetriebsplan) for groundwater monitoring in Schleidberg as part of their permitting process with specific measures on how to protect the groundwater resource. Vulcan has also committed to implementing additional measures in line with international standards; a few of them have been listed below:

- Monitor operations to check for local aquifer drawdown effect and any adverse water quality effect.
- All facilities and structures will be regularly inspected and maintained to ensure proper and efficient operation at all times, and especially after heavy rainfall. Sediment deposits will be regularly removed and disposed of either by spreading on-site (if uncontaminated) or at a suitably licensed facility.
- The size and duration of exposure of areas of the open ground will be kept to a minimum.
- A spillage risk assessment will be undertaken as part of the development of the Emergency Preparedness and Response Plan (EPRP).
- The EPRP Plan should specify that Spill Response Kits will be available, including absorbent materials suitable for the materials to be handled on-site, will be held at secure, clearly signposted locations, instructions will be provided with the kits and personnel will be trained in their use.
- Any spillages will be immediately contained on-site and all contaminated materials including soils will be removed from the site for suitable treatment and disposal.
- All staff and subcontractors will be required to report any incidents, and these will be subject to investigation and remedial and preventive actions will be taken.

6.1.7 IMPACTS RELATED TO TRAFFIC AND LAND ACCESS

Baseline conditions

The Project Area is located on mostly arable land -- sites 40 Morgen, Trappelberg, Schleidberg, Hasenberg, Spreissgraben and the Insheim geothermal plant are located on and next to agricultural land and non-irrigated farmland. However, in the Landau area where the GLEP D12 site and Landau geothermal plant are located the area is semi-industrial or peri-urban[14]. Traffic throughout the entire study area is relatively minimal except for the nearest urban centres and

[14] UNESCO defines per-urban as an area that is transitioning from rural to urban land areas. Source: UNESCO, Peri-Urban Landscapes, retrieved from: https://en.unesco.org/events/peri-urban-landscapes-water-food-and-environmental-security#:~:text=Peri%2Durban%20areas%20are%20zones,centres%20and%20the%20rural%20environment. Accessed in October 2023.

villages where roads are narrow, and potential 'bottlenecking' can occur at intersections of main routes within these urban centres. During ERM's site visit to the town of Insheim, the Vulcan team noted community concerns about the Project's increased traffic movements and large/heavy vehicles carrying materials within the small town.

Potential Impacts and Mitigation Measures

As Project activities ensue there may be an increase in traffic or the disruption of access to transport infrastructure within and around the AoI. Increased number of personnel or vehicles on the road may congest the already narrow paved roads and in extreme cases compromise road safety or infringe upon nearby land access. Increased congestion, and the transport and handling of hazardous materials may also pose low risks to occupational health and safety.
Civilians in the town of Insheim have previously expressed concern to the Vulcan team about increased Project-specific traffic in their small towns.

Construction Phase

During construction additional access roads will be built near each component to allow for vehicles carrying equipment and workers to access the sites. There may also be road closures during the process of pipelaying. Thus, locals will be temporarily restricted, namely farmers and landowners, from using certain roads, thus potentially disrupting the use of landscapes that may have previously been used for agriculture and recreation. Alternative routes may be available near some Project components.

Additionally, vehicles driving on these narrow roads will be moving at slow speeds carrying large an abnormal[15] equipment loads. Flat-bed trucks will be used to transport materials such as drill rigs to the site and dump trucks will be used to move gravel, dirt, and earth during construction. Thus, there is a potential risk of congestion on these relatively small and narrow roads. Failure to properly coordinate and manage the influx of traffic may also lead to potential occupational health and safety risks (i.e., collisions and traffic accidents) and reduction(s) in overall efficiency (time and resources).

This impact will likely be a minimal, temporary, and reversible impact and will primarily affect the local community. The severity and duration of the impact will also depend on where these large vehicles need to access the public road network; however, this may still only contribute to minimal impact as large vehicles will probably only need to access main roads at specific times and for short durations. The severity of the impact may also vary across seasons – in winter there may be less activity along these roads due to poor weather conditions (snow, precipitation, impairment to visibility etc.).

Operational Phase

During operation there is a low risk of road congestion or prevention to road access. Vehicles accessing the area and Project AoI will be less frequent after construction and be limited mainly to maintenance, inspection crews, and operational staff visiting the drill rigs. This is likely to pose minimal risk to road access and traffic flows.

During operation trucks will frequently transport brine from the Project AoI to the Höchst Industrial Park.

[15] Abnormal for the type of vehicles and goods that are normally transported on these narrow roads.

The motorway route from Landau (GLEP) to Frankfurt Industrial Park Höchst (CLP) covers approximately 130 kilometres, relying solely on major motorways and avoiding residential areas. However, despite these precautions, the transportation of hazardous materials may still pose potential risks to both traffic safety and nearby communities. The potential risks include the following:

- **Traffic Safety Risks:** Transporting hazardous materials may increase the risk of road accidents. An accident involving a truck or railcar carrying these materials could lead to spills, fires, or explosions, especially if the lithium meets water or other reactive substances.
- **Traffic Congestion Risks:** Large trucks hazardous materials can contribute to traffic congestion, especially in industrial or urban areas. This increases the likelihood of accidents and can cause delays for emergency services, potentially exacerbating the risks in case of a hazardous material spill or other incidents.
- **Accidental Spills or Leaks:** Accidents involving hazardous material (such as sulfuric acid, used in processing) could lead to spills that endanger nearby communities. Spills may contaminate local water supplies, damage infrastructure, and require emergency evacuations.
- **Fires and Explosions:** Hazardous materials are highly flammable, and in the event of a collision they may release toxic fumes or causing explosions. This could pose a significant threat to communities near transport routes.

Nonetheless, with mitigation this impact significance can likely be minimized to an acceptable level. For instance, Vulcan has committed to the following mitigation measures including (but not limited to):

- Develop a Traffic Management Plan in coordination with the local authorities. The TMP will include a wide range of measures such as stakeholder engagement before temporary closure and diversion of the roads, appropriate signage, speed limits, drivers' training requirements, etc.
- Aim to minimize road closure or access restriction as much as possible by expediting construction processes and by coordinating with local land users.
- Identify and inform local stakeholders and land users/owners of alternative routes they may use while road access is restricted.
- Limit the hours of operation for specific equipment or operations (*e.g..* trucks or machines operating in or passing through community areas) as much as feasible.

Vulcan will also implement specific mitigation measures to avoid and minimize any negative impacts generated by the transportation of the hazardous material transportation, such as (but not limited to):

- Use of real-time monitoring and equip transportation vehicles with GPS tracking systems that provide real-time data on vehicle speed, route, and driving conditions. This will ensure that authorities can intervene quickly in case of deviation from safety protocols or accidents.
- Secure packaging and containment adhering to the ADR regulations, lithium and related chemicals must be securely packaged in certified containers that can withstand impacts and prevent leaks.
- Develop an Emergency Response Plan including coordination with the authorities, fire services, hospitals, and local police. Vulcan emergency response teams will be trained in

handling lithium-related incidents, and communities along transport routes should be informed of evacuation procedures. These teams will have access to absorbent materials, neutralizing agents, and specialized equipment to clean up spills before they spread into waterways or soil.

- Vulcan will conduct sessions to inform residents about the transport of hazardous materials and safety measures in case of emergencies.

6.1.8 CUMULATIVE IMPACTS

Cumulative impacts are defined for this ESIA as impacts which result from incremental changes caused by the Project together with other presently ongoing, or reasonably foreseeable future planned actions/projects within the Project Area[16].

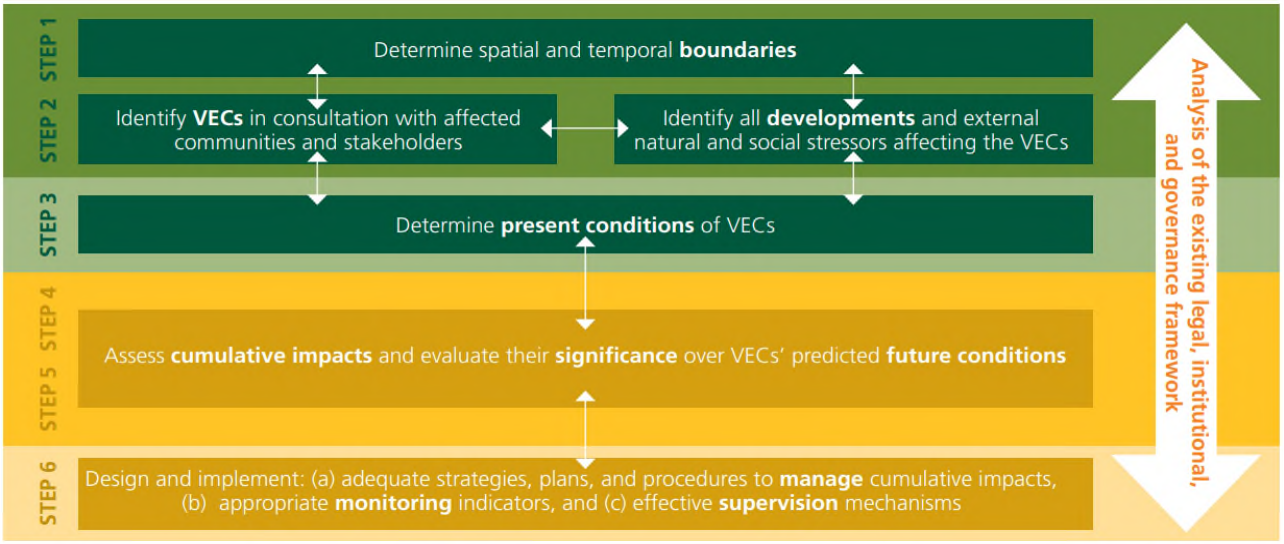
Depending on the type/characteristics of other identified projects and their specific impacts, the main issues of concern with respect to the Cumulative Impact Assessment (CIA) can thus include any type of impact that is considered in the ESIA.

In general, this cumulative impact assessment follows the recommended approach to a rapid CIA (RCIA) as described by the IFC Handbook and is undertaken through the following methodology (Figure 6-7):

- **Step 1:** Definition of the relevant spatial and temporal boundaries;
- **Step 2:** Identification of key Valued Environmental Components (VECs) and screening/Identification of potentially relevant other projects in the region;
- **Step 3:** Determine present conditions of the VECs; and
- **Step 4,5 & 6:** Assessment of potential cumulative impacts and identification of appropriate mitigation measures17.

[16] The definition is also based on that given in the EC Document "Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions", May 1999; in addition, the IFC Good Practice Handbook "Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets, 2013, was used to inform the assessment process.

[17] Please note that Steps 4, 5 and 6 are included as one element here within the approach as the results of assessment and proposed mitigation are presented (in one table) for each of the projects where there are considered to be overlapping VECs.



Source: IFC, 2013

FIGURE 6-7 CUMULATIVE IMPACT ASSESSMENT PROCESS

These steps are elaborated in detail in the ESIA study and summarized for the purpose of this NTS in the subsections below.

The CLP at Höchst is subject to rigorous local permitting requirements that specifically address environmental impacts. These permits, issued by local authorities, are designed to assess and mitigate any additional impacts caused by new or modified facilities. This includes an analysis of cumulative impacts alongside existing operations. Because the CLP is integrated within the existing industrial ecosystem, its cumulative environmental impacts—such as air emissions, water discharges, and waste generation—are already incorporated into the site's regulatory framework and therefore, not assessed further in this chapter.

Other Relevant Projects in the Region

Privacy regulations in Germany are exceptionally stringent, often restricting the publication of any planned projects unless they necessitate official disclosure due to permitting requirements. In particular, details of a project are not made public unless it requires a full Environmental Impact Assessment (EIA). Consequently, the public typically only becomes aware of the specifics of a project when it reaches the stage where a full EIA is mandated, reflecting the careful balance between developmental transparency and privacy.

Therefore, to obtain information on planned projects around the defined area, ERM searched in the following available databases:

- Umweltprüfungsportal des Bundes (*Federal Environmental Assessment Portal)*
- Verbund UVP der Länder (*Projects Subject to an EIA*)
- Bebauungspläne in Rheinland-Pfalz (*Legal zoning plans in Rhineland-Palatinate*)
- GeoPortal Landau (*Geoportal of the city of Landau*)
- Netzausbau - Karte (*Federal Network Agency*)
- Stadt Landau in der Pfalz Flächennutzungsplan 2030 (*Land Use Plan 2030 for the city of Landau)*

In addition, Vulcan reached out to the city of Landau to obtain further information on planned projects that might not yet be publicly available.

The ERM screening results indicate that no major new developments are planned around the Project's Area of Influence. Only minor urban maintenance projects, such as road repairs and tree planting, are expected near the GLEP site. While there are plans to expand the D12 industrial park near Landau, specific details were not available at the time of the assessment, and the Vulcan infrastructure is expected to occupy only a small portion of this area. Furthermore, Landau's Land Use Plan focuses primarily on commercial and residential development. Geographic constraints, including the Ebenberg nature reserve to the south and road routes A65 and B10 to the east and north, limit significant new development in these directions, which is also where the Project's components are located (see Figure below).

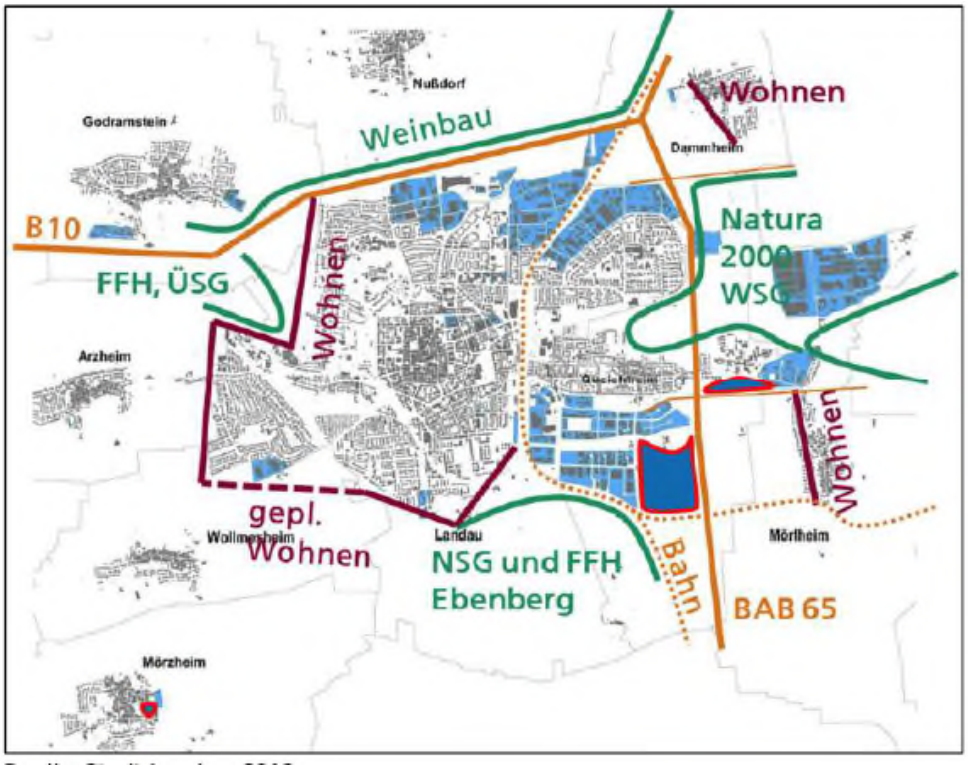


FIGURE 6-8 SPATIAL DEVELOPMENT POTENTIAL FOR COMMERIAL BUILDING AREAS – EXTERIOR TO THE CORE OF THE CITY OF LANDAU

Source: City of Landau, 2019

With regards to brine, the existing geothermal plants at Insheim and Landau were incorporated in the dynamic flow modelling completed for the Project and thus, the predicted impact already considers these projects, and additional cumulative impact is not required for the existing geothermal sites. No other lithium projects connected to the same brine field have been identified.

Results

Whilst the Project will contribute positively, in a cumulative sense, through employment opportunities created, these are likely to be small contributions when compared to all other industry and commercial activities in the area and are not worth considering further.

Also, the net positive impact of the Project in terms of the provision renewable 'clean' energy/heating can be considered from a cumulative effects perspective (given there are already other geothermal power plants in Landau and surrounding areas); however the data to quantify such an impact is not yet available for this purpose. The potential for broader cumulative positive impacts as a result of future Vulcan projects should be acknowledged and these can also be considered catalysts for additional renewable energy projects in the region.

6.1.9 TRANSBOUNDARY IMPACTS

The region for the Project is in the Upper Rhine Valley (URV) (Figure 6-9) which extends into three countries: Germany, France, and Switzerland.

FIGURE 6-9 UPPER RHINE VALLEY (URV)

The area is located centrally in Europe and is highly developed with many rural and urban centers throughout which are interconnected via roadways, freeways, and railways.

The deep subsurface reservoirs in the Upper Rhine Valley (URV) have been extensively explored and are characterized by high temperatures, making them ideal for geothermal energy production. Since the 1980s, the region has a well-established history of deep well development aimed at both hydrocarbon and geothermal resources. Historically, many wells in the URV were drilled for oil and gas, but there has been notable geothermal research and development as well.

Key geothermal projects in the region include:

- Insheim and Landau, Germany: Commercial geothermal power plants located within Vulcan's planned development area.
- Bruchsal, Germany: Renowned for its research and development in geothermal technologies.
- Soultz, France: A significant site for testing various geothermal power generation technologies.

Considering the above, ERM has conducted a screening of possible transboundary impacts as a result of the Project. The following aspects were considered during the assessment:

- **Geographical distance**: The Project area and its Area of Influence are located at a significant distance from the neighboring country's border (over 60km distance to France). Due to this considerable separation, it is highly unlikely that any direct environmental or socio-economic impacts would extend across the border. The impact of operation on the shallow groundwater will be spatially limited and negligible during construction and operation respectively, therefore supporting this conclusion further.
- **Localized environmental impact**: The E&S impacts of the Project, such as air emissions, water usage, hydrology, and land use changes, are expected to be contained within the Project's vicinity.
- **Lack of pathways for impact transmission**: For a transboundary impact to occur, there must be a clear pathway for transmission, such as shared water bodies, air currents, or migratory species routes. In this case, there are no identified pathways that would allow the project's impacts to travel the distance required and this further reduces the likelihood of transboundary impacts.
- **Compliance with national and European regulations**: The Project has been designed and evaluated in accordance with national and European environmental regulations, which include provisions for preventing any significant adverse impacts beyond Germany's borders.

In summary, the significant geographical distance between the Project area and the neighboring country, coupled with the lack of transmission pathways and the localized nature of the environmental impacts, justifies why transboundary impacts were not foreseen in this Project.

7. HOW WILL THE IDENTIFIED PROJECT RISKS BE MANAGED?

An Environmental and Social Management Plan (ESMP) is developed to outline the mitigation measures that will be undertaken by Vulcan and its contractors during construction and operation of the Project. The ESMP serves as an overarching guideline that identifies potential environmental and social impacts and associated mitigation and additional management plans and actions that need to be in place to avoid, mitigate and monitor these impacts.

The ESMP also briefly summarizes and defines the scope of the Project's issue specific environmental and social management and monitoring plans. The ESMP is part of the full ESIA report which will be disclosed to the stakeholders.

The ESMP provides a consolidated summary of the environmental and social (E&S) commitments relevant to the Project and a framework of the E&S Management System to be developed and implemented by Vulcan to ensure systematic and effective execution of these commitments along the different Project phases.

The requirements of the ESIA and ESMP will be reflected in the contract documents with the EPC Contractor(s), sub-contractors & suppliers. In addition, the EPC Contractor(s) will prepare a Construction and Environmental and Social Management Plan (CESMP) specifically as a management tool to be used by the EPC Contractor and its sub-contractors & suppliers to implement the environmental and social (E&S) mitigation measures.

8. HOW WILL THE IMPLEMENTATION BE MONITORED?

Inspection and monitoring of the construction, operational and decommissioning activities will enable the effectiveness of environmental mitigation to be evaluated; it will also allow any potential impacts to be identified and responded to at an early stage.

A monitoring program will be developed including monitoring requirements specified by German regulatory authorities and international standards such as IFC PS requirements. Monitoring program will also inspection and audit plan to be implemented by Vulcan and EPC Contractor(s). Where issues of non-compliance are identified by either the Vulcan representative or the EPC Contractor(s), they will be immediately reported to Vulcan and corrective action will be identified by the Vulcan representative in conjunction with the EPC Contractor.

Following an audit conducted by Vulcan, the EPC Contractor(s) will prepare a Corrective and Preventive Action Plan in accordance with the findings of the audit and the corrective actions and recommendations will be implemented by the contractor accordingly. This could take the form of, for example, further direct mitigation, or changes to procedures or additional training.

An activity may be stopped by Vulcan representative if he/she is of the opinion that the corrective action is not being appropriately or effectively implemented by the contractor. In the case of continued or severe non-compliance, Vulcan will stop work until necessary corrective actions are taken.

APPENDIX A GRIEVANCE FORM

GRIEVANCE FORM	
Reference No. *(To be assigned by Project office personnel):*	
Preferred language for communication	☐ **German** ☐ **English** ☐ **Other, please specify:** _____
Please enter your contact information and grievance. This information will be dealt with confidentially. Please note: If you wish to remain anonymous, please enter your comment/grievance in the box below without indicating any contact information – your comments will still be considered by	
Full Name	
Anonymous submission	☐ **I wish to raise my grievance anonymously** ☐ **I request not to disclose my identity without my consent**
Please mark how you wish to be contacted (mail, telephone, e-mail).	☐ **By telephone (please provide telephone number):** _____ ☐ **By e-mail (please provide e-mail address):** _____

Description of incident or grievance:	What happened? Where did it happen? Who did it happen to? What is the result of the problem?

Date of incident/grievance: **_____** **_**	☐ **One time incident/grievance (date _____)** ☐ **Happened more than once (how many times? _____)** ☐ **On-going (currently experiencing problem)**
What would you like to see happen to resolve the problem?	

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