



System Requirements Specification V.2.1
11-1-2023

Waste Watcher Built for the Senator George J. Mitchell Center for Sustainability
Solutions by:

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1. Introduction

The Food Waste Tracking & Measuring software application is a University of Maine Capstone project for Susanne Lee, in partial fulfillment of the Computer Science BS degree for the University of Maine. Susanne Lee is a Faculty Fellow at the Mitchell Center for Sustainability Solutions at the University of Maine. Susanne leads a student/faculty team working towards developing solutions to end food waste in Maine. Due to the massive amounts of food that goes to waste each year the need for our project arose. The goal of our Food Waste Tracking & Measuring app is to make the user aware of how much food they waste and what they can do to minimize food waste in their household. This project is being developed to provide a cost-free product that will assist in the tracking of food waste among schools, businesses, and households in Maine.

“In 2015, a Mitchell Center multidisciplinary team identified eliminating food waste as the single most important issue to ensure a more sustainable waste system in Maine.” - [\[1\]](#)

1.1 Purpose of This Document

This document lays out the foundation for the construction of the food waste tracking system. This document defines the necessary requirements the product must meet before being considered complete and deployable. This document not only enumerates the product requirements, but also the user interface design, and the final deliverables of the product. The primary audience for this document is our client, Susanne Lee and the Mitchell Center for Sustainability Solutions, and the secondary audience is our peer team in order to gain insight as to how we can improve our system requirements.

1.2. References

kayakuser (2022), food-waste-tracker, kayak-development-capstone
<https://github.com/kayakuser/Kayak-Development-Capstone>

callenshaeffer (2023), Waste-watcher, Waste-watcher
<https://github.com/callenshaeffer/Waste-Watcher>

Senator George J. Mitchell Center for Sustainability Solutions at UMaine. (2023, November 28). Senator George J. Mitchell Center for Sustainability Solutions.
<https://umaine.edu/mitchellcenter/>

Food Rescue MAINE, 4 Nov. 2023, <http://umaine.edu/foodrescuemaine/>.

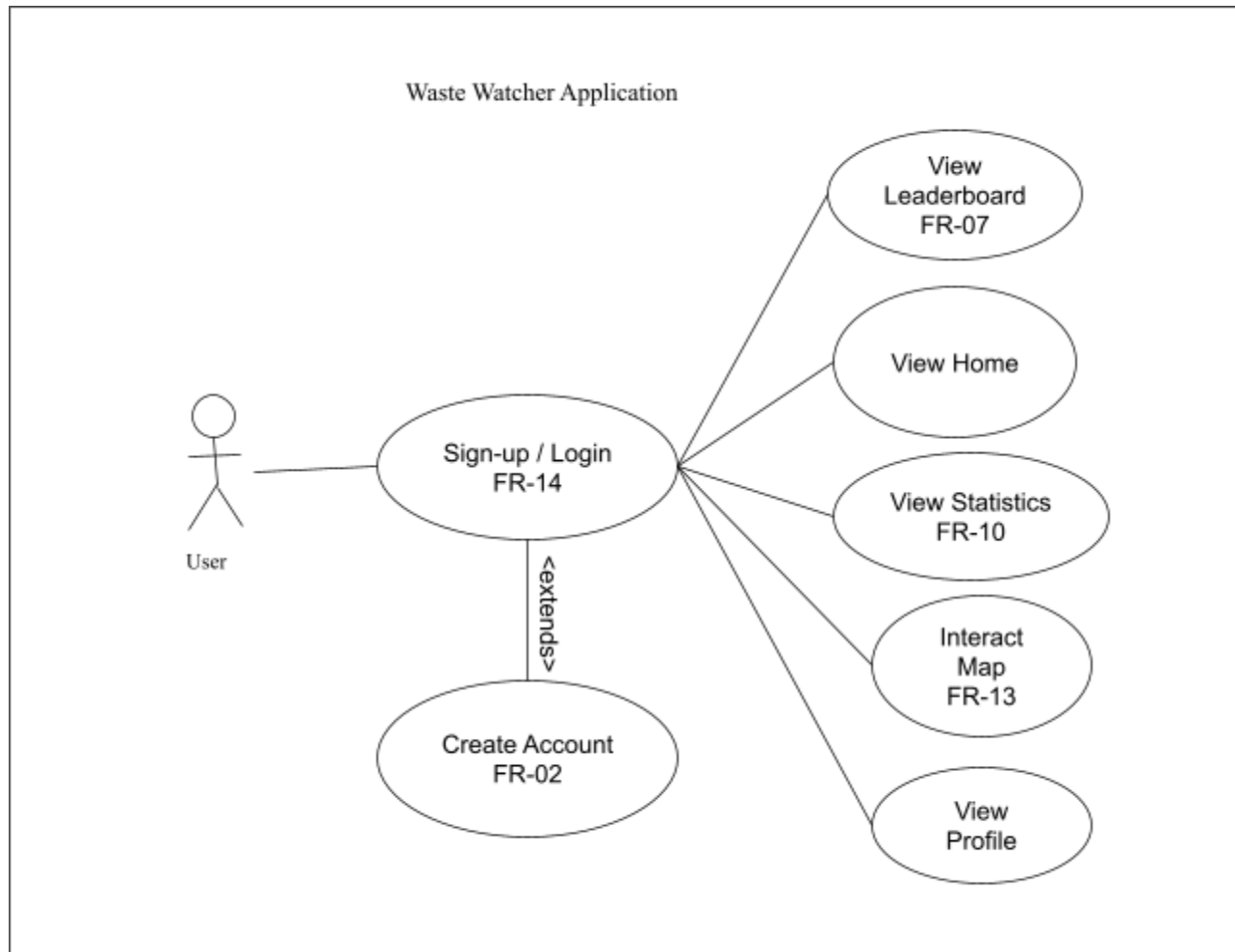
Sustainable Waste Solutions has been provided with the login to a GitHub repository created by the Kayak Development Solutions team who has worked on this project in the past. In addition to the start of a working product, their team also provided us with considerable documentation on the prototype, which has assisted greatly in getting the codebase running and planning our completion of the project. In particular, the SRS has proven useful to give us an idea of what the original goals of the project were, and what still must be accomplished.

1.3. Purpose of the Product

This product is intended to be a cheap and versatile tool which aids in the tracking and research of food waste among schools, businesses, and households. While some tools do exist for this purpose, they are either too expensive or too cumbersome to be useful for the research needs of the Senator George J. Mitchell Center for Sustainability, This is located on the University of Maine campus. Therefore we must design a new tool that can properly address these needs.

1.4 Product Scope

Product Scope Use-Case Diagram: Figure 1.4.1



Description: 1.4.1

This figure displays a top level diagram of how our functional requirements are part of the application as a whole. The user is first prompted to Login or Sign up. There is no option for a user to navigate the app without logging in or signing up. After a user logs in or signs up they are taken to the home screen which can access any of the other major pages within the application.

2. Functional Requirements

This section serves to break down all of our functional requirements into descriptions based on use case diagrams and use cases. This is to define the effect each choice the user makes based on the requirements provided. All possible scenarios need to be accounted, expected, and adjusted for.

2.1 System Functional Requirements

Figure 2.1 Functional Requirements

Functional Requirements		
Number	Priority	Description
FR-01	5	The system shall allow the user to enter daily food waste information (amount by weight or volume, the type of food by category, the cause of waste, in home or out of home, and the meal eaten/BLD, date eaten into UI.)
FR-02	5	The system shall be able to request information about the user such as, username, zip code, household size, user gender, age and income range.
FR-03	4	The system logs the destination of food waste, and presents a hierarchy for managing food waste: consumption, followed by donation to individuals, animals, compost, and trash.
FR-04	3	The system shall allow the user to add friends and family.
FR05	3	The system shall provide a referral option (link to app store) to elicit users to invite their friends/family to use the application.
FR-06	5	The system shall include an option to opt out of data collection other than location.

FR-07	3	The system shall use user data to create a “leaderboard” of food waste reducers based on food waste reduction percentage, as well as by participation streak.
FR-08	2	The system shall allow the user to earn progress-based badges to their profile.
FR-09	5	The system shall provide food saving tips to the user based on their type or cause of waste.
FR-10	4	The system shall have a history feature that displays the users past food waste data in a graphical view.
FR-11	4	The system shall display the total approximate cost of their food waste for a selected time period.
FR-12	4	The system shall store information related to home/away from home eating habits (meals eaten away from home per week. And display the difference).
FR-13	5	The system shall provide a section that contains additional food waste resources per interest, and a map of places to donate food.
FR-14	5	The user must be able to create and log into a user account.

2.2 Use Case Specifications

Number	FR-01	
Name	Input Daily Food Waste Information	
Summary	Allow for the user to input food waste information such as the amount by weight or volume, the type of food by category, the cause of waste, in home or out of home, date, and the meal eaten/BLD (breakfast, lunch, dinner)	
Priority	5	
Preconditions	The user must be logged in	
Postconditions	The users food waste information is stored to the database	
Primary Actor	User	
Secondary Actors	The food waste database	
Trigger	User presses the button to input their data	
Main Scenario	Step	Action
	1	User selects the button to input their food waste information
	2	The app displays fields for all of the required information and prompts the user to fill out each of the fields
	3	The app stores the data that the user input into the database

Number	FR-02	
Name	User Data Request	
Summary	The system shall be able to request information about the user such as, username, zip code, household size, user gender, age and income range.	
Priority	5	
Preconditions	The user must be in the process of creating an account	
Postconditions	The information is stored in the database attached to their account	
Primary Actor	User	
Secondary Actors	Database	
Trigger	User presses the create new account button	
Main Scenario	Step	Action
	1	User is served with data collection UI
	2	User selects submit button
	3	Data is stored in database

Number	FR-03	
Name	Waste Destination Recording	
Summary	The system records the destination of waste and displays Food waste hierarchy, the hierarchy being eaten, then donating to a person, then feeding animals, then compost, then trash.	
Priority	5	
Preconditions	The user is logged in	
Postconditions	The data the user enters is saved in a database attached to their account	
Primary Actor	User	
Secondary Actors	Database	
Trigger	The user selects the track waste button	
Main Scenario	Step	Action
	1	The user is served with the waste tracker data collection UI
	2	The user fills out the form
	3	The user selects submit
	4	The data the user entered is stored in a database attached to their account

Number	FR-04	
Name	Add Friends	
Summary	The system shall allow the user to add friends and family.	
Priority	3	
Preconditions	The user must be logged in	
Postconditions	The system sends a friend request from one user to the target user	
Primary Actor	User	
Secondary Actors	The user database	
Trigger	User presses the button to add a friend	
Main Scenario	Step	Action
	1	User selects the button to add a friend
	2	The app displays a field and prompts the user to input the username of the user they would like to add
	3	The app sends a friend request to the target user
	4	The target user is able to either accept or decline the friend request
Extensions	Step	Branching Action
	4a	The target user accepts the friend request,two users become friends
	4b	The target user declines the friend request

Number	FR-05	
Name	Friend referrals	
Summary	The system shall provide a referral option (link to app store) to elicit users to invite their friends/family to use the application.	
Priority	3	
Preconditions	The user must be logged in	
Postconditions	The user shares a referral link via social media	
Primary Actor	User	
Secondary Actors		
Trigger	The user pressed the invite friends button	
Main Scenario	Step	
	1	The system prompts the user to select the platform in which they would like to share the referral
	2	The system generates a referral link that leads to the app store
	3	The system sends the link along with a brief message about the app and the user that is referring them

Number	FR-06	
Name	Data-collection opt-out	
Summary	The system shall include an option to opt out of data collection other than location.	
Priority	5	
Preconditions	The user must be in the process of creating an account.	
Postconditions	Data other than location will not be collected for this user.	
Primary Actor	User	
Secondary Actors		
Trigger	User selects opt-out of data collection button after or during sign-up process	
Main Scenario	Step	
	1	User selects option to opt-out of data collection

Number	FR-07	
Name	Friend leaderboard	
Summary	The system shall use user data to create a “leaderboard” of food waste reducers based on food waste reduction percentage, as well as by participation streak.	
Priority	3	
Preconditions	Users must have created an account, and access the database where the data is stored for the leaderboard. Users must be logged in.	
Postconditions	User can view leaderboard displaying their stats and those of friends	
Primary Actor	User	
Secondary Actors	Database	
Trigger	User presses button to switch to leaderboard view	
Main Scenario	Step	
	1	User presses leaderboard view button
	2	UI is switched to leaderboard view

Number	FR-08	
Name	Profile badges	
Summary	The system shall allow the user to earn progress-based badges to their profile.	
Priority	2	
Preconditions	Users must be logged in and actively using the application to track food waste.	
Postconditions	A badge is added to the users profile to showcase their achievements	
Primary Actor	User	
Secondary Actors	Badge System	
Trigger	The user achieves a specific milestone related to food waste reduction	
Main Scenario	Step	
	1	The user engages with the application to track their food waste activities.
	2	The badge system evaluates the user's activities and progress.
	3	The user achieves a specific milestone set by the badge system.
	4	The badge system awards a badge to the user's profile.
	5	The user receives a notification about the new badge and can view it on their profile.
Extensions	Step	
	3a	If the user does not achieve the milestone, they continue using the app and the badge system re-evaluates at a later time.
Notes	The badges should serve as motivation for users to continue reducing their food waste and engaging with the app.	

Number	FR-9	
Name	View Food waste tips	
Summary	The system shall provide food saving tips to the user based on their type or cause of waste.	
Priority	5	
Preconditions	The user must have entered food waste data into the system. User must be logged in.	
Postconditions	The user receives personalized food saving tips	
Primary Actor	User	
Secondary Actors	Food saving tips database	
Trigger	The user inputs food waste information into the system.	
Main Scenario	Step	
	1	The user inputs food waste data
	2	The system analyzes the entered data
	3	The system retrieves relevant food saving tips from the database
	4	The user receives personalized tips based on the analyzed data
Extensions	Step	
	2a	If the system does not have enough data for personalized tips, it provides general food saving advice
Notes	The tips should help the user better manage their food waste	

Number	FR-10	
Name	View Food waste graph	
Summary	The system shall have a history feature that displays the users past food waste data in a graphical view, shown on the Statistics screen.	
Priority	4	
Preconditions	The user must be logged in. The user must have input their food waste information at least three times	
Postconditions	The user gets to view a graphical representation of their recent food waste	
Primary Actor	User	
Secondary Actors	Food waste database	
Trigger	The user selects the food waste history button	
Main Scenario	Step	
	1	The database requests the users recent food waste history
	2	The system display the information in a graphical view

Number	FR-11	
Name	Food waste cost counter	
Summary	The system shall display the total approximate cost of their food waste for a selected time period.	
Priority	5	
Preconditions	Complete request from database of food waste cost over a predetermined time period, correct calculation of total cost.	
Postconditions	Total approximate cost is displayed on the track waste page.	
Primary Actor	User	
Secondary Actors	Firebase	
Trigger	Track waste page selection	
Main Scenario	Step	
	1	Track waste page is selected
	2	Application sends request to database with timeframe
	3	Data is received
	4	Average is calculated by application
	5	System displays calculation on track waste page
Extensions	Step	
	5b	Track waste page is selected
	5c	Application sends request
	5d	No data is present
	5e	System displays “Please input food waste data”
Notes		

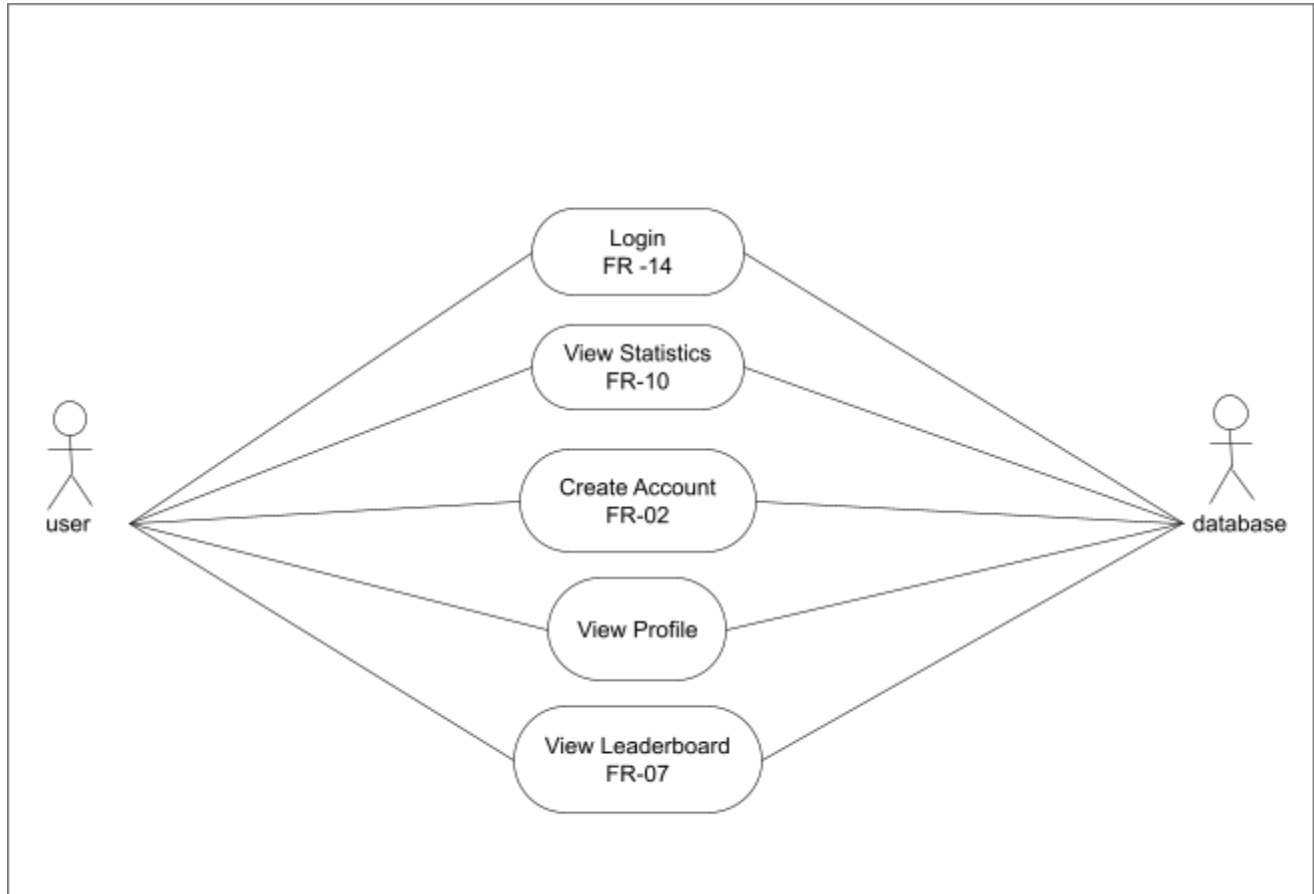
Number	FR-12	
Name	Meal location display	
Summary	The system shall store information related to home/away from home eating habits (meals eaten away from home per week. And displayed the difference).	
Priority	5	
Preconditions	Complete request from database of food waste location over a predetermined time period, correct calculation of total cost.	
Postconditions	Difference in waste in house/out house means are displayed on the track waste page.	
Primary Actor	User	
Secondary Actors	Firebase	
Trigger	Track waste page selection	
Main Scenario	Step	
	1	Track waste page is selected
	2	Application sends request to database with timeframe
	3	Data is received
	4	Difference is calculated by application
	5	System displays calculation on track waste page
Extensions	Step	
	5b	Track waste page is selected
	5c	Application sends request
	5d	No data is present
	5e	Displays “Please input food waste data”
Notes		

Number	FR-13	
Name	Donation map	
Summary	The system shall provide a section that contains additional food waste resources per interest, a map of places to donate food.	
Priority	5	
Preconditions	Google maps api key is accurate Application request to api is granted	
Postconditions	User has stable internet connection	
Primary Actor	User	
Secondary Actors	google maps api	
Trigger	Welcome page is activated	
Main Scenario	Step	
	1	App is opened and welcome page is activated
	2	Request is sent to google maps api
	3	Request is granted
	4	Google maps with relative locations are displayed
Extensions	Step	
	5b	App is opened and welcome page is activated
	5c	Request is sent to google maps api
	5d	Request is not successful
	5e	Display google logo
Notes		

Number	FR-14	
Name	Account Handling	
Summary	The user must be able to create and log into a user account.	
Priority	5	
Preconditions	User is not currently logged into an account	
Postconditions	User is logged into an account	
Primary Actor	User	
Secondary Actors	User data collection system	
Trigger	User presses the sign in button	
Main Scenario	Step	
	1	User is served with the login button
	2	User enters their account name and password
	3	User account is authenticated and user is logged into the system
Extensions	Step	
	2a	User instead selects the create new account button
	2b	User inputs new account information
	2c	New user account is saved into database and user is logged in
	3a	User account is not authenticated and user is served an error message explaining this
Notes		

2.3 Use Case Sub-Diagrams

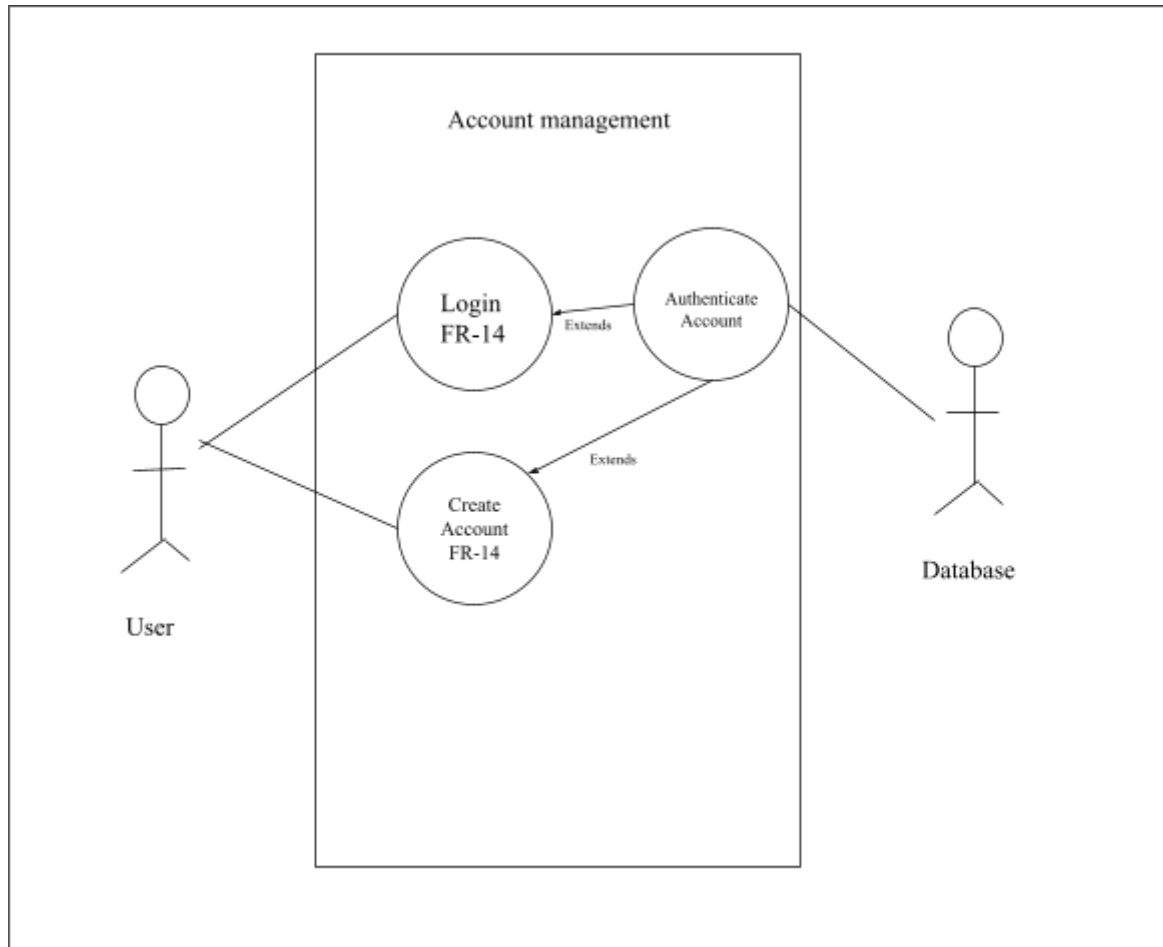
Figure 2.3.1 Data Collection Use Case Diagram



Description: Figure 2.3.1

This figure displays the relationship between the user and the database in terms of the data that the system collects as well as the information the user can access. This data includes the users login information and profile, the food waste and donation statistics, as well as the users personal statistics and leaderboard.

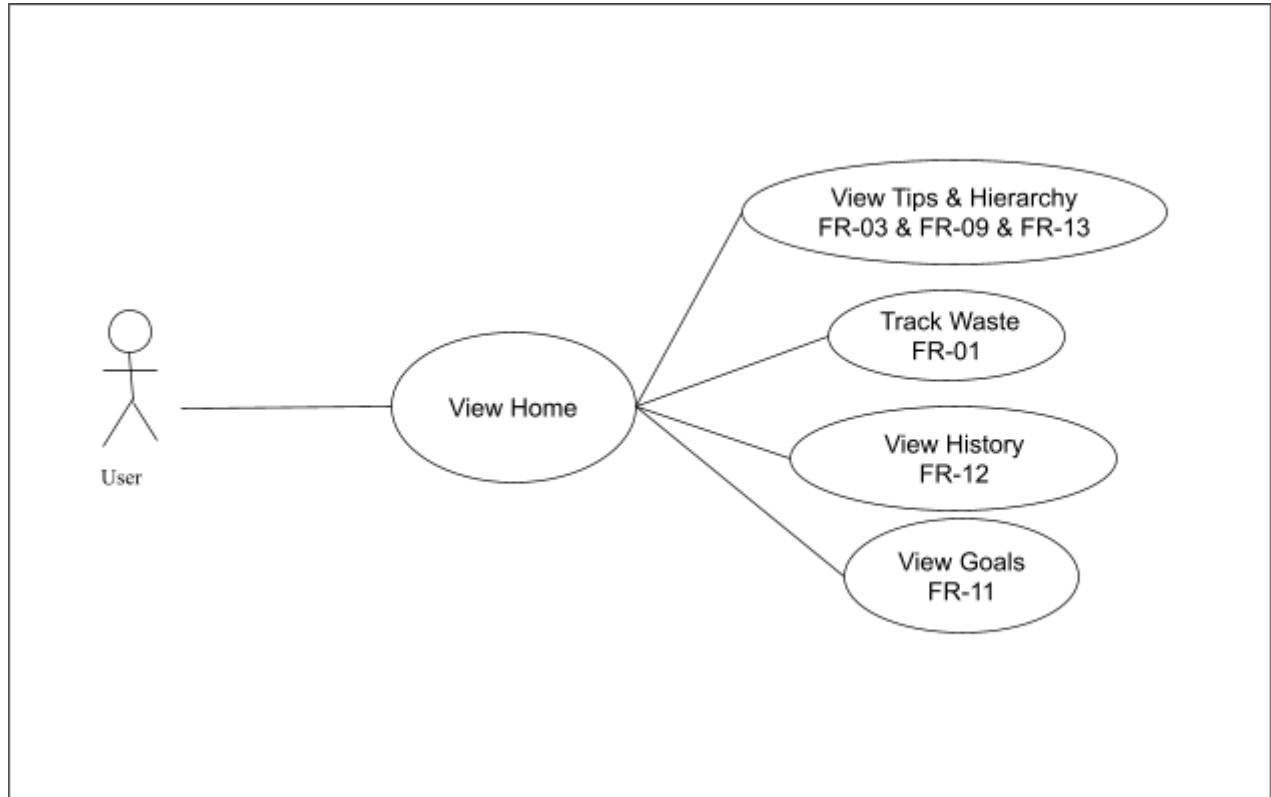
Figure 2.3.2 Account Management Use Case Diagram



Description: Figure 2.3.2

This figure shows the interaction between the user and the database when the user is either logging in or creating an account. The database will check whether the user account exists when the user attempts to login, if it doesn't exist it will prompt the user to instead create one. It will also check if an email is already in use when the user attempts to create an account, if it already exists then it will prompt the user to login instead.

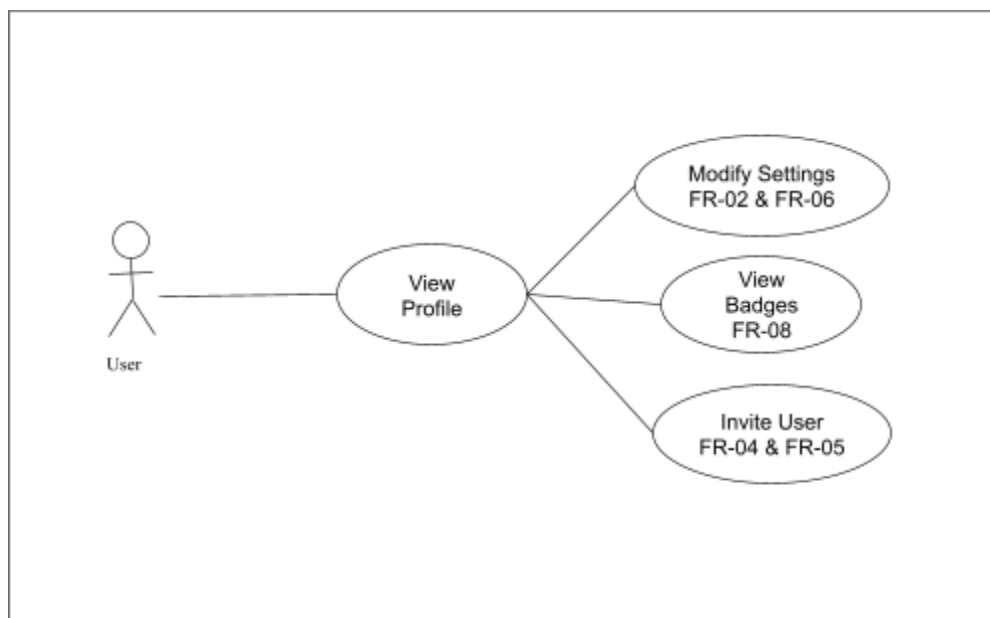
Figure 2.3.3 View Home Use Case Diagram



Description: Figure 2.3.3

This figure displays the different pages that will be available on the applications main page. From the app's home page the user will be able to select to input their food waste, view their waste history, view their goal progress, and view tips based on their recent food waste.

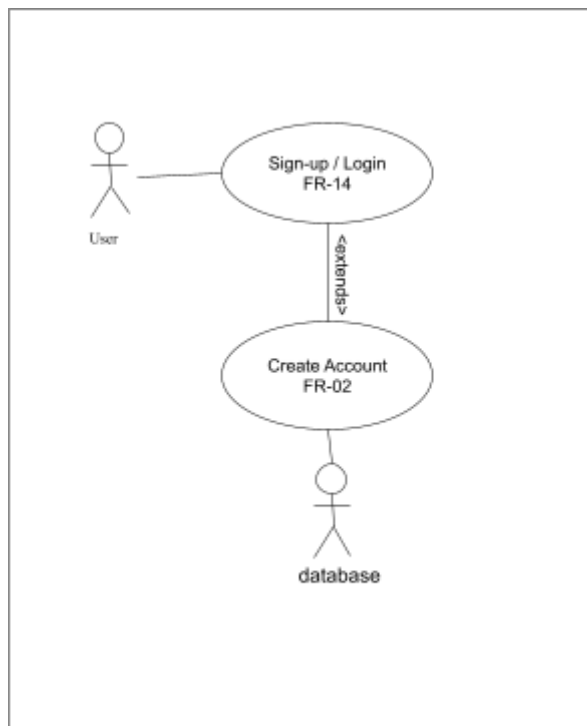
Figure 2.3.4 View Profile Use Case Diagram



Description: Figure 2.3.4

This diagram shows the different pages that will be available from the applications profile menu. From the user profile the user will be able to select to modify the applications settings, view their profiles badges, and invite users to join the app.

Figure 2.3.5 User Data Request Case Diagram



Description: Figure 2.3.5

This diagram displays the data transfer between the application and the database. When a user signs up they are sent to the account creation screen which prompts the user if they want to accept or decline the application gathering about the user, as well as creating a username and password. The data being collected is username, zip code, household size, user gender, age and income range. The login that was created is sent to the database, and any user data that was input is sent to the database as well. After the account creation requirements have been fulfilled the user is sent back to the Login page and ultimately the application. In regards to FR-06 Data-collection opt-out, if the user wants to opt out of data collection the part of the account creation page that accepts input on data collection can be left blank and that would be specified on that page.

3. Non-Functional Requirements

Non-functional requirements break down different operational standards that the system shall adhere to. These non-functional requirements are represented as tables detailing the requirements, priority and a brief testing plan for testing the respective NFR. Below is a list of NFRs. This [NFR Tables](#) document gives more detail about these NFRs.

Non-Functional Requirements		
Number	Priority	Description
NFR-01	5	The system shall work cross platform between IOS and android devices.
NFR-02	4	The system shall be able to support 5000 concurrent users.
NFR-03	4	The system shall be able to query any user data from a database within 2 seconds 90% of the time.
NFR-04	4	The system shall store user information entered into the UI in the database within 2 seconds 90% of the time.
NFR-05	4	The system shall be able to process touch screen input from the user within 2 seconds 90% of the time.
NFR-06	5	The system shall adhere to the US Privacy Act of 1974.
NFR-07	5	The system shall implement encryption for storing user locations.
NFR-08	5	The system shall implement encryption for storing demographic information.
NFR-09	3	The system shall generate food waste statistics with data collected within the last week.
NFR-10	5	The system shall generate food waste statistics within 3 seconds of the user navigating to the statistics page of the application 90% of the time.
NFR-11	4	The system shall undergo Non-Functional Requirement (NFR) testing to ensure compliance with all specified NFRs.

4. User Interface

This section serves as reference to our User Interface Design Document in which we detail the aspects of the User Interface that have been designed for this application. See “User Interface Design Document for Waste Watcher”.

5. Deliverables

This section details which deliverables and which various documents will be delivered to the customer. Each deliverable will be given to the client both electronically in pdf format and in a paper format if they request it. The due dates used in this document will be the same as the course syllabus and are subject to change.

- Systems Requirements Specification - **Due Nov. 1st 2023**
- System Design Document - **Due Nov. 15th 2023**
- User Interface Design Document - **Due Nov. 29th 2023**
- Critical Design Review Document Draft - **Due Dec. 4th 2023**
- Critical Design Review Document Final - **Due Dec. 15th 2023**

6. Open Issues

- Deciding who we want to use as a database - **Due Dec. 5th 2023**
- Deciding whether this is a web page based application, or if it will rely on the expo go bundler, a mobile app development platform. - **Due Dec. 5th 2023**
- Deciding the best way to display the food waste donation map. - **Due Dec. 5th 2023**


Appendix A – Agreement Between Customer and Contractor

This section describes what Susanne Lee and Waste Management Solutions will be agreeing to upon signing this document.


By signing this document, Susanne Lee and Waste Management Solutions agree upon the basic system requirements for this project. This agreement also verifies the project scope, deliverables, and project purpose.


In the case that there are any changes to the requirements, scope, or other important details regarding this project, the development team will edit this document for future deliverables as necessary, and the client will use DocuSign to approve the changes made.


Client Signature:


Name: Susanne Lee	Date: 11/10/23
Signature: 	
Comments:	

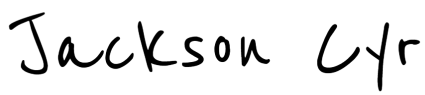
Team Signatures:

Name: Kevin Bretthauer	Date: 11/01/23
Signature: 	
Comments:	

Name: Callen Shaeffer	Date: 11/01/23
Signature: 	
Comments:	

Name: Christian Silva	Date: 11/01/23
Signature: 	
Comments:	


Name: Caiden Emerson	Date: 11/01/23
Signature: 	
Comments:	


Name: Jackson Cyr	Date: 11/01/23
Signature: 	
Comments:	


Appendix B – Team Review Sign-off


By signing this document, the team members agree that they have reviewed the document and agree on its content and format.

Team Signatures:

Name: Kevin Bretthauer	Date: 11/01/23
Signature: 	
Comments:	

Name: Callen Shaeffer	Date: 11/01/23
Signature: 	
Comments:	

Name: Christian Silva	Date: 11/01/23
Signature: 	
Comments:	

Name: Caiden Emerson	Date: 11/01/23
Signature: 	
Comments:	

Name: Jackson Cyr	Date: 11/01/23
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Signature:

Jackson Cyr

Comments:

Appendix C – Document Contributions

- Kevin Bretthauer
 - Contributed to section 2
 - Created 2 use case tables
- Christian Silva
 - Wrote section 1.1-1.4
 - Created Figures 1.1 and 2.4
 - Created 3 Use Case Tables
- Caiden Emerson
 - Contributed to sections 2, 3, 5
 - Created 3 Use Case Tables
- Callen Shaeffer
 - Contributed to Sections 1, 2, 3, 6
 - Created 3 Use Case Tables
 - Created 4 Use Case Sub-diagrams
- Jackson Cyr
 - Created Use Case tables 7 & 8
 - Contributed to sections