NYC Water Charges Web Application

Rachel Friedman | rfriedman113@gmail.com

Database Systems CISC 3810 | Project 2 Full Stack Application | May 2021

Click here to access the web application

Important! Please note:

Since I am using the free tiers of Heroku:

1. Please allow up to a full minute for the initial web application to load.
2. Since the maximum records allowed was 10K, I had to combine some tables and set it up differently than my original schema in order to save rows. I also had to eliminate some data, so I deleted all charges for all boroughs other than Brooklyn.

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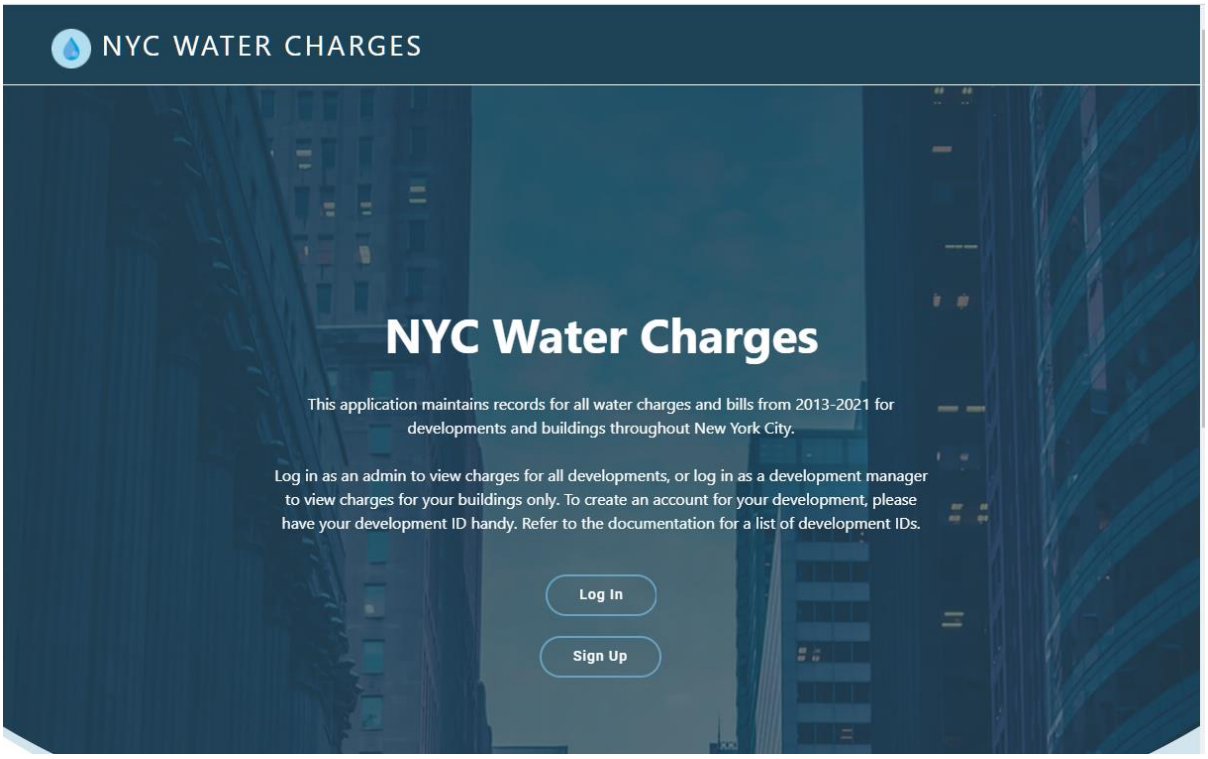


About this Project

This web application was created for CISC 3810 Database Systems. The goal of this project was to create a full stack application, complete with a database layer, business layer and a user-friendly front-end interface. The data is stored in a Postgres database, hosted on Heroku. Python is used for the business layer, with Flask for the web framework, along with SQLAlchemy as an Object Relational Mapper and Flask-Login for user authentication and session management. The front-end is created in HTML 5, CSS, and JavaScript. Bootstrap is used to style the elements and to create a responsive web application. In addition, Bootstrap DataTables are used to display the rows of data. The web application is hosted on Heroku and can be accessed here.

What purpose does this software serve?

The primary purpose of this software is for the New York City Housing Authority to maintain a record of all water charges and related bills for all developments and buildings in New York City.

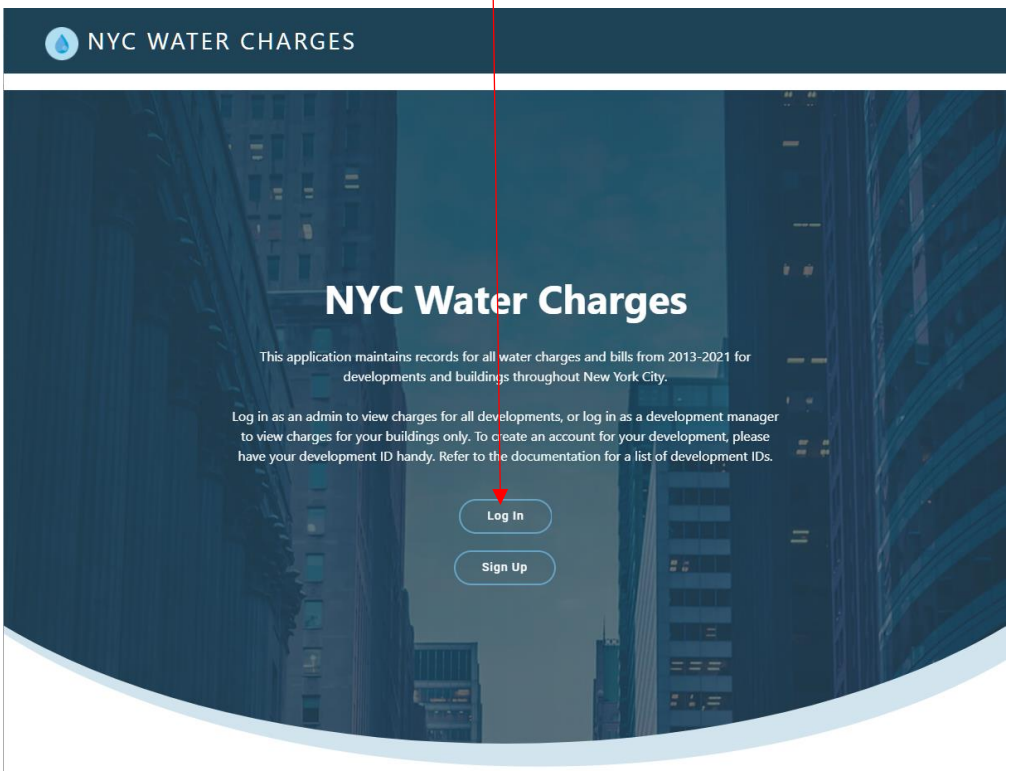
The secondary purpose of this software is for managers of those developments and buildings to be able to view the water service charges associated with their developments and buildings.

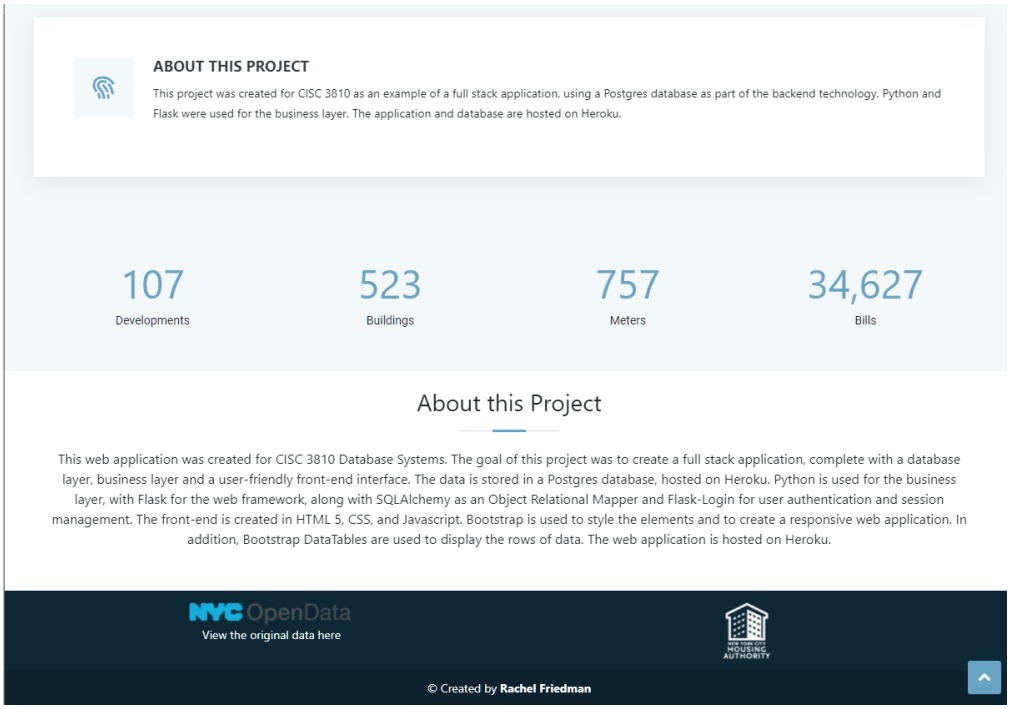
The software provides different levels of access for NYCHA users and for development/building users. NYCHA users have the ability to edit and delete charges. Development/Building users have the ability to view (but not edit or delete) charges.

Login (NYCHA Users)

Log In with the following credentials:

- Username: admin
- Password: nycha





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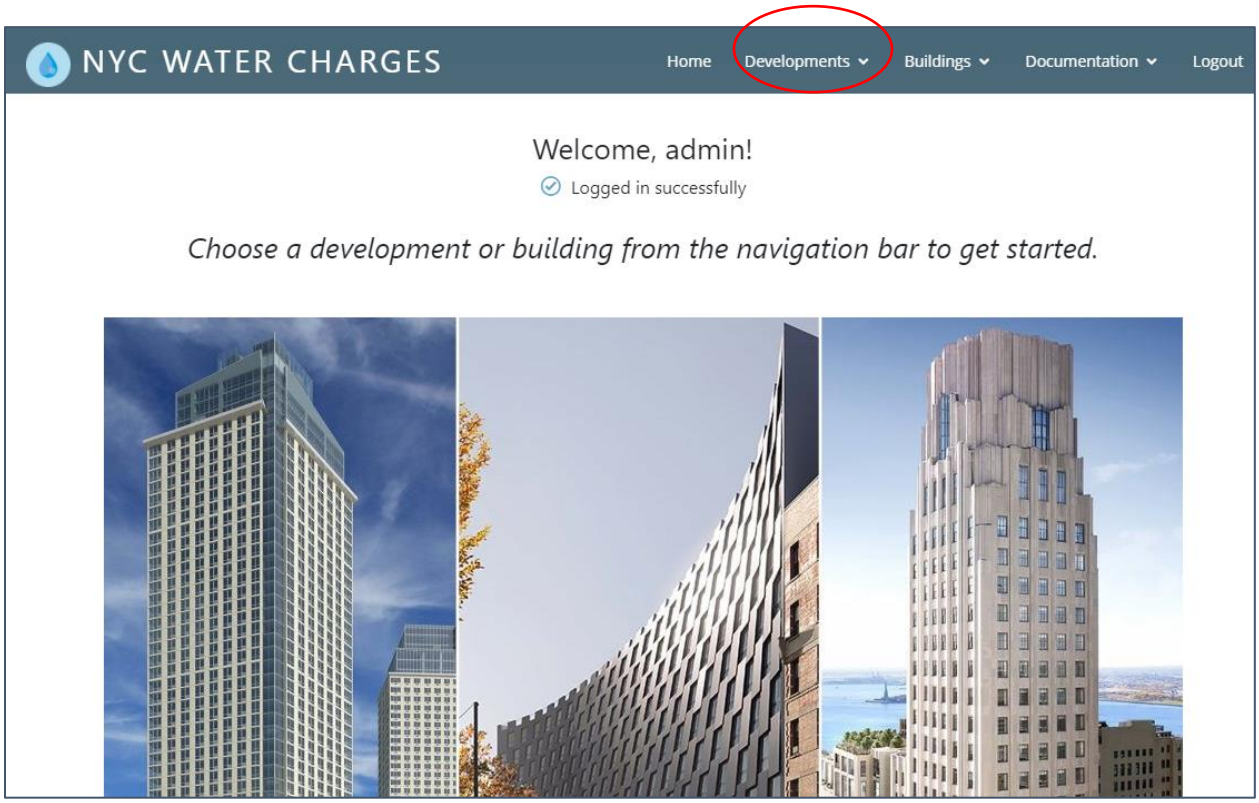
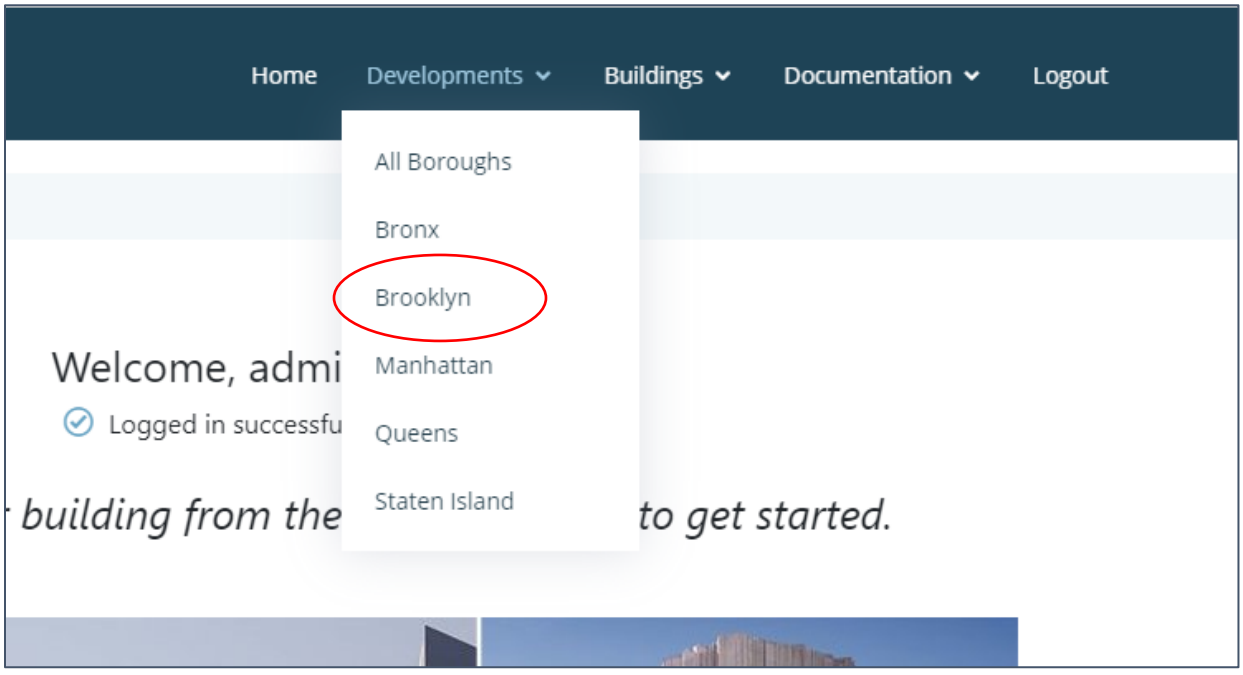
View Developments and Buildings (NYCHA Users)

1. Click on **Developments** (or Building) from the navigation bar.



2. Choose a borough. (Due to space constraints, only **Brooklyn** data is available at this point.)



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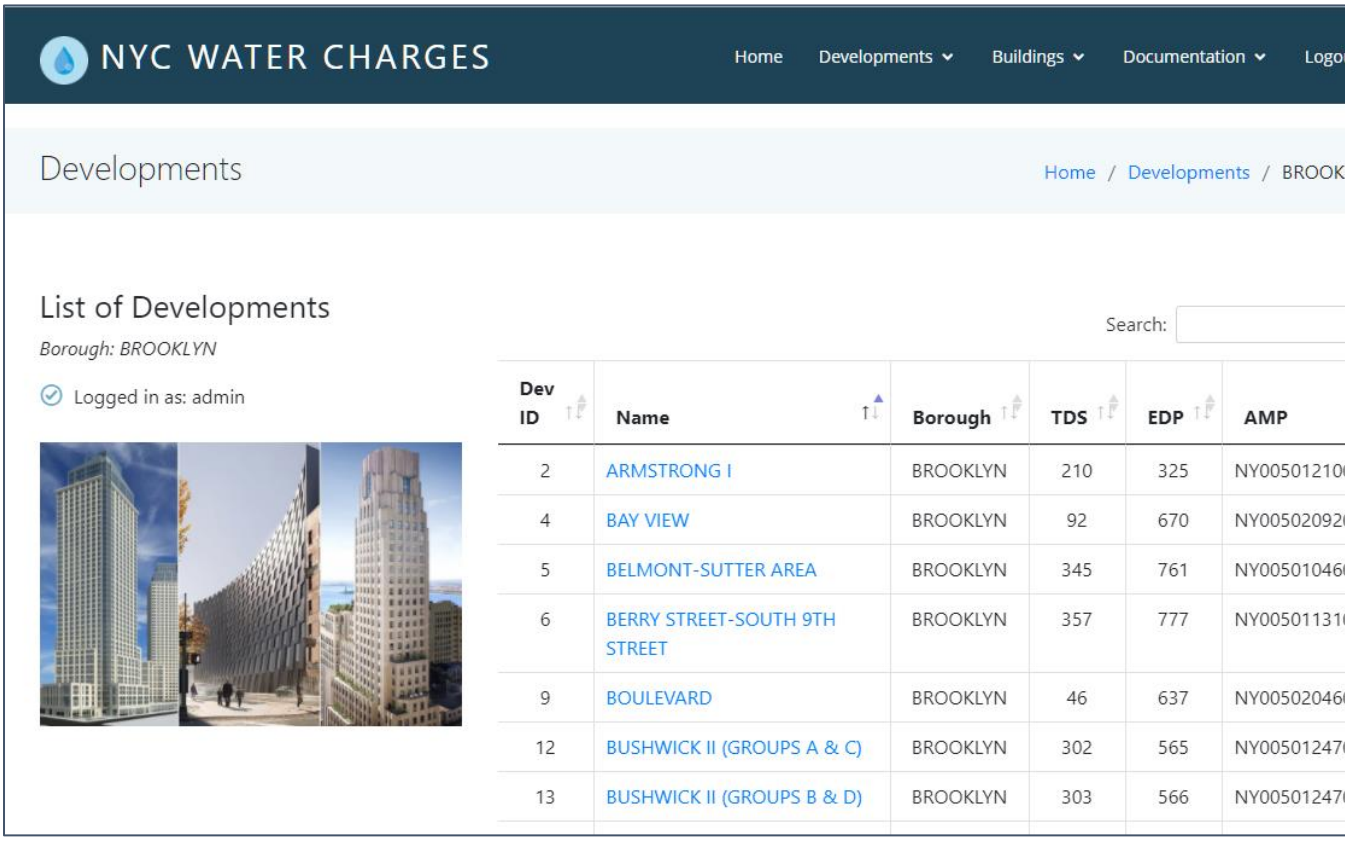
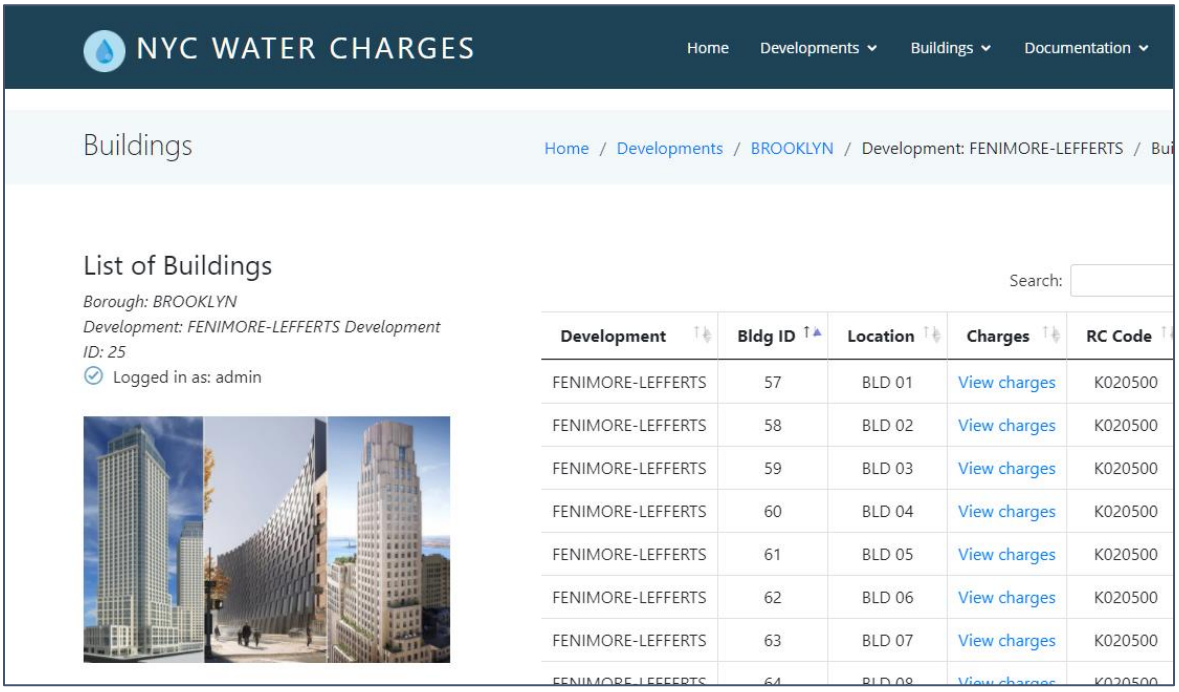
3. You will be presented with a list of all developments in that borough.

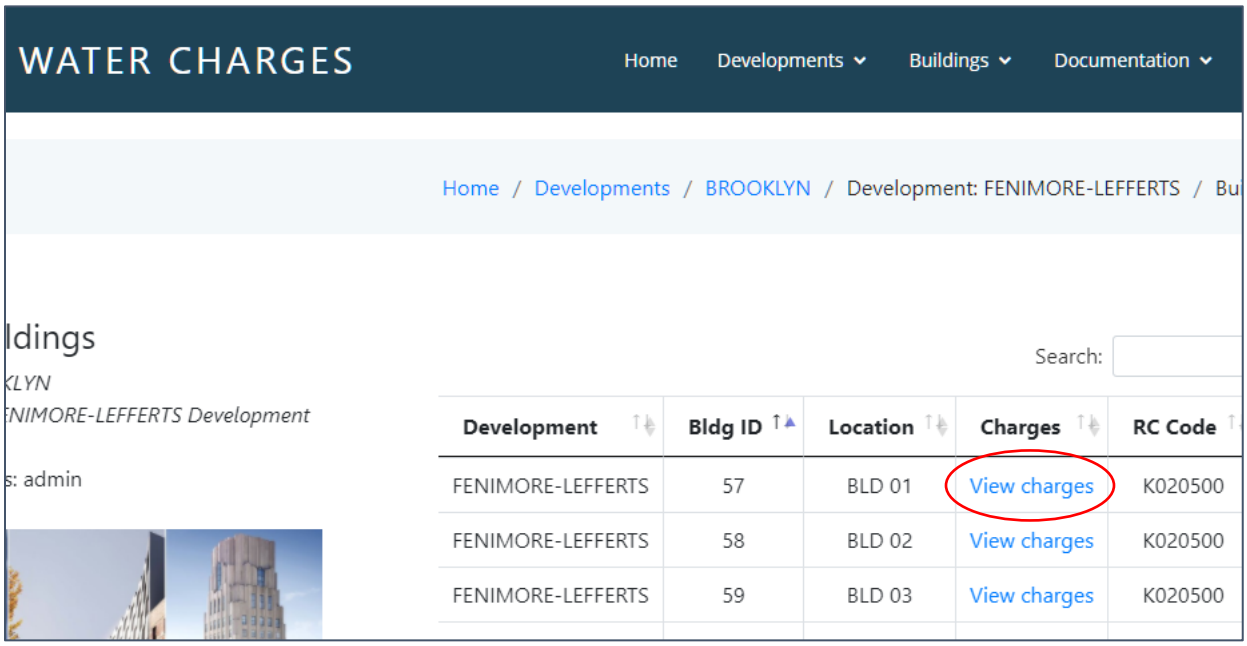


4. Click on a development to see a list of buildings owned by that development.

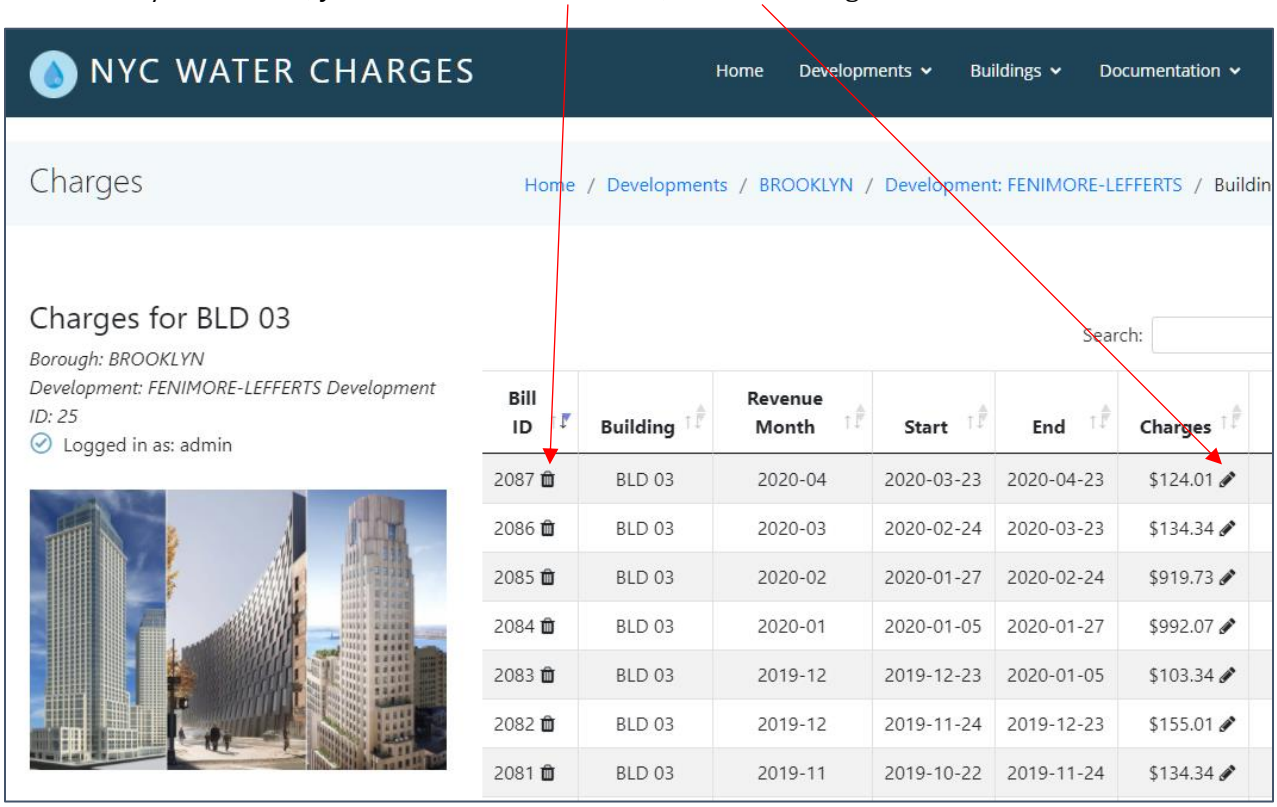


View Charges (NYCHA User)

1. When viewing a list of buildings, click on **View charges** to view charges associated with that building.

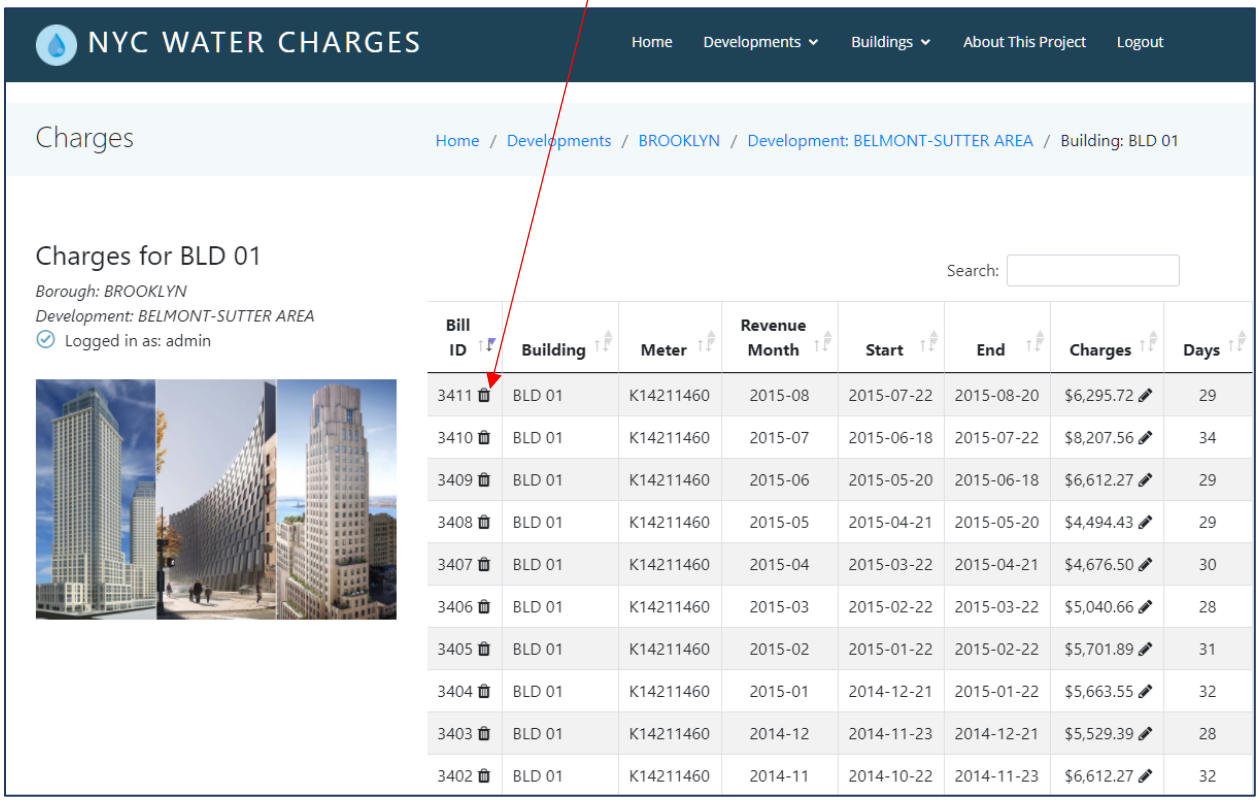


2. As a NYCHA/admin user, you are able to **delete** a bill, or **edit** a charge.

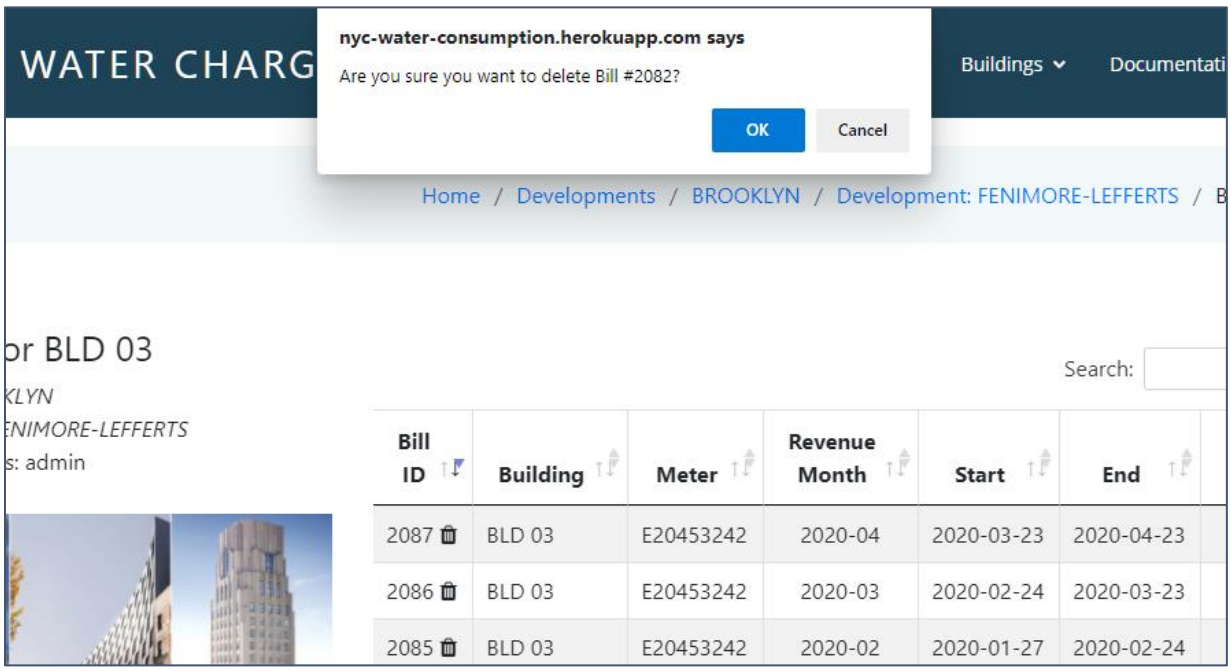


Delete a Bill (NYCHA User)

1. After viewing the list of charges, click on the **Delete** symbol next to the Bill ID.



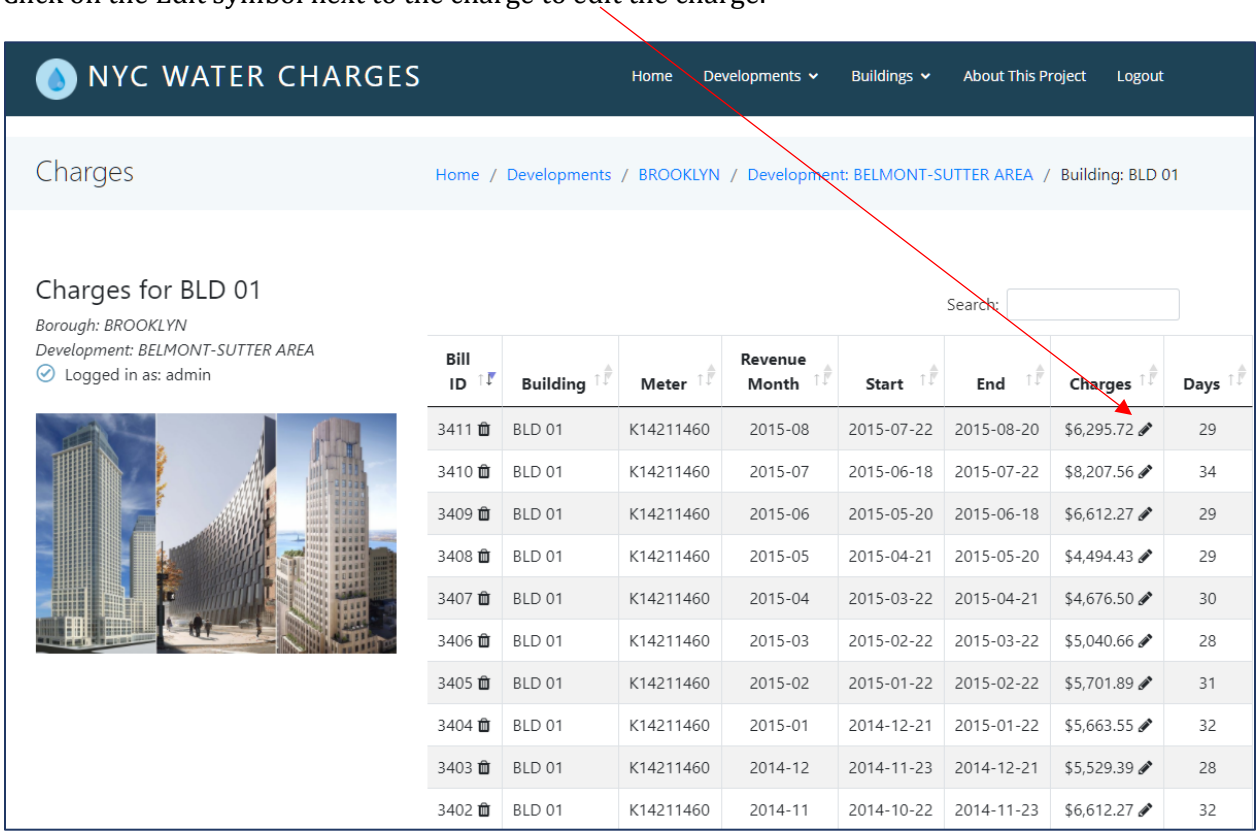
2. Press OK to confirm that you wish to delete, or Cancel if you wish to cancel.



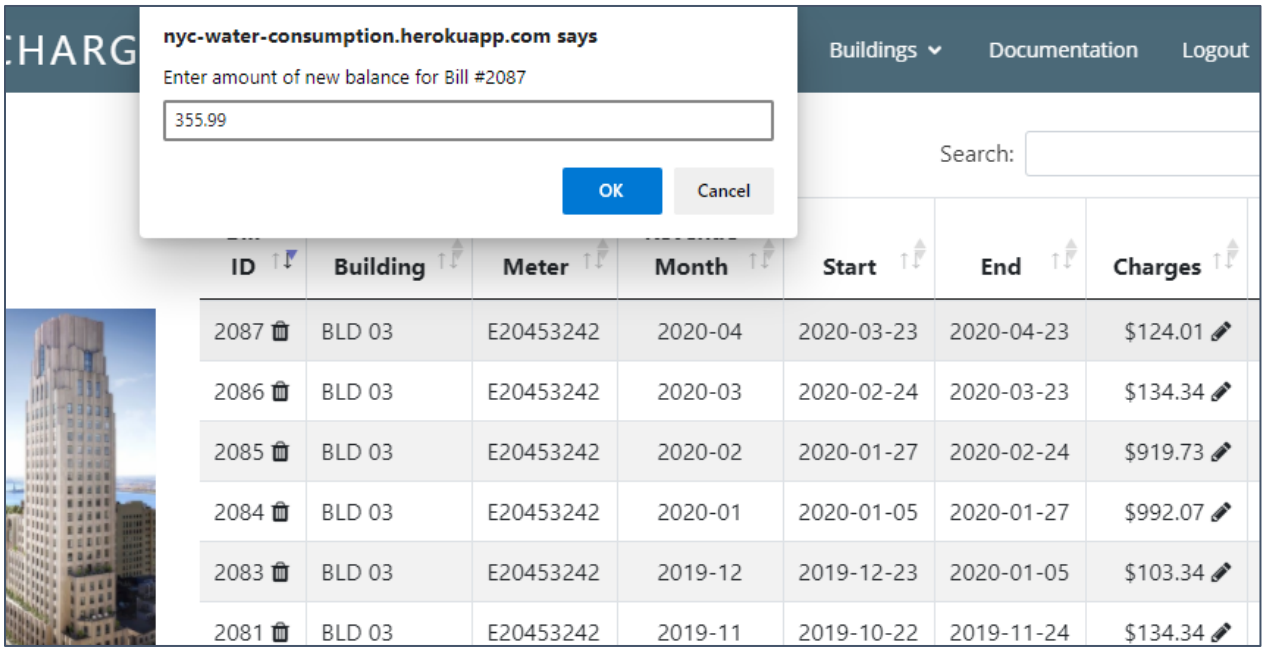
3. An alert will appear on your screen, informing you that the bill was deleted. That bill will no longer appear in the list of charges.

Edit a Charge (NYCHA User)

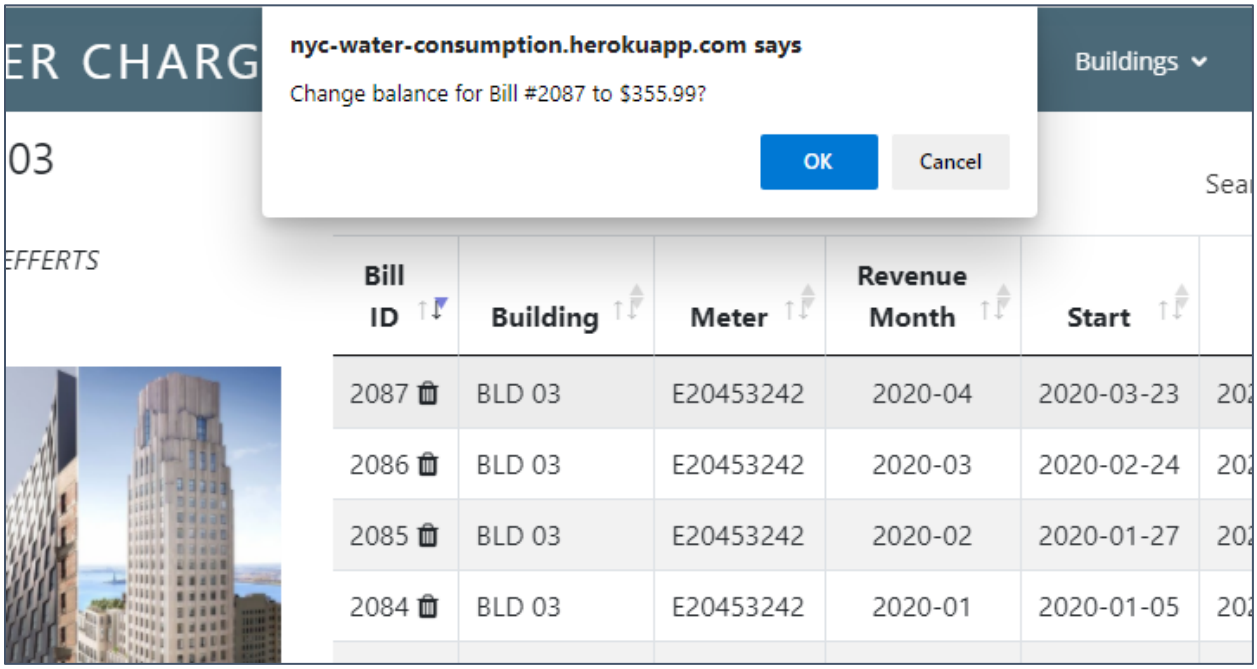
1. Click on the Edit symbol next to the charge to edit the charge.



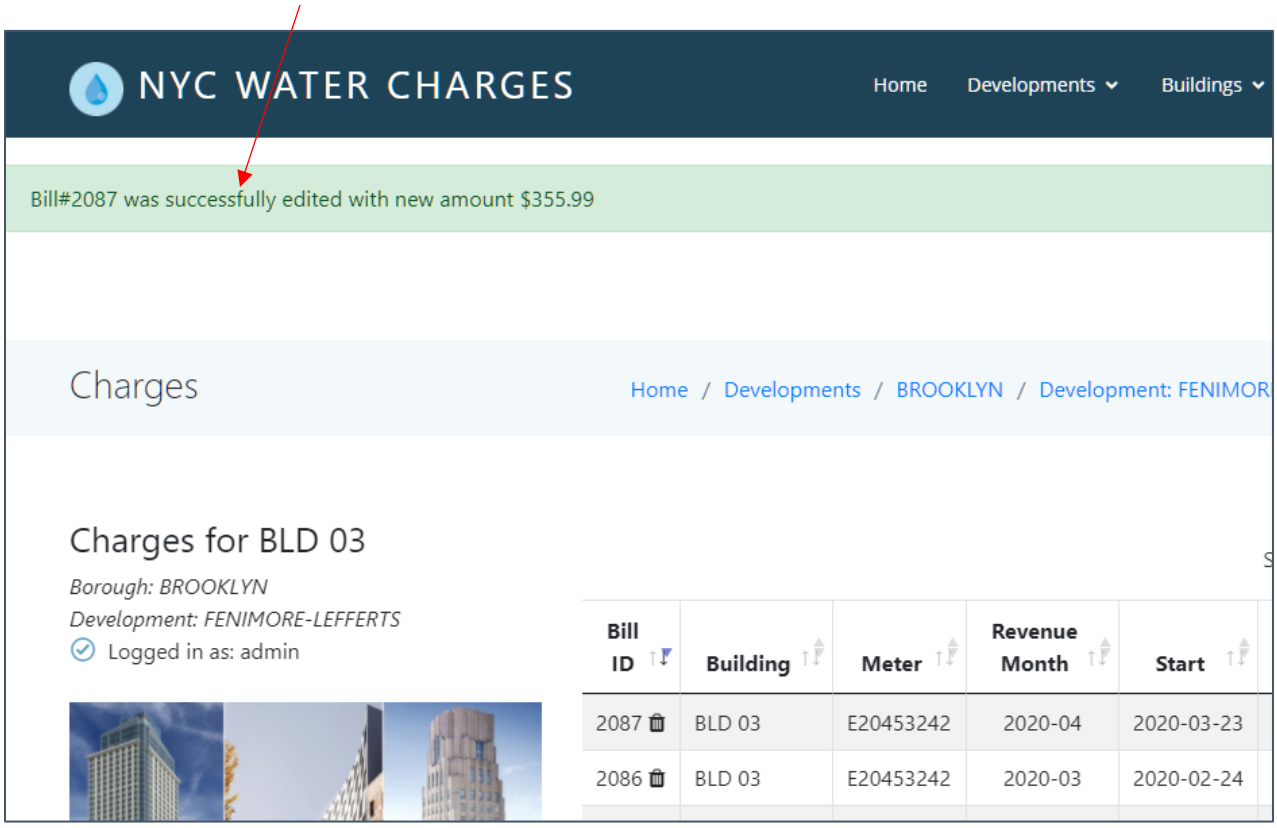
2. Enter the amount of the new charge.



3. Press OK to confirm, or cancel to undo the change.



4. After pressing OK an alert will appear, confirming that the amount was updated.



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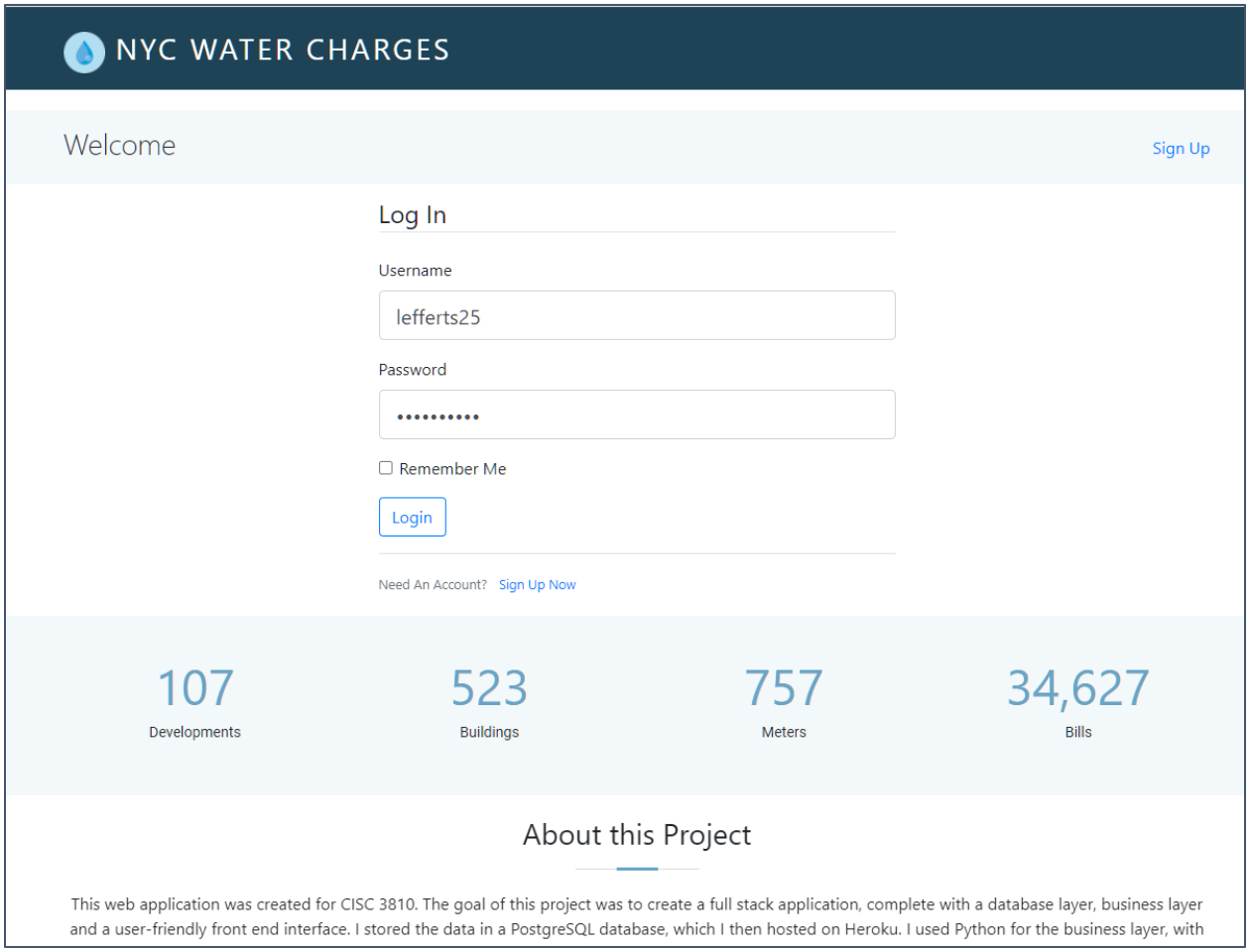
Log In (Dev/Building Users)

For demonstration purposes, I created some development accounts. Feel free to skip the Sign Up section and log in with one of the following accounts:

Username: lefferts25
Password: lefferts25

Username: belmont5
Password: belmont5

Username: berry6
Password: berry6



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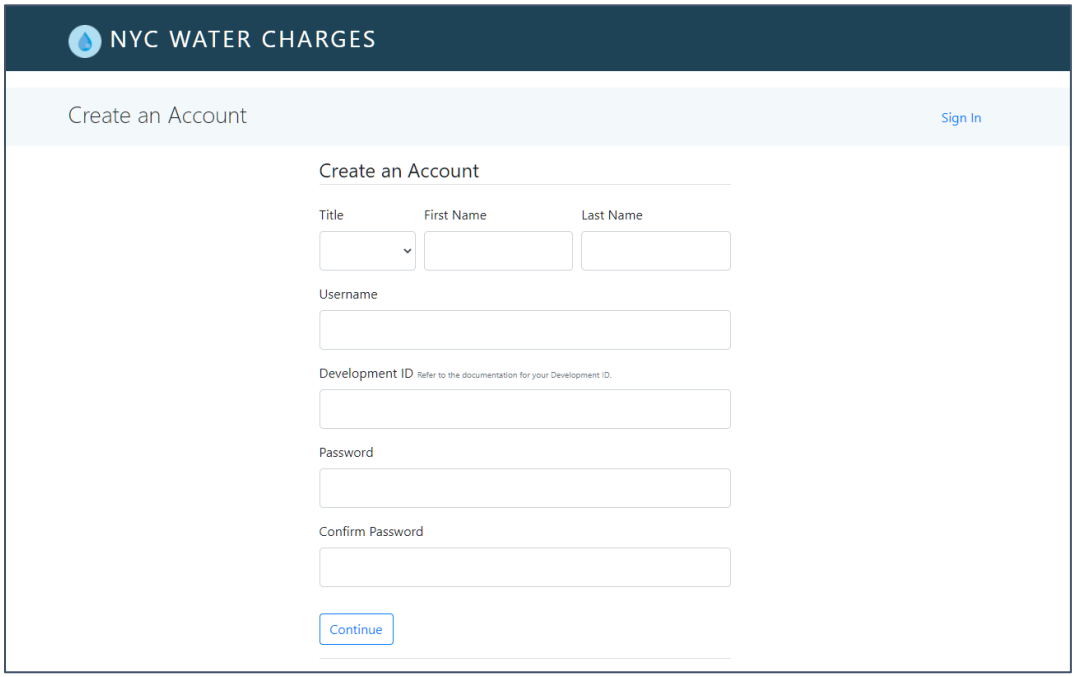
Sign Up (Dev/Building Users)

Note that there is only one admin account, which has already been created. Any user signing up will be signing up as a Development/Building user and will have to use the associated Development ID.



To create an account for a specific development, create a username and password and choose the associated Development ID. Only numbers 1-127 can be used. Refer to list of developments and Development IDs below. *(Note: Please create accounts for **Brooklyn developments only** , since I deleted the data for all other boroughs due to space constraints on Heroku.)*

List of Developments and Development IDs

Dev_id	Name	Borough
1	154 WEST 84TH STREET	MANHATTAN
2	ARMSTRONG I	BROOKLYN
3	BAISLEY PARK	QUEENS
4	BAY VIEW	BROOKLYN
5	BELMONT-SUTTER AREA	BROOKLYN
6	BERRY STREET-SOUTH 9TH STREET	BROOKLYN
7	BETANCES III, 9A	BRONX
8	BETANCES VI	BRONX
9	BOULEVARD	BROOKLYN
10	BOYNTON AVENUE REHAB	BRONX
11	BRYANT AVENUE-EAST 174TH STREET	BRONX

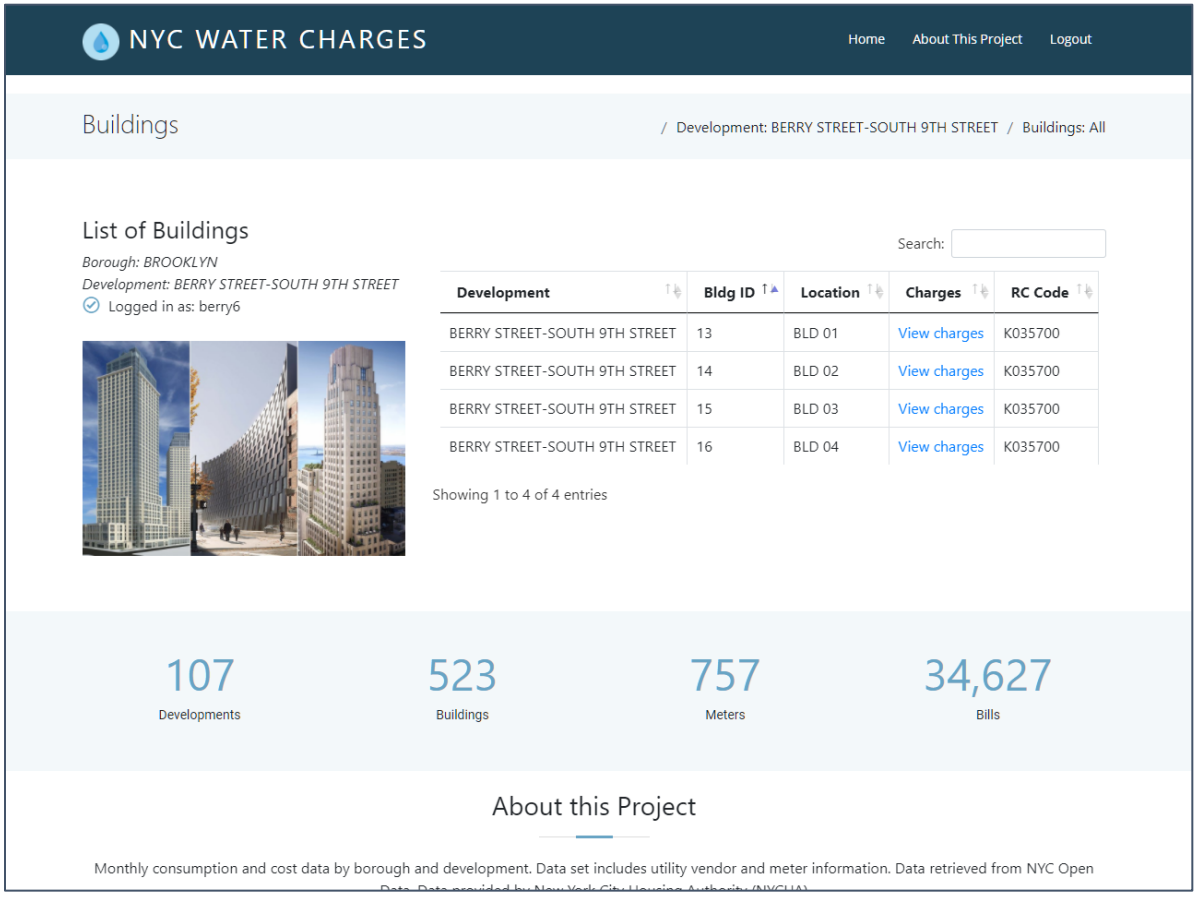
12	BUSHWICK II (GROUPS A & C)	BROOKLYN
13	BUSHWICK II (GROUPS B & D)	BROOKLYN
14	BUSHWICK II CDA (GROUP E)	BROOKLYN
15	CLAREMONT REHAB (GROUP 2)	BRONX
16	CLAREMONT REHAB (GROUP 4)	BRONX
17	CLINTON	MANHATTAN
18	CONLON LIHFE TOWER	QUEENS
19	CROWN HEIGHTS	BROOKLYN
20	EAST 004TH STREET REHAB	MANHATTAN
21	EAST 152ND STREET-COURTLANDT AVENUE	BRONX
22	EAST 165TH STREET-BRYANT AVENUE	BRONX
23	EAST 173RD STREET-VYSE AVENUE	BRONX
24	EAST NEW YORK CITY LINE	BROOKLYN
25	FENIMORE-LEFFERTS	BROOKLYN
26	FHA REPOSSESSED HOUSES (GROUP I)	FHA
27	FHA REPOSSESSED HOUSES (GROUP II)	FHA
28	FHA REPOSSESSED HOUSES (GROUP III)	FHA
29	FHA REPOSSESSED HOUSES (GROUP IV)	FHA
30	FHA REPOSSESSED HOUSES (GROUP IX)	FHA
31	FHA REPOSSESSED HOUSES (GROUP V)	FHA
32	FHA REPOSSESSED HOUSES (GROUP V)	FHA
33	FHA REPOSSESSED HOUSES (GROUP VI)	FHA
34	FHA REPOSSESSED HOUSES (GROUP VII)	FHA
35	FHA REPOSSESSED HOUSES (GROUP VII)	FHA
36	FHA REPOSSESSED HOUSES (GROUP VIII)	FHA
37	FHA REPOSSESSED HOUSES (GROUP X)	FHA
38	FHA REPOSSESSED HOUSES (GROUP X)	FHA
39	FIRST HOUSES	MANHATTAN
40	FORT WASHINGTON AVENUE REHAB	MANHATTAN
41	FRANKLIN AVENUE I CONVENTIONAL	BRONX
42	FRANKLIN AVENUE II CONVENTIONAL	BRONX
43	FRANKLIN AVENUE III CONVENTIONAL	BRONX
44	GOMPERS	MANHATTAN
45	HARRISON AVENUE REHAB (GROUP B)	BRONX
46	HIGHBRIDGE REHABS (ANDERSON AVENUE)	BRONX
47	HOWARD AVENUE	BROOKLYN
48	HOWARD AVENUE-PARK PLACE	BROOKLYN
49	HUNTS POINT AVENUE REHAB	BRONX
50	INGERSOLL	BROOKLYN
51	INGERSOLL	BROOKLYN
52	INTERNATIONAL TOWER	QUEENS
53	LONGFELLOW AVENUE REHAB	BRONX
54	LOWER EAST SIDE I INFILL	MANHATTAN
55	LOWER EAST SIDE II	MANHATTAN

56	LOWER EAST SIDE III	MANHATTAN
57	LOWER EAST SIDE REHAB (GROUP 5)	MANHATTAN
58	MANHATTANVILLE REHAB (GROUP 2)	MANHATTAN
59	MARCY AVENUE-GREENE AVENUE SITE B	BROOKLYN
60	MARLBORO	BROOKLYN
61	MELROSE	BRONX
62	MORRISANIA AIR RIGHTS	BRONX
63	NDF - CENTRAL MAINTENANCE SHOP, 23 ASH ST	NON DEVELOPMENT FACILITY
64	NOSTRAND	BROOKLYN
65	OCEAN BAY APARTMENTS (OCEANSIDE)	QUEENS
66	OCEAN HILL-BROWNSVILLE	BROOKLYN
67	PARK ROCK REHAB	BROOKLYN
68	POLO GROUNDS TOWERS	MANHATTAN
69	QUEENSBRIDGE NORTH	QUEENS
70	QUEENSBRIDGE SOUTH	QUEENS
71	RALPH AVENUE REHAB	BROOKLYN
72	RANGEL	MANHATTAN
73	RED HOOK EAST	BROOKLYN
74	REHAB PROGRAM (COLLEGE POINT)	QUEENS
75	REHAB PROGRAM (TAFT REHABS)	MANHATTAN
76	REID APARTMENTS	BROOKLYN
77	SAMUEL (CITY)	MANHATTAN
78	SAMUEL (MHOP) I	MANHATTAN
79	SAMUEL (MHOP) II	MANHATTAN
80	SHELTON HOUSE	QUEENS
81	SMITH	MANHATTAN
82	SOTOMAYOR HOUSES	BRONX
83	SOUTH BRONX AREA (SITE 402)	BRONX
84	SOUTH JAMAICA I	QUEENS
85	SOUTH JAMAICA II	QUEENS
86	STANTON STREET	MANHATTAN
87	STAPLETON	STATEN ISLAND
88	STEBBINS AVENUE-HEWITT PLACE	BRONX
89	STERLING PLACE REHABS (SAINT JOHNS-STERLING)	BROOKLYN
90	STERLING PLACE REHABS (STERLING-BUFFALO)	BROOKLYN
91	STUYVESANT GARDENS II	BROOKLYN
92	TAFT	MANHATTAN
93	TAPSCOTT STREET REHAB	BROOKLYN
94	TAPSCOTT STREET REHAB	FHA
95	THOMAS APARTMENTS	MANHATTAN
96	UNION AVENUE-EAST 166TH STREET	BRONX
97	UPACA (SITE 5)	MANHATTAN
98	UPACA (SITE 6)	MANHATTAN

99	VAN DYKE I	BROOKLYN
100	WASHINGTON HEIGHTS REHAB (GROUPS 1&2)	MANHATTAN
101	WASHINGTON HEIGHTS REHAB PHASE III	MANHATTAN
102	WASHINGTON HEIGHTS REHAB PHASE IV (C)	MANHATTAN
103	WASHINGTON HEIGHTS REHAB PHASE IV (D)	MANHATTAN
104	WEST FARMS ROAD REHAB	BRONX
105	WEST FARMS SQUARE CONVENTIONAL	BRONX
106	WHITMAN	BROOKLYN
107	WILLIAMSBURG	BROOKLYN

View Your Buildings (Dev/Building Users)

After you log in, you will automatically be redirected to your list of buildings. Note that as a Dev/Building user, you do not have the option to view other developments or other buildings.



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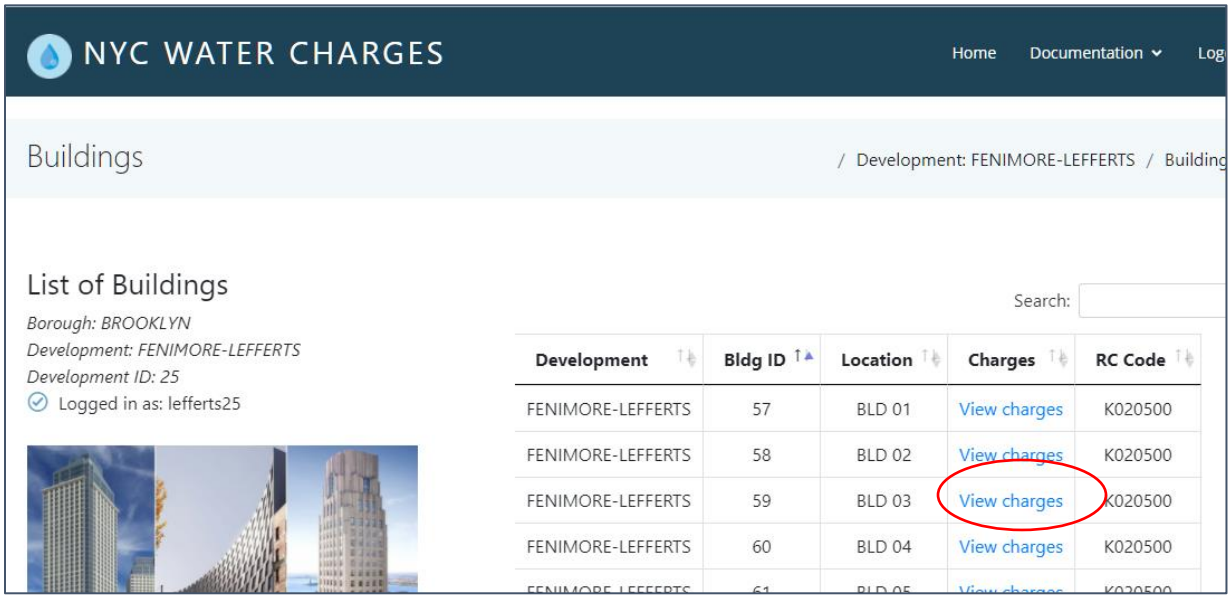
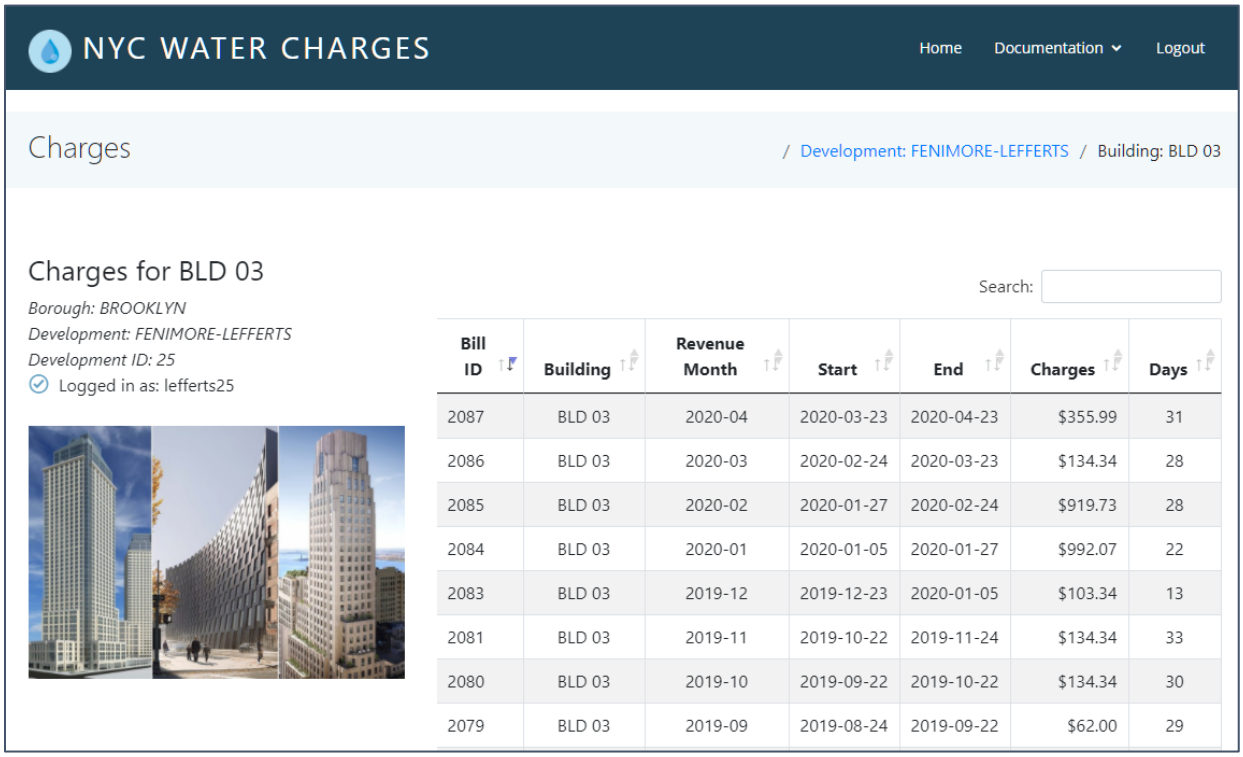
View Your Bills (Dev/Building Users)

1. To view the charges associated with that building, click on **View charges**. Note that as a user, you do NOT have the option to delete or edit a bill.



2. You will be presented with a list of bills associated with that building.



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CRUD Implementation

This software incorporates all the CRUD functionality associated with a typical database application. Below is how these functionalities were implemented.

Create: This is implemented by allowing the creation of new accounts. A new user is added to the Users database table. The process is initiated when a user signs up to create a new account.

Read: This is implemented by querying the database to display all relevant information. The data is displayed and formatted using Bootstrap DataTables and jQuery.

Update: This is implemented by allowing NYCHA users to edit the charges associated with a specific bill. This process is triggered when a user with an admin account clicks on the "Edit" icon next to a bill. This feature is only available to admin users and will not appear when logged in as a development/building user.

Delete: This is implemented by allowing NYCHA users to delete a bill. This process is triggered when a user with an admin account clicks on the "Delete" icon next to the bill id. This feature is only available to admin users and will not appear when logged in as a development/building user.

Technology Stack

The technology stack is as follows:

The business layer was created in Python. I used Flask as the web framework and SQLAlchemy for Object Relational Mapping. In addition, I used Flask-Login to implement user authentication and session management.

The data was provided by NYC OpenData in the form of a csv file with 42.6K rows and 25 columns. I normalized the data and then stored it in a Postgres database, hosted on Heroku.

The front-end was created using HTML, CSS, JavaScript, Bootstrap and jQuery. In addition, Bootstrap DataTables are used to display the relevant records.

I used git and Github for version control.

Both the database and the application are hosted on Heroku.

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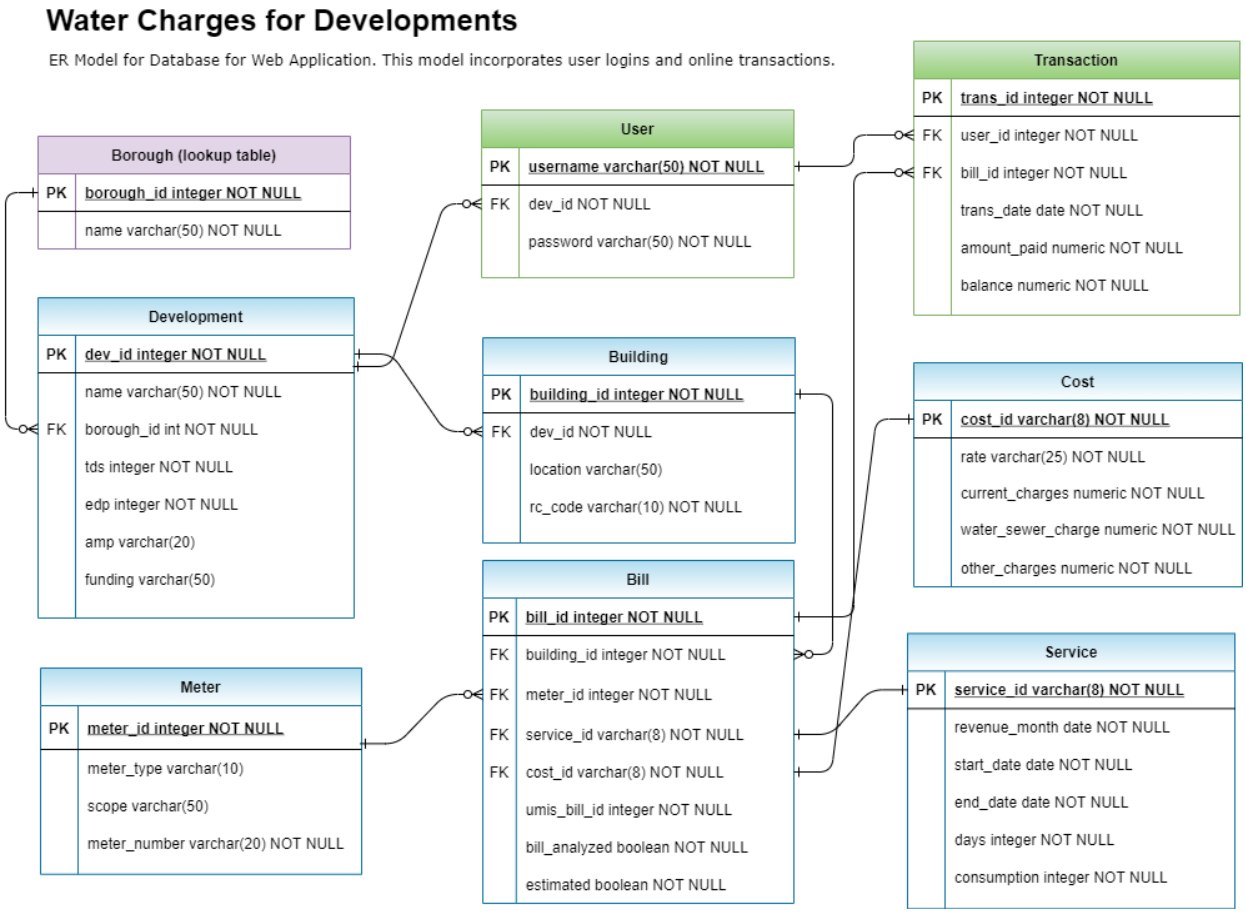
Schemas and ER Diagram

The following tables and attributes (primary key, *foreign key*) are included in this database:

- **Development** (dev_id, name, *borough_id*, tds, edp, amp, funding)
- **Borough** (borough_id, name)
- **Building** (building_id, *dev_id*, location, rc_code)
- **Meter** (meter_id, type, scope, meter_number)
- **Service** (service_id, *vendor_id*, revenue_month, start_date, end_date, days, consumption)
- **Cost** (cost_id, *rate_id*, current_charges, water_sewer_charge, other_charges)
- **Rate** (rate_id, class)
- **Bill** (bill_id, *building_id, meter_id, service_id, cost_id*, umis_bill_id, estimated, bill_analzyed)
- **Users**(username, *dev_id*, password)
- **Transactions**(trans_id, *user_id, bill_id,* trans_date, amount_paid, balance)



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Extra Credit: Hosting on Heroku

Both the database and the web application are hosted on Heroku.

How to host a **web application** with a Python backend on Heroku:

1. In your project directory, run `pip freeze > requirements.txt` to gather all the Python dependencies used in the project.
2. Create a file named `Procfile` and add the following content to ensure that Heroku knows which commands it needs to run the application:
   ```
   web: gunicorn run:app
   ```
3. Create a new repository in Github to upload all your necessary files for the application.
4. Initialize your current local directory and the remote branch by running the following git commands:
   - `git init`
   - `git remote add origin address-goes-here`
5. Use the following commands to add, then commit, then push your files to your repository:
   - `git add .`
   - `git commit -m "Message goes here"`
   - `git push origin master`
6. Create a new application on Heroku.
7. Click on Deploy, and for the deployment method, choose Github.
8. Connect to Github and search for the repository created in the previous steps.
9. `Run heroku git:remote -a your-application` to add the Heroku remote to your local repository
10. Now you can deploy to Heroku by simply running the following 3 commands with the necessary parameters: `git add`, `git commit`, then `git push heroku master`.

How to provision a **Postgres database** on Heroku:

1. In the Overview section of the relevant Heroku app, click on Configure Add-ons then search for Postgres.
2. Select the Heroku Postgres add-on.
3. Click on it to edit.
4. Click on Settings → View Credentials to view all the settings needed to connect to the database.
5. Log in to the database using those settings and create all the necessary tables.
6. In Python, retrieve the database connection string by calling the appropriate environment variable.
   For example: `DB_URL = os.environ['NYC_WATER_DATABASE_URL']`
7. Use that URL to configure the app in Python/Flask:
   `app.config['SQLALCHEMY_DATABASE_URI'] = DB_URL`
8. Your app can now communicate with your database.
9. Optional: use SQLAlchemy as your ORM to communicate with your database.

```
app = Flask(__name__)

db = SQLAlchemy(app)

engine = create_engine(DB_URL)
```