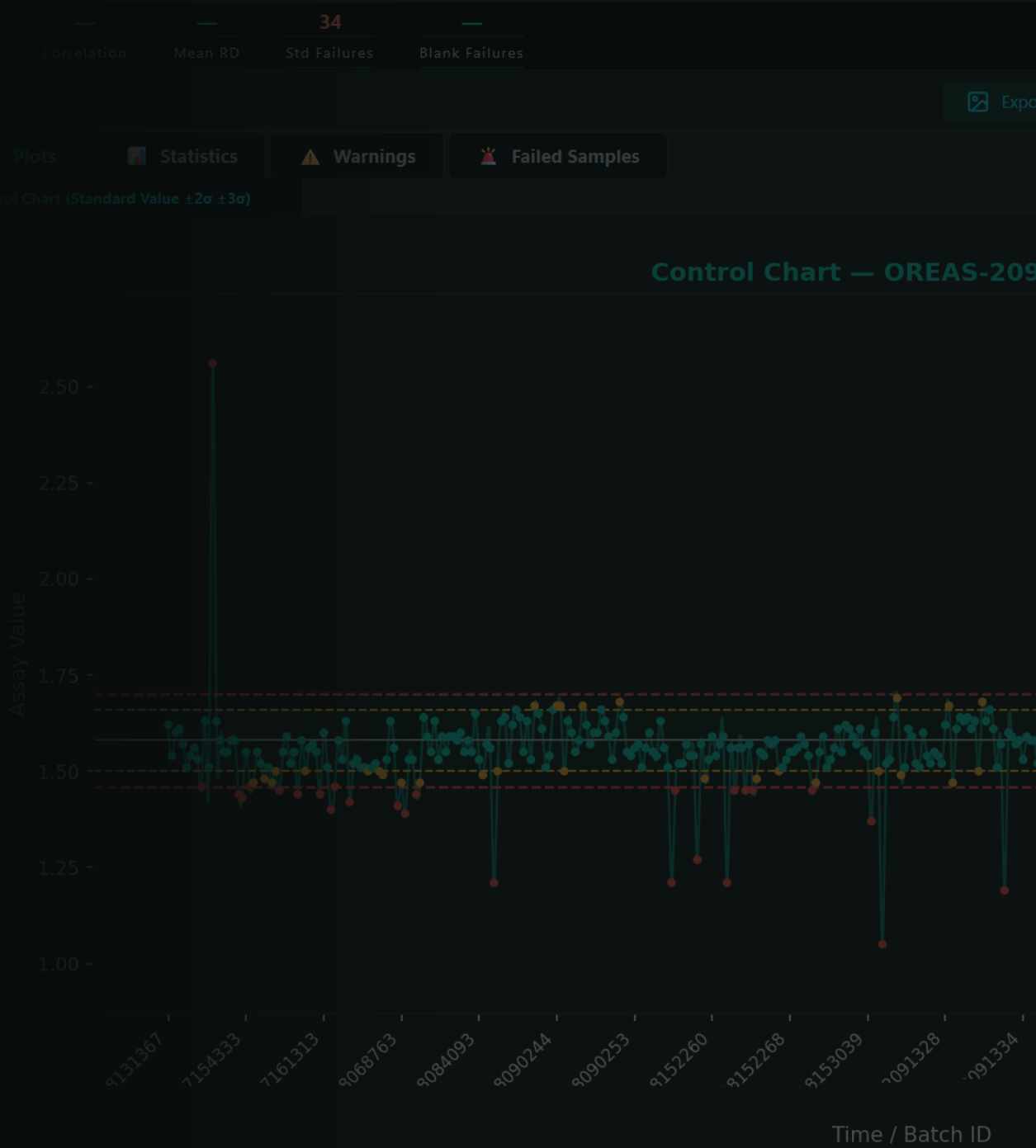




QAQC Manager

Standards, blanks and duplicates scored against the Westgard rules, with a per-batch verdict, a signed PDF report and a one-click re-assay request.

- Group: Analysis
- Run history stored in the database
- 8 paired plots · 3 control plots
- PASS / WARNING / FAIL verdict per batch



Executive summary

The QAQC Manager does more than draw charts: it returns a per-batch verdict — PASS, WARNING or FAIL — justified by four weighted checks, writes it into the database, and raises the re-assay request for the rejected batches.

01 What it replaces

The in-house QA/QC workbook, its charts redrawn at every delivery and its verdict carried by one person — with no record of the rule applied.

02 How it works

The identifier codes decide what each calculation may read; the acceptance criteria decide the verdict. Both are printed in the report, and are therefore contestable.

03 Who it is for

The QA/QC geologist, the database owner and the external auditor — who all find the same data and the same criterion there.

19,7 %

control samples in the real dataset

1 / 17,1

standard insertion rate

6

Westgard rules evaluated

11

plot types available

Rates measured on the 26,377 samples of the KOUKOUDAN database.

Contents

01 What the module settles

Did the laboratory return acceptable work, batch by batch.

02 The three control populations

Certified standards, blanks, duplicates — each with its own criterion.

03 Eleven plots

Eight paired plots and three control plots.

04 Westgard rules

1-3s, 2-2s, 2of3-2s, R-4s, 4-1s, 10-x — drift caught before failure.

05 The per-batch verdict

Four weighted checks give PASS, WARNING or FAIL, with the reasons.

06 RD and HARD

Two measures of the same disagreement, not interchangeable.

07 Anonymised data

26,377 samples, 19.7 % control, OREAS-209 across 403 readings.

08 Report, history, re-assay

Signed PDF, database write, automatic re-assay dispatch.



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SECTION I

The module

The problem addressed, the capabilities delivered, the processing chain and the module's place in the platform.

-
- 01 Context
 - 02 Key capabilities
 - 03 Processing chain
 - 04 Place in the platform
-

Context

A $\pm 3 \sigma$ control chart answers the question “did one sample blow up?”. A batch is not accepted or rejected on that alone.

GeoMate therefore scores every batch on four checks — Westgard sequences, insertion rate, blank carry-over, duplicate precision — and returns a reasoned verdict.

Drift passes every point

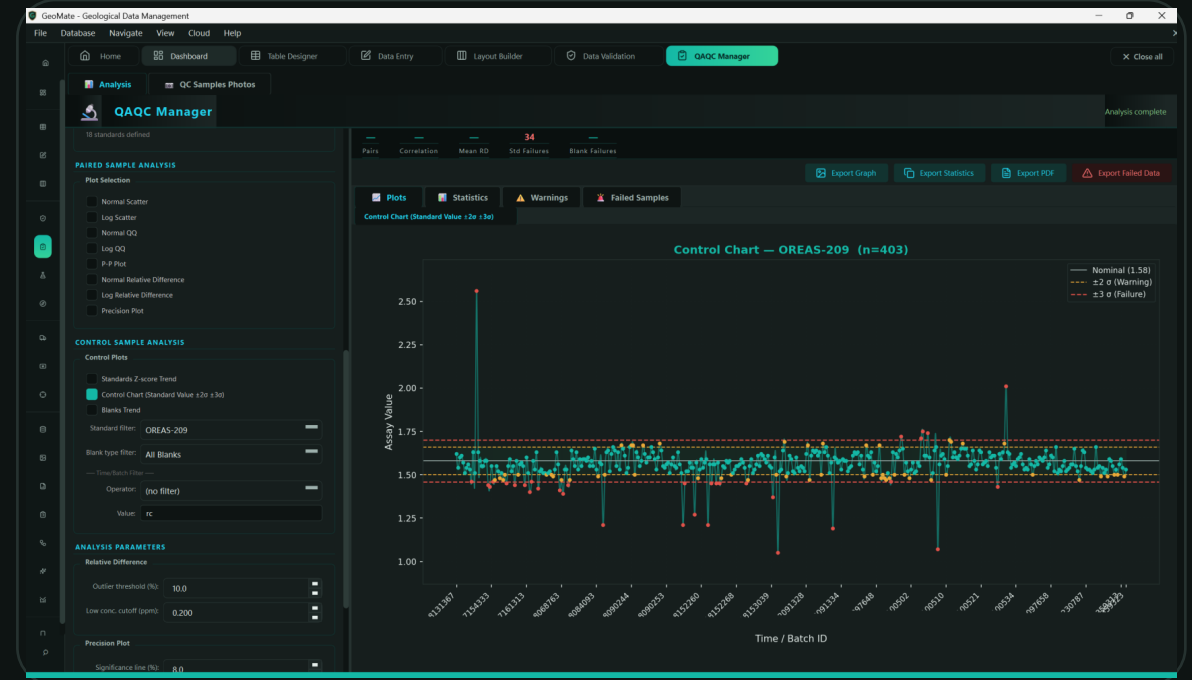
A CRM reading half a sigma high for twenty samples stays inside the limits and is still a calibration defect. The 10-x rule sees it.

Near the detection limit there is no precision

0.01 against 0.02 ppm Au is one digit apart and reads as 66 %. Pairs below the low-concentration cutoff are counted, not condemned.

A laboratory repeat is not a field duplicate

They are two different precision populations with two different acceptance limits. The identifier codes keep them apart.



On a QA/QC-only extract — more than half the rows are controls — the insertion rate has no denominator and the row before a blank is not the sample that really preceded it. GeoMate says so rather than reporting a flattering figure.

Key capabilities



01

Eight paired plots

Normal and log scatter, normal and log QQ, P-P, normal and log relative difference, precision plot.



02

Three control plots

Standards Z-score trend, control chart at certified value $\pm 2\sigma$ $\pm 3\sigma$, blanks trend.



03

Westgard rules

1-3s, 2-2s, 2of3-2s and R-4s as failures; 4-1s and 10-x as bias warnings, evaluated in submission order.



04

Batch verdict

Four weighted checks — Westgard, insertion rate, blank carry-over, duplicate precision — give PASS, WARNING or FAIL with their reasons.



05

Signed PDF report

Cover naming project, database, source, period, filter and criteria; verdict, findings, batch table, failed controls, statistics and plots; a Prepared / Reviewed / Approved block.



06

Re-assay request

The ordinary samples of rejected batches go out as a dispatch, with method, submission type and data type picked from the reference tables.

Processing chain

From the laboratory certificate to a batch verdict, recorded and defensible.

A Inputs

Assays and control reference material

- CSV source or database table, loaded and counted
- Mapping: sample type, assay value, standard ID, batch
- Standard, blank and duplicate codes — several per family
- CRM definitions: certified value and standard deviation
- Acceptance criteria and time / batch filter

B Assessment

Four weighted checks

- Westgard sequences: 1-3s, 2-2s, 2of3-2s, R-4s, 4-1s, 10-x
- QC insertion rate per batch against the objective
- Blank carry-over after a high-grade sample
- Duplicate precision: HARD, HRD, ARD at a stated confidence
- Pairs below the low-concentration cutoff set aside and counted

C Outputs

Report, record and action

- PASS / WARNING / FAIL verdict per batch, with its reasons
- Signed PDF report — Prepared / Reviewed / Approved
- Written to the database: QAQC_Runs, QAQC_BatchVerdicts, QAQC_Failures
- Browsable history of previous runs
- Re-assay request opening a dispatch

TWO MEASURES OF THE SAME DISAGREEMENT

$RD = 200(a-b)/(a+b)$, signed, and $HARD = |a-b|/(a+b) \times 100$, which is half of its absolute value. The outlier threshold applies to $|RD|$; the duplicate limit in the acceptance criteria applies to $HARD$. Confusing them doubles or halves the reported failure rate.

On a pure QA/QC extract — more than half control samples — the insertion rate has no denominator and blank carry-over loses its meaning. GeoMate says so rather than reporting a flattering figure.

Place in the platform

FED BY

10 Assay Importer

Supplies the laboratory results, standards and blanks included.

09 Dispatch Manager

Supplies the submission batch and the order in which controls were inserted.

03 Data Entry

Supplies the DHSamples register, without which a re-assay cannot be linked.



QAQC Manager

The judge of the analytical data: it decides whether a batch is accepted, and records on what grounds.

FEEDS

09 Dispatch Manager

Receives the re-assay request for the rejected batches, ready to print.

15 Audit Report Builder

Picks up the verdict, its criteria and the recorded history.

11 Assay Intercept

Should only work on accepted batches — that is the logical order of reporting.

A sample missing from DHSamples cannot be dispatched: the database refuses the link. Those samples are dropped before writing and counted in the confirmation.



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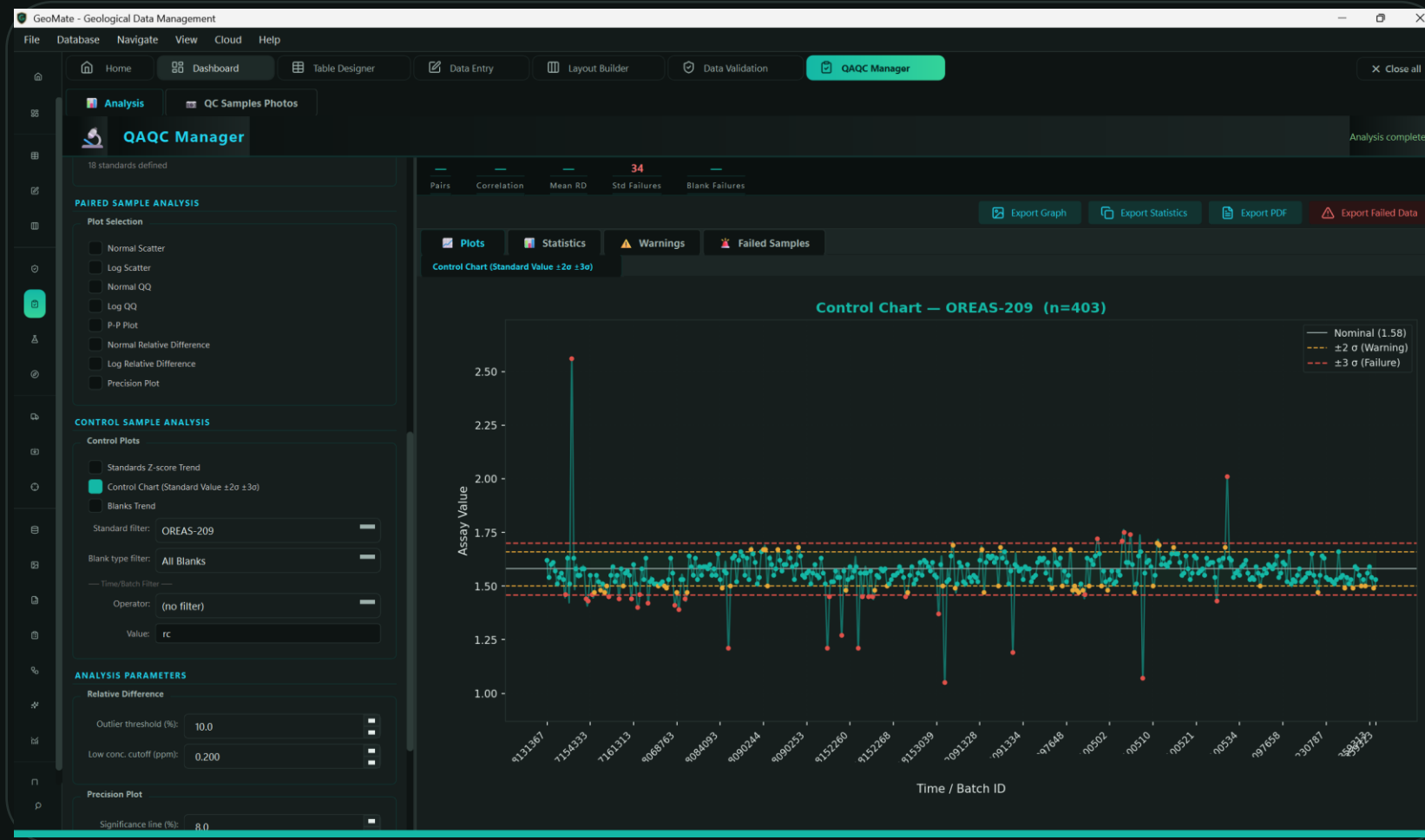
SECTION II

In practice

The real interface, the operating workflow, the reference settings, good practice and the questions that come up.

-
- 01 The interface
 - 02 Operating workflow
 - 03 In depth
 - 04 Good practice
 - 05 Frequently asked
-

The interface



1 Configuration panel

Source, mapping, identifiers, standards, plots, time/batch filter, parameters and acceptance criteria.

2 Summary bar

Pairs, correlation, mean RD, standard failures, blank failures, run verdict.

3 Control chart

OREAS-209 over 403 readings: certified value 1.58, $\pm 2\sigma$ envelope in amber and $\pm 3\sigma$ in red.

4 Result tabs

Plots, statistics, warnings, failed samples, batch verdict.

5 Exports

Graph, statistics, signed PDF, and an export of the failed data.

Actual GeoMate 2026 v2026.3.1.5 screen capture — Midnight theme.

Operating workflow

Six steps, from source to re-assay dispatch.

1

Load

CSV or database table — including the ordinary samples, not only the controls.

2

Map and identify

Sample type, value, standard ID, batch — then the STD, BLK and DUP codes that define each population.

3

Define the standards

Manage the CRMs: certified nominal value and standard deviation for each standard used.

4

Run

The chosen plots open as tabs; the summary bar shows the overall run verdict.

5

Rule batch by batch

The Batch Verdict tab gives PASS, WARNING or FAIL with the reasons, exportable to CSV.

6

Report and re-assay

Signed PDF, run written to the database, and an automatic dispatch of the rejected batches.

The four batch-verdict checks

CHECK	WHAT IT CATCHES	WEIGHT
Westgard sequences	1-3s, 2-2s, 2of3-2s and R-4s as failures; 4-1s and 10-x as bias. A calibration drift that passes every individual point.	FAIL / WARNING
QC insertion rate	Standards, blanks and duplicates per batch against the objective — 1 in 20 by default. The first question of an external audit.	WARNING
Blank carry-over	A failed blank straight after a high-grade sample: crusher contamination, which condemns the previous result too.	FAIL
Duplicate precision	HARD, HRD, ARD and the precision reached at a stated confidence: "90 % of pairs agree within X %". A mean hides the tail an auditor reads.	WARNING / FAIL

Failure thresholds and disagreement measures

METRIC	WARNING	FAILURE	NOTE
Z-score (standards)	$ Z > 2$	$ Z > 3$	Against the CRM certified value and standard deviation
Relative difference (duplicates)	$> 5 \%$	$> \text{threshold}$, Poor beyond 30 %	$RD = 200(a-b)/(a+b)$, signed
HARD	—	$> \text{duplicate limit}$	$ a-b /(a+b) \times 100$ — half of $ RD $, the conventional form
Blank value	Above the detection limit	Significantly above	Checked against the configured detection limit
Low concentration	—	—	Pairs below the cutoff are not assessed: they are counted and stated

The outlier threshold applies to $|RD|$; the duplicate limit of the acceptance criteria applies to HARD. The two are not interchangeable.

Good practice

What has to be settled for a QA/QC verdict to stand up.



Point at a complete source

The source must hold the ordinary samples as well as the controls, or the insertion rate and blank carry-over have no meaning.



Define the CRMs before running

Certified value and standard deviation per standard: without them the Z-score means nothing and the control chart has no envelope.



Declare every control code

Several codes per family, separated by ";". A sample type no code claims is analysed by nothing — the application says so.



Set the low-concentration cutoff

Near the detection limit a relative difference measures rounding, not precision. Those pairs are set aside and counted, never condemned.



Do not confuse a lab repeat with a field duplicate

They are two different precision populations, with different acceptance limits. The code is what separates them.



Save the run to the database

The history travels with the assays: months later anyone on the same database can say whether a batch was accepted, and why.

Frequently asked

The questions asked when reading a QA/QC report.

Q No plots after Run Analysis?

Check that the source is loaded — the counter at the top shows it — that mapping is complete, especially Sample Type and Assay Value, and that at least one plot is ticked.

Q Why does a batch pass with every point inside $\pm 3\sigma$?

It may not: a CRM reading half a sigma high for twenty samples respects every point and is still calibration drift. That is what the 10-x rule catches.

Q Can I export the PDF without a plot?

Yes. As soon as a run has scored batches the report is available: the verdict does not depend on the plot.

Q Do the QAQC_* tables already exist?

They are created on first use, on Access as on SQL Server. Nothing to prepare on the database side.

Q Does the re-assay send the standards?

No. The batch's ordinary samples go back: a failed standard condemns the batch around it, and the controls were consumed. Fresh ones are inserted with the new submission.

Q Does everything have to be reconfigured each session?

No: thresholds, mappings and standards persist between sessions. One configuration per assay type is enough.

Source: built-in documentation, QAQC Manager page (press F1).



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SECTION III

The data

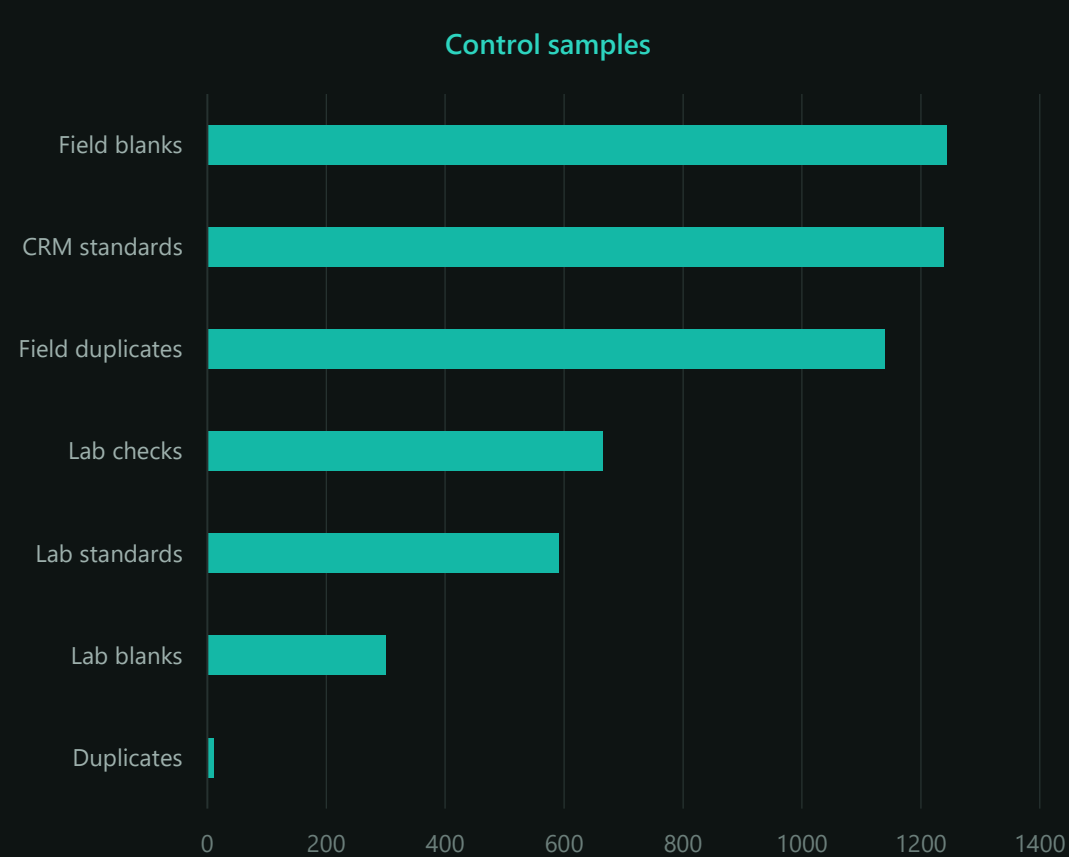
What the module produces on a real dataset, and the vocabulary needed to read those results.

01 Anonymised data

02 Key concepts

Anonymised data

The real composition of the 26,377 samples in the KOUKOUDAN database and the insertion rates achieved.



POPULATION	COUNT	1 IN
Ordinary samples	21 186	—
Field blanks	1 243	17.0
CRM standards	1 239	17.1
Field duplicates	1 140	18.4
Lab checks	665	—
Lab standards	592	—
Lab blanks	301	—
Duplicates	11	—
TOTAL CONTROL	5 191	19.7 %

Usual insertion objective: 1 control per 20 ordinary samples. All three families beat the objective. Source: KOUKOUDAN project database (Senegal) — figures computed from the real data exported from GeoMate.

Key concepts

The vocabulary of analytical quality control.

CRM

Certified Reference Material: material of certified grade inserted into the stream to measure the laboratory's accuracy.

Westgard rules

A grid of sequence rules — 1-3s, 2-2s, 2of3-2s, R-4s, 4-1s, 10-x — that catches drifts no single point betrays.

Blank carry-over

A failed blank straight after a high-grade sample: contamination carried by the crusher, which condemns the previous result too.

Z-score

A reading's departure from the certified value, in standard deviations. $|Z| > 2$ warns, $|Z| > 3$ fails.

HARD

Half Absolute Relative Difference: $|a-b|/(a+b) \times 100$.
The form in which a duplicate limit is conventionally written.

Insertion rate

The proportion of control samples to ordinary ones — 1 in 20 by default. The first question of an external audit.



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SECTION IV

Value & specifications

What the module changes for the project, and its technical integration profile.

01 Business value

02 Technical profile

Business value

The batch is judged, not just the sample

Four weighted checks replace the single glance at $\pm 3 \sigma$: drift and insertion shortfall are caught.

PASS / WARN / FAIL

The report is audit-ready

Cover, criteria applied, verdict, findings, batches, failures, statistics and plots, with a signature block — printed on white whatever the screen theme.

Signed PDF

History stays with the assays

QAQC_Runs, QAQC_BatchVerdicts and QAQC_Failures are created on first use: months later the decision is still readable.

3 tables

The re-assay leaves with no re-keying

The ordinary samples of FAIL batches are pushed into a dispatch, with codes constrained by foreign key.

One click

False positives are set aside

Low concentration, laboratory repeats, QC-only extracts: GeoMate refuses to condemn what it cannot measure.

Statistically honest

Technical profile

Analysed populations

Standards

Against CRM definitions: value and standard deviation

Blanks

Against the configured detection limit

Duplicates

Pairs formed by code, or wide two-column format

Multiple codes

Separated by “;” — BLK; LABBLK

Filtering

Time / batch filter

Date, text or number depending on the mapped column

Text operators

is one of, contains, starts with, ends with — % ? * wildcards

Date operators

on, before, after, between — whole days

Feedback

The number of rows kept is shown before the run

Outputs

Plots

PNG of the eleven figures

Tables

Statistics, failures, batch verdicts as CSV

Report

Signed PDF, available as soon as a batch is scored

Persistence

QSettings for configuration, database for history



One platform, from field to report

The “QAQC Manager” module is one of the 19 modules of GeoMate 2026 — a single, fully offline platform covering the whole chain: database design, data entry, validation, QA/QC, dispatch, analysis and reporting.