



List of specifications for the OpenLog QGIS plugin v2

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Table of Contents

1	Executive summary/Introduction.....	3
2	Motivation.....	4
3	QGIS: the Open Source advantage.....	4
4	Previous art.....	5
5	License and Intellectual Property.....	6
6	Administration.....	7
6.1	OpenLog Consortium.....	7
6.2	Direction & authority.....	7
6.3	Project management.....	7
6.4	Production team.....	7
7	Technology.....	8
7.1	OpenLog Software.....	8
7.1.1	Database.....	8
7.1.2	Plugin.....	8
7.1.3	QGIS Core.....	8
7.2	Dev ops.....	8
7.3	Documentation.....	8
7.3.1	End User.....	8
7.3.2	Developer.....	8
8	Performance.....	9
8.1	Expected configuration.....	9
8.2	Rendering.....	9
8.2.1	Log viewer.....	9
8.2.2	Cross-section viewer.....	9
8.3	Processing.....	9
8.3.1	Database.....	9
8.3.2	Log viewer.....	10
9	Schedule.....	10
10	Budget.....	10
11	Features.....	11
11.1	Log-viewer.....	11
11.2	Cross-section viewer.....	20
11.3	Database.....	26
11.4	Map viewer.....	27
11.5	QA/QC.....	28
11.6	Table viewer.....	29
11.7	3D viewer.....	30

1 Executive summary/Introduction

This document presents high level specifications for the OpenLog software, an Open Source [QGIS](#) plugin developed by Apeiron and financed by the OpenLog consortium.

The OpenLog software provides high performance drillhole data analysis and visualization features directly integrated into the QGIS platform via an ultra-lightweight plugin.

The present specifications for the 2nd iteration of OpenLog's development are focused on use cases involving mining exploration, development, and operation.

From a software engineering point of view it includes the following elements:

- The [OpenLog plugin](#), a standard QGIS Python plugin for the purposes of data viz and UI,
- The [xplordb database template](#), a PostgreSQL/Spatialite drillhole database for the purposes of safe and efficient data storage,
- The [Elevation Profile C++ plugin](#) that is native to QGIS for the purpose of cross-section view capability,
- The [3D Map View](#) module that is native to QGIS for the purpose of 3D view capability, note that this last element is solely financed by the [CEA](#) (French Atomic Agency).

2 Motivation

The motivation for this project lies in a lack of professional Open Source GIS solutions dedicated to the uses cases of the mining industry.

This gap in the Open Source offering has allowed the market to settle into, and be dominated by, niche proprietary products boasting inflated prices, bloated footprint, lack of GIS integration, outdated technology, instability, feature creep, and poor performance.

With the rise of [QGIS](#), a fully Open Source software with [over 15 million unique monthly users](#), as the prime mapping solution, the current situation leaves companies reliant on QGIS without an alternative but to invest in needlessly overloaded solutions even in the case of fairly simple user requirements such as drillhole data visualization.

In this context, the OpenLog project aims to answer this need in an engineer-driven and user-focused QGIS plugin.

3 QGIS: the Open Source advantage

QGIS is a community-driven project where professional software engineers from Open Source software development companies around the world contribute to daily. As an active member of the QGIS community, Apeiron's code is always fully Open Source for the benefit of all, including third party software development companies.

This unique collaborative mindset is key to the exponential synergy effect that has propelled QGIS to the forefront of the mapping world over the last decade. A better codebase satisfies a larger userbase which attracts funding and leads developers to improve upon the existing solution, thus perpetuating a virtuous cycle.

Decentralized development, infrastructure, and governance guarantees access to all, regardless of their economical, political, or social circumstances. The challenges of explosive growth, restructurations, or activity spikes leave QGIS users unphased as it comes free of clutter such as licenses servers, node limitations, or other kinds of proprietary restrictions.

Its modular architecture enables the endless customization of QGIS via the plugin manager. Users may then craft the most fit-for-purpose tool for themselves while preserving its performance.

As the most popular GIS package, QGIS boasts the largest talent pool. Hundreds of professional developers contribute new features every month for the benefit of millions of users. Comprehensive code reviews by peers enforce strict coding standards, avoid feature creep, and maintain quality.

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4 Previous art

Numerous ad-hoc proprietary software with drillhole data visualization features have been developed over the last 30 years and OpenLog is not poised to revolutionize this aspect.

Product	Description	Publisher	License	Use case	Overlap	Pricing model
Acquire Gim suite	Drillhole database	Acquire	Proprietary	Exploration/ Operation	10%	Node/ Server/Saas
Datamine	Mine scale modeling	Datamine	Proprietary	Exploration/ Operation	30%	Node/Server
Datashed	Drillhole database	MaxGEO	Proprietary	Exploration/ Operation	10%	Node/ Server/Saas
Discover for ArcGIS	Drillhole data viz	Datamine	Proprietary	Exploration/ Operation	80%	Node
GemPy	Regional scale modeling	Terranigma Solutions	FOSS	Exploration	40%	Free
GeoModeller	Regional scale modeling	Intrepid Geophysics	Proprietary	Exploration	50%	Node
Geoscience Analyst	Geological data viz	Mira Geoscience	Proprietary	Exploration	70%	Freemium
Geoscience QGIS Plugin	Desurveying, x-section projection	Roland Hill	FOSS	Exploration	20%	Free
Geotic	Drillhole database	Goldspot	Proprietary	Exploration/ Operation	10%	Node/ Server/Saas
ImagoLog viewer	Log viewer	Seequent	Proprietary	Exploration/ Operation	20%	Server/Saas
Leapfrog Geo	Regional scale modeling	Seequent	Proprietary	Exploration/ Operation	50%	Node/Server
Loop 3d	Regional scale modeling	CET	FOSS	Exploration	40%	Free
Micromine	Res estimation, planning	Micromine	Proprietary	Geotech/ Operation	30%	Node/Server
PZero	Regional scale modeling	Pro Iter	FOSS	Exploration	50%	Free
SKUA-GOCAD	Regional scale modeling	Emerson	Proprietary	Exploration	50%	Node
Surpac	Mine scale modeling	Dassault Systemes	Proprietary	Operation	30%	Node
Target for ArcGIS	Drillhole data viz	Seequent	Proprietary	Exploration/ Operation	80%	Node
WellCAD-Logplot	Log viewer	Rockware	Proprietary	Exploration/ Operation	20%	Node

Regardless of other characteristics, none of the current solutions matches the following criteria which OpenLog aims to satisfy:

- full log/map/section/3D visualization
- GIS package integration
- Open Source
- Lightweight
- High performance

5 License and Intellectual Property

All content produced under the OpenLog consortium is the sole Intellectual Property of Apeiron.

All software - including code end-user documentation, and developer documentation - produced by Apeiron for the development of the OpenLog plugin is and will continue to be published under the [GPL v2 license](#) or any other legally required Open Source inherited license.

6 Administration

6.1 OpenLog Consortium

The OpenLog consortium is an partially open group of private and public companies, as well as government agencies, that contribute at least USD5,000.00 annually to the development of the OpenLog software.

The consortium is open to new members over a period of 4 months starting from the publication date of the previous full release of the OpenLog software. Prospective members may [contact Apeiron](#) directly to join the consortium.

6.2 Direction & authority

The project falls under the authority of Apeiron and appoints [Evren Pakyuz-Charrier](#) as director. The director's responsibilities include:

- progress reports to the consortium
- production goals definition
- promotion and consortium enrollment
- budget estimation

6.3 Project management

The project is managed by Apeiron with [Evren Pakyuz-Charrier](#) as leader. The leader's responsibilities include:

- feature definition
- planning and scheduling
- team management

6.4 Production team

Production is performed by a team of 5 spread over a 3.5 full time equivalents roster:

- 3 software engineers: [Vincent Larmet](#), [Benoit de Mezzo](#), and [Jean Felder](#)
- 1 graphics designer: [Sylvain Beorchia](#)
- 1 algorithm engineer/documentation writer: [Evren Pakyuz-Charrier](#)

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7 Technology

7.1 OpenLog Software

7.1.1 Database

[Xplordb](#) is the official drillhole database provided with OpenLog and depends on PostgreSQL v13 and PostGIS v3.

7.1.2 Plugin

The [OpenLog plugin](#) is developed using Python 3.10 and depends on the latest release of [PyQGIS](#) as well as any other dependencies [listed in its End-User documentation](#).

7.1.3 QGIS Core

Features that require QGIS core development are developed according to the [Developers Guide for QGIS](#)

7.2 Dev ops

The plugin code is hosted, tested, released, and deployed at the [Apeiron group](#) registered on the [gitlab.com](#) platform.

The platform is also the reference system for feedback and bug report via the creation of [gitlab issues](#).

7.3 Documentation

7.3.1 End User

[End-User documentation](#) is built using [sphinx](#), made available online via the [gitlab.com](#) platform. It is maintained up to date the latest [major point released version of OpenLog](#).

7.3.2 Developer

Developer documentation is embedded within the code base itself.

8 Performance

8.1 Expected configuration

The solution shall be designed with the following minimum hardware configuration :

- CPU : 8 core @2.3GHZ
- RAM : 16GB @2933 MT/s DDR4
- Local storage : 1TB M.2 NVMe SSD
- GPU : 8GB GDDR6 @1.5GHZ

8.2 Rendering

8.2.1 Log viewer

The Log viewer shall be able to :

- display at least 5 graphs per log for up to 3 drillholes
- be able to display at least 100k points for each graph
- present a loading time of no more than 3 seconds for the above target
- avoid noticeable input lag

8.2.2 Cross-section viewer

The Cross-section viewer shall be able to:

- render up to 100 projected drillhole traces
- display up to 5 cross-sections simultaneously
- present a loading time of no more than 3 seconds for the above target
- avoid noticeable input lag

8.3 Processing

8.3.1 Database

The PostgreSQL implementation of the xplordb database schema shall be able to:

- desurvey up to 100k drillholes in no more than 600 seconds

8.3.2 Log viewer

The Log viewer shall be able to:

- render up to 30 graphs
- display up to 100k datum per graph
- present a loading time of no more than 3 seconds for the above target
- avoid noticeable input lag

9 Schedule

The presented features are to be produced and delivered gradually over a period of 10 to 14 months starting from the date of publication of OpenLog 1.0.

10 Budget

The estimated budget is as follows, note that these numbers effectively act as funding targets which completion is required to meet the feature specifications:

Module	USD Budget
Log-viewer	124,000.00
Cross-section viewer	88,000.00
Database	28,000.00
Map viewer	8,000.00
QA/QC	12,000.00
Table view	8,000.00
3D view	N/A
Documentation	12,000.00
TOTAL	USD 280,000.00

11 Features

11.1 Log-viewer

Title: Depth/Altitude switch
Module: Plugin
Type: Improvement
Description: A feature that provides the user with a toggle action between depth and drilled length when displaying downhole data.
Use case: General

Title: Geographical graph reordering
Module: Plugin
Type: Improvement
Description: A feature that allows the user to reorder graphs on the basis of their X,Y coordinate pair, either [X-major ; Y-minor] or [Y major ; X minor].
Use case: General

Title: Free graph reordering
Module: Plugin
Type: Improvement
Description: A feature that allows the user to reorder graphs at will, on click and drag over the selection tree items.
Use case: General

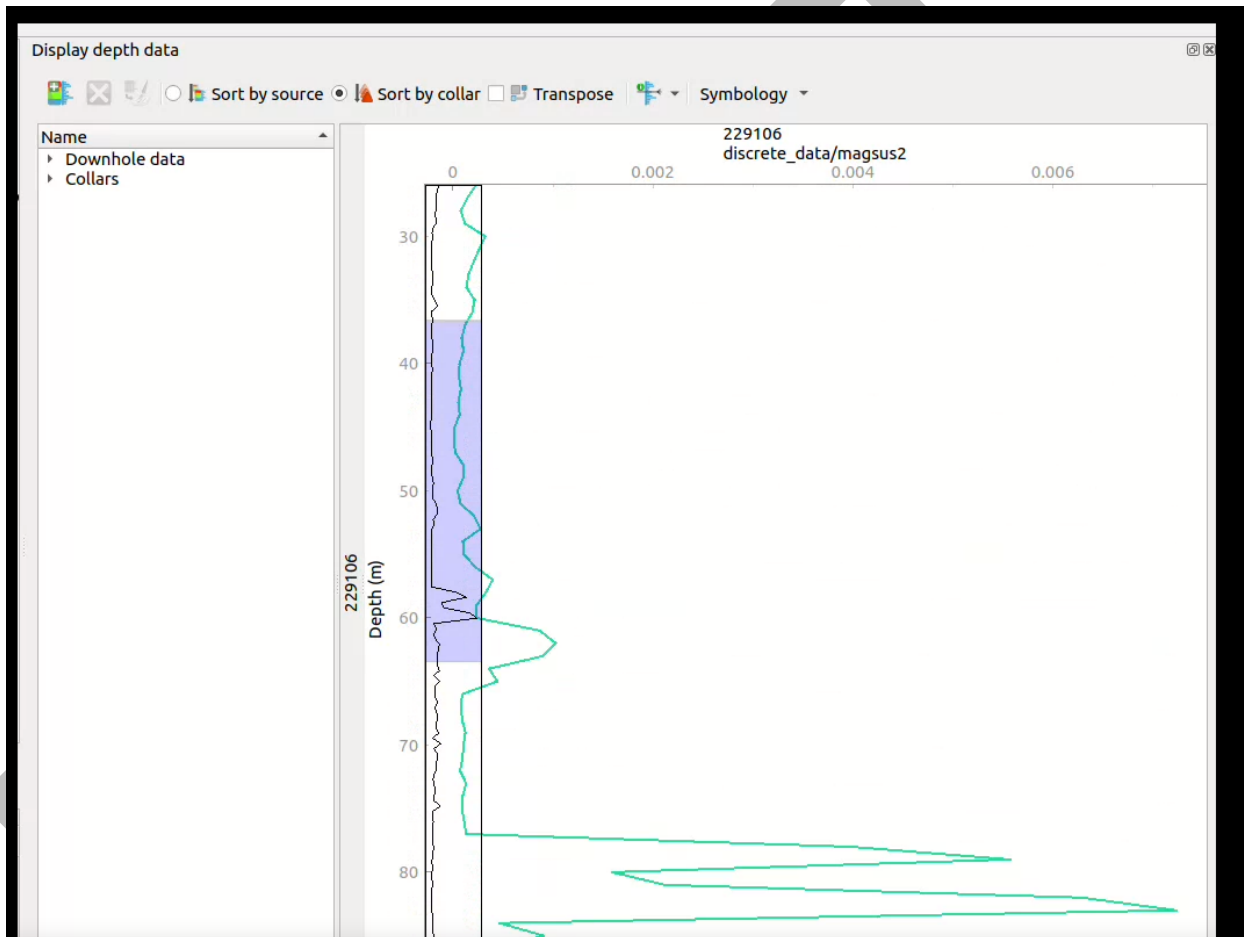
Title: **Series contextualization**

Module: Plugin

Type: Improvement

Description:

A feature that displays a visual representation of the current extent of a graph relative to the entire data space.



Use case: General

Title: Error bar symbology
Module: Plugin
Type: Improvement
Description: A feature that provides options for color, line-type, and end-type on error bars.
Use case: General

Title: Geolocalized data inspection
Module: Plugin
Type: Improvement
Description: A feature that adds 3D coordinates to the inspector tool for improved spatial awareness.
Use case: General

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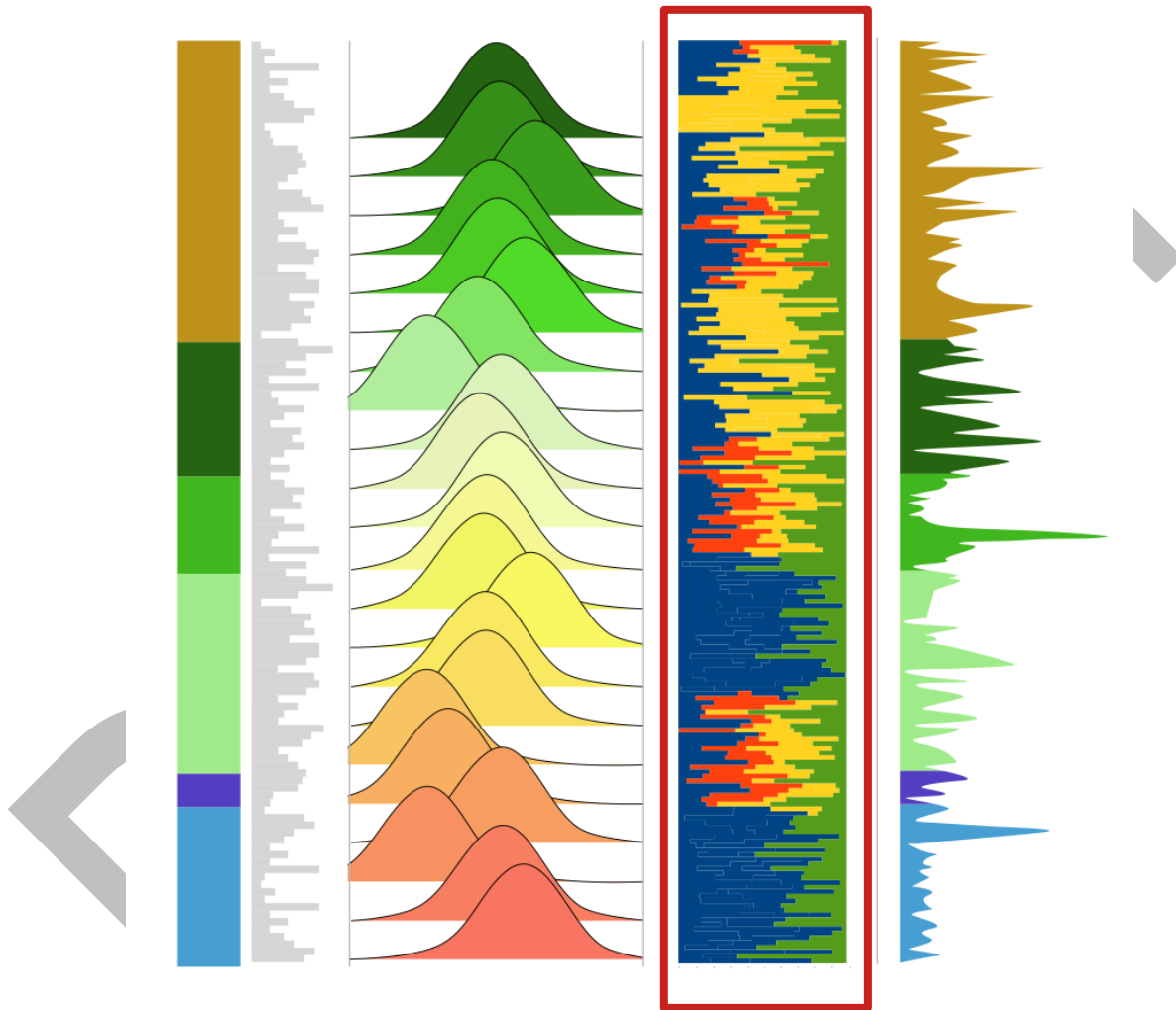
Title: **Stacked bar charts**

Module: Plugin

Type: New feature

Description:

A feature that allows any number of numerical series from the same assay to be compiled into a single bar chart.



Use case: mainly found in geochemical data representation.

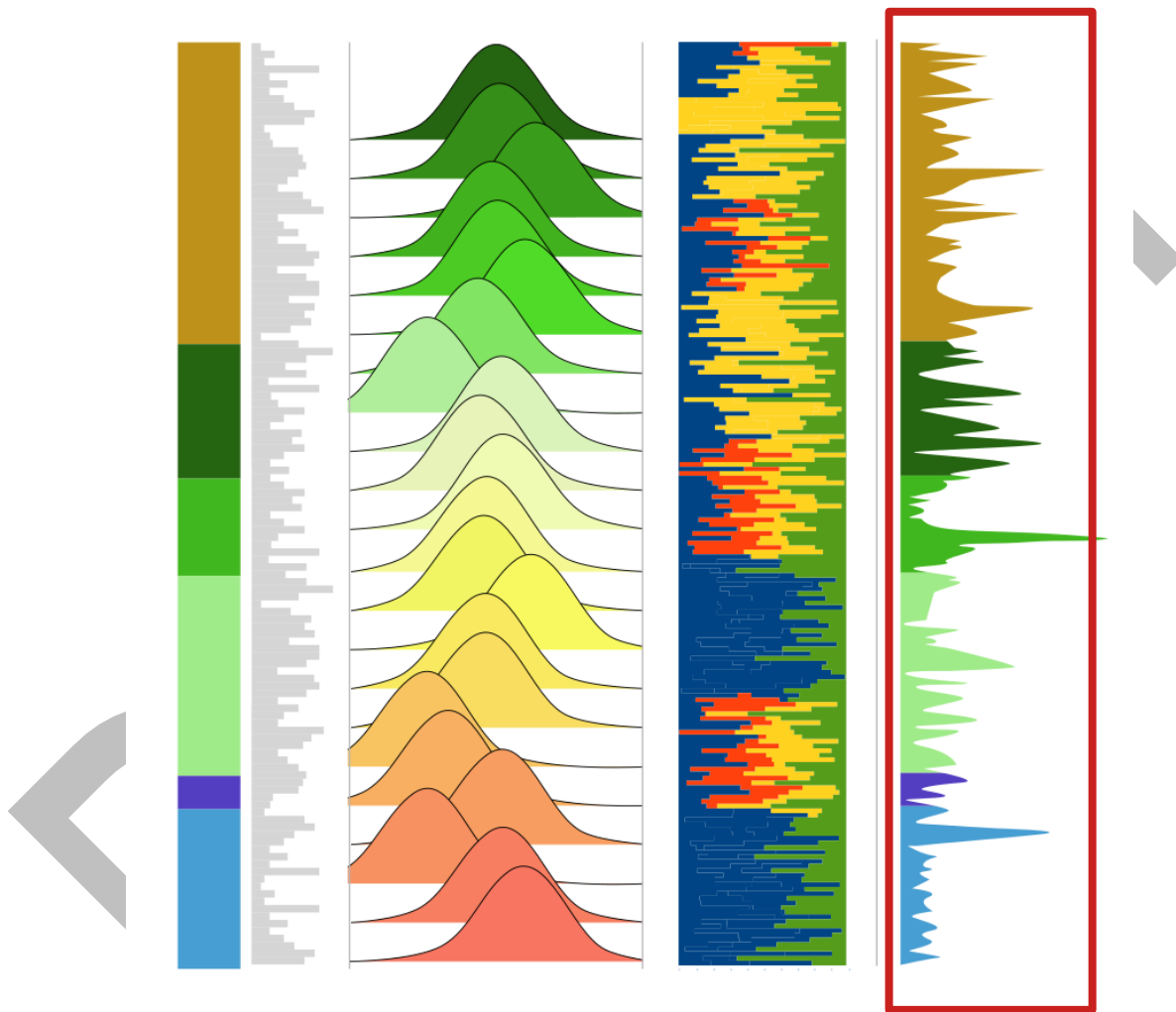
Title: **Integral color ramp with cross-symbology**

Module: Plugin

Type: New feature

Description:

A feature that provides an option to color the area under a curve on the basis of another variable from the same assay or drillhole.



Use case: General

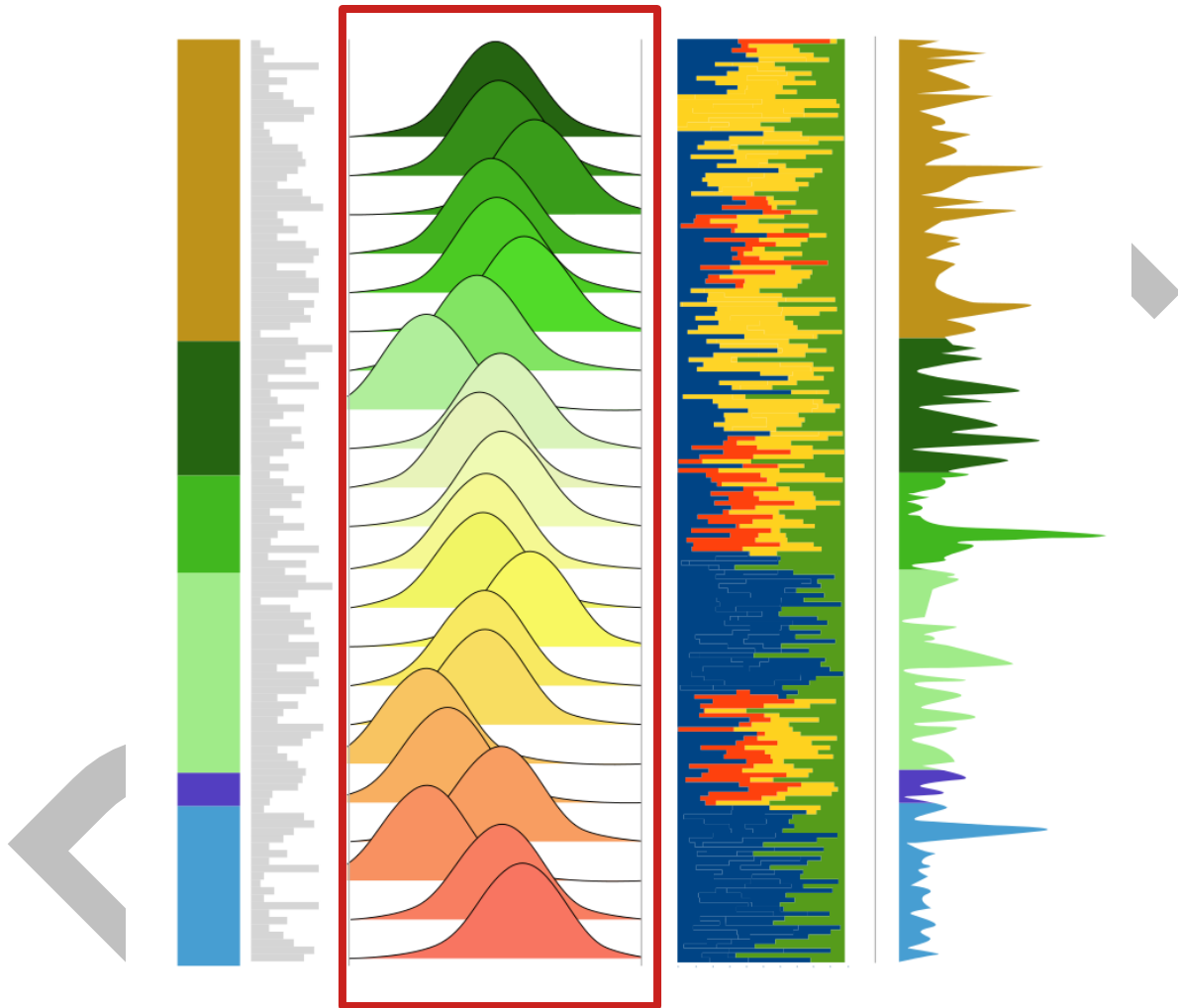
Title: **Ridgeline graphs**

Module: Plugin

Type: New feature

Description:

A feature that adds ridgeline graphs to the chart types available in the log viewer.



Use case: uncertainty representation for numerical discrete variables, temporal series measured at varying depths, or round-core measurements.

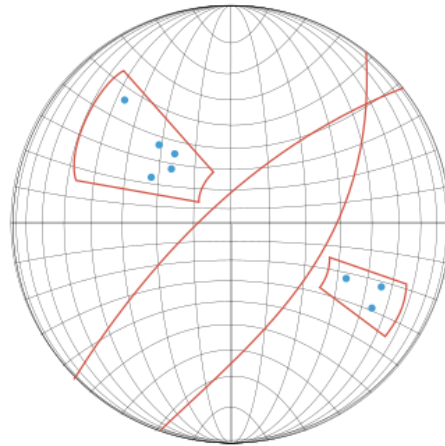
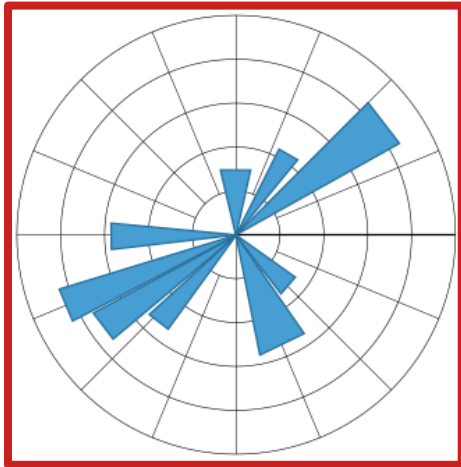
Title: **Polar bar charts**

Module: Plugin

Type: New feature

Description:

A feature that adds polar bar chart to the chart types available in the log viewer.



Use case: single or aggregated direction measurements representation.

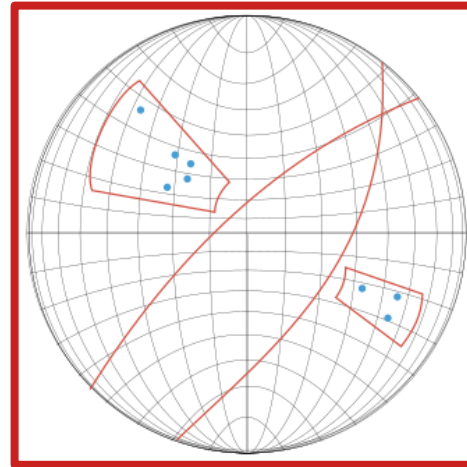
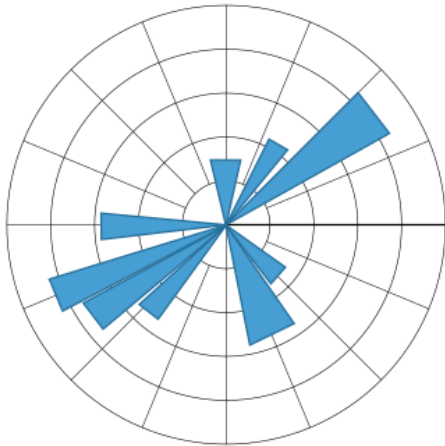
Title: **Stereonets**

Module: Plugin

Type: New feature

Description:

A feature that adds Wulff nets to the chart types available in the log viewer.



Use case: single or aggregated structural measurements representation.

Title: **Numerical cross-correlation toolkit**

Module: Plugin

Type: New feature

Description:

A feature that provides a basic cross-correlation toolkit to represent co-variation of numerical variables within the same assay. The toolkit shall include the Pearson correlation coefficient, covariance, autocorrelation, VS line charts.

Use case: General

Title: Categorical cross-correlation toolkit
Module: Plugin
Type: New feature
Description: A feature that provides a basic cross-correlation toolkit to represent interval matches of categorical variables within the same assay. The toolkit shall include [TBD].
Use case: lithological/alteration/stratigraphical sequence comparisons.

Title: Log-viewer state retention
Module: Plugin
Type: New feature
Description: A feature that adds a save option for drillhole/assay selection and graph symbology.
Use case: General

Title: Virtual downhole data calculator
Module: Plugin
Type: New feature
Description: A feature that implements a basic 4 operations calculator that can operate on existing downhole data series within the same assay.
Use case: general

11.2 Cross-section viewer

Title: Edit cross-section geometry
Module: Core/Plugin
Type: Improvement
Description: A feature that allows users to reposition, remove, or add trace nodes to an existing cross-section.
Use case: General

Title: Support multiple cross-sections
Module: Core
Type: New feature
Description: A feature that implements a cross-section management wizard.
Use case: General

Title: Save cross-sections to project
Module: Plugin
Type: New feature
Description: A feature that adds an option to save cross-section parameters to a QGIS project for reuse.
Use case: General

Title: Cross-section plane vector drawing toolkit
Module: Core
Type: New feature
Description: A feature that implements a basic vector drawing toolkit derived from QGIS native tools to be used on the cross-section interface.
Use case: subsurface interpretation and engineering.

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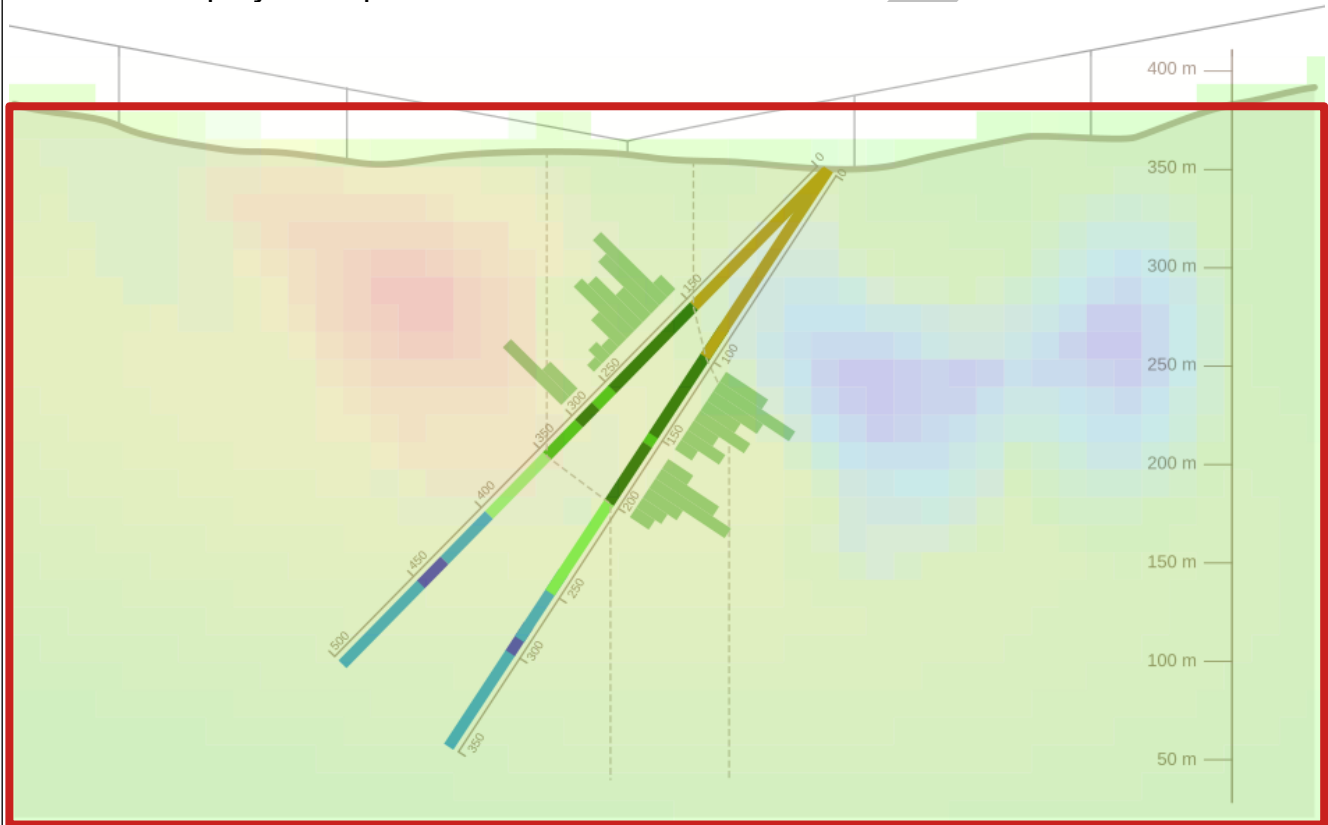
Title: Cross-section plane raster import and display

Module: Core

Type: New feature

Description:

A feature that allows users to import raster files to be displayed on top of an existing cross-section projection plane.



Use case: subsurface interpretation and engineering.

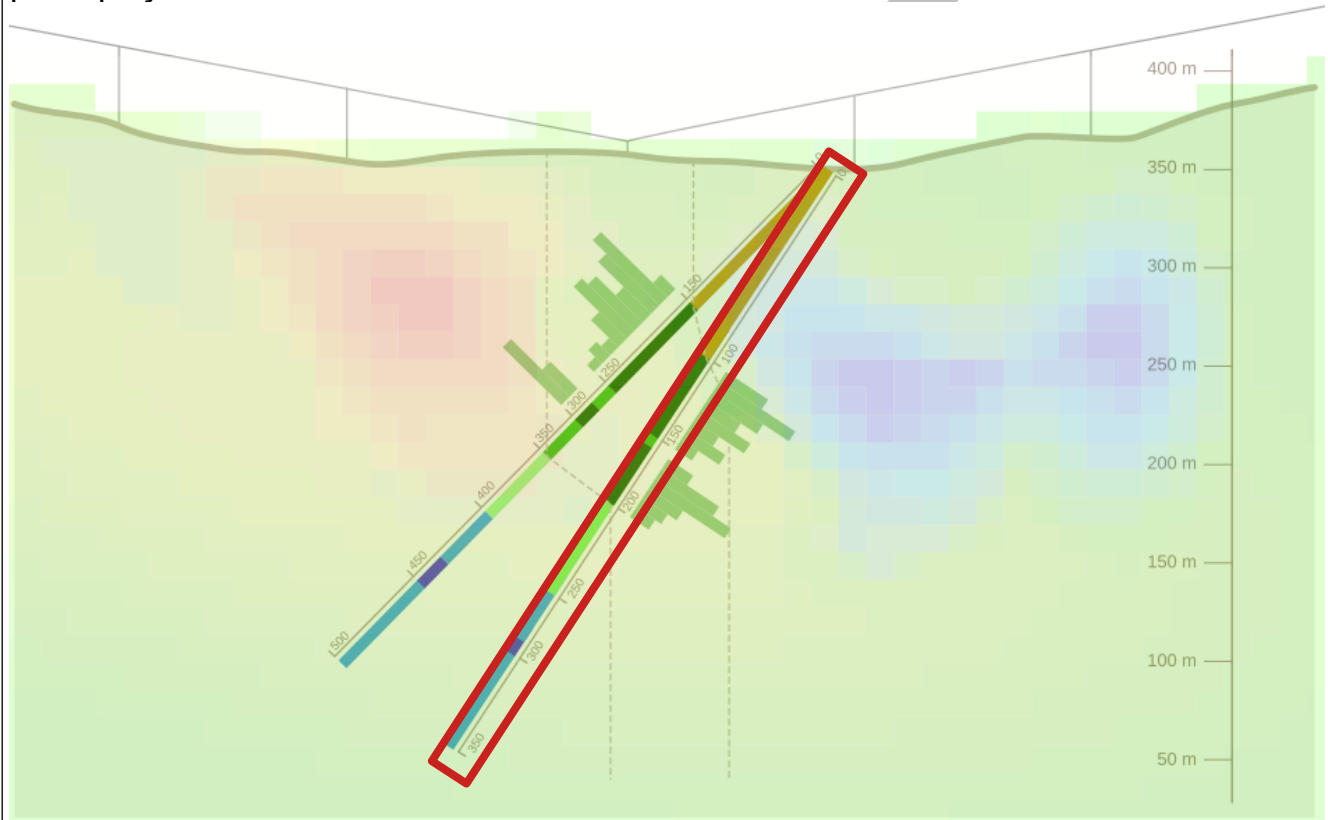
Title: **Length markers**

Module: Core

Type: New feature

Description:

A feature that provides an option to display graduated depth markers over cross-section plane projected line traces.



Use case: drillhole geometry analysis, subsurface interpretation, and engineering.

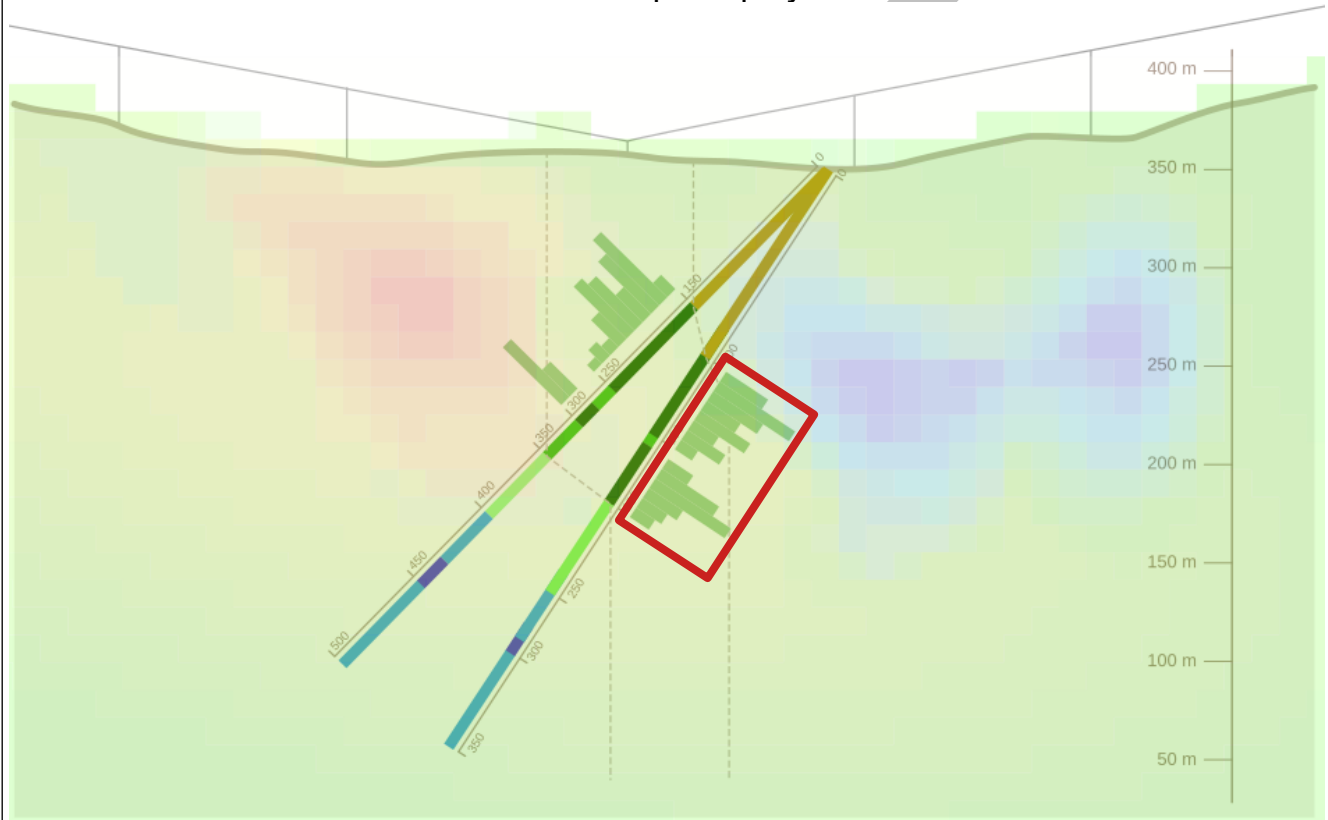
Title: **Bar chart projection**

Module: Core

Type: New feature

Description:

A feature that provides an option to display a simplified bar chart representation of numerical downhole data over cross-section plane projected line traces.



Use case: drillhole geometry analysis, subsurface interpretation, and engineering.

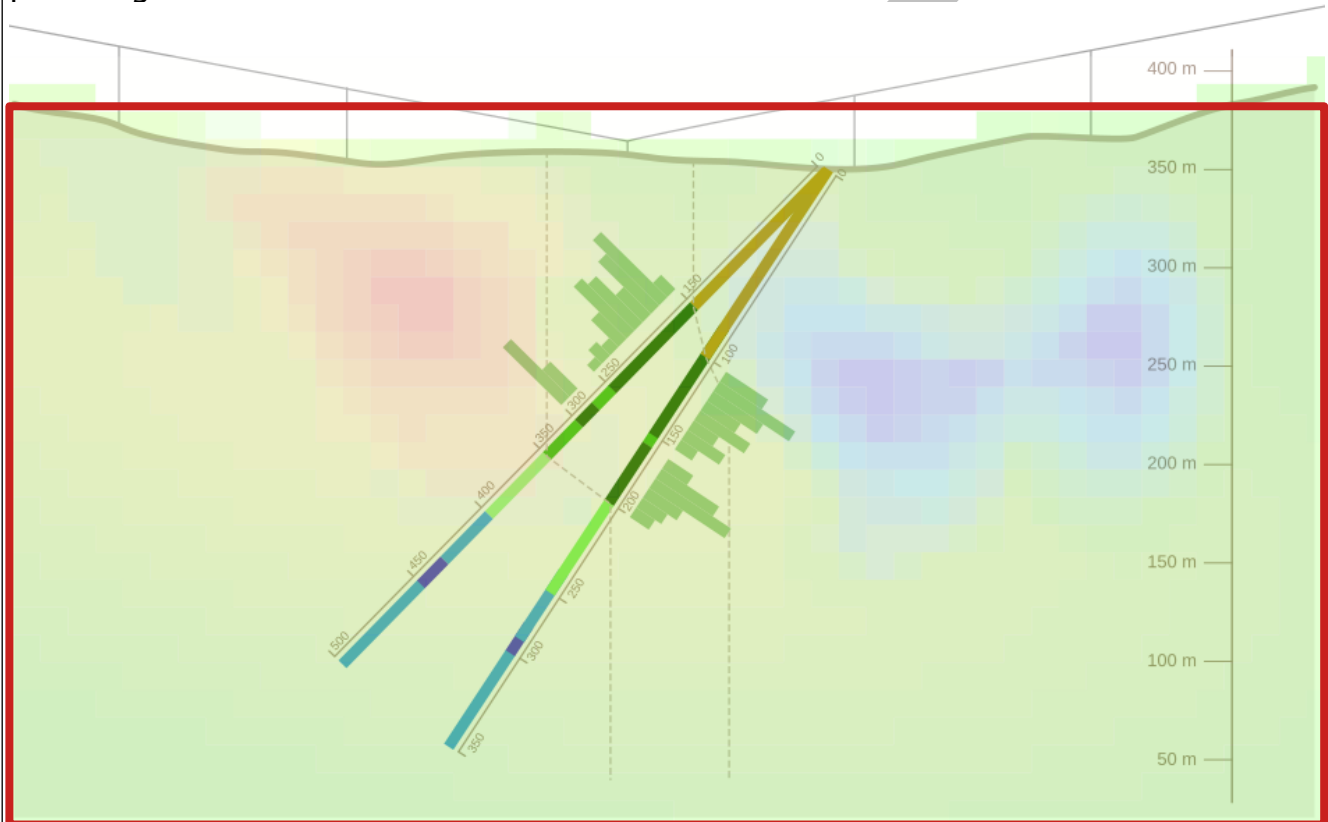
Title: **3D grid slice projection**

Module: Core

Type: New feature

Description:

A feature that provides an option to display the 3D voxels that intersect the projection plane in grid form.



Use case: geophysical/geological/hydrological models analysis, subsurface interpretation, and engineering.

Title: Cross-section titles
Module: Core/Plugin
Type: New feature
Description: A feature that provides an option to display a title on top of the projection plane of a cross-section.
Use case: General

Title: Panel heading indicator
Module: Plugin
Type: New feature
Description: A feature that provides an option to display the azimuth/heading of every panel on top of the projection plane.
Use case: General

Title: Trace node indicator
Module: Plugin
Type: New feature
Description: A feature that provides an option to display the coordinates of every cross-section trace node on top of the projection plane.
Use case: General

11.3 Database

Title: .las file support
Module: Database/Plugin
Type: New feature
Description: A feature that implements an import option for Log ASCII Standard (.las) files into xplordb via the OpenLog plugin UI.
Use case: mining/petroleum drillhole data management.

Title: Structural data support
Module: Database/Plugin
Type: New feature
Description: A feature that implements an import option into xplordb via the OpenLog plugin UI as well as a bespoke data type for S^2 vectors.
Use case: plane/line geometry characterization in mining/petroleum applications.

Title: Planned VS effective survey support
Module: Plugin
Type: New feature
Description: A feature that provides a versioning system to survey tables in xplordb.
Use case: drillhole planning/reconciliation.

Title: arbitrary attribute table support
Module: Database/Plugin
Type: New feature
Description: A feature that implements an import option of collar, survey, or downhole data from existing attribute tables into xplordb via the QGIS layer browser and plugin UI.

Use case: general.

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11.4 Map viewer

Title: Target-based collar implantation
Module: Plugin
Type: New feature
Description: A feature that provides a collar implantation wizard for the purpose of intersecting a specified subsurface target at a specified inclination/azimuth.
Use case: mining exploration/exploitation, hydrogeology.

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11.5 QA/QC

Title: Survey-Log mismatch
Module: Plugin/Database
Type: New feature
Description: A feature that adds an import and static verification routine to mismatches between survey data and downhole data such as length collisions.
Use case: any where drillhole data is collected.

Title: Collar-DTM mismatch
Module: Plugin/Database
Type: New feature
Description: A feature that adds an import and static verification routine to mismatches between collar height and DTM values at each location taking into account time-stamped data.
Use case: settings where topography is significantly altered over short periods of time such as large construction sites, or mine sites.

Title: Spatial outliers
Module: Plugin/Database
Type: New feature
Description: A features that supplies a basic routine to identify collars that are are placed at incongruous locations.
Use case: general.

11.6 Table viewer

Title: Statistical outliers
Module: Plugin
Type: New feature
Description: A features that supplies a basic routine to identify datum that are statistically anomalous in terms of Z-score, LOF, or IF.
Use case: general.

Title: Downhole data view
Module: Plugin
Type: New feature
Description: A feature that supplies downhole data in table format on demand via the QGIS layer browser.
Use case: general.

Title: Survey data view
Module: Plugin
Type: New feature
Description: A feature that supplies surveys data in table format on demand via the QGIS layer browser.
Use case: general.

11.7 3D viewer

The 3D viewer component of OpenLog is solely funded by the CEA as part of the SIG-CEP project and is therefore not subject to the authority of the OpenLog consortium.

The specifications for this component will be provided to OpenLog consortium members and candidates on demand.

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