An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

NPWS
An tSeirbhís Páirceanna
Náisiúnta agus Fiadhúlra
National Parks and Wildlife
Service

NPWS Data Standards and Project Delivery Guidelines

Version 2.0
Issued: 22 April 2026

Published by the Department of Housing, Local Government and Heritage

gov.ie

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Purpose

This document sets out the data management guidelines, project requirements, specifications, data standards, templates and nomenclature standards for all NPWS projects involving the collection of scientific data.

Scientific data is understood as all data, both spatial and non-spatial, used as evidence to validate, analyse and replicate scientific findings necessary to support NPWS in carrying out its functions.

These guidelines underpin the NPWS Project Process.

This is a working document. NPWS is in the process of upgrading many of the data management tools currently in use. These standards, and guidelines will be updated as new solutions and processes come on stream.

Overview

This document is supplied as part of the Project Delivery Pack (PDP) which is a ZIP archive containing resources necessary for delivery of scientific projects to NPWS. The latest version of this archive along with a project example is available for download from the NPWS Data Standards section of the NPWS website. This document should be studied along with all relevant Project Delivery Pack components.

This document is divided into three main sections:

- Section 1 – describes Project ID, details Project Delivery Pack content and purpose, gives an overview of the steps involved in the NPWS scientific project life cycle with focus on critical resources and milestones, and lists ways of delivering project archives and/or data to NPWS.
- Section 2 – provides details on the specific, project and data related requirements, formats, naming conventions, schemas and templates, database design principles and standards, GIS/geospatial data standards, metadata, and data policies.
- Section 3 – provides information on nomenclature standards for protists, fungi, plants, vertebrates, invertebrates, habitats and vegetation.

NPWS Project Roles

NPWS led or funded project personnel are assigned one of three principal roles outlined in Table 1, below.

Table 1. The personnel roles associated with an NPWS Scientific Project Process

ROLE	DESCRIPTION
NPWS Project Coordinator	The NPWS staff member leading the project, including contract management, if applicable.
NPWS Data Specialist	The NPWS Data Specialist refers to NPWS staff responsible for NPWS scientific and spatial data management. There may be several NPWS Data Specialists involved in a project. NPWS Data Specialists assist, over the life cycle of the project, coordinating primarily with the NPWS Project Coordinator, to ensure projects are designed and managed in accordance with the requisite process and standards.
Supplier	The person or organisation responsible for project data deliverables, which may include external contract Suppliers. The Project Coordinator is their main point of contact within NPWS.

Section 1 - Project Life Cycle, Data Management and Delivery

A flowchart of the NPWS project life cycle is shown in Figure 1, below. It highlights the responsibilities and milestones involved in delivering resources of a project on both the NPWS and Supplier side.

It is the Supplier's responsibility to follow the procedures described, in conjunction with any project-specific requirements that may be requested. This will ensure that the systems and standards in use from the outset are appropriate for both the project and NPWS data management systems.

At the outset of the project, a Data Kick-off meeting will be arranged by the NPWS Project Coordinator with NPWS Data Specialists and external Suppliers delivering the project. This provides an opportunity for the Suppliers to raise any questions they have on the project data standards and process, and to confirm the suite of data deliverables and scheduling.

During the early phases of the project, the Supplier must provide the Project Coordinator with an example or preliminary subset of any datasets created. This will allow NPWS Data Specialists to check that the format, structure, and quality are fit for purpose before the external Supplier commits fully to the data capture phase. This is particularly important for new project types so that NPWS can ensure data is designed to achieve interoperability with other projects and programmes. This preliminary sample of data will be treated as an interim delivery. An internal NPWS quality assurance, quality control (QA/QC) procedure will be conducted (see QA/QC steps outlined on Figure 1, below). Any issues discovered, and advice on how to address them, will be conveyed to the Supplier through the NPWS Project Coordinator.

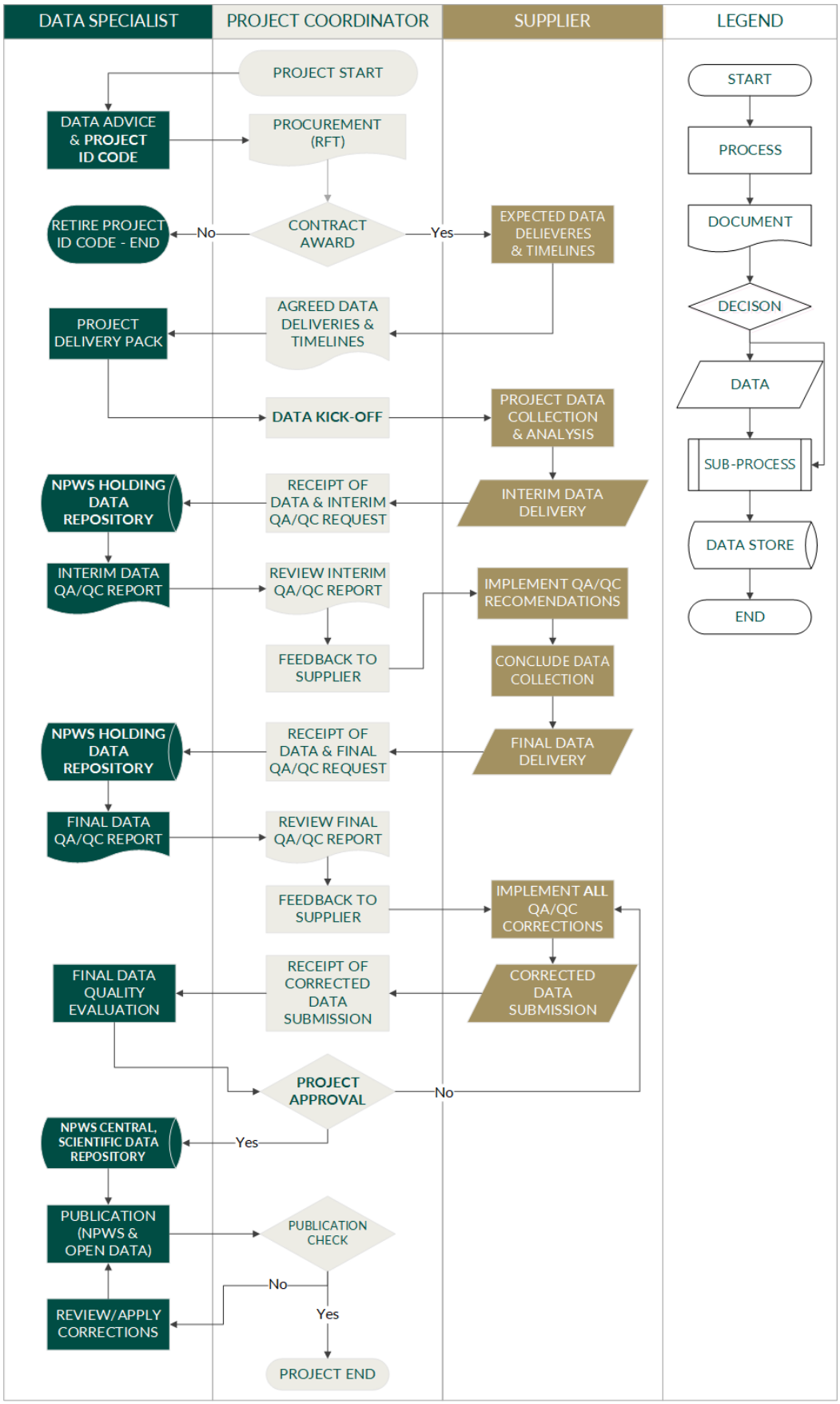

Figure 1. NPWS Scientific Project flowchart

1.1 - Project ID

- At the beginning of a new NPWS project, the Supplier will be provided with a unique Project Identifier Code, which they must use in naming the top-level directory, as a file name prefix for all data stored within the directory and all correspondence with NPWS. This is a mandatory requirement.
- This unique code consists of an 11-character string, based on a 4-part numeric code (for internal use), a 4-part character code (project title abbreviation), 2-part numeric code (indicating the initiation year), along with project versioning suffix (beginning at _01 for the baseline), which **must** be used to name top-level directory:
    - Top-level directory format: ####_PPPP##_01
    - Top-level directory example: 0605_LMPV08_01
- The Supplier **must** ensure that all files held within the directory use the 4-part character (project title abbreviation) and the 2-part numeric code (indicates the project start year) as a file name prefix, along with file versioning suffix (beginning at _01 for the baseline), as follows:
    - File name format: PPPP##_<insert_file_name>_01
    - File name example: LMPV08_Recorder_import_01

1.2 - Project Delivery Pack

- The Project Delivery Pack is a ZIP archive holding two top-level directories.

  The first contains a template directory with all the supporting documentation and templates required for an NPWS project (Table 2 and Figure 2).

  The second contains the Project directory tree structure in which NPWS expects to receive the data deliverables. It should contain all resources from a completed project provided in the relevant folder of the project directory tree (Table 3 and Figure 3):

  ..*@templates*

  ..*add_project_code_and_version*

- Please carefully study the top-level project directory hierarchy and its contents. This hierarchy should not be altered by renaming directories, but the structure can be augmented by additional directories to hold further subcategories of data, ideally at the lower levels in the project directory tree. When creating new subdirectories adhere to directories naming rules below (for more details on naming convention, refer to Section 2.2):

- Retaining lowercase naming conventions for new directories created at lower levels of the project root directory.
- Keep directory names brief and meaningful.
- Clarify the use of the new directory in a readme.txt file in the relevant directory if necessary.

- Deviations from the recommended structures and guidelines must be discussed with the NPWS Data Specialist in advance.

1.2.1 - The '*@templates*' Directory

Table 2. Details of the contents of the top-level directory '@templates'

DIRECTORY NAME	DESCRIPTION OF CONTENTS
data_fields	This folder contains NPWS conventions for frequently used data fields in spreadsheet format.
delivery_guidelines	This folder contains the latest version of the 'Data Standards and Project Delivery Guidelines' document, and a Project delivery checklist form.
logo	This folder contains copies of the official NPWS logo suite.
media_files_catalogues	This folder contains MS Excel templates for capturing media (audio, images and video) metadata together with populated example forms and batch files used to create the media files listing.
monitoring	This folder contains an MS Access habitat monitoring template database with templates for relevés, a data dictionary and data model document, three spreadsheet lists of impacts, an impact guidance document, and a database version log.
recorder	This folder contains an MS Excel Recorder 6 data import template.
reports	This folder contains an Irish Wildlife Manual template, Irish Wildlife Manual guideline document and accessibility guidelines documents.
resource_catalogue	This folder and associated subfolders contain the metadata capture form, examples of populated forms and guidance documents.

third_party_data_agreement	This folder contains licence agreement forms for project-specific data requests from contracted Third Parties.
turboveg	This folder contains an MS Excel template for TURBOVEG data import.

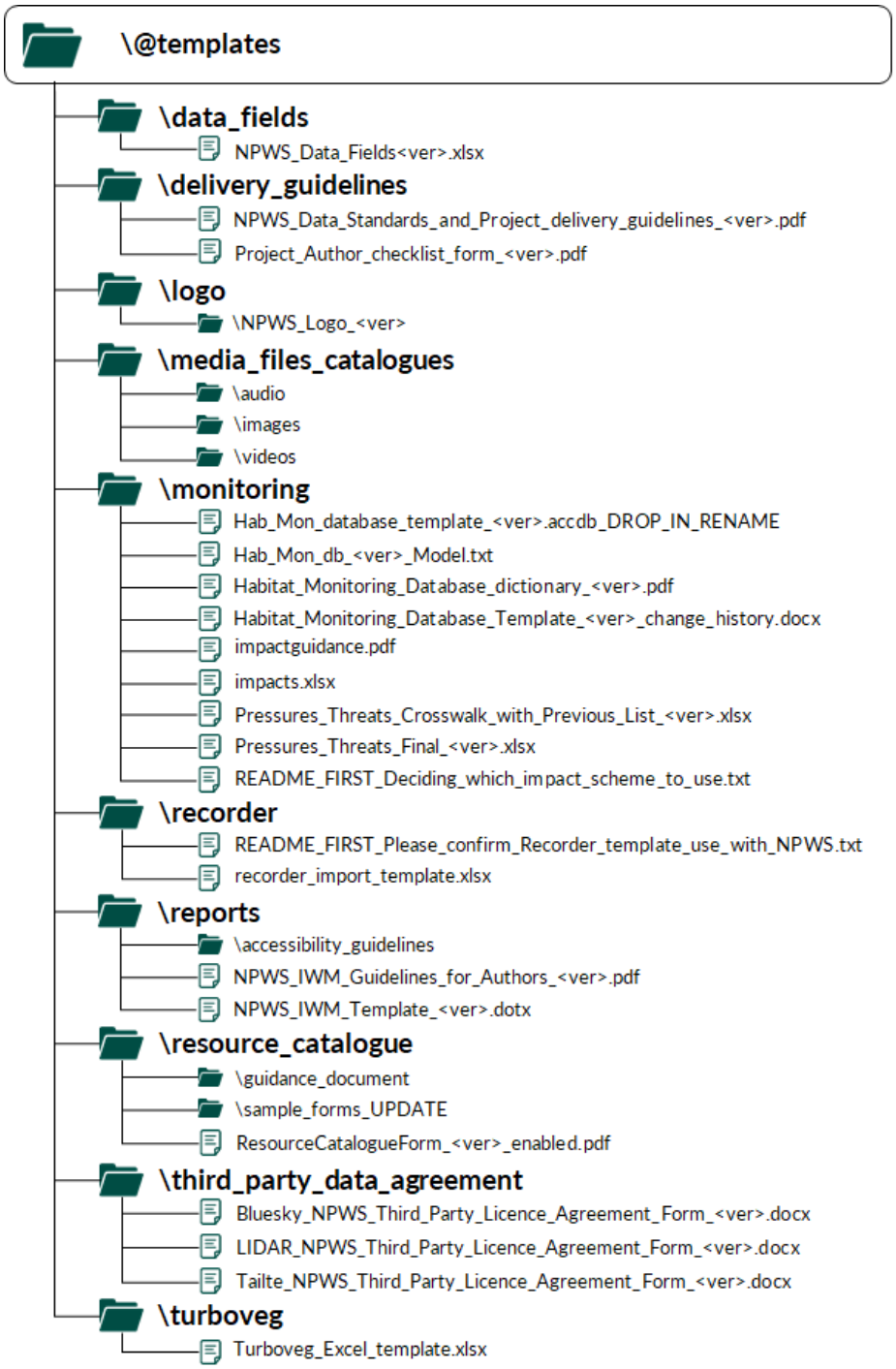

Figure 2. The content of '*@templates*' directory

1.2.2 - The 'add_project_code_version' Directory

- The ..*add_project_code_and_version* top level directory is the default working directory for any project. The directory structure as supplied should not be altered by renaming any existing directory, but the structure can be augmented by additional directories to hold further subcategories of data, ideally at lower levels in the directory tree (e.g. creating sub-folders).
- Prior to delivery at the end of a project, Suppliers are asked to delete any parts of the directory tree that don't hold data deliverables.
- Certain files contain suffix '_DROP_IN_RENAME' in the file extension. This is to render the files non-executable. To restore the functionality of these files this suffix must be removed by renaming the file:

  build_manifest.bat_DROP_IN_RENAME → *build_manifest.bat*

Table 3. Details of the contents in the *'add_project_code_and_version'* directory

FOLDER	DESCRIPTION
@manifest	This folder will hold one or more instances of date- and time-stamped file listings created by executing the manifest batch file in: ..*@add_project_code_and_version\build_manifest.bat*
@resource_catalogue	This folder contains an empty resource catalogue form (metadata form). Guidelines for its use are in: ..*@templates\resource_catalogue*
@version	This folder contains the project version history form (following file naming for versioning set out in these standards) and a log file (for project issues and their status).
data	This folder will hold all data products associated with the project.
data\gis	This folder will hold all GIS data resources.
data\gis\gis_files	This folder is intended for all shapefiles, geodatabases, symbology (.lyr) files, geopackages (.gpkg), Project/Map Packages, LiDAR (.las) files, DTMs etc.

data\gis\spatial_imagery	This folder is intended for project-related spatial imagery (aerial orthophotography, satellite imagery, drone imagery, etc.)
data\maps	This folder will hold all finished exported maps associated with the project. e.g. PDFs, JPEGs.
data\media_files	This folder will hold all non-spatial media files (audio, images, video) associated with the project.
data\media_files\audio\catalogue	This folder contains an audio files catalogue template.
data\media_files\images\catalogue	This folder contains an images catalogue template.
data\media_files\videos\catalogue	This folder contains a video files catalogue template.
data\non-spatial	This folder will hold all non-spatial data resources.
data\non-spatial\database	This folder will hold all databases associated with the project.
data\non-spatial\excel	This folder will hold all spreadsheets associated with the project. MS Excel is the expected file format.
data\non-spatial\other	This folder will hold all other categories of data associated with the project that are not listed elsewhere.
data\non-spatial\recorder	This folder will hold all Recorder 6 data associated with the project.
data\non-spatial\turboveg	This folder will hold all Turboveg data associated with the project.
docs	This folder will hold all documents generated by the project.
docs\publications	This folder will hold all published material arising from the project (e.g. Irish Wildlife Manuals, Journal articles etc.).
docs\reports	This folder will hold all project reports.
docs\sysdocs	This folder will hold miscellaneous content such as data dictionaries, thesauruses, data models, specifications, user requirements, etc.
docs\user_guides	This folder will hold Supplier provided user guides, particularly those related to complex resources such as applications or databases.

working_data	This folder will hold all sample (interim) data such as drafts, scanned field cards, working documents.
working_data\processing_files	This folder will hold intermediate data outputs.
working_data\publications	This folder will hold sample (interim) versions of reports and publications.
working_data\source_data	This will hold initial source data such as scanned field cards, GPS\GNSS data (i.e. GPX files), etc.

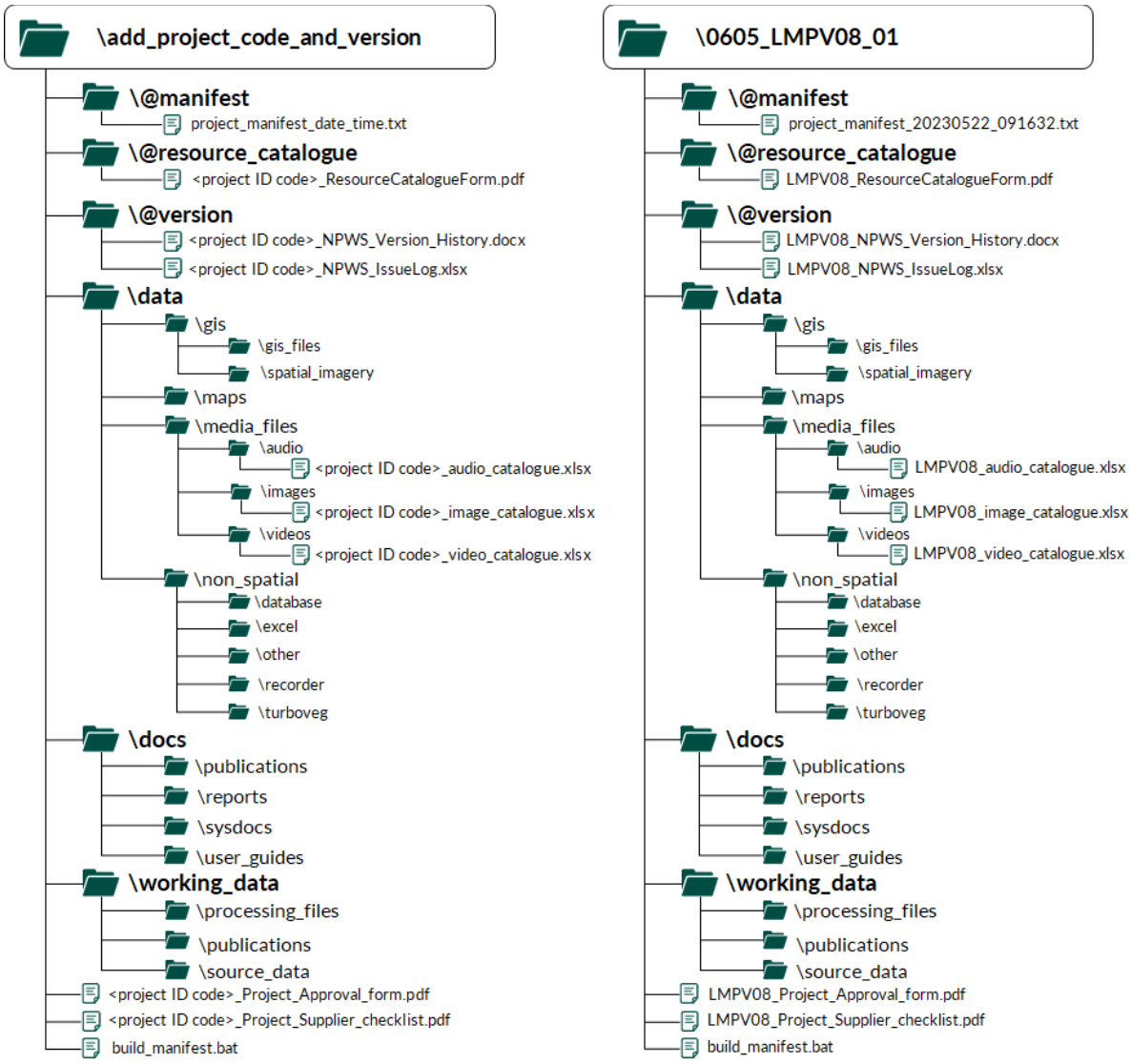

Figure 3. The content of the *'add_project_code_and_version'* directory

1.3 - Overview of the Project Delivery Process

The Supplier must follow the project delivery guidelines. If problems or limitations arise from use of the proposed project delivery system, then please notify the NPWS Project Coordinator. Paragraphs below provides an overview of the key stages in the NPWS Project Process. Starting from concept stage and RFT submission stage through preparation for project execution, initial project/data consultations between Supplier and NPWS, data acquisition, interim data submission, and ending on final data submission, archiving and dissemination.

In this document emphasis is placed on stages that are most relevant to project Suppliers. At the end of this paragraph practical aspects of data delivery and redelivery are discussed.

1.3.1 - Getting Started

This paragraph provides an overview of the early stages of the NPWS Project Process that take place prior to the data capture phase.

Drafting project concept

- NPWS Project Coordinator will outline project concept and must discuss project's objectives, deliverables and methods with the NPWS Data Specialist.

RFT stage

- NPWS Project Coordinator should submit draft Request for Tender (RFT) to the NPWS Data Specialist. They will review it and advise on adequate data standards statement to be included in the final RFT.
- Suppliers must be familiar with data standards and delivery guidelines outlined in this document prior to making their bids.

Extraction of Project Delivery Pack

- After the contract is awarded the Supplier, if not done already, is required to download a ZIP archive containing a compressed Project Delivery Pack from the NPWS website: NPWS Data Standards.
- Please clear the cache on your browser to ensure you are downloading the most up-to-date version of the ZIP archive, as this is updated frequently.
- Copy this archive to your allocated project parent directory.
- Use a file decompression utility to unzip the directories and files to your personal computer.

Review of NPWS data standards and project delivery guidelines

- Read this document carefully.
- Make sure that you understand the directory structure and the file/directory naming conventions (for additional information please consult paragraph 2.2).
- An associated checklist PDF form that covers most of the elements of the process has been supplied in the Project Delivery Pack, to assist you with project's tasks and milestones which must be supplied as part of project delivery:

  NPWS_Project_Supplier_checklist_form_enabled_<ver>.pdf

Review of project directory structure and naming convention

- The NPWS Coordinator will have advised the Supplier of the NPWS Project Identifier Code assigned to the project (for detailed description of Project ID and naming conventions please consult paragraph 1.1 and 2.2 respectively). It is essential Suppliers understand the directory structure and apply naming conventions correctly. This will save Suppliers time and effort at later stages of the project, when data deliveries are being prepared, as well as minimise risk of redeliveries.

Data Kick-off meeting

- The NPWS Coordinator will schedule the Data Kick-off meeting, including relevant NPWS staff involved in the project, the NPWS Data Specialist(s) and the Supplier(s), to discuss all data related project needs. At least one meeting of this type should be organised prior to commencement of the data capture phase.
- This meeting will focus on the NPWS Project Process to confirm roles and responsibilities relating to the project specific data management including, expected list of the data deliverables, requirement for interim and draft final deliverables, formats and estimated data volumes, file transfer modes, scheduling of deliverables, QA/QC turn around and resubmission timelines. These will be documented and approved by the NPWS Project Coordinator. It will provide an early opportunity for those involved in the project to raise any questions relating to the data delivery process and standards.
- The Data Kick-off meeting is particularly critical if the project is expecting to deliver data types that are novel and/or are not covered by this document, as well as if the Supplier is not familiar with the NPWS Projects Process.

1.3.2 - During the Project

This paragraph provides an overview of the data capture and internal data evaluation stages of the NPWS Project Process.

Submission of project's spatial footprint

- If agreed at a Data Kick-off meeting a GIS file delineating project's spatial footprint may be required at an early stage of the project.

Submission of sample data for QA/QC evaluation – interim delivery

- Before the Supplier fully commits to the data capture phase, they are required to submit to NPWS a data sample representative of expected project data outputs, including both spatial and scientific datasets, so that NPWS can evaluate formats, structure and quality and determine whether such data will be fit for purpose. This is a mandatory requirement for all but very brief or repeat projects and will be confirmed at the Data Kick-off meeting.
- Suppliers need to ensure, where relevant, that the data fields used in the datasets conform to the NPWS conventions for commonly used data fields in the data fields template provided as part of Project Delivery Pack. These are important data fields used by NPWS across several applications and must conform to the guidelines (see paragraph 2.5.2 for more details):
  ..\@templates\data_fields\NPWS_Data_Fields_<ver>.xlsx
- It is critical to submit examples of data that will form the main project deliverables. This enables NPWS to check its conformance to NPWS data standards and assess its interoperability with other datasets.
- Submitting sample data for comment early in the project significantly reduces the need for corrections and resubmissions before the project sign-off.
- Suppliers are expected to supply sample data in accordance with the project delivery process, unless otherwise agreed with NPWS.

Handling file dependencies

- File dependencies arise when resources reference other resources or point to external sources. This is particularly relevant for web applications. NPWS cannot accept data provided as an external shared resource. All data deliveries must be supplied as the raw dataset in the relevant folder of the project directory.
- All data sourced by the Supplier as part of the project must be included as part of the delivery and must include sufficient detail on sharing and reuse permissions (see paragraph 2.9 on Data ownership and permissions)

- Use relative paths (paths that point to a file or directory relative to the current working directory) when referencing and cross-referencing files within the Project directory tree.
- Use absolute paths (paths that include full address of the target file or web page) for all external pointing references and hyperlinks.

Carry out internal quality control (QA/QC) of project data

- Ensure that spatial resources have a defined and correct projection and correct geometry/topology. See paragraph 2.4.7 for further detail on spatial data quality checks.
- Ensure that data is adequately formatted and conforms to NPWS naming conventions (for additional information please consult Section 2, Table 5 and Table 7).
- Document the QA/QC process and make sure to fill in the Project Supplier checklist included in the *Project Delivery Pack*:
  NPWS_Project_Supplier_checklist_form_enabled_<ver>.pdf

1.3.3 - At the end of the Project

This paragraph provides an overview of the final stages of the NPWS project process where data is packaged, delivered, undergoes quality evaluation and is finally archived and disseminated.

Complete media files catalogues

- Complete the media files catalogues entries for all project media files, using applicable spreadsheets:
  audio_catalogue_template.xls
  image_catalogue_template.xls
  video_catalogue_template.xls
- Use the corresponding batch files provided to generate lists of applicable media files:
  build_audio_list.bat
  build_image_list.bat
  build_video_list.bat
- Fill in the remaining metadata information, not captured by the batch files, in the relevant media catalogues.

Check that project files are allocated to the correct directories

- Confirm that the project directory tree is complete and that all required files are allocated correctly. Please consult Section 1 paragraph 1.2 of this document for further information on expected directory content.

Create metadata

- NPWS requires that metadata for all project's resources are captured in a Resource Catalogue form provided as part of the Project Delivery Pack:
  ResourceCatalogueForm_external_enabled.pdf
- Please refer to paragraph 2.7 for further information on metadata. For a description of how to populate a Resource Catalogue form please consult the detailed guidance document provided as part of the Project Delivery Pack:
  NPWS_Resource_catalogue_form_entry_guidelines_external_<ver>.pdf
- Note that delivery of a completed Project Resource Catalogue form is a mandatory requirement for all NPWS Project data deliveries.

Build a project manifest

- A project manifest is a list of all the project resources (the file names) along with the size and file modification date and time.
- Execute (double click) the batch file provided in the Project root directory to create a Project Manifest:
  build_manifest.bat
- Verify that the manifest, in form of a text file, has been created in the directory:
  ..*@manifest*

Deliver the project resources – final delivery

- Directory containing project files should be compressed (zipped) prior to delivery to preserve directory time stamps. In cases where archiving might not be practical due to large size of certain projects resources (e.g. should project deliverables exceed 30 GB) please consult with the NPWS Data Specialist prior to delivery.
- At present project resources can be delivered via several channels: e-mail, upload to NPWS cloud service and via external storage media. Please consult paragraph 1.3.4 for further details.

QA/QC evaluation – final delivery

- Upon final delivery, projects resources will be evaluated by NPWS Data Specialists.
- Inconsistencies identified in data supplied to NPWS will be referred back to the Supplier for corrections.
- NPWS will evaluate individual resources, followed by a comparison between the resources to evaluate the overall coherence of the entire data delivery.

- NPWS Data Specialists will produce a QA/QC Report summarising conformance of projects resources with data standards. In the case of observing deviations NPWS Data Specialists will issue recommendations for corrective actions and submit them to the NPWS Project Coordinator for review.
- NPWS Project Coordinator can request the Supplier to respond to recommendations made by the NPWS Data Specialist and resubmit the delivery.
- In cases where resubmission is required it is mandatory to record and document changes made to project resources in the project version document provided as part of revised Project Delivery Pack:
  NPWS_Project_Version_History.docx

Project sign off, archiving and dissemination

- Where necessary, the NPWS Data Specialist will confirm all corrections have been implemented and refer to the NPWS Project Coordinator.
- Following project sign off the NPWS Data Specialist will archive projects resources into the NPWS Central Scientific Data Repository.
- NPWS Data Specialist will liaise with the NPWS Project Coordinator and publish qualifying project's resources as Open Data, if appropriate.

1.3.4 - Data delivery

Delivering of project archive to NPWS

- Depending on the size of the project directory there are three delivery methods currently in place to facilitate data delivery to NPWS as outlined in the Table 4, below.
- All project files must be compressed into a ZIP archive unless it is impractical due to size (> 100 GB) and alternative method of delivery was agreed with the NPWS Project Coordinator.

Table 4. Data delivery methods

SIZE	METHOD
< 20 MB	Project files ZIP archive is sent directly to the NPWS via an e-mail attachment
< 30 GB	Project files ZIP archive is uploaded to DHLGH cloud platform. The Supplier should contact the NPWS Project Coordinator to obtain access credentials and link to the platform. This is the NPWS default data delivery method.
> 30GB	Project files ZIP archive is saved on an external storage media (Hard Drive Disk) and is shipped directly via Courier to an address agreed with the NPWS Project Coordinator and the NPWS Data Specialist.

- If there are hard-copy (e.g. paper) or other non-digital resources associated with the project, these should be discussed with the NPWS Project Coordinator to assess if it is appropriate for these to be digitised (e.g. scanned) and supplied as digital resources, as part of the project delivery.
- NPWS Project Coordinator should consult with internal ICT for approval on use of external cloud sharing facilities for project delivery.

In case of redelivery

- In cases where additional data and/or any other project components are to be submitted, after a final delivery, a project version history must be provided by filling in the form Version History from:

  ..\@versions\NPWS_Project_Version_History.docx

  This is a mandatory requirement.
- In the Version History please list the files which have been added, edited, or deleted from the project. In addition, please provide a clear statement of any changes made to the project together with an explanation as to why these changes were deemed necessary.
- Adhere to a versioning system when naming files. Add a suffix to every file name such as _01a, _01b, _02a, etc. The number (01) indicates a major revision to a file or dataset. The lower-case letter a, b or c indicates a minor revision. Use of this system allows the Supplier to track incremental changes to their dataset as they work. It also serves as a local back-up where a dataset or a document is accidentally changed in an unintended manner.

Section 2 - Data Standards

This Section describes the acceptable formats for delivery of projects data. Suppliers should be aware that the data standards and project resource requirements may vary depending on the nature and purpose of the project. The following tools, naming and formatting rules, and data standards provide guidance on the systems used for information management within NPWS. However, Suppliers should consult with both the NPWS Project Coordinator and the NPWS Data Specialist as early as possible, ideally in the project Data Kick-off meeting to discuss the project's data requirements.

2.1 - Deliverables Formats Compatibility

NPWS operates, at desktop level, primarily in Microsoft Windows environments and utilises ESRI software for processing and visualising of spatial data. Suppliers are welcome to use software and environments they deem appropriate and have access to, but project deliverables when submitted must be compatible with Microsoft Windows and ESRI software. Other specialist formats should be discussed with the Data Specialist, to ensure appropriate measures are in place for readability and interoperability.

2.2 - Naming and Formatting Rules

NPWS requires standard folder structures and folder and file naming conventions to ensure coherence with its internal scientific and spatial data management systems. The Supplier is responsible for recording data in line with uniform and standard naming conventions throughout the duration of the project. Where several surveyors are involved in data capture, or where data is being captured over several years, the Supplier must ensure that all Supplier's staff and any sub-contractors follow the agreed naming conventions and employ good data management practices. This is particularly important for taxonomies, personal names and the names and extents of localities, including NPWS designated sites. For example, every instance of a species name, or a townland or county name must be spelt consistently throughout the project. Suppliers should utilise readily available tools to check for consistency, completeness etc, e.g. use of MS Excel to check for variability or duplicates (e.g. MS Excel's *Sort* and *Remove Duplicates* tools, when applied to certain columns of data, will also reveal cases where cell values are similar, but are not entirely consistent perhaps due to minor misspellings). Other spreadsheet applications (e.g. Libre Office Calc) will offer similar functionality. Inconsistencies identified in data supplied to NPWS will be returned to the Supplier for correction.

NPWS directory and file name formatting rules and naming conventions are outlined in Table 5, below. These rules should be strictly adhered to for all file/folder and object (e.g. attributes in spatial data) naming within a project and its components. Suppliers should create and use unique file/folder/object

names within a project and avoid name duplication or re-use in different directories. Data provided must be consistently structured and entirely free from errors in spelling and in formatting.

Where a project requires a database to be developed as a project deliverable, NPWS requires that the Supplier consults the NPWS Project Coordinator and the NPWS Data Specialist on the database structure and proposed data model design prior to committing to the data capture phase of the project. The agreed design will then be communicated in writing to NPWS. This is critically important where established NPWS database templates already exist e.g. monitoring surveys.

Table 5. Naming conventions and formatting

RULE NO.	NAMING/FORMATTING RULE
1	All file and folder names in this naming convention are created using characters and digits here referred to as 'elements' and a 'delimiter'. Use the underscore ('_', ASCII Code 95) as element delimiter in file/folder names. Do not use the hyphen ('-', ASCII Code 45).
2	Do not use periods, spaces or other special characters, such as: ! # $ % & ' @ ^ ` ~ + , . ; =)(. Avoid using reserved and key words.
3	Try to keep file, folder and object names short. Avoid extra-long file, folder and object names and complex hierarchical structures but use information-rich filenames instead. Observe file, folder and object name length limitations – which can be software specific (e.g. Field Name ten-character limit in Shapefile). Use lowercase for new directories created below top-level folder.
4	When elements include date stamps the dates should be ordered: YEAR, MONTH, DAY and in line with ISO 8601 basic date format (YYYYMMDD). To avoid ambiguity, always use two digits for the month and the day, e.g. 20240109.
5	Abbreviate the content of elements whenever possible. Abbreviating helps create concise file and folder names that are easier to read and recognise.
6	Personal names within an element should have the surname first, followed by first names or initials. Where pre-existing citations use different forms of a name, (e.g. Smyth, J.S.; Smyth, J S; Smyth, John S.; Smyth, Prof. J.), NPWS may require a list of synonyms to be provided for effective database retrieval. This is especially important where data is being acquired over a period of years or by different Suppliers. Please note consideration must be given to anonymisation of any personal data for data to be published as Open Data under CC-BY 4.0 licences (as recommended for Irish Government Open Data publication)
7	An NPWS project ID is used to archive all the projects data resources. This consists of an 11-character code: ####_PPPP## (e.g. 0602_LMPV09) where first four digits (####) refer to

RULE NO.	NAMING/FORMATTING RULE
	NPWS internal project theme/category classification while last six characters (PPPP##) are a unique, project specific alphanumeric code. For the top-level directory name use the Project ID followed by '_01' suffix denoting the project baseline version (e.g. 0605_LMPV08_01). When naming individual files use only last six characters from Project ID (PPPP##) as a prefix with file version name as a suffix: PPPP##_file_name_01.* (e.g. LMPV08_QC_Report_01.docx). In case of files, versioning is the sole responsibility of the Supplier.
8	In order that drafts and revisions can be managed more easily; Suppliers must include a version number on these documents. Use the convention: 01a, 01b, 01c ... 02a, 02b, etc. Increment the digits for project versions (major revisions - change of projects' directory structure and content, new resources, resubmission) and the letters (a-z) for file-level updates (minor revisions – corrections to individual files).
9	Be consistent, particularly when it comes to spacing and punctuation, spelling of names and locations.
10	NPWS conventions for commonly used attributes are provided in the Data Fields template: *NPWS_Data_Fields<ver>.xlsx*

2.3 - Database Standards

2.3.1 - NPWS Database Templates

- NPWS has several generic habitat and species database templates (in MS Access format) as well as several specific database templates developed as part of specific monitoring protocols (see Table 2, folder 'monitoring' and paragraph 2.5.6 for more detail). The use of an existing templates or otherwise should be agreed with the NPWS Project Coordinator and the NPWS Data Specialist and agreed at the Data Kick-off meeting.

2.3.2 - Guidelines for NPWS Databases

- The following are basic principles of database design intended to inform Suppliers on how NPWS will be evaluating submitted databases as part of internal QA/QC checks.
- Whenever a database is expected to be part of the project deliverables, NPWS advises that Suppliers request advice from the NPWS Data Specialist.

- Note that the description presented here only provides an initial guide to the design, creation and development of a database. It provides an insight into terminology, basic design concepts and rules, that the contents of your database should follow. The design and creation of a user interface for data management and reporting is beyond the scope of this guidance.
- Where NPWS project tabular data is likely to amount to more than one or two tables, a relational database format is recommended such as a Microsoft Access database, rather than a spreadsheet format. The project data content will be more clearly defined in a database format and relational databases permit relationships between tables to be represented and reduces risk of data corruption.
- Microsoft Access should be considered as a database platform if building a novel tabular database for NPWS project data. Some of the table guidance and rules below for relational databases are also relevant to the attribution requirements for spatial data stores such as file geodatabases and shapefiles. Please consult with the NPWS Data Specialist in advance if other formats are proposed.
- Project Suppliers are expected to consult the NPWS Project Coordinator to establish if there is a pre-defined database template available that can be used as a starting point for collating and storing your project data, before designing any databases for the project. If a relevant template exists it is possible to extend the data model within a suitable pre-defined template, or to remove tables that are unnecessary.
- Project Suppliers should discuss and agree changes and must document any such changes in the supporting documentation and metadata when using NPWS provided database templates.

2.3.2 - Relational Database Terminology

- Table 6 below presents some common Relational Database Terminology.

Table 6. Common relational database terminology

FORMAL NAME	COMMON NAME	COMMENTS
Relation	Table	Tables are like a spreadsheet workbook with columns and rows. For naming, use one or more relevant words separated by underscores. Note that table names should start with a letter, they should not start with a number or special character such as an asterisk (*) or percent sign (%). Table Names should not contain reserved words, such as *select* or *add*. Consult your

FORMAL NAME	COMMON NAME	COMMENTS
		Database Management System (DBMS) documentation for additional reserved words.
Entity	Table	An entity is an object or a concept that can be described by many attributes and represented in the database as a table. A database can manage relationships between entities.
Relationships	Table Relationships	Relationships are associations between tables. In some cases, the relationship will be represented by a table linking to other entity tables. This permits the querying of data by linking tables together.
Attribute	Column (Field)	An attribute is a named property of a table that describes some aspect of the table object that should be recorded. The term covers both Attribute Name and associated Column content.
Attribute Name	Column Name (Heading)	Attribute names must be unique in each table. Alphanumeric names should be used. Attribute names must start with a letter and should not contain spaces or reserved words. Keep attribute name values short and add underscores between words. Shapefiles have a 10-character limit for attribute names. Be sure to apply this limit where data are being exported to shapefiles from other formats, to avoid attribute names being truncated.
Attribute Type	Data Type	Indicates the nature of the data stored by the attribute. Different database platforms provide a wide range of data types but six commonly applied categories: numeric (including integer and decimal), string, date, time, binary and miscellaneous.
Attribute Value	Column Cell Value	A single value per cell as defined by the attribute data type.
Tuple	Row	The values in all table columns, containing one value per column. Each row in the table must be unique.
Primary Key	Primary Keyword, Unique Identifier	There can be only one Primary key for a table. This is the candidate key that is selected to identify rows or tuples uniquely within the table.

FORMAL NAME	COMMON NAME	COMMENTS
Foreign Key	Referencing key	An attribute, or set of attributes, within one relation that matches the candidate key of some (possibly the same) table (relation). They are used for linking tables.

- Relational databases usually hold multiple tables and details of the relationships between the tables.
- For tabular relational databases with multiple tables the data requirements should be analysed and designed to produce a set of normalised tables that minimise data redundancy and improve consistency and integrity.
- A simple example of a table occurrence with attribute values is presented in Figure 4, below for the table: *site*.

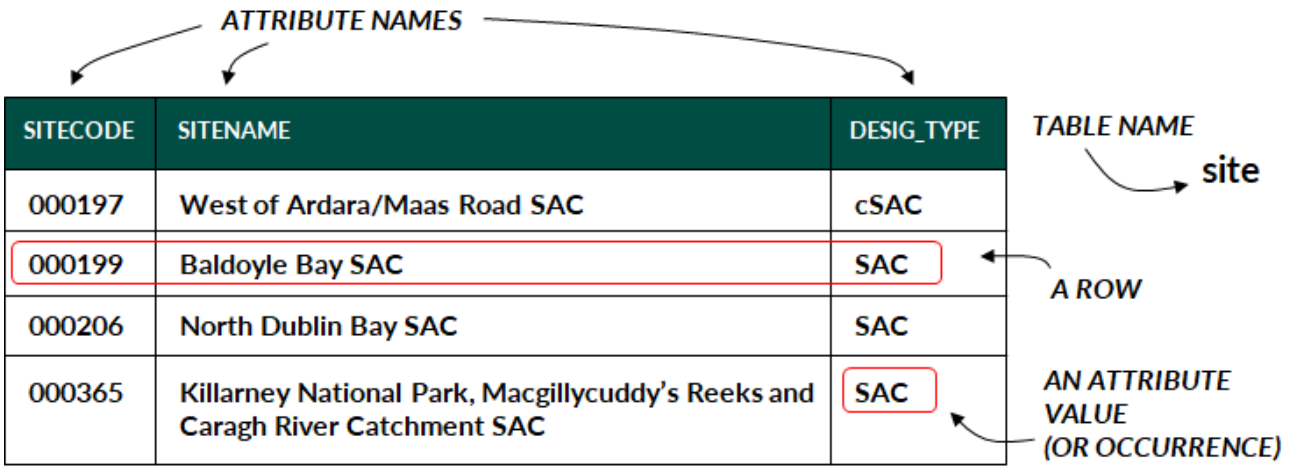

Figure 4. A sample database table '*site*'

2.3.3 - Database Analysis and Design Guidance

- One useful way to represent the entities and relationships that a tabular database contains is a visual Entity-Relationship Model (an ER model). This provides a top-down approach to designing a database. The w3schools website provides a DBMS Tutorial that includes basic details of ER models and other database concepts:

  https://www.w3schools.in/dbms

- Start with the production of a list of entities relevant to your project.

- List the likely **relationships** between entities. For example, a ***site*** may have none, one or many associated ***habitats*** recorded so a relationship between the two entities will be required. Consider the possibility that relationships between entities can be represented by a table.
- List the associated properties of each entity (and relationship) as attributes, listing their meaning along with a suitable name.
- You can prototype your database designs as Entity-Relationship Diagrams (ERDs) and Relational Schemas (Diagrams) using visual diagramming software such as the free, web-based tool ERDPlus.
- An example of an Entity-Relationship Diagram and a Relational Schema Diagram illustrating ***relationships*** between ***entities*** and ***attributes*** are shown as Figure 5 and Figure 6 below respectively.
- Apply appropriate data types for each attribute, along with length. For decimal numbers please identify the precision (length) and scale (decimal places). Select the smallest data type that matches the kind of data you have and that permits all the feasible values of your data. Naming of data types varies between data systems, but common data types are integers, numeric (x, y), date, datetime, text (varchar), and Boolean (true/false).

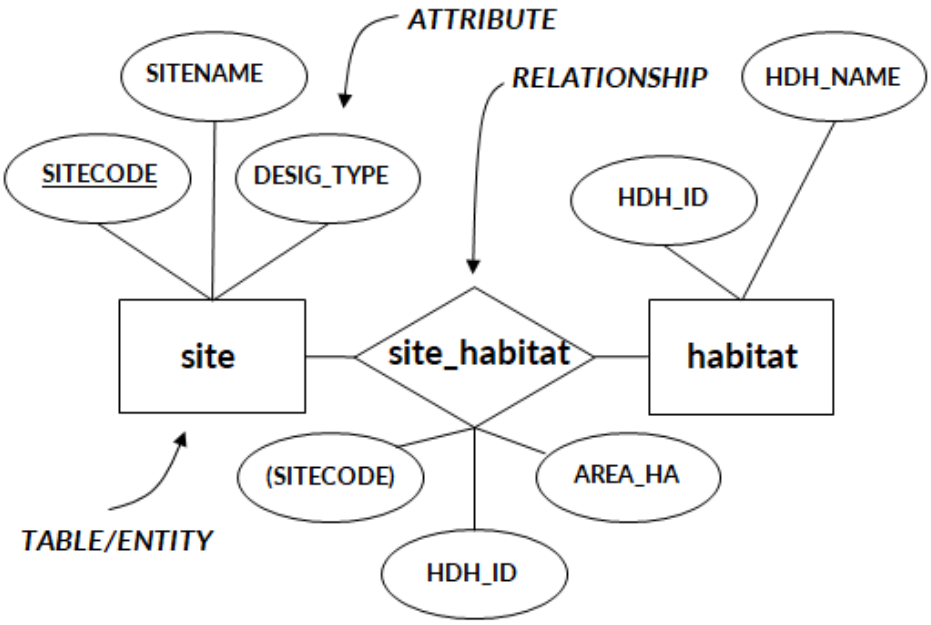

Figure 5. A sample notional Entity-Relationship Diagram (ERD)

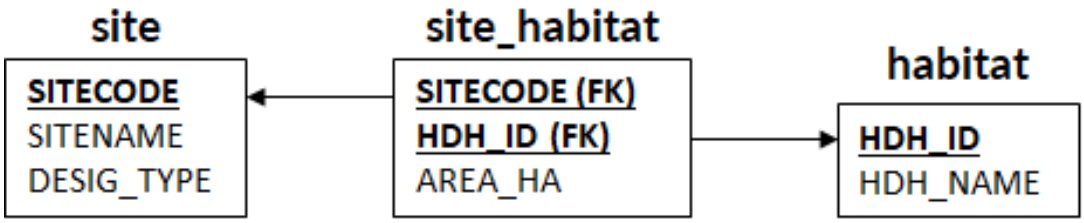

Figure 6. A sample database Relational Schema Diagram

- Note that when links were made between the 3 tables in Figure 6, above, two foreign key attributes (FK) were applied to the ***site_habitat*** table. A foreign key is generally an attribute (or attributes) within one table that matches the candidate key of some other table. The database topic *foreign key constraint* is not detailed in this document.
- When considering the range of values for an attribute please note that an attribute can have *null* values indicating that the value is 'unknown'. Nulls are a way of representing incomplete or exceptional data. Note that null is not the same as a numeric zero or a space filled text string. This is the absence of a value. Where possible avoid using null values in your databases.
- You can export a generic SQL Data Definition Language (DDL) statement from a Relational Schema in ERDPlus that you can use to build your database. See sample SQL DDL statements below:

```
CREATE TABLE site
(
 sitecode CHAR(6) NOT NULL,
 sitename VARCHAR(100) NOT NULL,
 desig_type CHAR(4) NOT NULL,
 PRIMARY KEY (sitecode)
);

CREATE TABLE habitat
(
 hdh_id CHAR(4) NOT NULL,
 hdh_name VARCHAR(110) NOT NULL,
 PRIMARY KEY (hdh_id)
);

CREATE TABLE site_habitat
(
 sitecode CHAR(6) NOT NULL,
 hdh_id CHAR(4) NOT NULL,
 area_ha NUMERIC(10,2) NOT NULL,
 PRIMARY KEY (sitecode, hdh_id),
 FOREIGN KEY (sitecode) REFERENCES site(sitecode),
 FOREIGN KEY (hdh_id) REFERENCES habitat(hdh_id)
);
```

2.3.4 - Database Table Content Design Guidance

- If you need to hold your project data in a tabular database and a pre-made template is not available, then you are advised to begin by listing candidate entity types. Relevant examples of tables may include entities such as ***site***, ***habitat*** and ***taxon***.
- List the likely attributes for each entity table. After listing the candidate tables for your project data, you should then assess the relationships between tables. Generally, a site will have zero, one or many habitats associated with the site, and you will want to maintain a list of these habitats per site in the database, therefore a relationship link table named ***site_habitat*** can be created to hold details. A potential structure for the ***site_habitat*** table is presented in Figure 7, below.

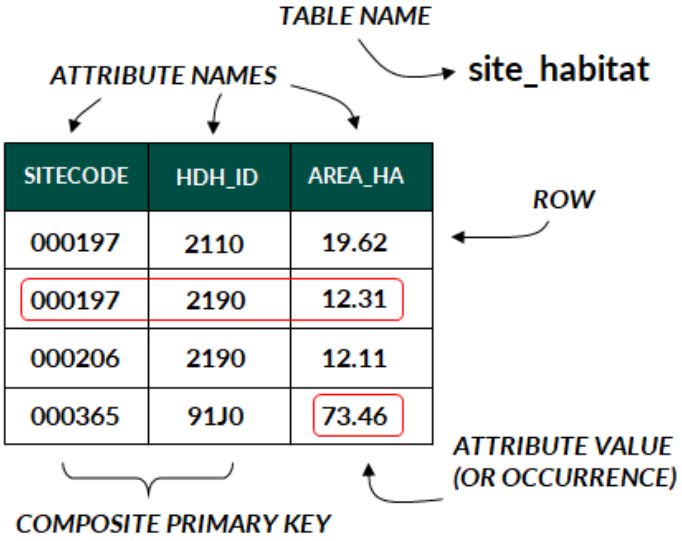

Figure 7. A sample database table '*site_habitat*'

- Ensure data types are an appropriate fit for the chosen attributes. An initial analysis of the ***site_habitat*** table in Figure 8, below suggests the following data types and formats.
- In the case of the ***site_habitat*** table above a combination of the attribute columns *SITECODE* + *HDH_ID* is sufficient to uniquely identify a table row. These attributes together form a composite candidate Primary Key. There may be other candidates but, in this case, the primary key chosen is based on attribute length and certainty of uniqueness.

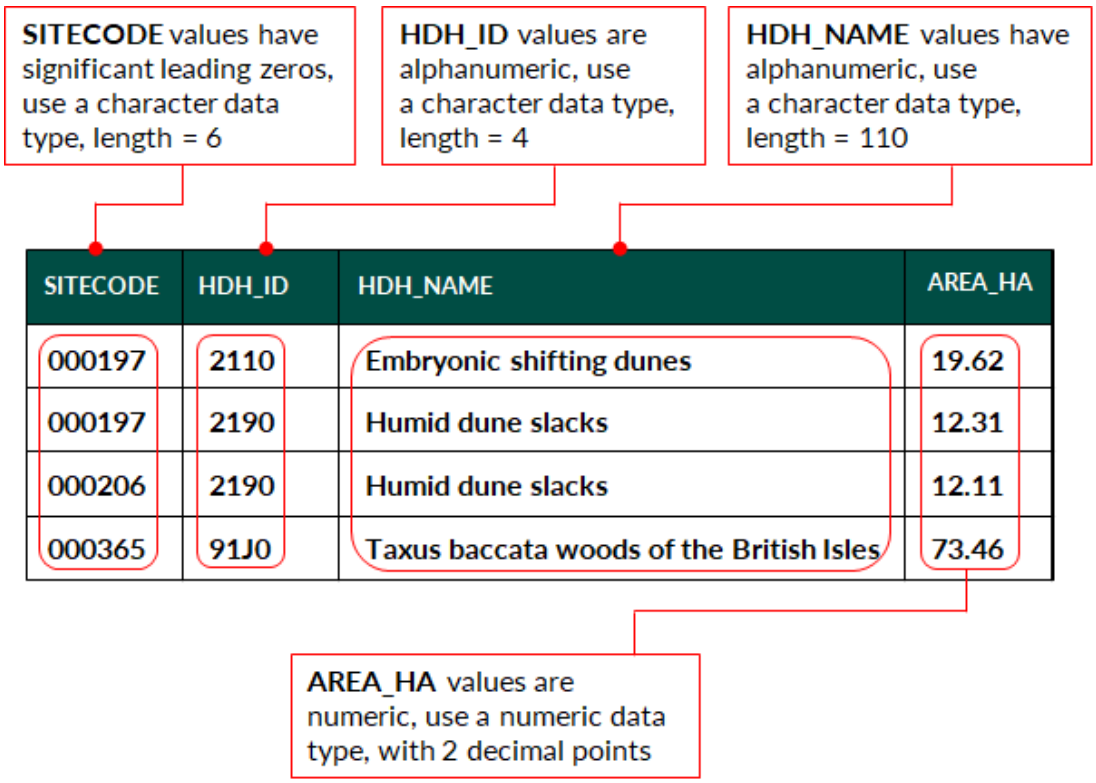

Figure 8. Assigning data types and format to attribute columns

- Please note that attribute HDH_NAME has been posted in this figure to better illustrate the content and does not represent optimal normalisation of this table.

2.3.5 - General Database Rules

The Table 7 below collates database-specific naming and design rules that are to be followed when designing a database for an NPWS funded project. Each database design must be approved by the NPWS Project Coordinator and the NPWS Data Specialist prior to commencement of the data capture phase. Appropriate documentation should accompany any new database deliveries. New attributes should be documented in a data dictionary, including details on any abbreviations used and field name aliases.

Table 7. General database rules

RULE NO.	NAMING/DESIGN RULE
1	Table names are usually written in the singular (e.g. Bird rather than Birds) and they should reflect the entity they represent. They should be descriptive yet concise.
2	Apply alphanumeric attribute names. Do not start an Attribute name with a numeric character. Keep attribute names short (Shapefiles have a 10-character limit for attribute names. Be sure to apply this limit where data are being exported to shapefiles from other

RULE NO.	NAMING/DESIGN RULE
	formats, to avoid attribute names being truncated) and add underscores between words. Use abbreviations when necessary to shorten attribute names.
3	Attribute Name/Column names must be unique within the table.
4	The case of Attribute names is dependent on the proposed database platform. PostgreSQL attribute names are best applied as lower-case names.
5	Each row/column intersection (cell) contains a single attribute value. Multiple values are generally not allowed in a cell.
6	Each row in a table must be distinct; no two rows can have all the same attribute values. (A row can always be uniquely identified by quoting an appropriate combination of attribute values.)
7	Ideally apply a unique identifier column to each table, commonly known as a *primary key*. This will be used to identify an individual row. The values in participating columns should not be Null.
8	Use unique project author initials and build a table to maintain the full names of the author (Supplier). Numeric codes could be applied instead of initials. Use of a Supplier Name table will facilitate Open Data publishing by excluding the Supplier Name table from the Open Data representation, thereby meeting GDPR requirements. NPWS will retain the Supplier Name table for internal use.

2.3.6 - Quality Checks

- QA/QC checks must be carried out on databases by third party Suppliers before submission.
- Suppliers should use database design principles and nomenclature standards outlined above as a guidance on typically required quality checks.

2.4 - Geospatial Data (GIS) Standards

All geospatial datasets that are supplied to NPWS as part of a project's contract must follow the standards/guidelines outlined below to ensure locational data consistency and integrity, and to ensure compatibility with NPWS systems and other datasets.

2.4.1 - Geospatial Data Formats

The Open Data Directive mandates the release of public sector data in free and open formats, for this reason NPWS requires geospatial data to be supplied in one of the recommended Open Data Formats (e.g. shapefile). While some proprietary geospatial formats like geodatabases* will be accepted, in these cases data must also be supplied in an open data format like shapefile.

- Data will be accepted in the following GIS\Geospatial formats.
    - Vector Format: Shapefile (.shp)
        - Please note Shapefiles consist of several component files, the following essential shapefile components must be supplied:
            - SHP (is the feature geometry).
            - SHX (is the shape index position).
            - DBF (is the attribute data).
            - PRJ (is the projection system)
    - Geographic/Spatial Database: File Geodatabase (.gdb)*, Geopackage (.gpkg).

      While geodatabases will be accepted by NPWS, the feature classes contained within must also be exported and supplied in shapefile format. If the geodatabase uses domains/drop downs please ensure 'Transfer Field Domain Description' is ticked on when exporting. This is a **mandatory requirement.*
    - Raster Formats: GeoTIFF (.tiff, .tif), ASCII Grid (.asc), ECW (.ecw), JPG or JPEG2000 with world file (.jpg or .jp2 & .jgw), IMG (.img).
    - LiDAR: LAS (.las), LAZ (.laz), ASCII XYZ (.xyz)
    - Additional GIS File Formats may also be accepted for internal archiving purposes: ArcGIS Pro Project (.aprx), ArcMap Map Document (.mxd), Layer File (.lyr or .lyrx), ESRI Toolbox (.tbx).
    - In exceptional circumstances, NPWS may accept other GIS formats, but only after consultation with the NPWS Data Specialist.
- Where possible, Suppliers are asked to provide spatial project deliverables as Map Packages or Project Packages, which are self-contained packages, containing both the map document/Project as well as all data layers. Please consult the ESRI Help site ESRI - Introduction to sharing packages detailing how to create a Map/Project Package using ESRI software or use the QGIS website to clarify creation of equivalent packages (e.g. Geopacker).

2.4.2 - Coordinates Systems and Geospatial Metadata

- Terrestrial spatial data must be submitted in Irish Transverse Mercator (IRENET95 / ITM, EPSG:2157) projected coordinate system*. The Irish Grid (TM75, EPSG: 29903) coordinate system is no longer accepted by NPWS for primary geospatial data delivery. Tailte Éireann make available a free Coordinate Conversion Tool for point data referenced in Irish Grid, ITM and ETRF89. ESRI also provide an approved NTv2 transformation within ArcGIS desktop software that accurately transforms Irish Grid points, lines and polygons to ITM. Equivalent NTv2 transformation functionality is also available for reprojecting between Irish Grid and ITM in QGIS.

  **For backwards compatibility, grid distributions for terrestrial habitats and species reporting under Article 17 and Article 12 mapping can be supplied in Irish Grid. However, the detailed underlying point, line or polygon data from which the grid data is derived should be supplied in Irish Transverse Mercator (ITM).*

- Marine spatial data must be submitted in World Geodetic System 1984 (WGS84, EPSG:4326) geographic coordinate system.
- Geospatial metadata must be provided in an XML format (.XML) for each individual spatial dataset. This is in addition to the general mandatory metadata submission. Metadata about spatial deliverables must also be captured in line with requirements outlined in paragraph 2.7.

2.4.3 - Attribution

- Supplier should adhere to the attribute schema where supplied.
- Please refer to the Data Field template which provides NPWS naming conventions for commonly used data fields (see further paragraph 2.5.2 below):
  ..\@templates\data_fields\NPWS_Data_Fields_<ver>.xlsx
- Use appropriate naming conventions, i.e. avoid spaces and special characters, avoid reserved\key words, keep field names concise (10-character limit for Shapefiles) but descriptive and use aliases to provide a clearer description. Please consult Table 5 in paragraph 2.2 for full naming convention rules.
- The unit of measurement should be specified in the field name (e.g. AREA_HA, AREA_M2, LENGTH_M, LENGTH_KM).
- The appropriate data type (i.e. integer, float, text, date) should be selected for each attribute in the dataset. Fields containing dates should always use the 'date' field type.
- Try to avoid mixing data types in one field (e.g. mixing number and text in the same field, e.g. 1050mm).

- Ensure consistency in the use of attribute values, avoid variation in spelling, spacing and punctuation (i.e. “Barley Cove, Mizen Hd.” and “Barly Cove, Mizen Head”). Consider using drop downs or domains to ensure consistency in attribute values.
- Appropriate consideration should be given to how Null values are handled, and a consistent approach should be taken.
- Minimise redundancy, avoid unnecessary duplication of fields.

2.4.4 - Scale, Resolution and Accuracy

- Generally, the tendering stage of a project will specify the surveying methodology, and accuracy & scale requirements. The NPWS Project Coordinator will also be available to discuss and agree those matters with the Supplier before the data capture phase of a project commences.
- All digitising must be carried out against up-to-date authoritative spatial data (i.e. TE - Prime 2), base maps or ortho-imagery (at a suitable resolution for the project) in the ITM coordinate reference system for terrestrial surveys.
- For data being captured in the field, Suppliers are expected to understand the positional accuracy of the GNSS\GPS device being used and ensure it can record the features to the specified resolution for the project (e.g. ± 2m).
- Information on resolution, digitising procedures, equipment used, positional accuracy of GNSS\GPS devices used, and quality control procedures should be included in the metadata for each individual dataset.

2.4.5 - Mobile Field Data Collection Applications

- Geospatial data captured using mobile field data collection applications should adhere to the data standards and guidelines outlined in this document.
- If a project has a requirement to collaborate with the NPWS GIS environment or to use NPWS hosted field applications for data collection, this must be discussed and agreed with the NPWS Project Coordinator and the NPWS Data Specialist in advance.

2.4.6 - GIS Data Publication – Dashboards, Viewers

- If there is a plan to develop web map applications (e.g. dashboards or map viewers) as part of the project, these should be discussed and agreed in advance with the NPWS Project Coordinator and the NPWS Data Specialist.

2.4.6 - Maps

- PDF versions of maps should accompany a delivery as reference documents, (saved in the *data\maps* folder), these should have a resolution of 300 dpi (dots per inch) or greater and with fonts embedded.

2.4.7 - Quality Checks

- QA/QC checks must be carried out on the GIS\Geospatial data by third party Suppliers before submission.
- Ensure the data is captured to the agreed scale and resolution.
- Ensure spatial accuracy (e.g. precise digitising, tracing or snapping to authoritative data sources (e.g. TE – Prime2), data captured with suitable GPS\GNSS accuracy). Data should be captured with precision and should accurately represent the features being recorded.
- Carry out geometry checks to ensure there are no sliver polygons, erroneously overlapping polygons or gaps, self-intersecting polygons, hanging nodes, invalid multipart polygons, duplicate features, or omissions. GIS and Geospatial software provide tools for undertaking geometry quality checks, and these should be utilised (ESRI Geometry Check, QGIS Geometry Check*).
- Ensure QA/QC has been completed and correct any missing or erroneous data in attribute fields.
- Typical QA/QC checks are listed in the Supplier checklist form provided in the Project Delivery Pack:

  NPWS_Project_Supplier_checklist_form_enabled_<ver>.pdf

  **Please note that geometry checks carried out using different software might yield slightly different results. NPWS utilises ArcGIS Pro to carry out geometry checks.*

2.5 - General Data Standards

2.5.1 - Projects Footprint

- A GIS file identifying the project's spatial footprint with basic information (e.g. Project ID, project start/end date) may be requested at an early stage of the project. Details will be agreed during the Data Kick-off meeting.

2.5.2 - Data Fields

- Suppliers need to ensure, where relevant, that the data fields used in the datasets conform to the data fields template provided as part of Project Delivery Pack. These are important data fields used internally by NPWS across several applications and must conform to the guidelines.
- An NPWS data fields template is provided, listing preferred data field names commonly used across several NPWS applications, as part of the Project Delivery Pack:

  NPWS_data_fields_<ver>.xlsx
- Where Suppliers are using any of the listed data fields as attributes in their own datasets, these must conform to the guidance on their use provided in the data fields template, unless agreed otherwise with the NPWS Project Coordinator and NPWS Data.

2.5.3 - Species Occurrence Data

- Suppliers should use the MS Excel template provided as part of Project Delivery Pack for all species records submissions:

  recorder_import_template.xlsx

  Species records are held by NPWS in a Recorder 6 database. The Excel template provided is the preferred method of submission of species records to NPWS.
- Species records, at a minimum, require a species name, grid reference, date and surveyor name, but a measure of abundance suited to the species should also be provided where possible.
- Marine mammal data requirements (Cetaceans and Seals) and all birds data requirements should be agreed with the NPWS Project Coordinator from the NPWS Scientific Advice and Research Directorate prior to commencement of data capture.
- If there are any limitations on data presentation or access due to sensitivity of data, arising from but not limited to: licensing restrictions, copyright constraints, GDPR compliance, environmental risk (sensitive data) etc., these should be brought to the attention of the NPWS Project Coordinator, to plan for data storage and sharing,

2.5.4 - Vegetation Data

- Where possible, projects recording vegetation data should use standard relevés and recognised abundance scales (DOMIN, DAFOR, etc.) as required.

- NPWS requires Suppliers to follow the *Guidelines and Standards for the Collection and Storage of Vegetation Data* in Ireland. This resource is available online at NBDC - Irish Wildlife Manual No. 49. The resource includes a standardised Relevé Recording card and guidelines on its use.
- The 2024 Irish Vegetation Classification and associated resources are available on NBDC website to support accurate vegetation data classification.
- The Supplier must ensure that the proposed relevé is of an appropriate size and dimension and it must be a size that has been agreed upon with the relevant NPWS habitat expert.
- Where appropriate, Suppliers should ensure that relevés are collected in a manner that facilitates habitat monitoring requirements (e.g. besides full relevé collection, monitoring stop data are also collected).
- Vegetation data should be entered directly into either SynBioSys - Turboveg 2 for Windows relevé management application or into a standard MS Excel template for upload into Turboveg (the template is available as part of the Project Delivery Pack):

  Turboveg_Excel_template.xlsx
- With the recent availability of Turboveg 3 for Windows, a further alternative vegetation data management system can be used. Turboveg 2 manages vegetation data in a relatively simple dBASE III Plus data model. Turboveg 3 offers a much more sophisticated data model, and the data are managed in a single SQLite database. If NPWS project data Suppliers intend to use Turboveg 3 to manage vegetation data, please notify the NPWS Project Coordinator. It is possible to import and export Turboveg 2 databases with Turboveg 3.
- Both Turboveg 2 and Turboveg 3 require a taxonomic checklist to permit vegetation recording. Please consult Section 3 – Nomenclature Standards for latest available taxonomic checklists.
- Suppliers are encouraged to use Digital Data Capture systems (for improved accuracy and reduction of data entry errors) for field data collection wherever available. For example, Turboveg software is available as an Android application – TurbovegSD, it can be used on any Android-compatible mobile device.
- Suppliers are expected to use the latest accepted taxon nomenclature for Irish plants when recording vegetation records. Please consult Section 3 – Nomenclature Standards below for list of NPWS recommended checklists and relevant literature references.

2.5.5 - Habitat Data

- NPWS utilises two habitat classification schemes:

- Habitats Directive habitat classification scheme. For further details please consult the Habitats Directive web resource provided by the European Commission.
- Heritage Council habitat classification scheme. For further details please consult A Guide to Habitats in Ireland and Best Practice and Guidance for Habitat Surveying and Mapping both published by The Heritage Council.

- Suppliers should refer to the habitat mapping guidance and Irish Vegetation Classification documents and resources cited above while developing their habitat mapping methodology. Developed methods must be authorised by the NPWS Project Coordinator before field mapping and digitising phases commence.
- Suppliers are required, where possible, to supply habitat maps utilising both the Habitats Directive and Heritage Council classification schemes.

2.5.6 - Monitoring Data

- Data collected during monitoring surveys should, where possible, follow standards and formats that will allow the data to be incorporated seamlessly into existing records. The Supplier must consult with NPWS prior to the data capture phase if they anticipate that any deviation from these standards and formats will be necessary.
- Suppliers are reminded that—in addition to the data derived from species, vegetation and habitat surveys—monitoring surveys also collect data on indicators that will allow the assessment of conservation status. The indicators must be appropriate to the survey, easy to assess and they must be repeatable.
- Monitoring protocols have been developed for specific habitats and species surveys by NPWS, for which specific monitoring templates (databases and score cards, see details in Table 2) which are included in the templates) have been developed. These templates should be used unless otherwise agreed with the relevant NPWS specialist. The appropriate templates should be confirmed at the Data Kick-off meeting.
- Suppliers will be required to provide information on the areas surveyed, including detail on the type and time of survey.
- NPWS will provide the Supplier with a list of activities and a protocol covering the assessment of the impacts that these activities might have. The protocol, the list of impacts and the guidance documents will be provided to the Supplier as part of the Project Delivery Pack:

  ..\@templates\monitoring

- The Supplier is reminded that, as monitoring surveys are repeated over time, it is vital to ensure that enough samples are surveyed to allow NPWS to detect change in a statistically robust manner over time. If the Supplier is concerned as to what constitutes a statistically robust sample count, they are encouraged to consult with the NPWS Project Coordinator and the NPWS Monitoring Unit.
- Suppliers are expected to use the standardised Habitat Monitoring database template that has been developed by NPWS: this is to ensure compatibility with existing records. This template will be provided to Suppliers as part of the Project Delivery Pack:

  ..\@templates\monitoring

2.5.7 - Protected Site Data

- If a Supplier is surveying a designated or non-designated Protected Site [Special Protection Areas (SPA), Special Areas of Conservation (SAC) or Natural Heritage Areas (NHA)] the collected data must always be accompanied by a full list of the sites that were surveyed, together with their individual Site Codes and boundary version used.
- The Protected Sites listings can be viewed on the NPWS website in the Protected Sites webpage or downloaded from Designated site data page – SAC and SPA datasheets.
- Historical data related to Protected Sites can be made available on request. Please contact NPWS directly.
- Suppliers must ensure consistency with the data schema, including site codes and site names and boundary versioning used in the published NPWS protected sites data.

2.6 - Image, Video and Audio Data

The following paragraph covers general guidance for delivery of image, video or audio data. The specific data requirements will vary depending on the application and should be agreed in advance with the NPWS Project Coordinator and the NPWS Data Specialist.

- Image and video deliverables must be submitted in their digital versions. The Supplier must use the opportunity to store the highest quality image possible photographing particularly if photographing or taking video a species of interest or relevés. In such cases RAW format is preferred.

- DNG (Digital Negative) - non-proprietary, open RAW file format is the NPWS format of choice for RAW image files. Files in other RAW formats can be converted to DNG using the freely available Adobe - DNG Converter.
- Lossless formats of media files are preferred. Supplier should follow the following guidelines:
    - Images: RAW > TIFF > JPEG.
    - Video: RAW > MOV using ProRes 422 HQ codec; MKV using FFV1/LPCM codecs (or other lossless compression formats) > MP4 using H.264 video (or other formats compatible with standard Windows codes).
    - Audio: WAV/AIFF > FLAC > MP3/AAC (or other formats compatible with standard Windows codes).
- TIFF and JPEG are the formats of choice for processed images. TIFF format is preferred to JPEG as the latter may suffer from diminished image quality due to the method used to achieve file compression.
- FLAC and MP3/AAC are the formats of choice for processed audio. FLAC is preferred to MP3/AAC because it offers lossless compression and thus higher quality.
- Images, videos and audio must be accompanied by metadata recorded in corresponding forms provided as part of Project Delivery Pack:

  audio_catalogue_template.xlsx
  image_catalogue_template.xlsx
  video_catalogue_template.xlsx
- A set of corresponding batch files is provided as part of Project Delivery Pack to create a manifest of all images, videos and audio files:

  build_audio_list.bat
  build_iamge_list.bat
  build_video_list.bat
- When supplying both processed/compressed and unprocessed/uncompressed formats of image, video and audio the different data formats must be stored separately.
- If using specific applications or digital surveys, then the format captured by the app/device takes precedence.

- Please note that it is advisable, if possible, to set up recording devices so that files names conform to naming convention at the point of capture of the data. It will save Suppliers time when preparing files for final delivery.

2.7 - Metadata

- Metadata is the data about data. It means information that describes a dataset making it possible to discover, inventory and use the dataset. The key resource used for consistent metadata elements across all projects is the NPWS Resource Catalogue Form. Detailed and expanded description of all fields in the form are provided in the NPWS Resource Catalogue Guidelines document, provided as part of Project Delivery Pack:

  ..\@templates\resource_catalogue\guidance_document

- Metadata for spatial datasets must be compliant with the EU INSPIRE 2007/2/EC directive. The NPWS Resource Catalogue form incorporates elements from other metadata specifications including other metadata standard requirements such as ISO 19115, Dublin Core Metadata Initiative and the Global Biodiversity Information Facility issued Darwin Core standard.

- To facilitate the capture of metadata in compliance with the standards listed above, an NPWS Resource Catalogue form, example forms, and guidance documentation are provided as part of the Project Delivery Pack:

  ResourceCatalogueForm_<ver>_enabled.pdf

  INSPIRE_Lineage_guidance.docx

  NPWS_Resource_Catalogue_Guidelines_<ver>.pdf

- Metadata must be submitted to NPWS according to the NPWS Resource Catalogue Guidelines. This is a **mandatory requirement**.
- NPWS advises Suppliers to review the Resource Catalogue form and associated guidance documents at the earliest opportunity and allocate sufficient resources for the creation of this mandatory deliverable.

2.8 - Report Format

- Documents should be supplied in MS Word format (DOCX), or in Rich Text Format (RTF).
- If required to deliver PDF versions of documents, please produce a PDF/A -1a (ISO 19005-1) compliant PDF document for key reports. (When generating PDF from Microsoft Word 2016 or

later application ensure that ISO 19005-1 compliant PDF version is selected from Save As > Options contextual menu).

- All diagrams created as part of the project should be supplied separately in full resolution, lossless or suitable vector format agreed with the NPWS Project Coordinator and the NPWS Data Specialist.
- The NPWS Project Coordinator will confirm if a project report is to be provided in a specific reporting template [such as the Irish Wildlife Manual (IWM)]. Final draft of an IWM must be complete and submitted in the *.docx* format.
- The Irish Wildlife Manual template, accompanied by instructions, is made available to Suppliers as part of the Project Delivery Pack:

  NPWS_IWM_Guidelines_for_Authors_<ver>.pdf

  NPWS_IWM_Template_<ver>.dotx

2.9 - Excerpts from NPWS Data-related Policies

2.9.1 - Data Ownership

- Please refer to the Request for Tender (RFT) and contractual Intellectual Property (IP) documentation relating to the IP of your project.
- Any datasets (raw, derived or spatial), reports and other products created as part of an NPWS funded project are contractually required to become the sole property of the Minister for Housing, Local Government and Heritage, unless otherwise decided by the NPWS Project Coordinator.
- Ownership of any datasets (raw, derived or spatial), reports and other products created as part of projects co-funded by NPWS and other public or private partners will be decided on project-by-project basis and subject to an Intellectual Property (IP) agreement between NPWS and their partners.

2.9.2 - Access and Acquisition of Third-party Data

- Suppliers may avail of NPWS licenced spatial data e.g. basemaps and ortho-photography created by Tailte Éireann (formerly Ordnance Survey Ireland), Bluesky® and LIDAR data respectively for the purpose of delivering on NPWS projects. Suppliers that wish to access these data must discuss with the NPWS Project Coordinator and the NPWS Data Specialist in advance and complete and sign the appropriate *Third-Party Licence Agreement* form for delivery to the NPWS Project

Coordinator. Three blank Third-Party Agreement forms containing licencing agreement are part of the Project Delivery Pack and can be accessed from the following Project Delivery Pack directory:

..\@templates\third_party_data_agreement

- Each NPWS licenced dataset source has a separate third-party licence agreement form:

  Tailte_NPWS_Third_Party_Licence_Agreement_Form_<ver>.docx

  Bluesky_NPWS_Third_Party_Licence_Agreement_Form_<ver>.docx

  LIDAR_NPWS_Third_Party_Licence_Agreement_Form_<ver>.docx

- When third-party and/or proprietary data is acquired by the Supplier as part of an NPWS funded project, they must ensure that appropriate rights for use of the data are acquired. Unless otherwise specified or agreed, third-party and/or proprietary data acquired by the Supplier as part of an NPWS funded project must be appropriately licenced for use by NPWS and the Department of Housing, Local Government and Heritage. The Supplier shall supply all data acquired from third-parties as part of the project delivery along with evidence of the licence agreement.
- Access to third-party and/or proprietary data for the purpose of delivering on NPWS projects is allowed, if it does not impact on NPWS ownership rights to project deliverables, including acquisition of any third-party data.

2.9.3 - Open Data Policy

- NPWS, as a public sector body, is bound by the Open data and re-use of public sector information Directive (EU) 2019/1024. It was transposed into Irish law by Statutory Instrument 376/2021 on 22nd of July 2021. This legislation mandates the release of public sector data in free and open formats. The directive emphasises the need for maintaining consistent, internationally recognised data delivery standards and practices, as described in this document.
- NPWS is actively engaged in the Ireland's Open Data Initiative (ODI) which is part of Government of Ireland Open Data Strategy for 2023-2027. NPWS aims to publish, where appropriate, its datasets to the NPWS website and the Open Data portal.
- NPWS Open Data Policy for storing and disseminating biodiversity data (spatial and non-spatial) is available online at NPWS Open Data Policy.

2.9.4 - Data Protection

- NPWS and all Suppliers are bound by the General Data Protection Regulation (GDPR) (EU) 2016/679. It applies generally to the processing of personal data in the EU, setting out extensive obligations on data controllers and processors, and provides strengthened protections for data subjects. In Ireland, the national law, which amongst other things, gives further effect to the GDPR, is the Data Protection Act 2018.
- A biological record should where possible include the Recorder and or the Determiner/Verifier names as they are part of scientific records and can be considered a quality qualifier and thus fall under Legitimate Interest clause. This is critical for assessing accuracy of Recorder's determinations in the field (e.g. a student might not be as skilled as botany professor when identifying plant species).
- However, as the recommended Open Data Licence CCBY licence precludes inclusion of personal identifiers, the NPWS Project Coordinator must request Suppliers to supply both an uncensored original version along with an anonymised/pseudonymised version suitable for Open Data publication.
- When data submitted to NPWS contains personal data, Suppliers are required to state this clearly, in the '*Conditions on access and use*' field in the Resource Catalogue Form (see paragraph 2.7), by inserting the following statement:

  'THIS RESOURCE CONTAINS PERSONAL DATA'

- The Data Protection Commission Guidance Note on anonymisation and pseudonymisation of personal data is available online at:

  DPC - Guidance on Anonymisation and Pseudonymisation – June 2019.

- The NPWS Project Coordinator should ensure compliance with the Department's Data Protection Policy, the current version of which is available online at:

  DHLGH - Data Protection Policy - March 2023.

2.9.5 - Sensitive Data

- Where data is considered sensitive, the NPWS Project Coordinator may request Suppliers to provide a version of the data at full resolution and an additional version where the location and or attribution information is generalised in accordance with Global Biodiversity Information Facility recommendations on generalisation of species occurrence data, to enable dissemination as Open Data.

Section 3 - Nomenclature Standards

These are the standard nomenclatural references relating to species and habitats used by NPWS. For further information on primary source of distributional data please consult resources and references published by National Biodiversity Data Centre – NBDC.

Please note all external nomenclature links were verified at the date of publication on 22 April 2026.

3.1 - General

- Ferriss, S. E., Smith K. G., & Inskipp T. P. (eds.) (2009) Irish Biodiversity: a taxonomic inventory of fauna. Irish Wildlife Manuals, No. 38. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland. Available online at NPWS - Irish Wildlife Manual No. 38.

3.2 - Algae

- Gregor, T. (2024) Checklist of European Charophytes. In: Schubert, H., et al. Charophytes of Europe. Can be accessed online at Springer Nature.
- Guiry, M.D. (2019) A Preliminary Check-list of the Algae of Ireland. Available online at NBDC – Algae Preliminary Checklist.
- Guiry, M.D. (2012) A catalogue of Irish seaweeds. pp. [1]-250, 1 pl. Ruggell: A.R.G. Gantner Verlag K.G.
- John, D.M., Williamson, D.B. & Guiry, M.D. (2011) Catalogue of the desmids (Streptophycophyta, Zygnematophyceae, Zygnematales) of Ireland. Occasional Papers National Botanic Gardens Glasnevin Dublin 15: 1-83. Available online at AlgaeBase.
- Carter, R.T. (2011) The Freshwater Diatoms of Ireland. Available online at Diatoms Ireland.

3.3 - Fungi

- Legon, N.W., Henrici, A., Roberts, P.J., Spooner, B.M. & Watling, R., (2005) Checklist of the British and Irish Basidiomycota. Royal Botanic Gardens, Kew.
- Henderson, D.M., (2000) A Checklist of the Rust Fungi of the British Isles. British Mycological Society, Cambridge, England, UK.
- Fox, H., (2001) Census catalogue of the lichenicolous fungi of Ireland (~150 species). National Botanic Gardens, Dublin. Available online at NBDC - Lichenicolous Fungi Checklist.

3.4 - Plants

3.4.1 - Bryophytes

- Blockeel, T.L., Hodgetts, N.G., Pilkington, S.L. & Pescott, O.L. (2021) A census catalogue of British and Irish bryophytes 2021. British Bryological Society.
- Pilkington, S.L. & Hodgetts, N.G., with technical assistance from Blockeel, T.L. (2023) Interim Census Catalogue 2023. British Bryological Society.
- A complete checklist and census catalogue, together with machine readable census data, together with machine readable census data updated in June 2023, and previous editions of British and Irish Bryophytes are available online at BBS – Bryophytes Checklist.

3.4.2 - Lichens

- Coppins, B. J. (2002) Checklist of Lichens of Great Britain and Ireland. British Lichen Society, London. Available online at LichenIreland.
- Seaward, M.R.D. (2010) Census Catalogue of Irish Lichens (3rd Edition). National Museums Northern Ireland, Belfast.

3.4.3 - Vascular Plants

- A combined and fully synonymised vascular plant checklist (2021) has been collated by the National Botanic Gardens and is available online at NBDC - MS Excel.
- The 2024 Irish Vegetation Classification and associated resources are available on NBDC website.
- Further references to primary sources of distribution data are available online at NBDC – Vascular Plants.
- Stace, C. (2019) New Flora of the British Isles. 4th Edition. Cambridge University Press.

3.4.4 - Plant Communities

- White, J. & Doyle, G. (1982) The vegetation of Ireland: a catalogue raisonné. In: J. White (ed.), Studies on Irish Vegetation. Journal of Life Science, 3: 280-368. Dublin. Royal Dublin Society.
- Weekes, L.C. & FitzPatrick, Ú. (2010) The National Vegetation Database: Guidelines and Standards for the Collection and Storage of Vegetation Data in Ireland. Version 1.0. Irish Wildlife Manuals, No. 49. National Parks and Wildlife Service, Department of Environment,

Heritage and Local Government, Dublin, Ireland. Available online at NBDC – National Vegetation Database.

3.5 - Invertebrates

3.5.1 - Insects

- Summary table of national checklist for Irish Insects (2022) is available online at NBDC – Irish Insects. Checklist of Irish insects divided by orders are given below.

3.5.2 - Coleoptera - Beetles

- National checklist for Irish beetles is available online at Invertebrates Ireland as well as downloadable files in MS Word, MS Excel formats.

3.5.3 - Mollusca – Slugs & Snails

- National checklist for Irish slugs and snails is available online at Invertebrates Ireland as well as downloadable files in MS Word, MS Excel formats.
- Anderson, R. (2008) Annotated List of the Non-Marine Mollusca of Britain and Ireland. Conchological Society of Great Britain and Ireland. Available online at Conchological Society - Freshwater Snail and Slugs Checklist.

3.5.4 - Odonata – Dragonflies & Damselflies

- National checklist for Irish dragonflies and damselflies is available online at Invertebrates Ireland as well as downloadable files in MS Word, MS Excel formats.
- Askew, R. R. (2004) The Dragonflies of Europe. Brill, Netherlands.

3.5.5 - Ephemeroptera – Mayflies

- National checklist for Irish mayflies is available online at Invertebrates Ireland as well as downloadable files in MS Word, MS Excel formats.

3.5.6 - Plecoptera – Stoneflies

- National checklist for Irish stoneflies is available online at Invertebrates Ireland as well as downloadable files in MS Word, MS Excel formats.

3.5.7 - Megaloptera – Alderflies

- National checklist for Irish alderflies is available online at Invertebrates Ireland as well as downloadable files in MS Word, MS Excel formats.

3.5.8 - Trichoptera – Caddisflies

- National checklist for Irish caddisflies is available online at Invertebrates Ireland as well as downloadable files in MS Word, MS Excel formats.

3.5.9 - Mecoptera – Scorpion flies

- National checklist for Irish scorpion flies is available online at Invertebrates Ireland as well as downloadable files in MS Word, MS Excel formats.

3.5.10 - Araneae – Spiders

- National checklist for Irish spiders is available online at Invertebrates Ireland as well as downloadable files in MS Word, MS Excel formats.

3.5.11 - Opiliones - Harvestmen

- National checklist for Irish harvestmen is available online at Invertebrates Ireland as well as downloadable files in MS Word, MS Excel formats.

3.5.12 - Lepidoptera – Moths & Butterflies

- National checklist for Irish moths and butterflies is under development and is available online at Invertebrates Ireland as well as downloadable files in MS Word, MS Excel formats.
- Agassiz, D.J.L., Beavan, S.D. & Heckford, R.J. (2013) Checklist of the Lepidoptera of the British Isles. Royal Entomological Society. A complete checklist and census catalogue, together with machine readable census data updated in July 2022 is available online at NHM - British Isles Lepidoptera Checklist.
- Asher, J., Warren, M., Fox, R., Harding, P., Jeffcoate, G. & Jeffcoate, S. (2001) The Millennium Atlas of Butterflies in Britain and Ireland. Oxford University Press.

3.5.13 - Terrestrial, Freshwater and Marine Non-Insect Invertebrates

- Table of national checklist for Irish non-insect invertebrates is available online at NBDC – Irish Non-Insects Invertebrates.

3.6 - Vertebrates

3.6.1 - Freshwater Fishes, Amphibians and Reptiles

- King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011) Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland. Available online at NPWS – Amphibians, Reptiles & Freshwater Fish.
- Maitland, P.S. & Campbell, R.N. (1992) Freshwater fishes of the British Isles. HarperCollins Publishers, London.
- Went, A. E. J. (1976) List of Irish Fishes. National Museum, Dublin. Updates to this list were published in Irish Naturalist's Journal.
- Went, A. E. J. (1973) Supplement to List of Irish Fishes, Irish Fisheries Leaflet, Department of Agriculture and Fisheries. Available online at MI - Irish Fisheries Leaflet No 50.

3.6.2 - Marine Fishes

- Clarke, M., Farrell, E.D., Roche, W., Murray, T.E., Foster, S. & Marnell, F. (2016) Ireland Red List No. 11: Cartilaginous fish [sharks, skates, rays and chimaeras]. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. Dublin, Ireland. Available online at NPWS - Cartilaginous fish.
- Went, A. E. J. (1976) List of Irish Fishes. National Museum, Dublin. Updates to this list were published in Irish Naturalist's Journal.
- Quigley, D.T.G. (2000) Ireland's Marine Fish Fauna - An Assessment of Biodiversity; In: Biodiversity: The Irish Dimension (pp.59-75); Eds. Rushton, B.S.; Royal Irish Academy, Dublin.
- Draft checklist of Irish marine fishes by Quigley, D.T.G. (2024) is available at NBDC – Irish Marine Fishes.

3.6.3 - Birds

- Irish Rare Birds Committee (2019) Checklist of the Birds of Ireland. Birdwatch Ireland, Dublin. Available online at IRBC - Irish Birds List. A provisional checklist and census catalogue data updated in January 2023 is available online at IRBC – Provisional List.

3.6.4 - Land Mammals

- Marnell, F., Looney, D. & Lawton, C. (2019) Ireland Red List No. 12: Terrestrial Mammals. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland is available at NPWS - Terrestrial Mammals.
- Further references to primary sources of distribution data are available online at NBDC – Land Mammals.

3.6.5 - Marine Mammals

- National checklist for Irish cetaceans (2024) is available online at NBDC – Irish Cetacean Species.
- National checklist for Irish seal (2024) is available online at NBDC – Irish Seal Species.
- Further references to primary sources of distribution data are available online at NBDC – Marine Mammals.

3.7 - Protected, Rare and Threatened species

- Nelson, B., Cummins, S., Fay, L., Jeffrey, R., Kelly, S., Kingston, N., Lockhart, N., Marnell, F., Tierney, D. & Wyse Jackson, M. (2019) Checklists of protected and threatened species in Ireland. Irish Wildlife Manuals, No. 116. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland. Available online at NPWS - Irish Protected and Threatened Species. Most up to date version of the checklist is available online at NPWS website – MS Excel.

3.8 - Habitats

- European Commission (2013) Interpretation Manual of European Union Habitats. European Commission, Brussels. Available online at EEA - Habitats Manual.
- Fossitt, J. (2000) A Guide to Habitats in Ireland. The Heritage Council, Kilkenny. Available online at NPWS - Irish Habitats by Fossitt.
- Further references to primary sources of habitat data are available online at NBDC – Habitat Data.
- Smith, G.F., O'Donoghue, P., O'Hora, K. & Delaney, E. (2011) Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council, Kilkenny. Available online at Heritage Council.

- Joint Nature Conservation Committee (2022) The Marine Habitat Classification for Britain and Ireland Version 22.04. Available online at JNCC.
- European Environment Agency (2022) EUNIS marine habitat classification review (Tabular) version 1. Available for download from EEA – MS Excel and online at EEA.