2023 COASTAL MASTER PLAN

PROJECT DEVELOPMENT DATABASE DOCUMENTATION

ATTACHMENT F6

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COASTAL PROTECTION AND RESTORATION AUTHORITY

This document was developed in support of the 2023 Coastal Master Plan being prepared by the Coastal Protection and Restoration Authority (CPRA). CPRA was established by the Louisiana Legislature in response to Hurricanes Katrina and Rita through Act 8 of the First Extraordinary Session of 2005. Act 8 of the First Extraordinary Session of 2005 expanded the membership, duties, and responsibilities of CPRA and charged the new authority to develop and implement a comprehensive coastal protection plan, consisting of a master plan (revised every six years) and annual plans. CPRA's mandate is to develop, implement, and enforce a comprehensive coastal protection and restoration master plan.

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EXECUTIVE SUMMARY

As coastal Louisiana faces increasing threats from flooding and sea level rise, there is a great need to advance our scientific understanding of the coast and how coastal Louisiana will need to adapt to future conditions. The Coastal Protection and Restoration Authority (CPRA) is undertaking this challenge through six-year updates of Louisiana's Comprehensive Master Plan for a Sustainable Coast. This document summarizes the process by which CPRA developed candidate projects for consideration in the 2023 Coastal Master Plan.

The 2023 Coastal Master Plan builds on past progress and establishes a clear vision for the future. It refines past plans by improving the methods used to ensure projects are evaluated as efficiently, consistently, and effectively as possible. These improvements include changes to the costing methodology and project structure, as well as the development of the Project Development Geodatabase (PDG), the Project Development Database (PDD), and an automated Project Costing Tool (PCT). This document is intended to serve as the technical documentation as the PDD and PDG are developed for the Louisiana 2023 Coastal Master Plan. It will be a living document subject to revision as various portions of the new tools and processes are developed.

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LIST OF ABBREVIATIONS

ADCIRC	ADVANCED CIRCULATION
AWS	AMAZON WEB SERVICES
BS	BANK STABILIZATION
cf	CUBIC FEET
cfs	CUBIC FEET PER SECOND
CH	CHANNEL CREATION
CL	GAP CLOSURES
CLARA	COASTAL LOUISIANA RISK ASSESSMENT
CPRA	COASTAL PROTECTION AND RESTORATION AUTHORITY
CWCCIS	CIVIL WORKS CONSTRUCTION COST INDEX SYSTEM
DI	DIVERSION
EL	EXISTING LEVEE
ft	FOOT/FEET
FWOA	FUTURE WITHOUT ACTION
FWA	FUTURE WITH ACTION
GA	PROPOSED GATES
GIS	GEOGRAPHIC INFORMATION SYSTEM
HR	HYDROLOGIC RESTORATION
ICM	INTEGRATED COMPARTMENT MODEL
IP	INTEGRATED PROJECT
LB	LANDBRIDGE
LS	LUMP SUM
MC	MARSH CREATION
MPDAP	MASTER PLAN DATA ACCESS PORTAL
MPDV	MASTER PLAN DATA VIEWER
NAVD88	NORTH AMERICAN VERTICAL DATUM OF 1988
NS	NONSTRUCTURAL RISK REDUCTION
O&M	OPERATIONS AND MAINTENANCE
OR	OYSTER BARRIER REEF

PCS .... PROJECT COST SUMMARY
PCT .... PROJECT COSTING TOOL
PDD........ PROJECT DEVELOPMENT DATABASE
P/E&D........ PLANNING/ENGINEERING AND DESIGN
PL .... PROPOSED LEVEE
PSC .... PITTSBURGH SUPERCOMPUTING CENTER
PT .... PLANNING TOOL
PW .... PROPOSED FLOODWALL
QAQC .... QUALITY ASSURANCE AND QUALITY CONTROL
RR........ RIDGE RESTORATION
SP .... SHORELINE PROTECTION
SR........ STRUCTURAL RISK REDUCTION
SQL........ STRUCTURED QUERY LANGUAGE
SWAN .... SIMULATING WAVES NEARSHORE
USACE .... U.S. ARMY CORPS OF ENGINEERS
XX........ MISCELLANEOUS QUANTITY

1.0 INTRODUCTION

As Louisiana faces increasing threats from coastal flooding and sea level rise, there is a great need to advance our scientific understanding of the coast and how coastal Louisiana will need to adapt to future conditions. The Coastal Protection and Restoration Authority (CPRA) is undertaking this challenge through six-year updates of Louisiana's Comprehensive Master Plan for a Sustainable Coast. The 2023 Coastal Master Plan builds on past progress and establishes a clear vision for the future. It refines past plans by improving the methods used to ensure projects are evaluated as efficiently, consistently, and effectively as possible.

As discussed in Appendix F: Project Concepts (Sprague, 2023a), previous master plan iterations required hundreds of Excel spreadsheets, dozens of CSV files, and over forty unique Esri shapefiles to measure, quantify, calculate, and aggregate project information, which in turn required frequent manual data transfers between different modeling teams. Because the 2023 Coastal Master Plan is intended to tackle the analysis of broader, more complicated projects than previous plans, a new system was devised for defining and assembling the building blocks used to describe a project. This new system streamlines this process by replacing the cumbersome spreadsheets and shapefiles with four primary features:

1. A centrally accessible PostgreSQL database, called the Project Development Database (PDD), which houses tables of relevant project attributes, metadata, bid items, costs, and any project-level outputs that may need to be passed between modeling teams. Custom Structured Query Language (SQL) scripts are used to access data directly from the PDD as needed and may be stored in the PDD as views or materialized views.
2. A python program, called the Project Costing Tool (PCT), which reads inputs from the PDD, calculates quantities and costs of each feature within a project, and stores values back into the PDD. Additional data processing scripts are used in conjunction with the PCT to define project attributes and to streamline quality assurance and control (QAQC) procedures.
3. An Esri geodatabase, called the Project Development Geodatabase (PDG), which contains the geospatial representations of all projects in three feature classes (for points, polygons, and polylines); in future iterations of the master plan, geospatial data is intended to be integrated into the PDD with a Spatial Database Engine (SDE). While the PDG is the source of truth for all geospatial data, a copy of the PDG also exists, referred to as the Mapping PDG, which joins project-level attributes from the PDD to the points, lines, and polygons in the PDG. The Mapping PDG is automatically re-created every time the PDD or PDG is updated.
4. A reporting system (presently using Jaspersoft software) that reads from the PDD to

produce project-level Project Cost Summary (PCS) reports.

Ultimately, the PDD and PDG act as a central repository for tabular and basic geospatial data used and generated by the four primary master plan modeling teams: the Advanced CIRCulation (ADCIRC) and Simulating WAves Nearshore (SWAN) team, the Integrated Compartment Model (ICM) team, the Coastal Louisiana Risk Assessment (CLARA) model team, and the Planning Tool (PT) team. Basic project attributes and vector-based geospatial data are developed and then read by the ADCIRC+SWAN, ICM, and CLARA models. Additional project attributes are produced by these models and stored back into the PDD. The PCT reads attributes and produces costs, which are in turn read by the Planning Tool, along with model outputs from the ICM and CLARA, to prioritize projects and store project-level results back to the PDD (Figure 1). This effort is intended to streamline data generation and transfer, while greatly reducing the number of files and overall file size required for project definition within the master plan. The Project Cost Summary (PCS) reports are used to summarize detailed project attributes and costs for CPRA engineers to review as part of the project definition process.

To present the project (via vicinity and project maps) and modeling outputs (i.e., estimated cost and duration, project benefits graphs) in a clear, digestible manner, different fact sheets were created for at four unique geographic scales. Regional Fact Sheets show compiled data for the five designated coastal regions of Louisiana (e.g., Chenier Plain, Terrebonne etc.). Parish Fact Sheets are created for parishes with master plan projects or those impacted by modeling (e.g., Jefferson Parish, Tangipahoa Parish etc.). Community Fact Sheets documents model outputs and maps for designated community areas (e.g., Belle Chasse Area, Slidell Area etc.). Finally, Project Fact Sheets provide project specific data. All facts sheets are found in the Attachments F2 to F5.

Additionally, timeseries data developed by the ICM and CLARA modeling teams are formatted within the PDD for specific API calls by the Master Plan Data Access Portal (MPDAP), which allows the public to view and download more detailed model outputs than are available in the fact sheets or in the Master Plan Data Viewer.

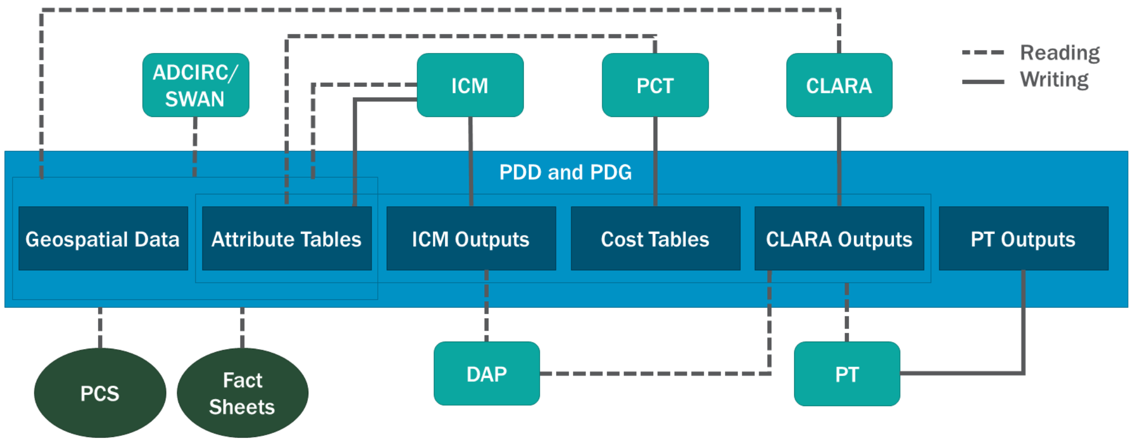

Figure 1. General workflow for data handoffs between modeling teams.

This document is intended to serve as a framework to define the architectural details of the **PDD**, the **PDG**, and the **Mapping PDG** as it stands in July 2023, at the conclusion of the 2023 Coastal Master Plan. The attached data model represents a detailed description of all fields in all tables, views, and materialized views in each schema of the PDD and for each feature class in the PDG and Mapping PDG. Sections 2.0 through 7.0 detail the structure of the PDD, while Section 8.0 describes the PDG and Mapping PDG.

1.1 PROJECT ORGANIZATION

As detailed in Appendix F: Project Concepts, there are eight distinct project types evaluated in the master plan, split into two primary categories: Risk Reduction and Restoration. Risk Reduction projects can either be Structural (designated as SR) or Nonstructural (NS), while Restoration projects may fall under one of six categories: Diversions (DI), Hydrologic Restoration (HR), Landbridge (LB), Marsh Creation (MC), Ridge Restoration (RR), and Integrated Projects (IP). Each project is composed of one or many Elements, and multiple projects may reference the same Element. There are thirteen unique Element Types used to define Restoration and Structural Risk Reduction projects: Proposed Levees (PL), Improvements to Existing Levees (EL), Proposed Floodwalls (PW), Proposed Gates (GA), Channel Creation (CH), Marsh Creation (MC), Gap Closures (CL), Ridge Restoration (RR), Shoreline Protection (SP), Bank Stabilization (BS), Oyster Reef (OR), Miscellaneous Quantity (XX), and Lump Sum (LS). Nonstructural Risk Reduction projects are defined by the CLARA model based on counts of properties that may be floodproofed, elevated, or acquired, and do not follow the same project-Element relationships defined elsewhere in the PDD.

Each Element has a subgrouping of Components that comprise some feature of that Element. For example, Shoreline Protection rubble mound Elements include geotextile base, riprap, navigational aid, and settlement plate Components. Lists of Components utilized in costing each Element Type are described in detail in the *Project Costing Tool Technical Documentation* (Sprague 2023b).

1.2 GENERAL DATABASE INFORMATION

The official PDD is hosted by the Pittsburgh Supercomputing Center (PSC). Credentialed users may access either database directly via Python or other programming languages or by using a SQL client such as PGAdmin (a freeware commonly used for managing and supporting PostgreSQL Databases). The server host of the PDD is *vm007.bridges2.psc.edu* and the database name is *mp23_pdd*, accessible via an SSH tunnel with the host *bridges2.psc.edu* that require PSC authentication to connect. Credentials are required to access each database and are available to master plan project team members upon request.

The foundation of any relational database is the definition of tables, fields, and data types which are used to house and link relevant data. Relational databases use identification fields called primary keys to store tabular data. Each table will have a primary key that is unique for an entry in the table and is typically an auto-incremented integer. Data can then be linked to another table's data through a foreign key. A foreign key is the *relation* to a different table's primary key. These keys help join tables together for structure and efficiency. For example:

- Data at the project level are stored in the *ProjectMetadata* table. That data/table has a primary key *ProjectUID*.
- Another table is *ElementDefinition*, which has a primary key called *ElementUID* and a foreign key *PrimaryProjectUID*, which relates Element data to the project Metadata Table.

PostgreSQL databases specifically organize data using objects called schemas[1], which in turn contain tables. Different schemas are used to separate tables into logical groups based on relevance to each modeling team. Permissions are set at the schema level to preserve the integrity of the database by allowing users to access only the data relevant for their needs. Similarly, each schema can utilize its

[1] The term schema may also, at times, reference the architecture of a table itself, including its name, the names and types of each column, and the assignment of primary and foreign keys. In this document, the term schema will only refer to the PostgreSQL definition related to a grouping of tables within a database.

own set of rules regarding the primary units of measurement, depending on what is required for the relevant model. Six schemas are defined for the PDD (pct, pdd, icm, clara, pt, and dap[2]), described in Table 1 and discussed in further detail in Sections 2.0 through 7.0.

Table 1. PDD schema definition.

SCHEMA	DESCRIPTION	PRIMARY UNITS
pct	TABLES AND VIEWS RELATED TO ELEMENTS, COMPONENTS, AND COSTS	IMPERIAL
pdd	TABLES AND VIEWS AT THE PROJECT OR MODEL GROUP LEVEL, NOT SPECIFICALLY REQUIRED FOR THE PCT, BUT GENERALLY USED BY ALL MODELING TEAMS	METRIC
icm	DIRECT AND MANIPULATED OUTPUTS OF ICM	METRIC
clara	DIRECT AND MANIPULATED OUTPUTS OF CLARA	METRIC
pt	DIRECT AND MANIPULATED OUTPUTS OF PT	METRIC
dap	MANIPULATED TIMESERIES OUTPUTS OF ICM AND CLARA USED IN THE DATA ACCESS PORTAL	METRIC

In addition to tables, the PDD schemas store data in views and materialized views. Tables can be considered to store data that is *directly* inputted into the PDD, whereas views and materialized views represent a *manipulated* version of data stored in tables. These virtual tables store queried information that combines data from multiple tables, views, or materialized views for users to access information in a different manner than it is originally stored. A view represents data outputted from a query that is executed each time it is accessed, whereas a materialized view represents a stored copy of data outputted by a query. In the PDD, data in materialized views are updated automatically every day at midnight Central Time but can also be manually updated any time new data is posted.

Generally, within the PDD, views are used for queries related to model inputs and have names beginning with the prefix "*vw_*". For example, the *vw_element_assignment* view in the pct schema

2 The lowercase *pct, pdd, icm, clara,* and *dap* terminology designates the respective schemas within the (uppercase) PDD database, rather than the Project Costing Tool, the Project Development Database, the Integrated Compartment Model, the Coastal Louisiana Risk Model, or the Master Plan Data Access Portal.

adds relevant fields from the *ProjectMetadata, ElementDefinition,* and *Candidates* tables to the *ElementAssignment* table to add useful information like project type, Element type, project name, and construction duration for each Element assigned to each project. Materialized views are typically used for aggregating, filtering, and formatting model outputs and have names starting with the prefix “*mv_*”. For example, the *mv_land_veg_project_lnd_fwoa* materialized view in the icm schema filters data saved in the *land_veg* table to display just FWOA land area for a select subset of vegetation types, aggregated for each candidate project.

Views and materialized views in the PDD are used to aggregate and format data in a way that is more useful to other modeling teams (e.g., formatting data from ICM output tables use in the Planning Tool, etc.) or for creating master plan related documents (e.g., the 2023 Coastal Master Plan itself and other fact sheets). Detailed information, like field names, index fields and data sources, for the views and materialized views can be found in Supplemental Material F6.1: PDD Data Model Excel Workbook.

2.0 PDD SCHEMA

The pdd schema stores information required for the development and modeling of projects but not specifically required for the PCT. Data is in this schema is generally reported at a project or model group level. The pdd tables are read by all modeling teams and linked using the ProjectID as opposed to the UID fields utilized in the pct schema (see Section 3.0). Figure 2 shows the database relations between tables in the pdd schema and their connection to the source of the ProjectID field in the *ProjectMetadata* table in the pct schema.

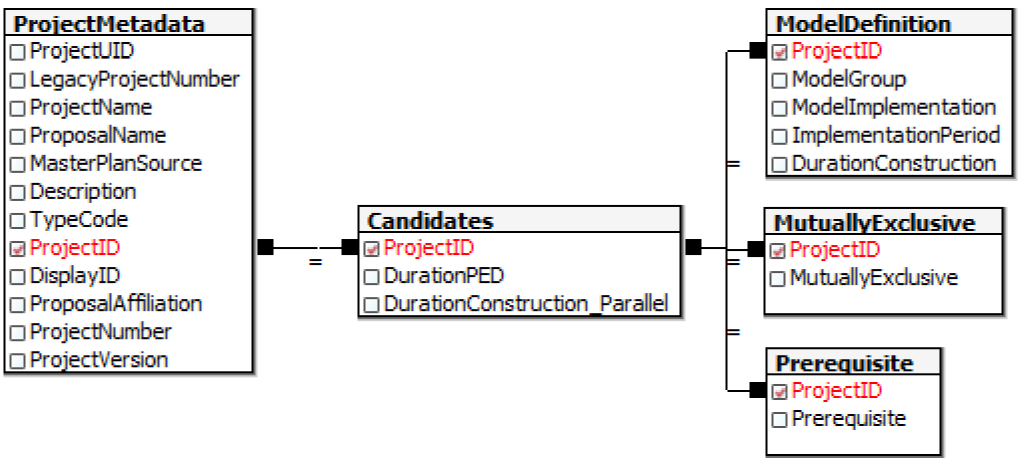

Figure 2. Database relation of pdd tables and link to pct schema.

Project development information, including candidate project durations, model group assignment, and lists of project prerequisite and mutually exclusive projects, are stored in the pdd tables, as summarized in Table 2. Descriptions of each field in the pdd schema tables are available in Supplemental Material F6.1: PDD Data Model Excel Workbook.

Some views and materialized views in the PDD represent data that is relevant to both projects and Elements. For example, in the Planning Tool, MC Elements are treated as pieces of larger IP, LB, or MC projects, but may also be modeled as individual projects themselves. In this case, and therefore have both cost and benefit information, just as other projects do. To efficiently combine these data, an additional ID field called the CombinedID is used to store both ProjectIDs and ElementIDs as appropriate in a mixed dataset.

Table 2. Tables in the pdd schema.

TABLE NAME	DESCRIPTION	PRIMARY KEY	NUMBER OF COLUMNS	NUMBER OF ROWS
AlternativeDefinition	DEFINES RELATIONSHIP BETWEEN PROJECTS AND MODEL GROUPS OF ALTERNATIVE RUNS (G515-G521)	MODELGROUP, PROJECTID	6	277
Candidates	LIST OF ALL CANDIDATE PROJECTS TO BE EVALUATED IN THE MASTER PLAN MODELS, ALONG WITH ANY ATTRIBUTES AT THE PROJECT LEVEL THAT ARE REQUIRED FOR MULTIPLE MODELS, BUT NOT FOR THE PCT	PROJECTID	4	166
CommunityAgriculture	LINKS A SUBSET OF COMMUNITIES THAT PRODUCE AGRICULTURE TO THE ECOREGIONS UPON WHICH THEY ARE DEPENDENT; USED TO DEFINE THE AGRICULTURE METRIC	COMMUNITYNAME	2	17
CommunityDefinition	DEFINES COMMUNITY-LEVEL METADATA SUCH AS THE ECOREGION, PARISH, AND AREA IN WHICH THEY RESIDE	COMMUNITYID	10	374
CommunityFishing	LINKS A SUBSET OF COMMUNITIES THAT HAVE PROMINENT FISHING INDUSTRIES TO THE RESOURCE USE AREAS (I.E., COLLECTION OF ECOREGIONS) UPON WHICH THEY ARE DEPENDENT; USED TO DEFINE THE FISHING METRIC	COMMUNITYNAME, RESOURCEUSEAREA	2	40
CommunityFishingResource	LINKS A SUBSET OF COMMUNITIES THAT HAVE PROMINENT FISHING INDUSTRIES TO THE HABITAT CODES OF SPECIES THAT ARE FISHED IN THEIR RESOURCE USE AREA; USED TO DEFINE THE FISHING METRIC	COMMUNITYNAME, HABITATCODE	2	203
CommunityOilGas	LINKS A SUBSET OF COMMUNITIES THAT HAVE PROMINENT OIL AND GAS INDUSTRIES TO THE REGIONS UPON WHICH THEY ARE DEPENDENT; USED TO DEFINE THE OIL AND GAS METRIC	COMMUNITYNAME, REGION	2	55
ExtractionPointAssignment	ASSIGNS EACH EXTRACTION POINT TO ONE OR MANY PROJECTS AND DEFINES THE DISTANCE BETWEEN THAT POINT AND THE PROJECT.	EXTRACTIONPOINT, PROJECTID	3	943
ExtractionPointDefinition	DEFINES A LIST OF EXTRACTION POINTS USED TO QAQC MODEL RESULTS AND THEIR CORRESPONDING ECOREGION	EXTRACTIONPOINT	2	678
MetricDefinition	DEFINES METRICS USED THROUGHOUT THE ICM AND CLARA MODELS, INCLUDING A DESCRIPTION, RELEVANT SECTORS, AND UNITS	METRICID	9	24
ModelDefinition	DEFINES THE RELATIONSHIP BETWEEN PROJECTS AND MODEL GROUPS FOR PROJECT-LEVEL RUNS (MODEL GROUPS BETWEEN 600 AND 699)	MODELGROUP, PROJECTID	5	238
MutuallyExclusive	DEFINES WHICH PROJECTS SHOULD NOT BE IMPLEMENTED WITH EACH OTHER, BECAUSE THEY HAVE OVERLAPPING FOOTPRINTS OR REDUNDANT INTENDED BENEFITS	MUTUALLYEXCLUSIVE, PROJECTID	2	21
NaturalProcessesUse	CATEGORICALLY DEFINES THE WAY IN WHICH A PROJECT MAKES USE OF NATURAL PROCESSES	DOMINANTCHARACTERISTICS, PROJECTTYPECODE	4	11
ParishDefinition	DEFINES PARISH-LEVEL METADATA, SUCH AS THE REGION IN WHICH IT RESIDES AND THE DESCRIPTIONS FOR USE IN THE PARISH FACT SHEETS	PARISHFIPS	7	24
RegionDefinition	ASSIGNS EACH ECOREGION TO A REGION AND INCLUDES OTHER ECOREGION METADATA, SUCH AS NAME AND DESCRIPTION	ECOREGION, REGION	6	25
ResourceUseAreaDefinition	DEFINES THE ECOREGIONS THAT COMPRISE EACH RESOURCE USE AREA USED IN DEFINING THE FISHING METRIC	ECOREGION, RESOURCEUSEAREA	2	33

3.0 PCT SCHEMA

The pct schema is used to store tables related to Elements, Components, and costs, as well as queries for different views of the data. The PCT reads data from the pct, pdd, and icm schemas and writes results back into the pct schema. All units for fields in the pct are in imperial units, due to the PCT's dependency on US-based engineering design features, such as the Element design templates themselves and available bid item data.

FIGURE 3, FIGURE 4, AND

Figure 5. Database relation and structure of MC, borrow source, and output cost tables.

show the general structure of the pct schema, with relations between primary and foreign keys in red. As shown in Figure 3, Elements are initialized in the *ElementDefinition* table and linked to projects in the *ElementAssignment* table. Elements may be assigned to one or many different projects, such as when two DI projects have the same general features, but unique operating regimes. Each element is also assigned a *PrimaryProjectUID*, indicating the source project where that element originated. As Element attributes are changed over time, the PDD archives the change and incrementally increases the version number for that Element. All attributes from the appropriate Attribute table are then linked to the relevant version of the Element in the Version table via the *VersionUID*, and costs are calculated only for the most up-to-date versions of Elements.

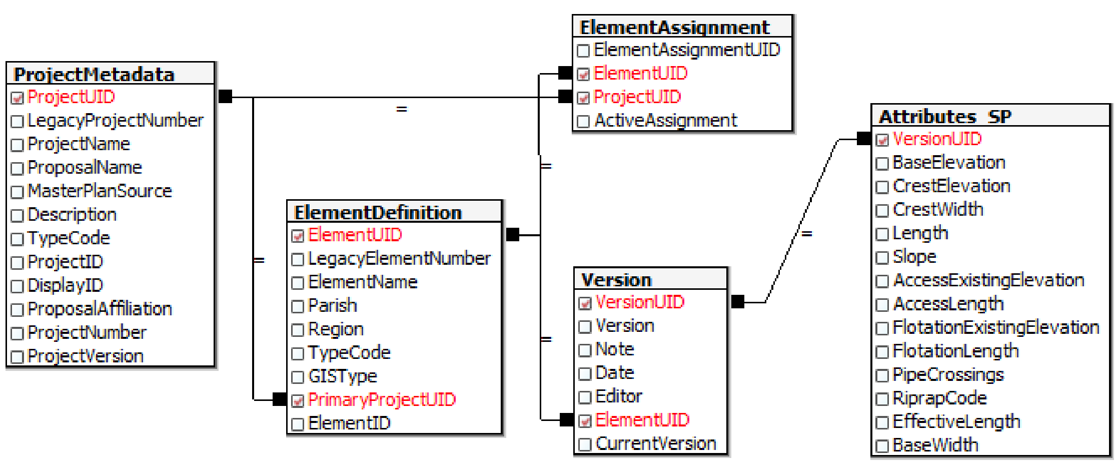

Figure 3. Database relation and structure of metadata and attributes.

The PCT reads from each attribute table to produce quantities and costs for each component within each Element. Figure 4 describes how Components are linked to the *Item* table, which holds the unit costs for each available bid item. Many different types of Components may link to the same bid item; for example, mechanical dredging is used to build ridges for RR elements and to dredge channels for CH elements. The *Item* table is in turn linked to the *CostCategory* and *CostIndex* tables, which are used to escalate inputted bid item costs to 2020 USD using the U.S. Army Corps of Engineers (USACE) Civil Works Construction Cost Index System (2020). The *Item* table is also linked to the *ConfidenceRanking* table, which is used to provide a range of cost estimates based on assigned uncertainties in each bid item unit cost.

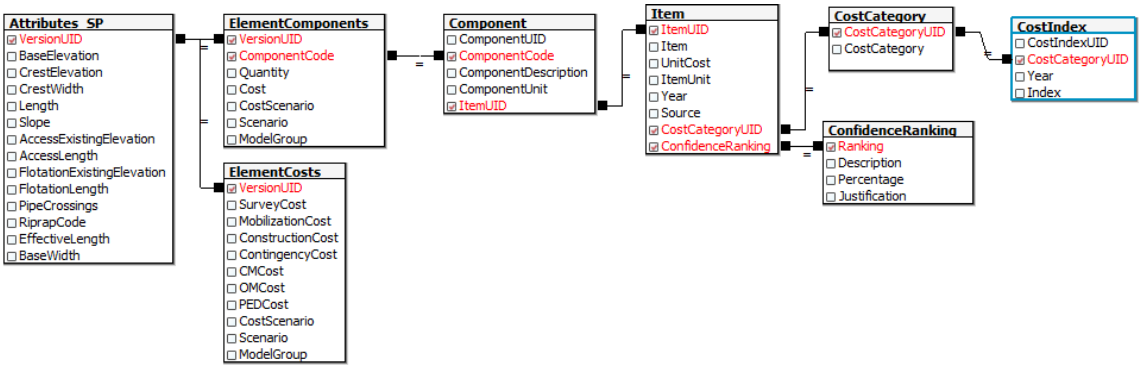

Figure 4. Database relation and structure of attributes and output cost tables.

Design marsh elevations vary over time due to sea level rise and subsidence. As such, the ICM determines the required area and volume to build marsh for each model group and environmental scenario, as the same project may be implemented in different years, depending on how it is modeled. The PCT, therefore, calculates MC Element costs for each combination thereof. Additionally, the PCT also determines MC Element costs for multiple borrow source options so that the Planning Tool can optimize project selection based on limited sediment availability. Figure 5 describes how these costs are linked to both inputted dredge mobilzation attributes that vary by Element and Borrow Source and by the ICM-produced area and volume attributes that vary by model group and scenario.

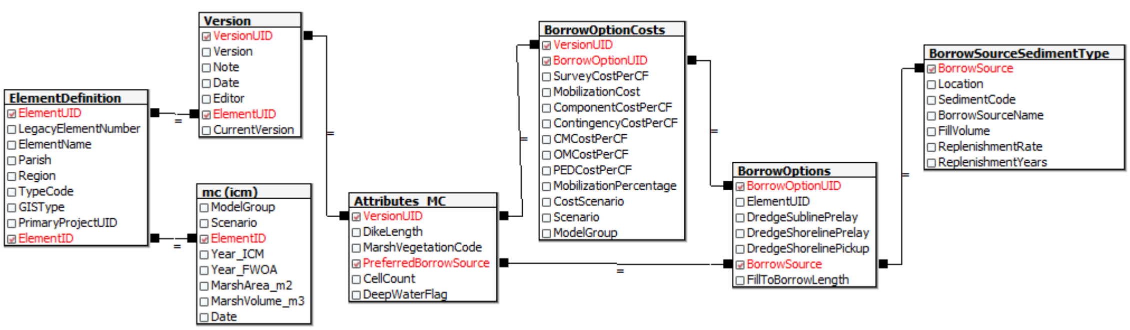

Figure 5. Database relation and structure of MC, borrow source, and output cost tables.

Tables in the pct schema fall into four general categories, shown below. Table 3 provides a summary of all database tables in the pct schema and descriptions of all table fields are available in Supplemental Material F6.1: PDD Data Model Excel Workbook.

1. **Metadata and Version Tracking**. project, Element, and Version metadata, including descriptive attributes (e.g., names and descriptions) as well as data related to how Elements and projects are linked to each other.
2. **General Lookup Tables.** Background data needed to estimate costs, such as bid item unit costs and cost escalation indices.
3. **Element Attributes**. Attribute data used to define projects and determine costs for each of the 13 Element types.
4. **PCT Outputs.** Outputted costs at the Element and Component levels.

The project metadata table is used to define and describe all projects that have ever been considered in any master plan since 2012. This table serves as the foundation for project organization within the PDD. These metadata attributes are common for all Restoration and Risk Reduction projects. As described in Figure 3 and Table 3, the *ElementDefinition*, *ElementAssignment*, and *Version* tables are used to define Element-level metadata and link Elements to specific projects and versions. Inputs are versioned; however, outputs are not versioned since the database will always reflect a live view of the latest information. Versioning inputs allows for the regeneration of past attributes versions, should they be required.

Several tables are required to facilitate intermediate calculations in the PCT as well as to provide additional information to other modeling teams and to any report generation software. The *Costs* table summarizes the application of unit costs and cost percentages, while *Gate* and *Type* tables link to *Attribute* and *Component* tables to describe general information not provided elsewhere in the PDD, but needed by modeling teams, such as information about the generic gate sizes. The *CostCategory* and CostIndex tables contain price index information from the US Army Corps of Engineers Civil Works Construction Cost Index System, also known as CWCCIS (USACE, 2020). These are used to adjust Unit Costs for inflation based on Year and Cost Category UID, and Appendix F1 contains a more detailed description of the cost escalation process.

Certain costs are generally applied as a percentage of other costs (e.g., contingency is typically 20% of construction costs). These costs and their associated percentage values are contained in the *CostPercentage* table. Certain projects may require cost percentages that differ from the default values, and these exceptions are assigned to specific projects in the *CostPercentageOverride* table. Appendix F1 has more detail regarding how cost percentages are applied.

Principal attributes for each Element type that comprise projects proposed in the 2023 Coastal Master Plan are stored in attribute specific tables. These attribute tables contain all information required for the functions of the PCT. Appendix F1 provides additional project- and Element-level assumptions. Some attributes are provided in multiple tables (e.g., crest elevation for proposed and existing levee features) for the PCT to appropriately calculate required quantities of materials.

AS DESCRIBED IN

Figure 5. Database relation and structure of MC, borrow source, and output cost tables.

, the PCT pulls data from the *Attributes_MC* and *BorrowOptions* tables in the pct schema, along with the mc table in the icm schema, to produce costs that vary by model group, Scenario, and Borrow Source. Data listed in the *BorrowOptions* table are determined at the Cell level before being aggregated within an Element.

PCT output tables are used to store the cost estimation results from the PCT, calculated for each Component comprising each Element in the *ElementComponents* table, for each Element in the *ElementCosts* table, and for each MC Element-borrow source combination in the *BorrowOptionsCosts* table. Costs are produced for three unique Cost Scenarios to determine a likely range of values, and ranges may vary by Environmental Scenario and model group. All costs are reported in 2020 USD, and are reported either in direct dollar values or, in the *BorrowOptionsCosts* table, in dollars per cubic foot of sediment required to build an MC Element. Additional information regarding cost calculation assumptions can be found in Appendix F1.

The *ElementComponents* table intentionally does not have a primary key, as the same Element may have costs associated with multiple uniquely calculated quantities of the same Component. For example, EL Elements typically have two entries associated with the sediment material component – one positive value representing quantity of material needed to upgrade the levee, and one negative value representing the amount of material that is already there in the existing feature.

Table 3. Tables in the pct schema

CATEGORY	NAME	DESCRIPTION	PRIMARY KEY	NUMBER OF COLUMNS	NUMBER OF ROWS
METADATA AND VERSION TRACKING TABLES	ElementAssignment	LINK BETWEEN PCT.ELEMENTDEFINITION AND PCT.PROJECTMETADATA, USED TO MATCH ONE ELEMENT TO ONE OR MANY PROJECTS	ELEMENTASSIGNMENTUID	4	1,607
	ElementDefinition	LIST OF ALL ELEMENTS AND RELEVANT METADATA; ONLY PROJECTS CONSIDERED FOR THE 2023 MASTER PLAN ARE BROKEN DOWN INTO ELEMENTS	ELEMENTUID	9	1,346
	IssuesContact	STORING MESSAGES RECEIVED FROM THE PCT USER INTERFACE	CONTACT_ID	6	0
	ProjectMetadata	LIST OF ALL PROJECTS PROPOSED SINCE THE 2012 MASTER PLAN AND RELEVANT METADATA	PROJECTUID	12	437
	Version	LINK BETWEEN ELEMENTS AND VERSIONS	VERSIONUID	7	1,346
GENERAL LOOKUP TABLES	BorrowSourceSedimentType	DESCRIPTION OF SEDIMENT TYPE IN EACH BORROW SOURCE	BORROWSOURCE	8	41
	Component	LIBRARY OF ALL COMPONENTS USED IN ANY ELEMENT, AND THEIR LINK TO THE SPECIFIC BID ITEMS WITH CORRESPONDING UNIT COSTS	COMPONENTUID	5	143
	ConfidenceRanking	LOOKUP TABLE THAT RELATES CONFIDENCE RANKINGS FOR UNIT COSTS TO DESCRIPTIONS AND PERCENTAGE VALUES.	RANKING	4	5
	Conversions	LIBRARY OF CONVERSION FACTORS BETWEEN UNITS (I.E., SQUARE FEET TO ACRES), USED TO LINK THE UNITS OF MEASUREMENT OF THE COMPONENTS TO THE BID ITEMS	CONVERSIONUID	4	22
	CostCategory	SUMMARY OF EACH OF THE TWENTY CATEGORIES IN THE USACE CIVIL WORKS CONSTRUCTION COST INDEX SYSTEM	COSTCATEGORYUID	2	20
	CostIndex	LIBRARY OF COST INDEXES PER CATEGORY PER YEAR, PULLED FROM THE USACE CIVIL WORKS CONSTRUCTION COST INDEX SYSTEM	COSTINDEXUID	4	322
	CostPercentage	DEFAULT PERCENTAGES FOR EACH OF THE SIX PRIMARY COST PARAMETERS APPLIED TO SUMS OF COMPONENT COSTS (CONSTRUCTION MANAGEMENT, SURVEYS, MOBILIZATION, OPERATIONS AND MAINTENANCE (O&M), P/E&D, AND CONTINGENCY)	COSTPERCENTAGEUID	5	6

CATEGORY	NAME	DESCRIPTION	PRIMARY KEY	NUMBER OF COLUMNS	NUMBER OF ROWS
	CostPercentageOverride	PERCENTAGE OVERRIDES BY PROJECTID FOR ANY OF THE RELEVANT SIX PRIMARY COST PARAMETERS	COSTPERCENTAGECODE, PROJECTUID	3	48
	Gates	LOOKUP TABLE RELATING GATE CODES TO GATE-SPECIFIC ATTRIBUTES USED IN THE ICM, SUCH AS INVERT ELEVATION AND WIDTH	GATEUID	3	29
	Item	LIBRARY OF UNIT COSTS AND LINK TO THE PCT.COSTCATEGORY	ITEMUID	8	129
	Types	LOOKUP TABLE THAT RELATES TYPE CODES TO TYPE DESCRIPTIONS (E.G., HR: HYDROLOGIC RESTORATION).	TYPEUID	5	19
ELEMENT ATTRIBUTES TABLES	Attributes_**	ATTRIBUTES FOR EACH OF THE 13 ELEMENT TYPES (BS, CH, CL, EL, GA, LS, MC, OR, PL, PW, RR, SP, AND XX), ASSOCIATED WITH EACH VERSION OF EACH ELEMENT	VERSIONUID	VARIABLE, SEE SUPPLEMENTAL MATERIAL F6.1	VARIABLE, SEE SUPPLEMENTAL MATERIAL F6.1
	BorrowOptions	DREDGE MOBILIZATION ATTRIBUTES FOR EACH ELEMENT-BORROW SOURCE COMBINATION	BORROWOPTIONUID	7	542
PCT OUTPUT TABLES	BorrowOptionCosts	COSTS ASSOCIATED WITH EACH THE LATEST VERSION OF EACH ELEMENT ASSOCIATED WITH EACH BORROW SOURCE IT IS LINKED TO IN THE PCT.BORROWOPTIONS TABLE	BORROWOPTIONUID, COSTSCENARIO, MODELGROUP, SCENARIO, VERSIONUID	13	5,670
	ElementComponents	QUANTITIES AND COSTS ASSOCIATED WITH THE COMPONENTS OF THE LATEST VERSION OF EACH ELEMENT		7	17,877
	ElementCosts	COSTS ASSOCIATED WITH THE LATEST VERSION OF EACH ELEMENT	COSTSCENARIO, MODELGROUP, SCENARIO, VERSIONUID	11	5,718

4.0 ICM SCHEMA

Data in the icm schema falls into three general categories, shown below and discussed in greater detail throughout this section.

1. **General Lookup Tables.** Project-level definition of operation regimes and ecoregions
2. **Model Outputs.** Data output from the ICM that is ultimately used to define benefits or other metrics in the PT or that is used as inputs to the PCT

The ICM calculates many types of metrics that are stored in the PDD, including habitat suitability, land area, and area of various types of vegetated cover. Benefits evaluated in the Planning Tool typically represent the difference in these metrics between the FWA and the FWOA ICM runs. When benefits are captured within the footprint of a project itself, they are considered “direct” benefits, and when they are captured within the region surrounding the project but not in the footprint itself, they are considered “indirect” benefits. The sum of direct and indirect benefits is referred to as the “total” benefits. Additionally, because the Planning Tool allows individual MC Elements that are part of MC Projects to compete for inclusion in the master plan just as other Projects do, benefits must be captured at both the project level and the MC Element level. This necessitates the need for a field that sometimes represents the ProjectID and sometimes represents the ElementID, depending on which benefit data is being represented, called the “CombinedID”. The CombinedID represents the ElementID for 94 MC Elements and 11 IP, 15 LB, 13 DI, 10 HR, and 22 RR Projects, for a total of 165 unique CombinedIDs. These terms are found frequently in the names and fields of the materialized views present in the icm schema.

Table 4 provides a summary of all database tables in the icm schema. Units for all data in the icm schema are metric and may be converted to imperial units for use in other models. Descriptions of all fields in icm schema tables is available in Supplemental Material F6.1: PDD Data Model Excel Workbook.

Table 4. Tables in the icm Schema

CATEGORY	TABLE NAME	DESCRIPTION	PRIMARY KEY	NUMBER OF COLUMNS	NUMBER OF ROWS
GENERAL LOOKUP TABLES	ecoregion_definition	USED TO ASSIGN PROJECTS TO ECOREGIONS THAT ARE AFFECTED BY THE PROJECT, USED TO GROUP ICM OUTPUTS	ECOREGION, PROJECTID	3	371
	element_ecoregion_definition	USED TO ASSIGN MC ELEMENTS TO THE ECOREGION IN WHICH THE FOOTPRINT LIES, USED TO GROUP ICM OUTPUTS	ELEMENTID	3	132
	mc_elevation	DEFINES THE TARGET DESIGN ELEVATION FOR EACH MC ELEMENT FOR EACH SCENARIO; SEE APPENDIX F1 FOR MARSH ELEVATION DESCRIPTION	ELEMENTID, SCENARIO	3	636
	operation_regime	DEFINITION OF OPERATIONAL STRATEGIES AND TRIGGERS FOR DIVERSION STRUCTURES	PROJECTID	5	26
MODEL OUTPUT TABLES	ag_salinity	SALINITY INDEX FOR EACH CROP IN EACH COMMUNITY FOR EVERY MODEL GROUP, ENVIRONMENTAL SCENARIO, AND YEAR COMBINATION	COMMUNITYNAME, CROP, DATE, MODELGROUP, SCENARIO, YEAR_ICM	9	408,096
	all_combined_benefits_by_ecoregion	SUPPLEMENTAL PROCESSED MODEL OUTPUT TABLE FOR MODEL GROUP 600; CONTAINS PROCESSED BENEFITS BY ECOREGION, COMBINEDID, YEAR, AND ENVIRONMENTAL SCENARIO	COMBINEDID, ECOREGION, MODELGROUP, PROJECTID, SCENARIO, YEAR_FWOA	17	1,700
	archaeological	LAND AREA OF THE GRID CELL ASSOCIATED WITH EACH ARCHAEOLOGICAL SITE FOR EVERY MODEL GROUP, ENVIRONMENTAL SCENARIO, AND YEAR COMBINATION	DATE, ECOREGION, MODELGROUP, SCENARIO, SITE, YEAR_ICM	10	TBD
	geomorph_output_exp_annual	ANNUAL TIMESERIES DATA COMPILED FROM ICM OUTPUT FILES FOR A VARIETY OF METRICS, INCLUDING SALINITY, MEAN WATER LEVEL, TIDAL RANGE, ELEVATION, DEPTH, MINERAL DEPOSITION, MINERAL ACCRETION, ORGANIC ACCUMULATION, ORGANIC ACCRETION, DEEP SUBSIDENCE, SHALLOW SUBSIDENCE, LANDTYPEID AND FFIBS.	MODELGROUP, SCENARIO, CALENDARYEAR, EXTRACTIONPOINT	21	TBD
	habitat_diversity	CALCULATED SHANNON INDEX FOR EACH REGION FOR EVERY MODEL GROUP, ENVIRONMENTAL SCENARIO, AND YEAR COMBINATION	DATE, MODELGROUP, REGION, SCENARIO, YEAR_ICM	8	TBD
	hsi	HABITAT SUITABILITY INDEX FOR EACH ECOREGION FOR EVERY MODEL GROUP, ENVIRONMENTAL SCENARIO, AND YEAR COMBINATION	DATE, ECOREGION, HABITATCODE, MODELGROUP, SCENARIO, YEAR_ICM	9	2,934,048
	hydro_output_annual	ANNUAL TIMESERIES DATA COMPILED FROM ICM OUTPUT FILES FOR A VARIETY OF METRICS, INCLUDING SALINITY, MEAN WATER LEVEL, TOTAL SUSPENDED SOLIDS, TEMPERATURE, LAND AREA, AND SUMMER TIDAL RANGE.	CALENDARYEAR, DATE, HYDROCOMPID, MODELGROUP, SCENARIO	13	371,696
	hydro_output_daily	DAILY TIMESERIES DATA COMPILED FROM ICM OUTPUT FILES FOR A VARIETY OF METRICS, INCLUDING SALINITY, MEAN WATER LEVEL, TOTAL SUSPENDED SOLIDS, TEMPERATURE, AND TIDAL RANGE.	CALENDARDAY, DATE, HYDROCOMPID, MODELGROUP, SCENARIO	12	135,761,964
	land_veg	AREA OF LAND AND VEGETATION COVER FOR EACH LAND/VEGETATION TYPE IN EACH ECOREGION FOR EVERY MODEL GROUP, ENVIRONMENTAL SCENARIO, AND YEAR COMBINATION	DATE, ECOREGION, MODELGROUP, SCENARIO, VEGETATIONCODE, YEAR_ICM	9	5,087,907

CATEGORY	TABLE NAME	DESCRIPTION	PRIMARY KEY	NUMBER OF COLUMNS	NUMBER OF ROWS
	mc	MC AREAS AND VOLUMES FOR EVERY MODEL GROUP, ENVIRONMENTAL SCENARIO, AND YEAR COMBINATION; SOURCE OF DATA USED IN THE PCT	DATE, ELEMENTID, MODELGROUP, SCENARIO, YEAR_FWOA	8	78,140
	mc_shallow_open_water	REPRESENTS THE AREA OF SHALLOW OPEN WATER WITHIN EACH MC ELEMENT FOOTPRINT OF CANDIDATE PROJECTS FOR PARALLEL AND SERIAL IMPLEMENTATION YEARS; SEE APPENDIX F1 FOR MORE INFORMATION	ELEMENTID, MODELGROUP, PROJECTID, SCENARIO	8	478

5.0 CLARA SCHEMA

Data in the clara schema falls into three general categories, shown below and discussed in greater detail throughout this section. Table 5 provides a summary of all database tables in the clara schema and descriptions of all table fields are available in Supplemental Material F6.1: PDD Data Model Excel Workbook.

1. **General Lookup Tables.** Definition of Nonstructural Risk Reduction Projects, including costs, structure counts, and other relevant metadata
2. **Model Outputs.** Data output from CLARA that is ultimately used to define benefits or other metrics in the PT
3. **Archived Data:** A mix of general look-up tables and model outputs that reference an outdated list of communities

There are officially 374 distinct communities represented in the CLARA and ICM models, 314 of which are estimated to experience flood risk across 5 distinct asset types. These 374 communities represent the breakdown of 221 uniquely *named* communities in 30 areas across parish, ecoregion, and levee boundaries – for instance, the named "Amelia" community comprises 5 unique Community IDs (11: Amelia-TE-in, 12: Amelia-TE-out, 348: Amelia-Assumption-TE-in, 349: Amelia-Assumption-TE-out, and 350: Amelia-St Mary-TE-in) and rolls up to the Morgan City Area.

While some data tables summarize results for each of the five asset types for each of the 314 communities, other tables remove rows where there are no assets of a certain type present within a community, leading to some inconsistencies in row counts across tables. Previous community lists had different counts of impacted communities, and row counts in archived data reflect these differences.

More details on CLARA modeling and attributes can be found in Appendix E: Overview of Improvements to Risk Modeling (ADCIRC+SWAN, CLARA) for 2023 (Martin, 2023; Wilson, 2023a).

Table 5. Tables in clara Schema

CATEGORY	TABLE NAME	DESCRIPTION	PRIMARY KEY	NUMBER OF COLUMNS	NUMBER OF ROWS
GENERAL LOOKUP TABLES	asset_count	BASELINE COUNT OF ASSETS FOR EACH COMMUNITY IN COASTAL LOUISIANA, USED FOR EXPOSURE AND RISK ANALYSIS	ASSETTYPE, COMMUNITYID	3	877
	asset_count_critical_infrastructure	BASELINE COUNT OF CRITICAL INFRASTRUCTURE ASSETS FOR EACH COMMUNITY IN COASTAL LOUISIANA, USED FOR EXPOSURE ANALYSIS	CLARAGROUPID, COMMUNITYID, SOURCEDATASET	4	2,760
	asset_count_historic_properties	BASELINE COUNT OF HISTORIC PROPERTIES FOR EACH COMMUNITY IN COASTAL LOUISIANA, USED FOR EXPOSURE ANALYSIS	COMMUNITYID	2	70
	community_info	DISPLAYS DEMOGRAPHIC INFORMATION (E.G. PERCENT OF PEOPLE WHO IDENTIFY AS ASIAN, BLACK ETC., PERCENT OF LOW TO MODERATE INCOME) AND THE TOTAL POPULATION FOR EACH NAMED COMMUNITY	COMMUNITYNAME	17	219
	nsattributes	DISPLAYS COSTS AND COUNTS OF ASSETS REQUIRING FLOODPROOFING, ACQUISITION, AND ELEVATION FOR NS PROJECTS, COMMUNITIES, ASSET TYPES, AND PARTICIPATION RATES	ASSETTYPE, COMMUNITYID, NSPROJECTID, PARTICIPATIONRATE	10	9,420
	nsprojects	DESCRIBES THE CONDITIONS UNDER WHICH EACH NONSTRUCTURAL PROJECT IS DEFINED	NSACQTHRESHOLD, NSFRAGILITYSCENARIO, NSMODELGROUP, NSPROJECTID, NSRETURNPERIOD, NSSCENARIO, NSYEAR_FWOA	7	12
	population_projections	POPULATION PROJECTIONS IN FIVE-YEAR INCREMENTS FOR EACH PARISH IN COASTAL LOUISIANA FOR MULTIPLE MIGRATION AND SSP SCENARIOS	CALENDARYEAR, SCENARIO, PARISHFIPS, MIGRATION, DATE, SSP	8	21,440
	population_projections_census_blockgroup	DECADAL POPULATION PROJECTIONS FOR EACH CENSUS BLOCK GROUP IN COASTAL LOUISIANA FOR MULTIPLE MIGRATION AND SSP SCENARIOS	DATE, CALENDARYEAR, SSP, SCENARIO, PARISHFIPS, GEOID, MIGRATION, PERCENTILE	10	1,122,300
	source_dataset_definition	DEFINES AND GROUPS SOURCE DATASETS FOR CRITICAL ASSETS INTO CATEGORIES USED TO DISPLAY DATA IN PROJECT FACT SHEETS	SOURCEDATASET	4	63
MODEL OUTPUT TABLES	damage	ESTIMATED DAMAGE BY RETURN PERIOD FOR FWOA AND FWP MODEL RUNS FOR SR PROJECTS	ASSETTYPE, COMMUNITYID, DATE, FRAGILITYSCENARIO, MODELGROUP, PROJECTID, PUMPINGID, RETURNPERIOD, SCENARIO, YEAR_FWOA	15	1,921,680

CATEGORY	TABLE NAME	DESCRIPTION	PRIMARY KEY	NUMBER OF COLUMNS	NUMBER OF ROWS
	exposure	COUNTS OF EXPOSED ASSETS FOR FWOA AND FWP MODEL RUNS FOR SR PROJECTS	ASSETTYPE, COMMUNITYID, DATE, FRAGILITYSCENARIO, MODELGROUP, PROJECTID, PUMPINGID, RETURNPERIOD, SCENARIO, YEAR_FWOA	15	892,060
	exposure_critical_infrastructure	COUNTS OF EXPOSED CRITICAL INFRASTRUCTURE FOR FWOA AND FWP MODEL RUNS FOR SR PROJECTS	CLARAGROUPID, COMMUNITYID, DATE, FRAGILITYSCENARIO, MODELGROUP, PROJECTID, PUMPINGID, RETURNPERIOD, SCENARIO, SOURCEDATASET, YEAR_FWOA	15	2,812,480
	exposure_historic_properties	COUNTS OF EXPOSED HISTORICAL PROPERTIES FOR FWOA AND FWP MODEL RUNS FOR SR PROJECTS	COMMUNITYID, DATE, FRAGILITYSCENARIO, MODELGROUP, PROJECTID, PUMPINGID, RETURNPERIOD, SCENARIO, YEAR_FWOA	13	71,400
	flood_depths	10TH, 50TH, AND 90TH PERCENTILE FLOOD DEPTHS FOR EACH CLARA GRID CELL	DATE, FRAGILITYSCENARIO, MODELGROUP, POINTID, PUMPINGID, RETURNPERIOD, SCENARIO, YEAR_FWOA	13	27,758,280
	flood_elevations_icm	TIMESERIES OF DECADAL WATER SURFACE ELEVATIONS AT EACH CLARA GRID CELL BY ANNUAL EXCEEDANCE PROBABILITY	AEP, DATE, HYDROCOMPID, MODELGROUP, SCENARIO, YEAR_FWOA	13	629,460
	flood_elevations_icm_storm	TIMESERIES OF DECADAL WATER SURFACE ELEVATIONS AT EACH CLARA GRID CELL BY SYNTHETIC STORM MODELED IN ADCIRC	DATE, HYDROCOMPID, MODELGROUP, SCENARIO, STORMID, YEAR_FWOA	9	11,185,020
	grid_definition	LATITUDE AND LONGITUDE OF EACH CLARA GRID CELL	POINTID	3	126,174
	median_ground_elevation	TIMESERIES OF DECADAL MEDIAN GROUND ELEVATIONS AT EACH CLARA GRID CELL	DATE, MODELGROUP, POINTID, SCENARIO, YEAR_FWOA	8	2,775,828
	nsrisk	RISK IN TERMS OF EXPECTED ANNUAL DAMAGE FOR FWOA AND FWP MODEL RUNS FOR NS PROJECTS	ASSETTYPE, COMMUNITYID, FRAGILITYSCENARIO, MODELGROUP, NSPROJECTID, PARTICIPATIONRATE, PUMPINGID, SCENARIO, YEAR_FWOA	20	695,120
	risk	RISK IN TERMS OF EXPECTED ANNUAL DAMAGE FOR FWOA AND FWP MODEL RUNS FOR SR PROJECTS	ASSETTYPE, COMMUNITYID, DATE, FRAGILITYSCENARIO, MODELGROUP, PROJECTID, PUMPINGID, SCENARIO, YEAR_FWOA	19	310,860
	water_percentage	ANNUAL TIMESERIES REPRESENTING THE PERCENTAGE OF A CLARA GRID CELL THAT IS COVERED IN WATER	DATE, MODELGROUP, POINTID, SCENARIO, YEAR_FWOA	8	126,174

CATEGORY	TABLE NAME	DESCRIPTION	PRIMARY KEY	NUMBER OF COLUMNS	NUMBER OF ROWS
ARCHIVED DATA	community_ids	DEFINES THE ORIGINAL LIST OF COMMUNITIES AND THEIR METADATA, SUCH AS NAME AND PARISH LOCATION; REPLACED WITH PDD.COMMUNITYDEFINITION	MPCOMMUNITYID	9	473
	damage_original	SAME AS DAMAGE, BUT LINKED TO MPCOMMUNITYID RATHER THAN COMMUNITYID	ASSETTYPE, DATE, FRAGILITYSCENARIO, MODELGROUP, MPCOMMUNITYID, PROJECTID, PUMPINGID, RETURNPERIOD, SCENARIO, YEAR_FWOA	15	977,760
	exposure_original	SAME AS EXPOSURE, BUT LINKED TO MPCOMMUNITYID RATHER THAN COMMUNITYID	ASSETTYPE, DATE, FRAGILITYSCENARIO, MODELGROUP, MPCOMMUNITYID, PROJECTID, PUMPINGID, RETURNPERIOD, SCENARIO, YEAR_FWOA	15	1,942,200
	nsattributes_original	SAME AS NSATTRIBUTES, BUT LINKED TO MPCOMMUNITYID RATHER THAN COMMUNITYID	ASSETTYPE, MPCOMMUNITYID, NSPROJECTID, PARTICIPATIONRATE	10	52,380
	nsrisk_original	SAME AS NSRISK, BUT LINKED TO MPCOMMUNITYID RATHER THAN COMMUNITYID	ASSETTYPE, FRAGILITYSCENARIO, MODELGROUP, MPCOMMUNITYID, NSPROJECTID, PARTICIPATIONRATE, PUMPINGID, SCENARIO, YEAR_FWOA	20	314,280
	project_community_link	LINKS EACH PROJECT TO ONE OR MANY ARCHIVED COMMUNITIES.	MPCOMMUNITYID, PROJECTID	3	432
	risk_original	SAME AS RISK, BUT LINKED TO MPCOMMUNITYID RATHER THAN COMMUNITYID	ASSETTYPE, DATE, FRAGILITYSCENARIO, MODELGROUP, MPCOMMUNITYID, PROJECTID, PUMPINGID, SCENARIO, YEAR_FWOA	19	1,353,150
	temporary_community_link	LINKS THE UPDATED COMMUNITYIDS WITH THE ARCHIVED MPCOMMUNITYIDS, USED IN EARLY ITERATIONS OF PROJECT FACT SHEETS		3	397

6.0 PT SCHEMA

Data in the pt schema falls into two general categories, shown below and discussed in greater detail throughout this section. Table 6 provides a summary of all database tables in the pt schema and descriptions of all table fields are available in Supplemental Material F6.1: PDD Data Model Excel Workbook.

1. **Direct PT Outputs.** Data output from PT used to defined project costs and benefits.
2. **Post-Processed PT Outputs.** Data output from PT that is post-processed specifically for use in the master plan fact sheets.

The Planning Tool uses direct outputs from the PCT, ICM, and CLARA models to perform a cost-benefit analysis across a variety of metrics to prioritize candidate projects for selection in the master plan. Data stored in the pt schema of the PDD is a small subset of the Planning Tool outputs, specifically used to report project-level benefits and costs. The Planning Tool may determine that multiple borrow sources are required to construct MC Elements based on sediment availability, which may impact the cost of a project. Additionally, the Planning Tool interpolates land area benefits for restoration projects over two distinct time horizons: across the construction duration of a project and across the time difference between a project whose Elements are constructed in parallel compared to being constructed in a serial manner. More information about the Planning Tool and its processes can be found in Appendix G: Decision-Making (Wilson et al., 2023).

Table 6. Tables in the pt Schema

CATEGORY	TABLE NAME	DESCRIPTION	PRIMARY KEY	NUMBER OF COLUMNS	NUMBER OF ROWS
DIRECT PT OUTPUT TABLES	project_borrow_volume	ESTIMATED VOLUME OF SEDIMENT THAT EACH MC ELEMENT IS PULLING FROM EACH RELEVANT BORROW SOURCE	DATE, PROJECTBORROWVOLUMEUID	9	18,110
	restoration_adjusted_benefit	INTERPOLATED LAND AREA BENEFITS FOR ALL RESTORATION PROJECTS. BENEFITS ARE INTERPOLATED DURING THE CONSTRUCTION DURATION AND ADJUSTED BY A SHALLOW-OPEN WATER FACTOR TO ACCOUNT FOR PARALLEL RATHER THAN SERIAL CONSTRUCTION OF ELEMENTS WITHIN A PROJECT	DATE, RESTORATIONADJUSTEDBENEFITUID	11	47,434
	restoration_project_benefit	INTERPOLATED LAND AREA BENEFITS FOR EACH RESTORATION PROJECT IN EACH PLANNING TOOL ALTERNATIVE.	DATE, RESTORATIONPROJECTBENEFITUID	12	1,556,508
	restoration_project_cost	ESTIMATED COSTS FOR EACH RESTORATION PROJECT IN EACH PLANNING TOOL ALTERNATIVE. COSTS ACCOUNT FOR ELEMENTS ASSIGNED TO MULTIPLE BORROW SOURCES.	DATE, RESTORATIONPROJECTCOSTUID	8	21,646
	risk_project_benefit	ESTIMATED BENEFITS IN TERMS OF EAD AND EASD FOR EACH SR PROJECT IN EACH PLANNING TOOL ALTERNATIVE	RISKPROJECTBENEFITUID	13	2,073,776
	risk_project_cost	ESTIMATED COSTS FOR EACH SR PROJECT IN EACH PLANNING TOOL ALTERNATIVE.	RISKPROJECTCOSTUID	9	54,584
POST-PROCESSED PT OUTPUT TABLES	project_benefits_summary	SUMMARY OF PROJECT BENEFITS SPECIFICALLY FORMATTED FOR USE IN PROJECT FACT SHEETS. DATA CREATED BY SCRIPT USED TO GENERATE LAND AREA GRAPHICS FOR THE PROJECT FACT SHEETS.	DATE, MODELGROUP, PROJECTID, SCENARIO	11	296

7.0 DAP SCHEMA

In addition to the Master Plan Data Viewer, CPRA developed a Master Plan Data Access Portal (MPDAP) for users to view and download more detailed model outputs. These outputs include timeseries data for a variety of variables from the ICM, CLARA, and ADCIRC models (Table 7) at various spatial scales (Table 8) and time scales (decadal, annual, or daily). Views were developed and stored in the dap schema for the MPDAP API to read. Views are summarized in Table 9 below.

Table 7. Metric definitions

VARIABLE	DEFINITION	UNIT
DAMAGE	DAMAGE BY AEP	DOLLARS
DEPTH	WATER DEPTH	M
EAD	EXPECTED ANNUAL DAMAGE	DOLLARS
EAD_NS	EXPECTED ANNUAL DAMAGE WITH NONSTRUCTURAL PROJECTS IMPLEMENTED	DOLLARS
EADSTR	EXPECTED ANNUAL STRUCTURAL DAMAGE	DOLLARS
EADSTR_NS	EXPECTED ANNUAL STRUCTURAL DAMAGE WITH NONSTRUCTURAL PROJECTS IMPLEMENTED	DOLLARS
EASD	EXPECTED ANNUAL NUMBER OF STRUCTURES DAMAGED	COUNT
EASD_NS	EXPECTED ANNUAL NUMBER OF STRUCTURES DAMAGED WITH NONSTRUCTURAL PROJECTS IMPLEMENTED	COUNT
ELEVATION	WATER SURFACE ELEVATION BASED ON AEP	M
ELEVATION_STORM	WATER SURFACE ELEVATION BASED ON SPECIFIC STORM EVENTS	M
EXPOSURE	STRUCTURES EXPECTED TO EXPERIENCE FLOODING	COUNT
EXPOSURE_CI	CRITICAL INFRASTRUCTURE EXPECTED TO EXPERIENCE FLOODING	COUNT

VARIABLE	DEFINITION	UNIT
EXPOSURE_HP	HISTORICAL PROPERTIES EXPECTED TO EXPERIENCE FLOODING	COUNT
FFIPS	FORESTED, FRESH, INTERMEDIATE, BRACKISH OR SALINE SCORE	UNITLESS
GROUND_ELEVATION	MEDIAN GROUND ELEVATION	M
HSI	HABITAT SUITABILITY INDEX	UNITLESS
LND	LAND AREA (INCLUDING FLOTANT MARSH AND BAREGROUND)	M^2
LND_ID	LANDTYPE ID	UNITLESS
MNRL_ACCR	MINERAL ACCRETION	CM
MNRL_DEP	MINERAL DEPOSITION	G/CM^2-YR
ORG_ACCR	ORGANIC ACCRETION	CM
ORG_ACCU	ORGANIC ACCUMULATION	G/CM^2-YR
POPULATION	US CENSUS PPOPULATION ESTIMATE	COUNT
SAL	SALINITY	PPT
SAL2WKMAX	SALINITY (2 WEEK MAX)	PPT
STG	MEAN WATER LEVEL	M
SUBSI_DEEP	DEEP SUBSIDENCE	MM/YR
SUBSI_SHALLOW	SHALLOW SUBSIDENCE	MM/YR
TMP	TEMPERATURE	ºC
TRG	TIDAL RANGE	M
TSS	TOTAL SUSPENDED SOLIDS	MG / L
VEG	AREA BY VEGETATION TYPE	M^2

VARIABLE	DEFINITION	UNIT
WAVE	WAVE HEIGHT BASED ON AEP	M
WAVE_STORM	WAVE HEIGHT BASED ON SPECIFIC STORM EVENTS	M

Table 8. Timeseries data outputs

GEOGRAPHY	DEFINITION	COUNT
EXP	EXTRACTION POINT	2,941
CGRID	CLARA GRID	126,174
COMM	CLARA COMMUNITY	314
COMP	HYDRO COMPARTMENT	1,787
ECOR	ECOREGION	28
PARISH	PARISH	67
BG	CENSUS BLOCK GROUP	3,741

Table 9. Timeseries data for dap

SCHEMA	GEOGRAPHY	TIME UNIT	VARIABLE	FULL NAME	SOURCE TABLE
CLARA	BG	DECADAL	POPULATION	DAP.VW_CLARA_BG_DECADAL_POPULATION	POPULATION_PROJECTIONS_CENSUS_BLOCKGROUP
CLARA	CGRID	DECADAL	DEPTH	DAP.VW_CLARA_CGRID_DECADAL_DEPTH	FLOOD_DEPTHS
CLARA	CGRID	DECADAL	GROUND_ELEVATION	DAP.VW_CLARA_CGRID_DECADAL_GROUND_ELEVATION	MEDIAN_GROUND_ELEVATION
CLARA	COMM	DECADAL	DAMAGE	DAP.VW_CLARA_COMM_DECADAL_DAMAGE	DAMAGE
CLARA	COMM	DECADAL	EAD	DAP.VW_CLARA_COMM_DECADAL_EAD	RISK
CLARA	COMM	DECADAL	EAD_NS	DAP.VW_CLARA_COMM_DECADAL_EAD_NS	NSRISK
CLARA	COMM	DECADAL	EADSTR	DAP.VW_CLARA_COMM_DECADAL_EADSTR	RISK
CLARA	COMM	DECADAL	EADSTR_NS	DAP.VW_CLARA_COMM_DECADAL_EADSTR_NS	NSRISK
CLARA	COMM	DECADAL	EASD	DAP.VW_CLARA_COMM_DECADAL_EASD	RISK
CLARA	COMM	DECADAL	EASD_NS	DAP.VW_CLARA_COMM_DECADAL_EASD_NS	NSRISK
CLARA	COMM	DECADAL	EXPOSURE	DAP.VW_CLARA_COMM_DECADAL_EXPOSURE	EXPOSURE
CLARA	COMM	DECADAL	EXPOSURE_CI	DAP.VW_CLARA_COMM_DECADAL_EXPOSURE_CI	EXPOSURE_CRITICAL_INFRASTRUCTURE
CLARA	COMM	DECADAL	EXPOSURE_HP	DAP.VW_CLARA_COMM_DECADAL_EXPOSURE_HP	EXPOSURE_HISTORIC_PROPERITES
CLARA	COMP	DECADAL	ELEVATION	DAP.VW_CLARA_COMP_DECADAL_ELEVATION	FLOOD_ELEVATIONS_ICM
CLARA	COMP	DECADAL	ELEVATION_STORM	DAP.VW_CLARA_COMP_DECADAL_ELEVATION_STORM	FLOOD_ELEVATIONS_ICM_STORM
CLARA	COMP	DECADAL	WAVE	DAP.VW_CLARA_COMP_DECADAL_WAVE	FLOOD_ELEVATIONS_ICM
CLARA	COMP	DECADAL	WAVE_STORM	DAP.VW_CLARA_COMP_DECADAL_WAVE_STORM	FLOOD_ELEVATIONS_ICM_STORM
CLARA	PARISH	DECADAL	POPULATION	DAP.VW_CLARA_PARISH_DECADAL_POPULATION	POPULATION_PROJECTIONS
ICM	COMP	ANNUAL	LND	DAP.VW_ICM_COMP_ANNUAL_LND	HYDRO_OUTPUT_ANNUAL

SCHEMA	GEOGRAPHY	TIME UNIT	VARIABLE	FULL NAME	SOURCE TABLE
ICM	COMP	ANNUAL	SAL	DAP.VW_ICM_COMP_ANNUAL_SAL	HYDRO_OUTPUT_ANNUAL
ICM	COMP	ANNUAL	SAL_2WKMAX	DAP.VW_ICM_COMP_ANNUAL_SAL_2WKMAX	HYDRO_OUTPUT_ANNUAL
ICM	COMP	ANNUAL	STG	DAP.VW_ICM_COMP_ANNUAL_STG	HYDRO_OUTPUT_ANNUAL
ICM	COMP	ANNUAL	TMP	DAP.VW_ICM_COMP_ANNUAL_TMP	HYDRO_OUTPUT_ANNUAL
ICM	COMP	ANNUAL	TSS	DAP.VW_ICM_COMP_ANNUAL_TSS	HYDRO_OUTPUT_ANNUAL
ICM	COMP	DAILY	SAL	DAP.VW_ICM_COMP_DAILY_SAL	HYDRO_OUTPUT_DAILY
ICM	COMP	DAILY	STG	DAP.VW_ICM_COMP_DAILY_STG	HYDRO_OUTPUT_DAILY
ICM	COMP	DAILY	TMP	DAP.VW_ICM_COMP_DAILY_TMP	HYDRO_OUTPUT_DAILY
ICM	COMP	DAILY	TRG	DAP.VW_ICM_COMP_DAILY_TRG	HYDRO_OUTPUT_DAILY
ICM	COMP	DAILY	TSS	DAP.VW_ICM_COMP_DAILY_TSS	HYDRO_OUTPUT_DAILY
ICM	ECOR	ANNUAL	HSI	DAP.VW_ICM_ECOR_ANNUAL_HSI	HSI
ICM	ECOR	ANNUAL	LND	DAP.VW_ICM_ECOR_ANNUAL_LND	LAND_VEG
ICM	ECOR	ANNUAL	VEG	DAP.VW_ICM_ECOR_ANNUAL_VEG	LAND_VEG
ICM	EXP	ANNUAL	DEPTH	DAP.VW_ICM_EXP_ANNUAL_DEPTH	GEOMORPH_OUTPUT_EXP_ANNUAL
ICM	EXP	ANNUAL	FFIBS	DAP.VW_ICM_EXP_ANNUAL_FFIBS	GEOMORPH_OUTPUT_EXP_ANNUAL
ICM	EXP	ANNUAL	GROUND_ELEVATION	DAP.VW_ICM_EXP_ANNUAL_GROUND_ELEVATION	GEOMORPH_OUTPUT_EXP_ANNUAL
ICM	EXP	ANNUAL	LND_ID	DAP.VW_ICM_EXP_ANNUAL_LND_ID	GEOMORPH_OUTPUT_EXP_ANNUAL
ICM	EXP	ANNUAL	MNRL_ACCR	DAP.VW_ICM_EXP_ANNUAL_MNRL_ACCR	GEOMORPH_OUTPUT_EXP_ANNUAL
ICM	EXP	ANNUAL	MNRL_DEP	DAP.VW_ICM_EXP_ANNUAL_MNRL_DEP	GEOMORPH_OUTPUT_EXP_ANNUAL

SCHEMA	GEOGRAPHY	TIME UNIT	VARIABLE	FULL NAME	SOURCE TABLE
ICM	EXP	ANNUAL	ORG_ACCR	DAP.VW_ICM_EXP_ANNUAL_ORG_ACCR	GEOMORPH_OUTPUT_EXP_ANNUAL
ICM	EXP	ANNUAL	ORG_ACCU	DAP.VW_ICM_EXP_ANNUAL_ORG_ACCU	GEOMORPH_OUTPUT_EXP_ANNUAL
ICM	EXP	ANNUAL	SAL	DAP.VW_ICM_EXP_ANNUAL_SAL	GEOMORPH_OUTPUT_EXP_ANNUAL
ICM	EXP	ANNUAL	SAL_2WKMAX	DAP.VW_ICM_EXP_ANNUAL_SAL_2WKMAX	GEOMORPH_OUTPUT_EXP_ANNUAL
ICM	EXP	ANNUAL	STG	DAP.VW_ICM_EXP_ANNUAL_STG	GEOMORPH_OUTPUT_EXP_ANNUAL
ICM	EXP	ANNUAL	SUBSI_DEEP	DAP.VW_ICM_EXP_ANNUAL_SUBSI_DEEP	GEOMORPH_OUTPUT_EXP_ANNUAL
ICM	EXP	ANNUAL	SUBSI_SHALLOW	DAP.VW_ICM_EXP_ANNUAL_SUBSI_SHALLOW	GEOMORPH_OUTPUT_EXP_ANNUAL
ICM	EXP	ANNUAL	TRG	DAP.VW_ICM_EXP_ANNUAL_TRG	GEOMORPH_OUTPUT_EXP_ANNUAL

8.0 PDG STRUCTURE

The PDG and Mapping PDG contain geospatial data required to support project definition, PCT cost estimation, and communication of project details to the public. Feature classes within the PDG are listed in Table 10, and feature classes that are also present in the Mapping PDG are denoted with an asterisk (*). Each Element with a corresponding geospatial footprint contains one record in either the Points, Lines, or Polygons feature class in the PDG; however, if an Element is linked to multiple Projects in the *ElementAssignment* table in the pct schema, multiple records for that Element exist in the corresponding feature class in the Mapping PDG. Additionally, feature classes in the PDG contain attributes at the Element level, while those in the Mapping PDG contain additional attributes at the project level. Element-level attributes are common across the Points, Lines, Polygons, and Polygons_cells feature classes. Additional fields for Polygons_cells, Lines and ElementPath feature classes are detailed in Supplemental Material F6.1: PDD Data Model Excel Workbook. Element feature classes in the Mapping PDG contain additional fields as shown in Supplemental Material F6.1. Default GIS fields (ObjectID, Shape, Shape_Length, and Shape_Area) are present in all feature classes but are not included in Supplemental Material F6.1.

Attributes are linked to the PDD using the LegacyElementNumber (i.e., ElementID) as primary keys. The PDD remains the source of truth for attributes that are populated from the PDD, as they are only included as fields in PDG feature classes as references to facilitate mapping and GIS tool calculations. These attributes are populated with data from the PDD after updates are made to the PDD or PCT, as described in Attachment F7: Project Costing Tool Documentation (Sprague, 2023b). Conversely, some fields are only defined in the PDG and are used solely to facilitate GIS tool calculations.

Table 10. PDG Structure

FEATURE CLASS	DESCRIPTION
POINTS*	MULTIPOINT FEATURES OF PROPOSED ELEMENTS, SUCH AS GATES OR PUMPS
LINES*	LINE FEATURES OF PROPOSED ELEMENTS, SUCH AS STONE ARMOR OF SHORELINE PROTECTION OR LEVEE ALIGNMENTS OF STRUCTURAL RISK REDUCTION
POLYGONS*	POLYGON FEATURES OF PROPOSED MC ELEMENTS
POLYGONS_CELLS	POLYGON FEATURES OF PROPOSED MC 2,000-ACRE CELLS

FEATURE CLASS	DESCRIPTION
ELEMENTPATH*	LINE FEATURES REPRESENTING THE PATHS DRAWN FROM BORROW SOURCES TO MC ELEMENTS, AS PRODUCED BY THE DREDGE MOBILIZATION TOOL, DESCRIBED IN THE *PROJECT COSTING TOOL TECHNICAL DOCUMENTATION*
ELEMENTASSIGNMENT	TABLE MIRRORING THE *ELEMENTASSIGNMENT* TABLE IN THE PDD, USED TO LINK ELEMENT-LEVEL GEOSPATIAL DATA IN THE POINTS, LINES, POLYGONS, POLYGONS_CELLS, AND ELEMENTPATH FEATURE CLASSES TO PROJECTS AS NECESSARY
** FEATURE CLASSES THAT ARE ALSO PRESENT IN THE MAPPING PDG*	

9.0 REFERENCES

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