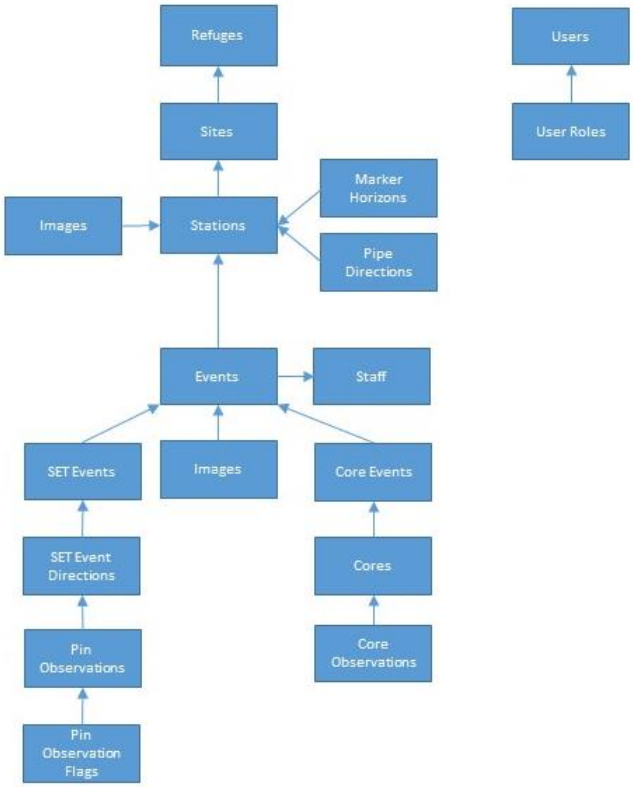
Physical Data Model and Dictionary

1 Model Overview

This document presents the physical data model of the SET database as well as field definitions. This model describes the structure of information exposed for the purpose of reporting and, when appropriate, for additional analyses. It represents the entire scope of all data managed in the SET Application although it differs from the logical model, which is the implementation specific to and optimized for the transactional database using SQL-Server and the .NET web framework.

This physical model is optimized entirely for the purpose of reporting and analyses. First, it is flattened to reduce the need for joins, particularly among the lookup tables. Second, has some redundancy for the purpose again of reducing the need for joins. Finally, there are some derived and aggregated fields in cases where the calculations are frequently done and shared.



2 Interpretation of the Tables

2.1 Links Among Tables

To understand how the tables are related, we use the PK/FK→ notation. For, example, in the following

Field	Description	Rqd	Type	Validation
CoreEventID	FK→Core Events	Y	INT	
CoreID	PK	Y	INT	

The unique index for this table is the CoreID. This table relates to the CoreEvents table using the CoreEventID as the common key when joining tables.

2.2 Source of the Data

As mentioned, the tables are optimized for reporting and analysis. Thus there is both redundancy and derived values. The following symbols and colors are used to help interpret these tables.

Data – The main table where the value resides
Derived/Calculated Data – This is a calculated value
Related Data from Other Table – This data is redundant with another table and is repeated to minimize the number of needed table joins

3 Cores

Field	Description	Rqd	Type	Validation
CoreEventID	FK→Core Events	Y	INT	
CoreID	PK	Y	INT	
CoreConditionID	FK→LU CoreCondition	Y	INT	
MarkerHorizonID	FK→MarkerHorizon	Y	INT	
CoreNotes	Notes about the core	N	CHAR(4000)	
StationID	See Stations			
SationCode	See Stations			
StationName	See Stations			
EventID	See Events			
EventDateTimeWithOffset	See Events			
ReaderFullName	See CoreEvents			
RecorderFullName	See CoreEvents			
MarkerHorizonLabel	See MarkerHorizons			
MaterialCode	See MarkerHorizons			
MarkerHorizonNotes	See MarkerHorizons			

4 Core Events

Field	Description	Rqd	Type	Validation
EventID	FK→Events	Y	INT	FK
CoreEventID	PK	Y	INT	
Reader_StaffID	FK→Staff	Y	INT	FK
Recorder_StaffID	FK→Staff	Y	INT	FK
CoreTypeCodeID	FK→CoreType	Y	INT	FK
CoreEventNotes	General information about coring during the specific event	N	CHAR(4000)	
StationID	See Stations			
StationCode	See Stations			
StationName	See Stations			
EventDateTimeWithOffset	See Events			
RecorderFullName	See Staff			
ReaderFullName	See Staff			

5 Core Observations

Field	Description	Rqd	Type	Validation
CoreID	FK→Core	Y	INT	
CoreObservationID	PK	Y	INT	
CoreObservationNumber		Y	INT	1-5
DepthToBenchmark_mm		Y	INT	>=0
StationID	See Stations			
StationCode	See Stations			
StationName	See Stations			
EventID	See Events			
EventDateTimeWithOffset	See Events			
CoreEventID	See CoreEvents			
RecorderFullName	See CoreEvents			
ReaderFullName	See CoreEvents			
MarkerHorizonID	See Cores			
MarkerHorizonLabel	See Cores			
CoreConditionID	See Cores			
CoreNotes	See Cores			
CoreConditionCode	See Cores			

6 Edits

Field	Description	Rqd	Type	Validation
EditID	PK	Y	INT	
DateModified	The date and time the database was edited	Y	DATETIME	
ModifiedBy	The username of the staff who made the edit	Y	CHAR(64)	
ApiProcedure	The type of edit made	Y	CHAR(64)	
DataBefore	The values prior to the change	Y	XML	
DataAfter	The values after the change	Y	XML	

7 Events

Field	Description	Rqd	Type	Validation
StationID	FK→Station.	Y	INT	FK
EventID	PK. Unique Event identifier	Y	INT	Unique
EventDateTime_UTC	The sampling Event Date time in UTC	Y	DATETIME	---
EventDAteTime_Local	The local	Y	DATETIME	---
InundationLevel_cm	The level of water inundation above ____?	N	DECIMAL	>=0
EventNotes	Additional notes about the visit to the station	N	CHAR(4000)	
DataProcessingLevelID	FK→DataProcessingLevel.	Y	INT	FK
DataProcessingLevelDate	Last date the data processing level was changed	Y	DATE	
DataProcessingLevelNote	Additional notes regarding the modification of the data processing level or other additional changes to the data for the purposes of QA or QC	N	CHAR(4000)	
NoCoreDataNotes	This field is required in cases where there are active marker horizons but there was not any collection of core data.	N	CHAR(1000)	
StationName	See Stations			
StationCode	See Stations			
DataProcessingLevelCode	See DataProcessingLevel			
DataProcessingLevelLabel	See DataProcessingLevel			
DataProcessingLevelSummary	See DataProcessingLevel			

8 Images

Field	Description	Rqd	Type	Validation
ImageID	PK	Y	INT	
ImageSize		N	INT	
ContentType		N	CHAR(100)	
FullSizeImage	The full size image in its original size. Note that some files may be large.	N	BINARY	
Thumbnail	Thumbnail graphic of the image. Only available for supported image types (jpg, bmp, gif)	N	BINARY	
FileName	Original file name when uploaded	N	CHAR(400)	
Title	Title of the image	Y	CHAR(100)	
Description	Description of the image	N	CHAR(4000)	
ImageDate	Date the image was created	Y	DATE	
StationID	FK→Station	Y	INT	
EventID	FK→Event. This ID is present for cases where the image is associated with a sampling even	N	INT	
StaffID	FK→Staff. StaffID of photographer in cases of photograph	N	INT	
CardinalDirectionCode	LV→CardinalDirection. Short code for cardinal direction (e.g, N, NW, etc.)	N	CHAR(5)	
CardinalDirectionLabel	LV→CardindalDirection. Cardinal direction as full text (e.g., North, Northwest, etc.)	N	CHAR(30)	
ImageType	LV→ImageType	Y	CHAR(100)	
Photographer	LV→Staff. Full name of the photographer in cases of a photograph	N	CHAR(201)	

9 Marker Horizons

Field	Description	Rqd	Type	Validation
StationID	FK	Y	INT	
MarkerHorizonID	PK	Y	INT	
MarkerHorizonLabel	Short alphanumeric label that identifies the marker horizon	Y	CHAR(5)	
DateEstablished	The date the marker horizon was created	Y	DATE	
MarkerHorizonMaterialID	FK→MarkerHorizonMaterials	Y	INT	
Notes	Additional notes about the marker horizon	N	CHAR(1000)	
DateRetired	Date the marker horizon was deemed to no longer be available for coring.	N	DATE	
DaysActive	The total number of days the marker horizon was active (DateRetired-dateEstablished). If not retired, the current date is used.			
StationCode	See Stations			
StationName	See Stations			
MarkerHorizonMaterial	See MarkerHorizonMaterials			
MarkerHorizonMaterialCode	See MarkerHorizonMaterials			

10 Pin Observations

Field	Description	Rqd	Type	Validation
SETDirectionID	FK→SETDirection	Y	INT	
PinObservationID	PK	Y	INT	
PinPosition	The relative pin position along the arm	Y	INT	1-9
PinHeigh_mm	The height of the pin above the arm	Y	INT	
PinNotes	Notes about the pin observation, including qualifications to the pin flags	N	CHAR(4000)	
StationID	See Stations			
StationCode	See Stations			
StationName	See Stations			
EventID	See Events			
EventDateTimeWithOffset	See Events			
DataProcessingLevelCode	See Events			
AzimuthDegrees	See SET Events			
StationPipeDirectionCode	See SET Events			
ObservationTypeCode	See SET Events			
RecorderFullName	See SET Events			
ReaderFullName	See SET Events			
SETArmID	See SET Events			
SETArmName	See SET Events			
PinFlagNotes				
PinFlags	Comma-delimited list of flags codes and labels			

11 Pin Observation Flags

Field	Description	Rqd	Type	Validation
PinObservationID	FK	Y	INT	Unique
FlagNotes	General notes that apply to all flags for the specific pin observation	N		
PinflagID	FK->LU_PinFlags			
PinFlagCode				
PinFlagLabel				
PinFlagNotes				

12 Refuges

Field	Description	Rqd	Type	Validation
RefugeCode	Cost Center code of the refuge	Y	CHAR(50)	
RefugeName	Full refuge name	Y	CHAR(255)	
RefugeAbbr	Abbreviated version of refuge name	Y	CHAR(100)	
Region	Associated region for the respective refuge	Y	CHAR(255)	
RegionFullName	Full name of region	Y	CHAR(255)	
RegionAbbr	Abbreviated version of region name	Y	CHAR(20)	
RegionNumber	Region Number	Y	INT	
CountyState	Counties and states intersecting the refuge	Y	CHAR(1000)	
SiteCount	Total number of sites associated with refuge	Y	INT	

StationCount	Total number of stations associated with refuge	Y	INT	

13 SET_Arms

Field	Description	Rqd	Type	Validation
SETArmID	PK.	Y	INT	
SETArmName		Y	CHAR(50)	
SETArmDescription		Y	CHAR(1000)	
IsActive	If True, the arm is still being used to collect data.	Y	Bit	

14 SET Events

Field	Description	Rqd	Type	Validation
EventID	FK→Event	Y	INT	FK
SETEventID	PK.	Y	INT	Unique
SetArmID	FK	Y	INT	
ObservationTypeCode	S-Standard; D-Duplicate	Y	CHAR(5)	
SETReader_StaffID	FK→Staff	Y	INT	FK
SETRecorder_StaffID	FK→Staff	Y	INT	FK
VegetationNotes	Notes about the surrounding vegetation	N	CHAR(4000)	---
SetEventNotes	Other notes specific to the SET event	N	CHAR(4000)	---
StationID	See Stations			
StationName	See Stations			
StationCode	See Stations			
EventDateTimeWithOffset	See Events			
EventNotes	See Events			
DataProcessingLevelCode	See Events			
SETArmName	See Events			
ReaderFullName	See Staff			
RecorderFullName	See Staff			

15 SETEventDirections

Field	Description	Rqd	Type	Validation
SETEventID	FK→SETEvent	Y	INT	FK
SETEventDirectionID	PK	Y	INT	Unique
PipeDirectionCodeID	FK→PipeDirections	Y	INT	FK
SETDirectionNotes	Field notes for all pin observations at a specific SET direction	N	CHAR(4000)	
StationID	See Stations			
StationCode	See Stations			
StationName	See Stations			
EventID	See Events			
EventDateTimeWithOffset	See Events			
SetEventNotes	See Events			

DataProcesssingLevelCode	See Events			
ObservationTypeCode	See SETEvents			
ReaderFullName	See SETEvents			
RecorderFullName	See SETEvents			
SETArmID	See SETArms			
SETArmName	See SETArms			
AzimuthDegrees	The direction of the ARM in degrees from north			
PipeDirectionCode	The label of the ARM direction,			

16 Sites

All site information

Field	Description	Rqd	Type	Validation
SiteID	PK. Unique Site ID	Y	INT	Unique
SiteCode	Short, meaningful and unique site code. This code can be used as a shorthand for longer site names and are useful for reports where space is limited. Furthermore, site codes can, to a certain degree, be valuable if the full names compromise protected locations.	Y	CHAR(16)	
SiteName	Full site name	Y	CHAR(200)	
SiteDescription	General description of the site	N	CHAR(1000)	----
RefugeCode	LV→FWS cost center code	Y	CHAR(16)	
Latitude_decimal_NAD83	Latitude in decimal degrees (NAD83)	N	DECIMAL	17 - 50
Longitude_decimal_NAD83	Longitude in decimal degrees (NAD83)	N	DECIMAL	-64 - -179
RefugeName	LV→ FWS CC Code. Refuge name	Y	CHAR(255)	----
RegionName	LV→ FWS CC Code. USFWS Region name	Y	CHAR(255)	----
RegionNumber	LV→ FWS Region Number	Y	INT	

17 Staff

Field	Description	Rqd	Type	Validation
StaffID	PK	Y	INT	PK
FirstName		Y	CHAR(100)	
LastName		Y	CHAR(100)	
Email				
IsActive	Indicates whether staff is actively collecting data with at least one region	Y	BIT	
FullName	First name and last name separated by a space	Y	CHAR(201)	
OrganizationCode	LV→Organization	Y	CHAR(5)	
OrganizationLabel	LV→Organization	Y	CHAR(100)	
OrganizationSummary	LV→Organization	N	CHAR(100)	
ProtectedStatusCode	LV→ProtectedStatus	Y	CHAR(5)	
ProtectedStatusLabel	LV→ProtectedStatus		CHAR(100)	
ProtectedStatusSummary	LV→ ProtectedStatus		CHAR(400)	

18 Stations

Field	Description	Rqd	Type	Validation
SiteID	FK→Site	Y	INT	FK
StationID	PK.	Y	INT	Unique

StationCode	Short, meaningful and unique site code. This code can be used as a shorthand for longer site names and are useful for reports where space is limited. Furthermore, site codes can, to a certain degree, be valuable if the full names compromise protected locations.	Y	CHAR(15)	
StationName	Full station name	Y	CHAR(100)	
StationDescription	Full description of the station	Y	CHAR(4000)	
StationLatitude	Latitude in Decimal Degrees (NAD83 Datum)	Y	DECIMAL	17 to 50
StationLongitude	Latitude in Decimal Degrees (NAD83 Datum)	Y	DECIMAL	-64 to -179
StationTimeZone	LV→TimeZone	Y	CHAR(200)	
StationElevation_m	Elevation of station above mean sea level in meters (NAD83 Datum)	N	INT	>=0
DateEstablished	The date the station installation was completed	Y	DATE	
DateRetired	The date the station was no longer being used for data collection	N	DATE	
ReceiverManufacturer	Name of the manufacturer of the SET receiver	N	CHAR(100)	----
RodManufacturer	Name of the manufacturer of the rods	N	CHAR(100)	----
RodMethodOfInstall	LV→RodMethodOfInstall. Equipment used to drive in the benchmark rod	Y	CHAR(50)	
RodDepth_m	The depth of the rod below ground in meters.	Y	DECIMAL	>=0
IsRodDepthRefusal	Indicates whether rod depth is to refusal based on NGS Standards.	Y	CHAR(3)	Yes, No
SETReceiverHeight_mm	Length (millimeters) of the receiver that extends above the benchmark rod	N	INT	>=0
DefaultSETArmID	FK. Set_Arms	Y	INT	
ProtectedStatusID	FK. ProtectedStatus	Y	INT	
DataProcessingLevelID	FK. DataProcessingLevel	Y	INT	
DataProcessingLevelDate	The last date and time that the data processing level was changed.	N	DATETIME	
DataProcessingLevelUserID	FK. Users	N	INT	
DataProcessingLevelNote	Notes discussing why the DPL was modified or any other notes related to the modification of data due to QA or QC tests	N	CHAR(4000)	
StationNameCode	Combination of station name and code where code is in parenthesis (e.g., "Station A1 (SA1)")	Y	CHAR(118)	---
StationLatLon_Geometry	The station coordinates represented as the geometry data type	Y	GEOMETRY	---
SETEventCount	Count of related SET Events	Y	INT	
CoreEventCount	Count of related Core Events	Y	INT	
RegionNumber	See Sites			
SiteCode	See Sites			
SiteName	See Sites			
ParkOrRefugeCode	See Sites			
UnitName	See Sites			
DefaultSETArmName	See SET_Arms			
ProtectedStatusCode	See ProtectedStatus			
ProtectedStatusLabel	See Protectedstatus			
ProtectedStatusSummary	See ProtectedStatus			
DataProcessingLevelUser	See Users			

19 Pipe Directions

Field	Description	Rqd	Type	Validation
StationID	FK→Station			
StationPipeDirectionID	PK	Y	INT	
StationPipDirectionCode		Y	INT	1-9
AzimuthDegrees				
Notes				

20 Users

Field	Description	Rqd	Type	Validation
UserID	PK	Y	INT	
UserCode	User code	Y	CHAR(128)	
Issuer	Indicates how the user was issued a user ID. FWS = FWS Staff; Partner = Non-FWS Staff	Y	CHAR(50)	
FirstName	First name of the user	Y	CHAR(64)	
LastName	Last name of the user	Y	CHAR(64)	
Email		Y	CHAR(128)	
IsAdmin	Indicates whether user has the administrative role within the SET application	Y	BIT	
LastFirstName	LastName, FirstName	Y	CHAR(128)	
FirstLastName	FirstName LastName	Y	CHAR(129)	

21 User Roles

Field	Description	Rqd	Type	Validation
UserID	PK	Y	INT	
UserCode	User code	Y	CHAR(128)	
Issuer	Indicates how the user was issued a user ID. FWS = FWS Staff; Partner = Non-FWS Staff	Y	CHAR(50)	
FirstName	First name of the user	Y	CHAR(64)	
LastName	Last name of the user	Y	CHAR(64)	
Email		Y	CHAR(128)	
IsAdmin	Indicates whether user has the administrative role within the SET application	Y	BIT	
LastFirstName	LastName, FirstName	Y	CHAR(128)	
FirstLastName	FirstName LastName	Y	CHAR(129)	

22 Lookups

22.1 LU DataProcessingLevels

Field	Description	Rqd	Type	Validation
DataProcessingLevelID	PK.	Y	INT	
DataProcessingLevelCode		Y	CHAR(5)	
DataProcessingLevelLabel		Y	CHAR(400)	

22.2 LU Pin Flags

Field	Description	Rqd	Type	Validation
PinFlagID				
PinFlagLabel				
PinFlagCode				
PinFlagDefinition				