



Oregon State University

*Project Step 5 Portfolio Assignment
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CS 340 - 400 - U2022
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URL: <http://flip2.engr.oregonstate.edu:9122/>

Executive Summary

Team 28 would like to first thank the Oregon State University faculty, teaching assistants, and students enrolled in CS 340 - Introduction to Databases; the feedback from the aforementioned parties have aided in the evolution in our portfolio project. Group 28 has designed a database revolving around a water municipality, which services a community with potable and recycled water.

First off, we updated the naming convention from snake-case to camel-case for both attributes and entities to achieve a consistent naming convention for easier referencing purposes. Also, we made all of our entities to be plural to abide by the fundamental database design practices. Furthermore, we cleaned up our outline by removing duplicates of the intersection tables and added a description to the outline for them to convey to the user the relationship and role the table has when serving in the relationship of other entities.

The user interface has been vastly upgraded with a more fluid look and design for both aesthetics and easier user functionality; this was achieved by incorporating bootstrap into the database app. In addition to that, we created a user interface for our intersection tables and showed how they are dynamically affected by CREATE, READ, UPDATE, and DELETE operations from involved entities in a M:M relationship. We also included a webpage for at least one SELECT that utilizes a search/filter with a dynamically populated list of properties on the Customers page to help search/filter for a customer based on zip code and occupant type. Additionally, we allowed a NULLable value in the Storages table under the materials attribute. This was achieved by changing the foreign key CASCADE DELETE to SET NULL.

Project Outline:

Marin Municipal Water District (MMWD) is the first water agency to be established in the state of California, United States. MMWD is responsible for providing water to Marin County's 200,000 residential, commercial, and government customers. Marin Municipal Water District has over 100 water storage tanks and over 10 reservoirs in their system. MMWD is fortunate enough to have 3 types of sources of water producing entities in local proximity. This website and database will help track the allocation of water that MMWD supplies from its sources to its customers. It will also help the MMWD manage Customers, Storage types, sources of water, the materials of storage types, etc.

Updated DataBase Outline

Customers: Records information about the customers and their water usage.

- customerID: int, auto_increment, unique, not NULL, PK
- occupantType: varchar(20), not Null, FK
- potableWater: int, not NULL
- recycledWater: int, not NULL
- Relationships:
 - 1:M relationship between Customers and Addresses is implemented with customerID as a FK inside of Addresses
 - M:1 relationship between Customer and OccupantTypes is implemented with occupantTypesOccupantType as a FK inside of Customers

OccupantTypes: Describes the type of occupants (Residential, Commercial, Government)

occupantType: varchar(20), not Null, unique, PK

- Relationships:
 - 1:M relationship between OccupantTypes and Customer is implemented with occupantTypesOccupantType as a FK inside of Customers

Addresses: The addresses for customers and storage

- addressID: int, auto_increment, unique, not NULL, PK
- street: varchar(45), not NULL
- city: varchar(45), not NULL
- state: varchar(2), not NULL
- zip: varchar(5), not NULL
- customersCustomerID: int, not NULL, FK

- Relationships:
 - M:1 relationship between Addresses and Customers is implemented with customersCustomerID as a FK inside of Addresses
 - M:N relationship between Addresses and Storage is implemented with addressesAddressID as a FK inside of StorageHasAddresses (intersection table)

StorageHasAddresses (intersection Table shows which storages have which addresses.)

- storageStorageID: int, not NULL, FK
- addressesAddressID: int, not NULL, FK

Storages: Records the type of water storage options.

- storageID: int, auto_increment, unique, not NULL, PK
- storageCapacity: int, not NULL
- isCovered: varchar(6), not Null
- materialsMaterial: char(10), Null, FK
- storageTypesStorageType: varchar(20), not Null, FK
- Relationships:
 - M:N relationship between Storage and Addresses is implemented with storageStorageID as a FK inside of StorageHasAddresses (intersection table)
 - 1:M relationship between Storage and Materials is implemented with materialsMaterial as FK inside of Storage (On Cascade delete for FK SET NULL)
 - 1:M relationship between Storage and StorageTypes is implemented with storageTypesStorageType as FK inside of Storage
 - M:N relationship between Storage and Sources is implemented with storageStorageID as an FK inside of StorageHasSources (intersection table)
 - materialsMaterial will SET NULL if Material is deleted. (updated 7/23)

StorageHasAddresses (intersection shows which storages have which addresses):

- storageStorageID: int, not NULL, FK
- addressesAddressID: int, not NULL, FK

Materials:

- material: varchar(10), unique, not NULL, PK
(wood, steel, concrete)

- Relationships:
 - M:1 relationship between Materials and Storage is implemented with materialsMaterial as FK inside of Storage. If material is deleted, it will set the material attribute in Storages to null.

StorageTypes: Describes the storage type (tank or reservoir).

- storageType: varchar(25), unique, not NULL, PK
- Relationships:
 - M:1 relationship between StorageTypes and Storage is implemented with storageTypesStorageType as FK inside of Storage

StorageHasSources (intersection table shows which storages have which sources):

- storageStorageID: int, FK
- sourcesSourceName: varchar(120), FK

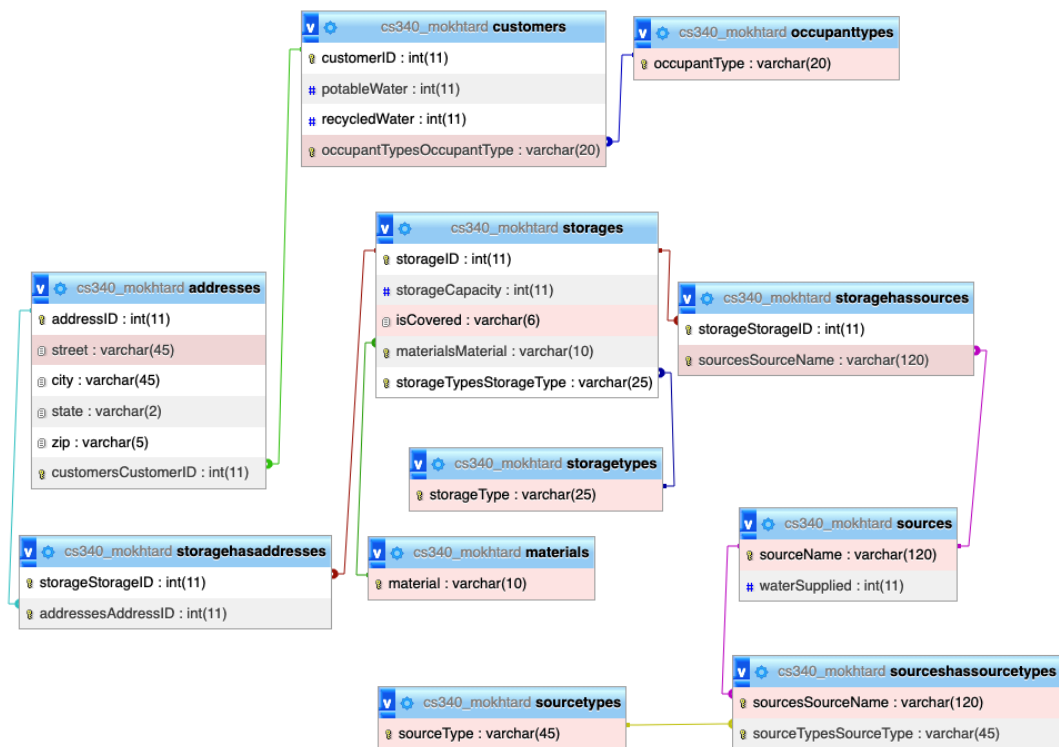
Sources: This is where the water comes from (River, Ocean, Groundwater Source).

- sourceName: varchar(120), unique, not NULL, PK
- sourceTypesSourceType: varchar(45), not Null, FK
- waterSupplied: int, not NULL
- Relationship:
 - M:N relationship between Sources and SourceTypes is implemented with sourcesSourceName as an FK inside of SourcesHasSourceTypes (intersection table)
 - M:N relationship between Sources and Storage is implemented with sourcesSourceName as an FK inside of StorageHasSources (intersection table)

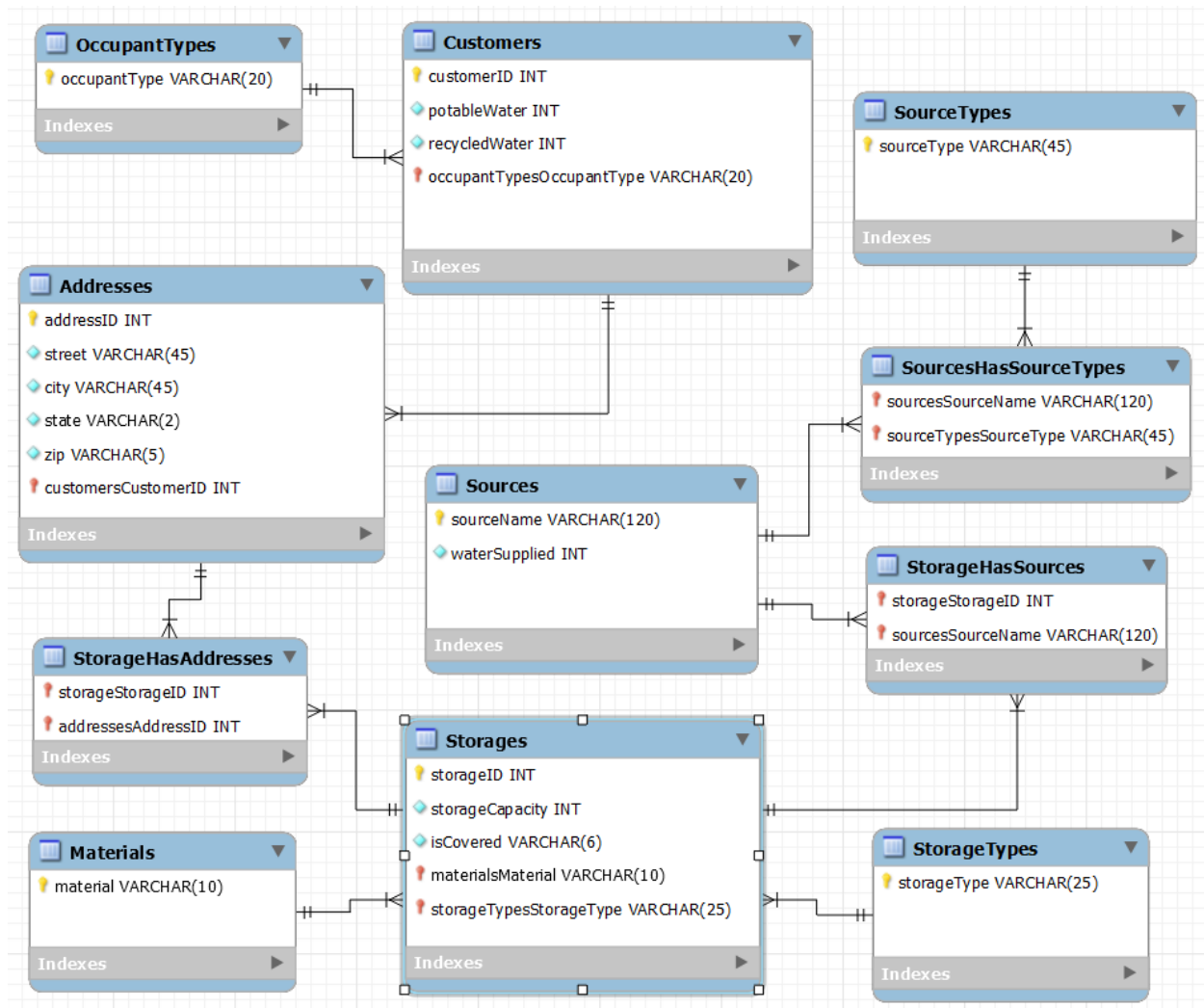
SourceTypes: These are the types of water sources available (River, Sea, Rainfall, Groundwater)

- sourceType: varchar(45); not Null, PK
- Relationship:
 - M:N relationship between SourceTypes and Sources is implemented with sourceTypesSourceType as an FK inside of SourcesHasSourceTypes (intersection table)

Updated Entity Relationship Diagram



Updated Schema



Updated Data Used in Database

Addresses:

addresses x

Limit to 1000 rows

1 • `SELECT * FROM wateragency.addresses;`

Result Grid Filter Rows: Edit: Export/Import: Wrap Cell

	addressID	street	city	state	zip	customersCustomerID
▶	1	220 Nellen Ave	Corte Madera	CA	94925	7
	2	225 Nellen Ave	Corte Madera	CA	94925	7
	3	240 Nellen Ave	Corte Madera	CA	94925	7
	4	10 School St	Fairfax	CA	94930	4
	5	25 Merwin Ave	Fairfax	CA	94930	5
	6	156 Acacia Rd	Fairfax	CA	94930	6
*	NULL	NULL	NULL	NULL	NULL	NULL

Customers:

customers x

Limit to 1000 rows

1 • `SELECT * FROM wateragency.customers;`

Result Grid Filter Rows: Edit: Export/Import: Wrap Cell Content: iA

	customerID	potableWater	recycledWater	occupantTypesOccupantType
▶	4	50000	1000	Commercial
	5	150	20	Residential
	6	20	20	Residential
	7	1500000	450000	Government
	9	250	100	Charity
*	NULL	NULL	NULL	NULL

Materials:

materials x

Limit to 1000 rows

```
1 • SELECT * FROM wateragency.materials;
```

Result Grid

material
Concrete
Metal
Plastic
Wood
NULL

OccupantTypes:

occupanttypes x

Limit to 1000 rows

```
1 • SELECT * FROM wateragency.occupanttypes;
```

Result Grid

occupantType
Charity
Commercial
Government
Residential

Sources:

sources

Limit to 1000 rows

1 • `SELECT * FROM wateragency.sources;`

Result Grid

	sourceName	waterSupplied
▶	Americano Creek	100000
	Groundwater	1200000
	Pacific Ocean	50000000
	Rainfall	6000000
	Rush Creek	500000

SourcesHasSourceTypes (Intersection Table):

sourceshas sourcetypes


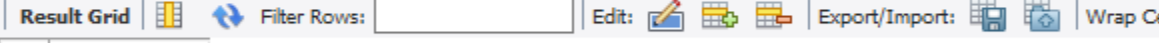
Limit to 1000 rows

1 • `SELECT * FROM wateragency.sourceshas sourcetypes;`

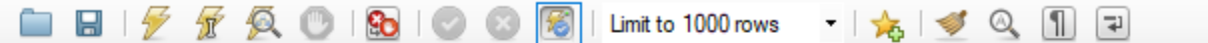
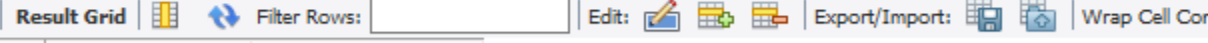
Result Grid

	sourcesSourceName	sourceTypesSourceType
▶	Americano Creek	Groundwater
	Americano Creek	Rainfall
	Americano Creek	River
	Groundwater	Groundwater
	Pacific Ocean	Ocean
	Pacific Ocean	Rainfall
	Rainfall	Rainfall
	Rush Creek	Groundwater
	Rush Creek	Rainfall

SourceTypes:

sourcetypes	
	
1 • <code>SELECT * FROM wateragency.sourcetypes;</code>	
	
sourceType	
▶ Creek	
Groundwater	
Ocean	
Rainfall	
River	
NULL	

StorageHasAddresses (Intersection Table):

storagehasaddresses	
	
1 • <code>SELECT * FROM wateragency.storagehasaddresses;</code>	
	
storageStorageID	addressesAddressID
▶ 1	3
2	2

StorageHasSources (Intersection Table):

storagehassources x

Limit to 1000 rows

1 • SELECT * FROM wateragency.storagehassources;

Result Grid

	storageStorageID	sourcesSourceName
▶	1	Americano Creek
	1	Rainfall
	2	Groundwater
	2	Rush Creek
	NULL	NULL

Storages:

storages x

Limit to 1000 rows

1 • SELECT * FROM wateragency.storages;

Result Grid

	storageID	storageCapacity	isCovered	materialsMaterial	storageTypesStorageType
▶	1	5000000	0	Concrete	Reservoir
	2	120000	1	Metal	Water Tower
	3	200000	1	Plastic	Storage Tank
	4	85000	1	Plastic	Storage Tank
*	NULL	NULL	NULL	NULL	NULL

StorageTypes:

The screenshot shows a database query tool interface. At the top, a tab labeled 'storagetypes' is active. Below the tab is a toolbar with various icons for file operations, search, and execution. A dropdown menu shows 'Limit to 1000 rows'. The main query editor contains a single SQL statement: `1 • SELECT * FROM wateragency.storagetypes;`. Below the query editor is a horizontal scrollbar. Underneath the scrollbar is another toolbar with options like 'Result Grid', 'Filter Rows' (with an input field), 'Edit', 'Export/Import', and 'Wrap Cell'. The 'Result Grid' is currently selected, displaying a table with the following data:

storageType
Catch Basin
Reservoir
Storage Tank
Water Tower
NULL

Screenshots of UI

Storages:

READ/CREATE/UPDATE storages page

WA

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Storages

Add a new Storage.

Storage ID	Storage Capacity	Storage Type	Cover Type	Material
1	5000000	Reservoir	0	Concrete
2	120000	Water Tower	1	Metal
3	200000	Storage Tank	1	Plastic
4	85000	Storage Tank	1	Plastic
5	2345325	Catch Basin	0	Concrete

Address ID	Street	City	State	Zip
1	220 Nellen Ave	Corte Madera	CA	94925
2	225 Nellen Ave	Corte Madera	CA	94925
3	240 Nellen Ave	Corte Madera	CA	94925
4	10 School St	Fairfax	CA	94930
5	25 Merwin Ave	Fairfax	CA	94930
6	156 Acacia Rd	Fairfax	CA	94930

Addresses

Add Storage

Storage Capacity Storage Type Catch Basin Is Covered Uncovered Material Concrete Address ID 1 Source Name Americano Creek

Add a Storage

Update Storage

Storage ID 1 Storage Capacity Storage Type Catch Basin Is Covered Uncovered Material Concrete

Update a Storage

Storage Types:

READ/CREATE Storage types page

WA

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Storage Types

Add a new Storage Type.

Storage Type
Catch Basin
Reservoir
Storage Tank
Water Tower

Add Storage Type

Storage Type

Add an Storage Type

Storage and Sources:

CREATE on storages entity INSERTS into storage and sources page;
READ storage and sources

WA

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Storage and Sources

Storage ID	Source Name
1	Americano Creek
1	Rainfall
2	Groundwater
2	Rush Creek
5	Americano Creek

Source Types:

CREATE/READ on source types page

Source Types

Add a new Source Type.

Source Type
Creek
Groundwater
Ocean
Rainfall
River

Add Source Type

Source Type

Add an Source Type

Storage and Addresses:

READ on Storage and Addresses page

Storage and Addresses

Storage ID	Address ID
1	3
2	2
5	5

Sources:

READ/CREATE/UPDATE/DELETE on sources page

WA

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Sources

Add a new Source.

Source Name	Water Supplied	Delete Source
Americano Creek	100000	<button>Delete</button>
Groundwater	1200000	<button>Delete</button>
Pacific Ocean	50000000	<button>Delete</button>
Rainfall	6000000	<button>Delete</button>
Rush Creek	500000	<button>Delete</button>

Add Source

Source Name Water Supplied Source Type Creek ▼

Add a Source

Update Source

Source Name Americano Creek ▼ New Source Name Water Supplied

Update a Source

Sources and Source Types:

CREATE on sources INSERTS into sources and source types with the associated source and source type ; READ storage and sources

WA

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Sources And Source Types

Source Name	Source Type
Americano Creek	Groundwater
Groundwater	Groundwater
Rush Creek	Groundwater
Pacific Ocean	Ocean
Americano Creek	Rainfall
Pacific Ocean	Rainfall
Rainfall	Rainfall
Rush Creek	Rainfall
Americano Creek	River

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Customers:

CREATE/READ/UPDATE/DELETE and SEARCH on customer page.

Customers

Add/update/delete customer. Search for customer using Zip and Occupant Type.

Customer ID	Potable Water	Recycled Water	Occupant Type	Street	City	State	Zip	Delete Customer
7	1500000	450000	Government	220 Nellen Ave	Corte Madera	CA	94925	Delete
7	1500000	450000	Government	225 Nellen Ave	Corte Madera	CA	94925	Delete
7	1500000	450000	Government	240 Nellen Ave	Corte Madera	CA	94925	Delete
4	50000	1000	Commercial	10 School St	Fairfax	CA	94930	Delete
5	150	20	Residential	25 Merwin Ave	Fairfax	CA	94930	Delete
6	20	20	Residential	156 Acacia Rd	Fairfax	CA	94930	Delete
9	250	100	Charity					Delete

Search Customer

Zip Code

Add Customer

Potable Water Recycled Water Occupant Type

Update Customer

Customer Id Potable Water Recycled Water Occupant Type

Addresses:

READ/CREATE on addresses page.

Addresses

Add a new address and associate it with an existing customer.

AddressID	Street	City	State	Zip	CustomerId
1	220 Nellen Ave	Corte Madera	CA	94925	7
2	225 Nellen Ave	Corte Madera	CA	94925	7
3	240 Nellen Ave	Corte Madera	CA	94925	7
4	10 School St	Fairfax	CA	94930	4
5	25 Merwin Ave	Fairfax	CA	94930	5
6	156 Acacia Rd	Fairfax	CA	94930	6

Addresses

Customer Id	Potable Water	Recycled Water	Occupant Type	Street	City	State	Zip
7	1500000	450000	Government	220 Nellen Ave	Corte Madera	CA	94925
7	1500000	450000	Government	225 Nellen Ave	Corte Madera	CA	94925
7	1500000	450000	Government	240 Nellen Ave	Corte Madera	CA	94925
4	50000	1000	Commercial	10 School St	Fairfax	CA	94930
5	150	20	Residential	25 Merwin Ave	Fairfax	CA	94930
6	20	20	Residential	156 Acacia Rd	Fairfax	CA	94930
9	250	100	Charity				

Customers

Add Address

Street City State Zip Customer 7 ▾

Materials:

READ/CREATE/DELETE on the materials page.

Materials

Add a new Material.

Materials	Delete Material
Concrete	<button>Delete</button>
Metal	<button>Delete</button>
Plastic	<button>Delete</button>
Wood	<button>Delete</button>

Add Material

Material

Add a Material

Occupant Types:

READ/CREATE on Occupant Types page

Occupant Types

Add a new Occupant Type.

Occupant Type
Charity
Commercial
Government
Residential

Add Occupant Type

Occupant Type

Add an Occupant Type