Public Disclosure Regarding Garpenberg Tailings Facility

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INTRODUCTION

Boliden has committed to apply the Global Industry Standard on Tailings Management (GISTM), adopted by the International Council for Mining and Metals (ICMM) in 2020, setting a precedent for the safe management of tailings facilities, towards the goal of zero harm (the "Standard" or "GISTM").

The Standard contains 77 specific requirements that need to be fulfilled to be in conformance with the Standard. The Standard also requires that adhering members annually issue a status report on their implementation of and conformance with the requirements to support public accountability. In accordance herewith, Boliden as the operator of its tailings facilities is to publish and regularly update information on its commitment to safe tailings facility management, implementation of its tailings governance framework, its organization-wide policies, standards and approaches to the design, construction, monitoring and closure of its tailings facilities

A separate document available via Boliden web, named Public Disclosure Regarding Boliden´s Tailings Management Framework, provides a general description concerning Boliden's tailings and dam safety management for all sites, in which much of the information within requirement 15.1 is met.

This document provides additional information specifically related to Garpenberg Ryllshyttan tailings facility to fully provide the required information. In addition, Chapter 11 of this document presents the status of implementation of GISTM for Garpenberg.

1. Description of the tailings facility

The Garpenberg mine is situated in Hedemora municipality, Dalecarlia in Sweden, see Figure 1. Mining in the area has been going on since 400 BCE. The coordinates (latitude, longitude) of the access gate of the tailings facility are 60°18'1.1"N 16°9'36.1"E.

The ore is a complex sulphide ore with zink, lead, and copper being the main products from the mine, along with silver and gold. Concentrates are transported by truck to Gävle harbour and shipped primarily to the Boliden smelters in Sweden, Norway, and Finland. The permitted production rate is 3,5 Mton, of which ~30 % is used as backfill in the mine and the rest become tailings.

Figure 1 Geographic location of Garpenberg mane and TSF in red.

Tailings are deposited in the tailings storage facility (TSF), colloquially called Ryllshyttan, located around 5 km southwest of the mill site, see Figure 2. After cycloning of the total tailings to use part of the stream for backfill in the mine, the remainder of the tailings stream is pumped to the tailings facility with the help of a booster station located between the concentrator and the TSF.

The facility consists of a tailings storage facility and a clarification pond, see Figure 3 for an overview and Table 1 for a description. The slurry is dewatered using a high rate thickener to a solids content of ~33 % and spigotted on the beaches around the whole facility. Deposited tailings are used for constructing the dam raises. The rate of rise is around 1 m per year.

Overflow from the thickener is discharged in the center of the facility. Water from the facility is treated before discharge to the clarification pond, where fines are allowed to settle. At the spillway from the clarification pond, 85-90 % of the water is reclaimed for use in the concentrator. For more information regarding the dams, see Chapter 5. Rockfill for construction originates from quarries located near the facility.

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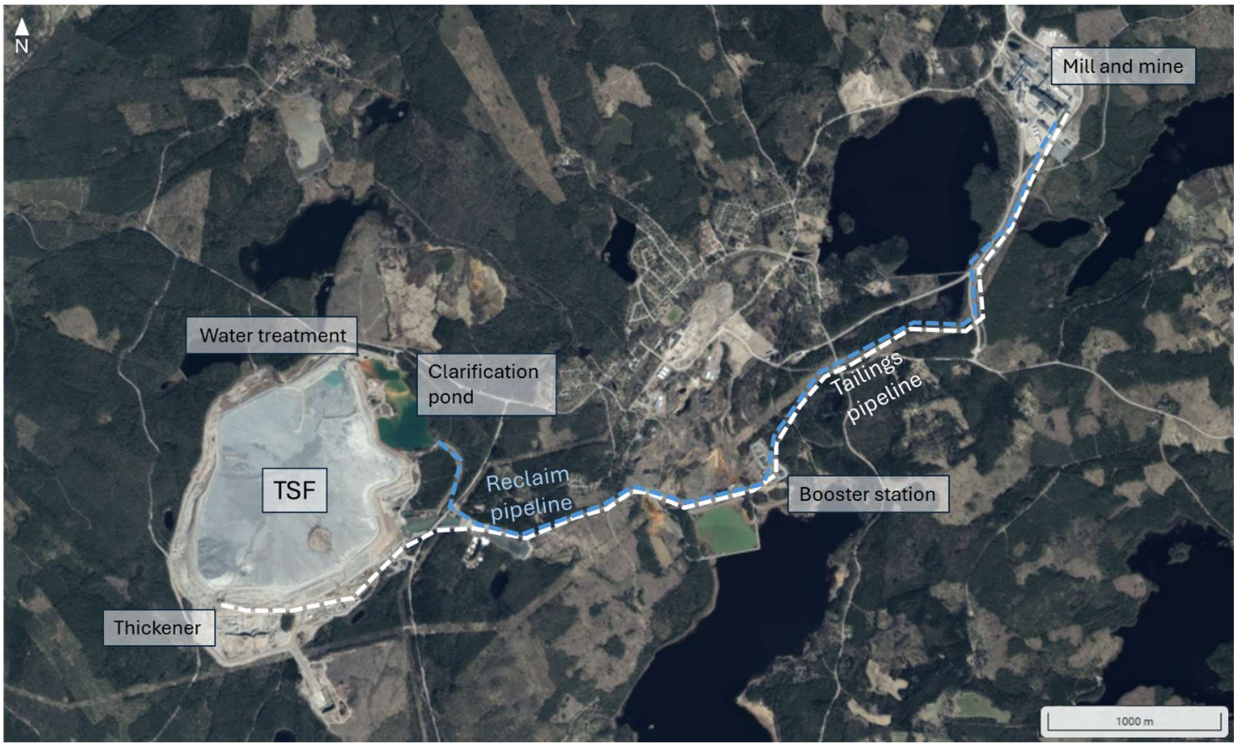

Figure 2 Aerial photo of the Garpenberg mine, mill, and tailings facility.

Figure 3 Aerial photo (Maj 2025) of the Garpenberg tailings facility.

Table 1 Description of main structures of the Garpenberg tailings facility

Object	Description
TSF	Construction began in 1963 and deposition in 1965. Tailings were originally deposited mainly under water in a natural lake. Starter dams and subsequent centerline raises were made with an impermeable till core. Beginning in 2009, construction transferred into upstream raises using tailings on the permeable dams A, C, D, E and I. In 2023 the design was changed again to centerline construction for these dams. The transition from upstream raise to centerline raise in currently ongoing and expected to be completed in 2027. Two impermeable dams, E2 and I2, impound the pre-clarification pond in front of the spillway. Tailings are deposited sub-aerially through spigots along the perimeter of the facility from all permeable dams. Process water is treated before reporting to the clarification pond. The whole facility covers an area of approx. 1,6 km^2, of which the clarification pond covers 0,3 km^2. As of 2024, approx. 40 Mton of tailings are stored in the facility.
Clarification pond	The clarification pond was commissioned in 2007 by the construction of dam J and the incorporated spillway. The pond stores approx. 0,6 Mm^3 of water. At the spillway, most of the water (85-90%) is recycled to the concentrator for process use. Excess water is released to the recipient. Environmental monitoring of the released water is performed in the channel just downstream of the spillway.

2. Consequence classification

The consequences in the event of a tailings facility failure in Garpenberg are estimated from breach analyses, see Chapter 4. The consequence classifications refer to conditions within the current permit.

The consequence classification for the Garpenberg tailings facility have been defined both according to Swedish legislation (Miljöbalken) and according to GISTM, see Table 2.

The consequence classification of the tailings storage facility according to Swedish legislation is "Dammsäkerhetsklass B". The classification was decided by the monitoring authority in May 2024. The clarification pond has a consequence classification of "U", meaning there are no consequences for external parties in case of failure.

The consequence classification of the tailings storage facility according to the Global Industry Standard on Tailings Management (GISTM) is High. This was confirmed by the AE in November 2024.

Table 2 Overview of consequence classes for all dams of the Garpenberg Ryllshyttan tailings facility.

Classification system	Facility	Class	Comment
Swedish legislation (Miljöbalken)	TSF	B	Risk for loss of life and danger to human health and the environment. Some damage to infrastructure and property depending on the direction of the failure.
	Clarification pond	U	Dam J does not cause any impact outside of the industrial area, and no danger to human life.
Global Industry Standard on Tailings Management (GISTM)	TSF	High	Risk for loss of life and danger to human health and the environment. Some damage to infrastructure and property depending on the direction of the failure.
	Clarification pond	-	The clarification pond does not impound tailings and has thus not been classified according to GISTM.

3. Risk assessment

Garpenberg has assessed risks in a manner consistent with the risk management instruction established by Boliden. Assessment of risks related to the operation and closure of tailings facilities have been undertaken by a team of multidisciplinary specialists. The risks have been evaluated regarding potential consequences related to a range of aspects, included but not limited to health and safety, environment, infrastructure, social aspects and local communities. The risk assessment is updated at least every three years, or more often if triggered by major changes.

Within Boliden's risk framework, risks are categorized into four levels, based on likelihood of occurrence and consequence of a critical hazard. Based on risk level, risks are managed according to Table 4.

Table 3 Required actions for different risks

Risk	Action
Extreme	Intolerable – Requires immediate actions to reduce the risk
High	Generally unacceptable – Detailed action plan required and mitigation plan during transition
Medium	Acceptable if ALARP – Monitor and manage as appropriate
Low	Acceptable – Monitor and manage as appropriate

An update of the risk assessment was undertaken in late 2023 and early 2024, after the work on the design change had started but before the most critical work was completed. The conclusion was that there were still some actions to be taken to reduce the High risks to Medium risks. The work – which had already started as soon as the new permit was granted in 2023 – continued into 2024, with some minor work completed in the first half of 2025. In the meantime, the risks were monitored a part of the regular, automatic surveillance program. A new risk assessment, planned for Q3 2025, will reflect the actions taken to lower the risk, with most risks expected to meet the ALARP principle ("As Low As Reasonably Practical"). Table 4 provides a list of the highest identified risks as well as the status of associated mitigation measures.

The identified events which can potentially lead to flow failure events, are used as input for the dam breach analysis (see Chapter 4), as well as for the Trigger Action Response Plan and the Emergency Preparedness Response Plan (see Chapter 8).

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Table 4 High and medium class risks and associated mitigation plans

Dams	Failure mode	Identified risks	Current mitigation used to manage and monitor identified risks
A, C, D, and E	Instability	Presence of weak layers (peat, organic mud) in the foundation underneath the original starter dams	• Stability analyses show that the factor of safety is satisfactory for current dam height • Excavate and replace all weak layers in the dam toe with competent support fill (completed) • Construction of new support fill founded on competent foundation without weak layers (completed) • Monitoring of movements in the dam
A, C, D, E, and I	Instability	Liquefaction of soft tailings originally deposited sub-aqueously from the starter dams	• Stability analyses show that the factor of safety is satisfactory for current dam height • Regular CPT investigations to understand the properties of the tailings • Automatic monitoring of pore pressure through the dams • Placement of support fill downstream of the dams to achieve satisfactory safety for the final dam height (ongoing, expected completion in 2027)
A, C, D, E, E2 and I2	Seepage and Erosion	Starter dams were partially founded on porous materials and constructed with insufficient filter transitions according to modern guidelines. Dam A has had several outlet pipes running through the core. All outlets were plugged before decommissioning.	• Automatic monitoring of pore pressures and seepage through the dam, including cameras to monitor material transport • Placement of filters and support fill downstream of the original starter dams (ongoing, expected completion in 2027) • Long beaches (>100 m) to keep free water away from the dams and foundation
E and I	Seepage and Erosion	Increased seepage could occur in the transition zone between permeable dams E and I and their connections to impermeable dams E2 and I2, respectively	• Seepage prevention extension designed for the connection between the permeable and impermeable dams

			• Seepage monitoring of dams E, E2, and I in place. Seepage monitoring of I2 planned for 2026. • Water level of the pre-clarification pond is monitored
E2 and I2	Overtopping	As the facility handles water from many different sources via pumps, a high flood situation in the area could possibly overwhelm the system	• The water management plan describes the different inflows and how they can be re-routed if needed. • The spillway has double capacity for a probable maximum flood • The facility is monitored 24/7

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4. Impact assessment

The impact assessments for the Garpenberg tailings facility are based on breach analyses of credible flow scenarios. The results are used to evaluate the consequence classification (see Chapter 2) of the dams and to develop the Emergency Preparedness Response Plan, see Chapter 8.

The impact assessment has been evaluated within two different frame works, according to Swedish legislation (Miljöbalken), and according to the Global Industry Standard on Tailings Management (GISTM).

The impact assessment is based on breach analyses from 2023. The analysis included breach modeling for all dams except I2, for which the impact is estimated based on surrounding dams. Modelling included both current conditions (crest +245 m.a.sl.) and final permitted conditions (crest +256 m.a.sl.). The impact assessment is reviewed if any major changes to the facility or local area occur, or in 2027 during the next dam safety review at the latest.

The assessment according to Swedish legislation is presented in Table 5. The impact assessment according to the Global Industry Standard on Tailings Management (GISTM) is presented in Table 6.

Table 5 Summary of the Garpenberg impact assessment according to Swedish legislation (Miljöbalken).

Dam	Impact assessment (major, large, moderate, small)	Risk for loss of, destruction of or disturbance of:						
		1. Human life	2. Cultural values	3. Electricity infrastructure	4. Infrastructure	5. Essential services	6. Environmental	7. Economy
Dam A	Large	X	X	X	X		X	X
Dam C	Large	X		X	X		X	X
Dam D	Large	X					X	X
Dam E	Large	X	X		X		X	X
Dam E2	Large	X	X		X		X	X
Dam I	Large	X	X	X	X		X	X
Dam I2	Large	X	X	X	X		X	X

Table 6 Summary of the Garpenberg impact assessment according to the GISTM

Consequence Criteria	Classification	Impact assessment
Potential Population at risk (PAR)	High	10-100 persons Population at risk is estimated to between 6 and 90 persons, depending on which dam fails.
Potential Loss of Life (LOL)	High	1-10 persons Loss of life is estimated to between 0 and 7 persons, most Boliden's own personnel, depending on which dam fails.
Environment	High	• Toxicity of process water: Moderately toxic process water. • Impact on habitat: Several lakes contaminated. • Affected species: Up to 32 species affected (6 endangered species). • Area of impact: up to 7.6 km^2. Time of restoration: More than 5 years.
Health, Social and Cultural	High	• Private companies affected: Up to 5 businesses affected • Communal/Social facilities affected: Some social facilities impacted • Loss of national heritage: Some ancient monuments/ruins affected. Affected areas for recreation: Some natural reserves affected.
Infrastructure and Economics	High	• Roads affected: Up to 4 major roads affected. • Power grid affected: Damaged power grid but probably not the part of the backbone system between Avesta and Horndal. • Relocation of people: 2-20 housings affected. Critical infrastructure affected (e.g. hospitals, major industrial complex etc): Minor impact

5. Description of the design of the tailings facility

See Table 7 for a description of the design of the main dams. A description of the overall tailings facility and the location of the dams is presented in Chapter 1.

Table 7 Description of the design for the dams and spillways in the Garpenberg tailings facility and clarification pond.

Unit	Description
Dam A	Oldest and highest dam at the facility, originally constructed in 1963. Starter dam consists of till, and consequent raises were made downstream and then centerline with a till core. From 2009, raises were constructed upstream with tailings. Foundation of the older parts of the dam was in part made on peat, mud and old mine waste. In 2021 the decision was made to change the dam design to centerline by raising the dam downstream to the original crest line and going centerline from that (applies to dam C, D, E and I as well). Construction started in 2023 after permit was granted and is expected to align with the original crest level in 2027. All new foundation of the support fill and dam toe is made on bedrock or high quality, competent soils. All outlets from the facility were constructed near or through dam A up until 2008. Tailings were deposited sub-aqueously from the crest until the same year. Dam length is about 780 m and dam height is around 40 m.
Dam C	Originally constructed in 1986 with a starter dam of till and subsequent centerline raises using till for both core and support fill. Upstream construction with tailings started in 2012, as the part of the facility between dams C and D was not in operation during the 2010's. In 2023, downstream raises to move back to the original crest line started. Dam length is about 710 m and dam height is around 26 m.
Dam D	Originally constructed in 1986 with a starter dam of till and subsequent centerline raises using till for both core and support fill. Upstream construction with tailings started in 2012, as the part of the facility between dams C and D was not in operation during the 2010's. In 2023, downstream raises to move back to the original crest line started. Dam length is about 1180 m and dam height is around 30 m.
Dam E	Originally constructed in 1986 with a starter dam of till and subsequent centerline raises with a till core. Upstream construction with tailings started in 2009. In 2023, downstream raises to move back to the original crest line started. Dam length is about 420 m and dam height is around 25 m.
Dam I	Originally constructed in 2007 to act as a barrier between the tailings facility and the clarification pond, it is the only dam fully constructed as a permeable dam from the beginning and only raised using upstream raises with tailings. In 2023, downstream raises to move back to the original crest line started. Dam length is about 370 m and dam height is around 23 m.
Dam E2	Originally constructed in 2007 with a till core and upstream support fill of compacted tailings. The function of the dam is to keep a pre-clarification pond in front of the spillway to allow for settlement of fines before discharge and water treatment. The dam is designed as a centerline dam and is not affected by the design change. Dam length is about 410 m and dam height is around 22 m.
Dam I2	Originally constructed in 2009 with a till core and upstream support fill of compacted tailings. The function of the dam is to keep a pre-clarification pond in front of the spillway to allow for settlement of fines before discharge and water treatment. The dam is designed

	as a centerline dam and is not affected by the design change. Dam length is about 420 m and dam height is around 20 m.
Piers E2 & I2	The piers act as barriers between the main part of the tailings facility and the pre-clarification pond in front of the spillway, to allow more tailings to settle in the main part of the facility. The piers are raised with rockfill as needed when the tailings surface rises.
Spillway K-20	Built in 2020 and commissioned in 2024 when the old spillway K-12 reached the end of its life. The spillway consists of two intakes regulated by stop-logs, and a concrete tunnel founded on bedrock. Water is released in front of the water treatment plant intake. Each spillway intake is capable of discharging a PMF without overtopping the facility and with little to no regulation of the threshold.
Dam J and spillway K-06	Built in 2009 to final height, as a classic water retention dam with a till core. The spillway, which is located in the middle of the dam, has the reclaim intake for the concentrator as well as an overflow weir for discharge of excess water to the recipient.

The main goal for mine closure is to leave an area free of hazards which allows for alternative use of the area, for example recreation, hunting and forestry. To achieve the main goal the facility will be treated so that:

- The environmental impact from pollution is restricted in accordance with environmental requirements set in the approved closing plan for the mine.
- The facility will be designed to fit into the landscape
- The facility needs a minimum of maintenance and supervision.

Methods to reduce the environmental impact from pollution are for example:

- The long-term oxidation of sulfides is minimized through placement of a qualified till cover on the TSF.
- The water level in the clarification pond is lowered, and all dried out areas rehabilitated. Sludge that has settled in the clarification pond will be removed and placed in the tailings facility before covering.
- If needed, all water released from the operation after closure will be treated before discharge.

As far as possible, objects of cultural and historical importance will be kept.

6. Annual Performance Review

The following activities relating to dam safety and tailings management were undertaken during 2024:

- Design and construction, including:
    - downstream raises of all permeable dams
    - centerline raises of impermeable dams
    - plugging of old spillway
    - raises of piers E2 and I2
    - foundation of support fill and dam toe on dams A, C, D, and E
    - new seepage collection systems on dams A, C, D, and E
- Redesign of the monitoring program to match the new design, including classification of instruments
- Emergency response simulation with county administrative board (monitoring authority) and First Responders as observers
- Independent review, including site visit
- Seismic event settlement analysis
- An updated closure design for the dams, based on the change in dam design
- Updates of tailings management documents and routines, such as OMS manual, standard operating procedures (SOP), Trigger Action Response Plan (TARP) and Emergency Preparedness Response Plan (EPRP).

Based on the review, the facility was assessed to have satisfactory safety.

7. Environmental and social monitoring program

The environmental performance of the tailings facility is monitored according to an established environmental monitoring program.

Groundwater monitoring is carried out in 12 monitoring wells installed around the facility. The water is sampled and analyzed 2-12 times a year, depending on the placement of the well.

Surface water monitoring is carried out in 3 points, 4-12 times per year and reported quarterly to the monitoring authority. Sediments are tested every 5 years.

Dam seepage is collected at all perimeter dams, meaning dams A, C, D, E and E2. All seepage is pumped to the tailings facility to go through water treatment. Starting in Q3 2025, seepage from dam I will be collected as well. Seepage from dam I2 is collected in the clarification pond and thus not treated before release. Seepage water quality is measured in each seepage well around the tailings facility every quarter.

Dust control measures include a rotating deposition schedule to keep the beach sufficiently moist. Water and/or salt or polymers are applied to roads, quarries, and the parts of the crest where tailings are left in the open. Dust is collected in 12 monitoring stations around the facility and measured monthly. There are no permitted limits for allowed dusting.

An annual environmental report is uploaded to the Swedish authority portal for environmental reporting.

External stakeholder meetings are held with e.g. neighbors, local sports and other associations, the municipality of Hedemora and the County Administrative Board (monitoring authority). Measures exist to record and address any potential grievance. A social and local economic impact assessment was carried out in 2017-2018 and updated in 2023-2024.

8. Emergency Preparedness and Response Plan (EPRP)

The Emergency Preparedness and Response Plan (EPRP) is triggered by a failure or a near failure. The triggers of the EPRP are defined in the Trigger Action Response Plan (TARP).

When the EPRP is triggered by a dam safety related incident, the dam safety emergency group is activated to support the Garpenberg emergency group with technical dam safety expertise. The dam safety emergency group is responsible for assessing the situation as well as proposing and leading dam safety related measures but is subordinated the Garpenberg emergency group.

The structure of the dam safety emergency group is similar to the dam safety organization in normal operation. Each role in the group has one responsible individual and at least one substitute. For each role, a checklist is available.

In case of an emergency, the EPRP provides routines for cooperation with local emergency authorities.

Emergency response simulations are held every year. The EPRP is reviewed yearly after every simulation and updated when necessary. During 2026 a new warning system, consisting of both sirens and other solutions for alerting affected people, will be installed around Garpenberg. Once the system is in place, the EPRP will go through a larger review to reflect the changes.

9. Independent review

One (previously two) Senior Independent Reviewer(s) (IR) have been appointed for Garpenberg, with online meetings scheduled annually and a site inspection scheduled bi-annually.

A Dam Safety Review (DSR) was conducted in 2022 by Tyréns Sverige AB. The reviews are scheduled every five years as required based on the consequence classification.

Table 8 Planned, ongoing, and conducted independent reviews (2023-2025)

Type	Conducted/planned	Year	By
Independent review	Online meeting (April 25) Site visit (May 22-25) Online meeting (June 15 and 16) Online meeting (Oct 25 and Dec 18)	2023	Nigel Goldup (Tetra Tech) Bob Chambers (KCB)
Independent review	Online meeting (May 2) Site visit (May 23) Online meeting (Oct 16)	2024	Nigel Goldup (Tetra Tech) Bob Chambers (KCB)
Independent review	Site visit (June 2-5) Online meeting (planned)	2025	Nigel Goldup (Tetra Tech)
DSR	Planned	2027	TBD

10. Reclamation securities and other financial safeguards

Boliden makes provisions in its accounts for future reclamation costs. Boliden´s current provisions for reclamation works can be found in its Annual and Sustainability Report. In addition, insurance is used to cover sudden and unexpected tailings related incidents.

Mining operations, including tailings management, are subject to court/authority approved environmental permits, including the posting of mandatory reclamation securities, usually in the form of bank guarantees. These securities are intended to make sure that there are sufficient financial resources available to cover estimated costs of planned closure, early closure, reclamation, and post-closure of the tailings facility and its appurtenant structures, even in a situation where the operator is unable to cover these costs.

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11. Implementation of the Global Industry Standard on Tailings Management

At Garpenberg self-assessment of the conformance to GISTM, based on the guidance in the ICMM Conformance Protocols, was conducted by the site personnel in October 2024, supported by staff from other Boliden sites. The result of the self-assessment indicated a few items that required actions during the first half of 2025. These were addressed, and Garpenberg is assessed in conformance with GISTM, as of June 2025.

To validate the results of the self-assessment, Boliden Garpenberg will undergo an external review of GISTM conformance status through an external independent auditor, planned for the latter half of 2025.