Land Survey Submission Standard

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DOCUMENT CONTROL

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Document History

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Contents

Nomenclature

Term / Acronym	Definition
WGS 84	World Geodetic System 1984 – the standard coordinate reference system for spatial data
MSL	Mean Sea Level – the vertical datum used for elevation references.
UTM	Universal Transverse Mercator – a global map projection system; Zone 43N is used in this document
Shapefile (.shp)	A widely used geospatial vector data format for geographic information system (GIS) software
.shx	Shapefile index file – stores index data for the main shapefile
.dbf	dBASE file – contains attribute data for the shapefile
.prj	Projection file – defines the coordinate system and projection information
.cpg	Code Page file – specifies the character encoding used for the attribute data
FBK	Field Book file – a text-based survey data format supported by Autodesk
LANDXML	An open data format for civil engineering and survey data exchange
RINEX	Receiver Independent Exchange Format – used to store raw satellite navigation system data
FCODE	Feature Code – a unique identifier assigned to a specific land or geographic feature. Common examples include Plot Numbers, RFCode (reef identifier), and LDCode (island identifier)
RFCode	A feature code prefixed with "RF", indicating a unique Reef Identifier
LDCode	A feature code prefixed with "LD", indicating a unique Island Identifier

1. Introduction

1.1. Purpose of the Standard

This standard establishes a comprehensive framework for the preparation and submission of land survey reports and associated datasets. It outlines the necessary documentation, data formats, and procedural requirements to promote uniformity, precision, and compliance with established regulations. The objective is to streamline the reporting and review process, ensuring that all submissions meet a consistent professional standard for review and approval.

1.2. Scope of Application

This standard applies to all land survey reports submitted to Geomatic Department of Ministry of Finance Planning (MoFP), for approval, regardless of the survey's purpose or methodology. It provides guidance on how survey results should be documented, structured, and presented to meet regulatory expectations. The document is intended for surveying professionals.

In cases where specific regulations, technical guidelines, or project requirements call for additional data, formats, or procedures beyond those outlined in this standard, such requirements must be fulfilled in addition to complying with this standard. Registered Surveyors are responsible for ensuring that all such additional obligations are incorporated into their submissions.

2. General Submission Requirements

In general, there are three parts to the submission of survey results.

   i. Survey Report including Survey Plan

   ii. Final Spatial Data used to produce the Survey Plan

   iii. Raw and intermediate data

All data *used in the production of the survey results* must be submitted. *Do not include* any intermediate or processed data that was **not used** in the final survey deliverables. This ensures submission clarity and avoids unnecessary or duplicate files.

2.1. General structure of a survey submission

   i. **Survey Report:** Report must be in PDF format and file name must follow the file naming conventions

       o Project Details

       o Survey Methodology

       o Survey Results

       o Conclusion and Recommendation

   o Document Annex: All supporting documents must be annexed at the end of the survey report such as:

    ▪ Survey Plan

    ▪ Stakeout Results

 ii. **Final Spatial data:** all files must be in a single zip file and file name must follow the file naming conventions. These are the fully processed data **used** in the production of the Survey Plans.

 iii. **Raw Data and Digital Field Book:** All raw survey data and the digital field book must be submitted in a single zip file. The zip file must follow the file naming conventions. Within the zip file, each type of dataset must be organized into its own dedicated subfolder. The following folder structure is mandatory (if the data type is applicable):

   o GNSS Raw: for GNSS observation files

   o Digital Field Book: for exported field book files from total station, GNSS instruments or other surveying equipment

   o Level Data: for levelling records and instrument height readings

    ▪ Additional folders may be included as needed for other datasets, but all data must be properly organized and clearly labelled.

2.2. Datum and projection:

All spatial data must be referenced to the following datum and projection unless otherwise specified in a particular standard or project requirement:

- Horizontal Datum: WGS 84 (World Geodetic System 1984)

- Vertical Datum: Mean Sea Level (MSL)

- Projection: UTM (Universal Transverse Mercator) Zone 43N

Any deviations from the specified datum and projection should be clearly stated and justified in the submission documentation.

2.3. Survey Submission Numbering and File Naming Convention

To ensure consistency, traceability, and version control across all survey submissions, each submission must include a standardized Survey Submission Number and follow a prescribed file naming convention.

(a). Survey Submission Number Format

The Survey Submission Number must be generated by the Registered Surveyor, following the format defined below. It must appear in all submitted documents, including:

- The cover page and footer of the survey report.

- All associated digital files (e.g., PDFs, shapefiles, spreadsheets).

- Registered Surveyors are responsible for ensuring the uniqueness of each submission number and maintaining proper version control for revised submissions.

- Survey Submission Number Format:

  [SurveyorRegistrationNo]_[###]_[R##]

  Where:

    o SurveyorRegistrationNo: Unique ID/code of the licensed surveyor (e.g., RS149)

    o YYYY: Year of submission

    o ###: Sequential submission number for that year,

    o R##: Revision number, starting from R00 (original), R01 (first revision), and so on

  Example: RS149_2025_002_R01

    o This identifies first revision of the second submission by **Registered Surveyor** RS149 in the year 2025

(b). File Naming Convention

All digital files submitted must have filenames that begin with the Submission Number as a prefix, followed by a brief, descriptive title.

- Format:

  [SubmissionNumber]_[DescriptiveFileName].[FileExtension]

  Examples:

    o RS149_001_R00_K_Hinmafushi_Land_Survey_Report.pdf

      ▪ Submission Number: RS149_001_R00

      ▪ Descriptive File Name: K_Hinmafushi_Land_Survey_Report

      ▪ File Extension: pdf

    o RS149_001_R00_ K_Hinmafushi_Parcels.shp

    o RS149_001_R00_ K_Hinmafushi_BoundaryLines.dbf

    o RS149_001_R01_ K_Hinmafushi_Land_Survey_Report _Revision1.pdf (first revision)

2.4. Reporting Units and precision

All measurements must be reported using the metric system (SI units). The following units of measurement must be used for spatial and attribute data:

Data Type	Unit
Coordinate Values	Meters (projected coordinate system)
Distances	Meters
Bearings	Decimal Degrees (°), referenced to true north
Areas	Square Meters (m²)
Elevation (if applicable)	Mean Sea Level (MSL)

All measurements must conform to the defined units to ensure compatibility with national geospatial and cadastral systems. Data precision requirements will be addressed in the relevant technical standards.

3. Required Survey Report Components

A comprehensive and professionally compiled survey report is a mandatory deliverable. The report must clearly describe the purpose, methodology, and results of the survey in a transparent and traceable manner.

General Requirements:

- The full survey report must be submitted as a single, consolidated PDF document.

- All supporting documentation, appendices, and supplementary materials must be included within this file.

- Any handwritten field notes, sketches, or on-site annotations must be scanned and embedded in the same PDF document.

The report must include the following structured components:

3.1. Project Details

This section must provide an overview of the project and identify the key parties and locations involved. It should include:

- *Project Title/Name*
- *Client Information:* Name (individual or company), address, and identification number (if applicable)
- *Survey Location Details:* Include all relevant administrative and land registry references such as the island name, Reef name, Block name, and Plot name, along with their corresponding Feature Codes (FCODEs).

- *Survey Dates and Duration*

- *Registered Surveyor's Full Name and Registration Number*

- *Declaration Statement:* A signed declaration by the *Registered Surveyor* affirming responsibility for the survey and the accuracy of the report

3.2. Survey Methodology

This section must comprehensively describe how the survey was executed, providing transparency about procedures, equipment, and data integrity. It must address the following components:

i. *Type of Survey Conducted:* Clearly state the survey type and its intended purpose (e.g., topographic, cadastral, boundary demarcation, engineering, or construction survey).

ii. *Survey Equipment and Technology Used:* List all instruments and technology utilized, including the make and model of equipment such as total stations, GNSS receivers, UAVs/drones, terrestrial laser scanners, digital levels, and any other tools employed.

iii. *Survey Control and Reference System:* Describe the geodetic or control framework adopted, including:

- Base stations, benchmarks, or network references used

- Coordinate reference systems and vertical datums

- Any applied transformation parameters or projection details

iv. *Field Procedures and Techniques:* Outline the field methodology in detail, including:

- Instrument setup procedures and observation techniques

- Traverse, resection, or GNSS network design

- Data capture workflows and feature coding

- Any manual field notes, sketches, or logs (to be included in the appendix)

v. *Data Processing and Computation:* Explain the post-processing workflow, including:

- Software and tools used for adjustment and computation

- Methods for coordinate transformation, error correction, and data validation

- Steps taken for deriving final coordinates, areas, and elevations

vi. *Quality Assurance and Accuracy Assessment:* Document the quality control measures applied, including:

- Error analysis, closure reports, and precision checks

- Compliance with specified survey standards or tolerances

- Any independent validations or control point verifications

vii. **Limitations and Assumptions:** Disclose any factors that could influence data quality, including:

- Environmental conditions (e.g., poor weather, line-of-sight obstructions)
- Access restrictions or hazards encountered
- Assumptions made in interpreting unclear boundaries or features

3.3. Survey Results

This section must present all finalized spatial data outputs, ensuring clarity and completeness for downstream users. Include the following:

i. *Survey Plan:* A detailed drawing/map showing parcel boundaries, physical features, structures, access ways, control points, and relevant annotations.

ii. *Point Tables:* Tabulated coordinates for all critical points, including boundary markers, survey control points, and relevant topographic features, along with associated attributes. (e.g., point ID, code, height)

iii. *Area and Dimension Table:* Clearly list parcel areas, boundary lengths, frontage measurements, and other relevant dimensions with units and tolerances

3.4. Conclusion and Recommendations

Conclude the report with a concise summary that:

- Confirms whether the objectives and scope of the survey were fully met
- Highlights any discrepancies, issues, or notable observations made during fieldwork or processing
- Provides professional recommendations regarding:
  - The validity and usability of the survey data
  - Any need for further verification, clarification, or supplementary surveys
  - Necessary actions to address detected issues or constraints

4. Survey Plan Requirements

All survey reports must include a clearly drafted Survey Plan as part of the submission. The Survey Plan shall be prepared in accordance with applicable standards and must include, but is not limited to, the following components:

i. Marginalia:

- Project title and description

- Client name and reference number (if applicable)

- Surveyor's name, firm, registration/licensing number

- Date of survey and date of plan production

- Scale, north arrow, and coordinate reference system used.

ii. Survey Control:

- Details of all horizontal and vertical control points used

- Coordinates, elevations, and datum references

- Benchmark descriptions and locations

iii. Site Features:

- Boundaries (existing and/or proposed) with dimensions and bearings

- Natural features (e.g., contours, vegetation, watercourses)

- Man-made structures (e.g., buildings, fences, roads, utilities)

- Easements, right-of-ways, and encumbrances

iv. Survey Observations:

- Survey stations, instrument positions, and reference lines

- Traverse or GPS baseline network (where applicable)

- Field notes relevant to data capture, anomalies, or constraints

v. Map Figures:

- A series of labelled and scaled figures must be included to illustrate the survey data

- Required figures include, but are not limited to

  a. Site Location Map

  b. Survey Boundary Map

  c. Topographic Map

  d. Control Point Map

  e. Utility Map (if applicable)

- All figures must contain a title, legend, north arrow, scale bar, and coordinate grid (if used)

vi. Legend and Notes:

- A clear legend identifying all symbology, line types, and abbreviations

- General notes regarding survey methodology, instruments used, and positional accuracy
- Limitations, disclaimers, and special conditions affecting the data

vii. Certification:

- Registered Surveyor's signed declaration certifying the accuracy and completeness of the plan
- Professional seal and date, where required by jurisdiction

All components must be compiled into a coherent and professionally formatted Survey Plan and included in the survey report. Omission of any required element may result in the survey report being deemed incomplete.

5. Spatial Data Submission Requirements

All spatial data must be submitted in ESRI Shapefile format (.shp). The submission must include all relevant vector layers used in the survey, each stored as a properly structured shapefile, with consistent attribute fields and projection information. The shapefiles must reflect all features shown on the corresponding survey plan and support cadastral data integration.

All shapefiles must be organized clearly in folders and compressed into a single ZIP file for submission. Each shapefile must include at least the following components:

- .shp – geometry
- .shx – shape index
- .dbf – attribute table
- .prj – projection (mandatory)
- .xml – metadata file
- .cpg – character encoding (recommended)

6. Submission of Digital Field Books and Raw Survey Data

Registered Surveyors are required to submit digital field books and raw data files generated from all survey instruments used in the field, including total stations, GNSS receivers, and any other applicable equipment. These digital records form a critical component of the survey deliverables and are essential for data verification, quality assurance, auditing, and potential reprocessing.

i. The submission must include:

    a Raw observation data (e.g., angles, distances, satellite measurements, point IDs)

     b Instrument setup details: station coordinates, instrument and antenna heights, backsight/foresight data

     c Survey metadata: date and time of observation, survey crew details, instrument serial numbers, and job identifiers

     d Coding and feature collection data where applicable

     e GNSS-specific data: antenna type/model, occupation duration, satellite observation logs, and base/rover configuration files

ii. All digital field book and raw data files must be submitted in both of the following formats:

     a *Generic/Open File Formats:* These facilitate interoperability, ease of review, and long-term accessibility. Accepted formats include:

        a. .CSV, .TXT, .XLS/.XLSX

        b. .FBK (Autodesk Field Book format)

        c. .LANDXML (for survey and civil data exchange)

        d. RINEX (.21, .obs, .nav) for GNSS observations

     b *Native Instrument File Formats:* Original files created by the survey instruments are required to ensure full traceability and support potential reprocessing. Accepted formats include (but are not limited to):

        a. Total Stations: .RAW, .JOB, .SDR, .RW5, .TP3, .DC, .TDS, .GSI

        b. GNSS Receivers: proprietary formats (e.g., .T01, .T02, .DAT, .JPS) and configuration files from manufacturers such as Trimble, Leica, Topcon, Sokkia, Hemisphere, etc.

     c *All files must be:*

        a. Clearly named and logically organized in folders by instrument type, date, or project section

        b. Referenced in the final survey report with a summary of included datasets

        c. Accompanied by a file index or readme (optional but recommended) for clarity

Failure to submit both generic and native format files for all instruments used will render the survey report incomplete and may require resubmission.