

Software Requirements Specification

for

VIPER Rocks!

Version 1.0.0 approved

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Revision History

Name	Date	Reason For Changes	Version
Entire Team	Dec. 8, 2023	Completed SRS Document	1.0.0

1. Introduction

The VIPER Rocks! project is a thrilling initiative that empowers citizen scientists, both amateur and expert, to participate in unraveling the mysteries of lunar geology. This project, developed in collaboration with NASA's Volatiles Investigating Polar Exploration Rover (VIPER) mission, leverages the power of citizen science to map and classify lunar rocks encountered during VIPER's historic exploration of the Moon's South Pole.

Ultimately, VIPER Rocks! plays a vital role in supporting NASA's long-term vision: establishing a sustainable presence on the Moon. By mapping and analyzing the distribution of ice and other resources near the Moon's South Pole, VIPER Rocks! paves the way for future missions to Mars and beyond.

This Software Requirements Specification (SRS) serves as a comprehensive guide to the technical aspects of the VIPER Rocks! project. It outlines the requirements, features, and functionality of the software that will enable citizen scientists to contribute to lunar geology research. The document also contains the project's objectives, user interfaces, technical approach, and testing strategies to ensure the successful development of VIPER Rocks!

1.1 Purpose

The purpose of this SRS is to define the software requirements and specifications necessary to build and test the VIPER Rocks! citizen science application. By clearly documenting the technical aspects of the project, this document serves as a comprehensive roadmap for the development team, ensuring that the software aligns with the project's objectives and vision.

1.2 Intended Audience and Reading Suggestions

This SRS is intended for various stakeholders involved in the VIPER Rocks! project, including software developers, project managers, data analysts, beta testers, and anyone interested in the technical details of the application. It provides a reference for understanding the project's scope, technical requirements, and functionality. It is organized for various types of readers, and each type of reader may interpret this document differently:

- Software Developers may focus on the detailed technical requirements outlined in the document
- Project Managers may focus on the document to reference scope and technical aspects
- Data Analysts may focus on the specific data requirements, formats, and process of data collection
- General audience may focus on the overall description of the system as well as the technical approach for a comprehensive understanding

1.3 Product Scope

1.3.1 Product: "VIPER Rocks!" citizen science website

1.3.2 Description: The VIPER Rocks! software will enable citizen scientists to actively participate in mapping and classifying lunar rocks encountered during NASA's VIPER mission. It will facilitate the scientific analysis of lunar rock populations and enhance our understanding of lunar geology. The software will allow users to measure rock size and classify rock shape, on both mobile and desktop displays.

1.3.3 Objectives: The software aims to enhance the science return of the VIPER mission and engage the public in lunar exploration. The objectives include creating this citizen science platform and improving our understanding of lunar rock populations.

1.4 Definitions, Acronyms, and Abbreviations

VIPER - Volatiles Investigating Polar Exploration Rover

SRS / SRD - Software Requirements Specification (Document)

UI - User Interface

NASA - National Aeronautics and Space Administration

Selenology - Term for lunar geology

GDPR - EU general data protection regulation

COPPA - Children's Online Privacy Protection Act

1.5 References

TBD

2. Overall Description

2.1 System Analysis

VIPER Rocks, is a web-based application (app) that will allow citizen scientists to actively participate in NASA's Volatiles Investigating Polar Exploration Rover (VIPER) mission, scheduled for launch to the moon in late 2024. Citizen scientists will be able to engage in rock classification tasks such as rock scouting, rock measurements, and shape classifications. Users will be able to gain an understanding of the Moon's history, the significance of the moon rocks and information related to the VIPER mission.

Major technical hurdles needed to be addressed:

1. Acquire accurate and up-to-date images and efficiently manage the large scale of data being collected.
2. Ensure security and privacy are implemented to help prevent cyber threats and protect sensitive data/user's personal information.
3. Design, develop, and maintain a responsive website that works on various devices and screen sizes.

Technical Hurdle Solutions:

1. Utilize a scalable cloud-based infrastructure to adjust the capacity of resources needed to meet the increasing demands.
2. Include encryption, firewalls, and user authentication. Establish a privacy policy/terms and conditions agreements.
3. Consult with experienced web developers and regularly test the site for responsiveness issues to improve the functionalities/design.

2.2 Product Perspective

The VIPER Rocks! citizen science application will be accessible to a diverse population of participants. Ranging from NASA's Science Activation Community, the NASA Night Sky Network astronomy clubs, the NASA Community College Network, and a variety of K-12 schools.

2.3 Product Functions

- Scouting
 - This function will provide an image to the users where they will need to demonstrate or tag the location of the rocks.
- Measuring
 - This function will allow users to determine the size of the rocks with the tools given by the system.
- Classification
 - Users will be able to identify the shape of the rocks as angular, sub-angular, rounded, or sub-rounded.
- Account
 - Users will have the opportunity to create an account on the website using various alternative methods.
- Scoring and Rewards
 - Achievements will be noted and displayed on the user's profiles/website homepage.
- Groups/Organizations
 - Users will be able to join a group/organization

2.4 User Classes and Characteristics

- Citizen Scientists:
 - Will be able to engage in classifying rocks to contribute in the data collection and research of NASA/JPL scientists.
- NASA/JPL Scientists:
 - Will be able to gain a better insight for the advancement of their Volatile Investigating Polar Exploration Rover (VIPER) mission by analyzing user data.
- Software Engineers/IT:
 - Will assist with the development, maintenance and improvements of the application.
- Manager/Admin:
 - Will overlook the progress of the project/results shown and focus on user statistics.
- BETA Testers:

- Will continuously test during the development of the website and provide feedback on changes that must be altered.

2.5 Operating Environment

The web-based application will be compatible with the latest versions of popular operating systems for both mobile devices and desktop computers, including Windows, macOS, iOS, and Android. This allows for easy access and participation in the citizen science project, regardless of device.

Software Components:

- React 18.2.0
- SQL Server 2022
- Docker 23.0.3

2.6 Design and Implementation Constraints

2.6.1 Long-Term Maintenance

2.6.2 Data and Research Constraints

2.6.3 Image Processing and Analysis

2.6.4 User Interface/Experience

Regulatory Policies

- Data protection laws for children such as COPPA and GDPR
- 508 compliance, accommodation for people with disabilities

Hardware Limitations

- Consideration of different input devices and browsers such as laptops, tablets, mobile phones, computers, etc.

2.7 User Documentation

The User Documentation that is going to be sent along with the software will be listed throughout this Software Requirement Specification (SRS) document or within the Software Design Document (SDD).

- The user will be given a tutorial for each task. They will be able to access it anytime through the website.

2.8 Assumptions and Dependencies

2.8.1 Operating System/Browser Compatibility

- 2.8.1.1 Device is assumed to be connected to the Internet.
- 2.8.1.2 Device is assumed to be able to run a web browser

2.8.2 Budget and Resource Availability

- 2.8.2.1 The application is dependent on images from NASA of the VIPER mission.

2.8.3 Data Migration and Integration

2.8.4 User Feedback and Testing

- 2.8.4.1 The beta version of the application is dependent on user feedback and testing in order to improve.
- 2.8.4.2 The application is dependent on users performing accurately.

2.9 Apportioning of Requirements

As of this version, the front-end team has created a list of functional and non-functional requirements that are going to be implemented throughout the website. There will be three essential tasks where users will be able to scout, size, and classify the rocks according to their preferences.

Furthermore, the back-end team has provided a database schema that is undergoing modifications. These ongoing changes will make it possible to ensure that the gathered information is accessed in the most reliable, efficient, and secure way.

After acquiring and combining both of these functions, the Viper Rocks! team will be able to proceed to finalize the documentation for the project and have the results for the end product.

3. External Interface Requirements

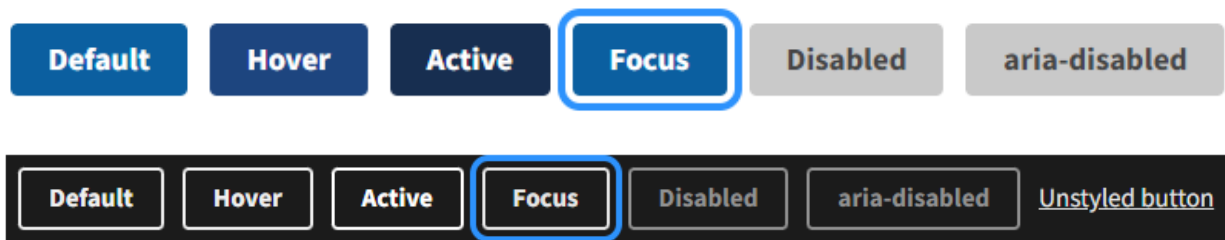
3.1 User Interfaces

USDS: <https://designsystem.digital.gov/>

NASAWDS: <https://github.com/bruffridge/nasawds>

We will be sticking with all the dark and blue versions of NASA components. Below are components we will make use of:

Button:



Icon List: <https://designsystem.digital.gov/components/icon/>

Alert:

STANDARD ALERTS



Informative status

Lorem ipsum dolor sit amet, [consectetur adipiscing](#) elit, sed do eiusmod.



Warning status

Lorem ipsum dolor sit amet, [consectetur adipiscing](#) elit, sed do eiusmod.



Success status

Lorem ipsum dolor sit amet, [consectetur adipiscing](#) elit, sed do eiusmod.



Error status

Lorem ipsum dolor sit amet, [consectetur adipiscing](#) elit, sed do eiusmod.



Emergency status

Lorem ipsum dolor sit amet, [consectetur adipiscing](#) elit, sed do eiusmod.

SLIM ALERT



Lorem ipsum dolor sit amet, [consectetur adipiscing](#) elit, sed do eiusmod.

ALERT WITH NO ICON

Lorem ipsum dolor sit amet, [consectetur adipiscing](#) elit, sed do eiusmod.

Header: Dark Version (Sampled in Mockup)

Footer: Dark Version (Sampled in Mockup)

Radio Buttons:

DEFAULT

Select one historical figure

- ☒ Sojourner Truth
- ☐ Frederick Douglass
- ☐ Booker T. Washington
- ☐ George Washington Carver

TILE

Select one historical figure

☒ Sojourner Truth

☐ Frederick Douglass
This is optional text that can be used to describe the label in more detail.

☐ Booker T. Washington

☐ George Washington Carver

Select:

Dropdown label

- Select -

Site Alert:

STANDARD INFORMATIONAL SITE ALERT

 **Short alert message**
Additional context and followup information including [a link](#).

STANDARD EMERGENCY SITE ALERT

 **Emergency alert message**
Additional context and followup information including [a link](#).

Step Indicator:



Tag:

DEFAULT TAG

INFO

BIG TAG

BIG

Text Input:

Text input label

Text area label

Typefaces: Source Sans Pro, Public Sans, Roboto Mono, Merriweather

The following five images are draft mockups of landing and scouting page:

**Glenn**
Research Center

About UsFAQContact UsSign Up/Login



VIPER ROCKS

Citizen Scientists Needed. Sign up to identify moon rocks for Viper rover expeditions.

[Start](#)

National Aeronautics and Space Administration

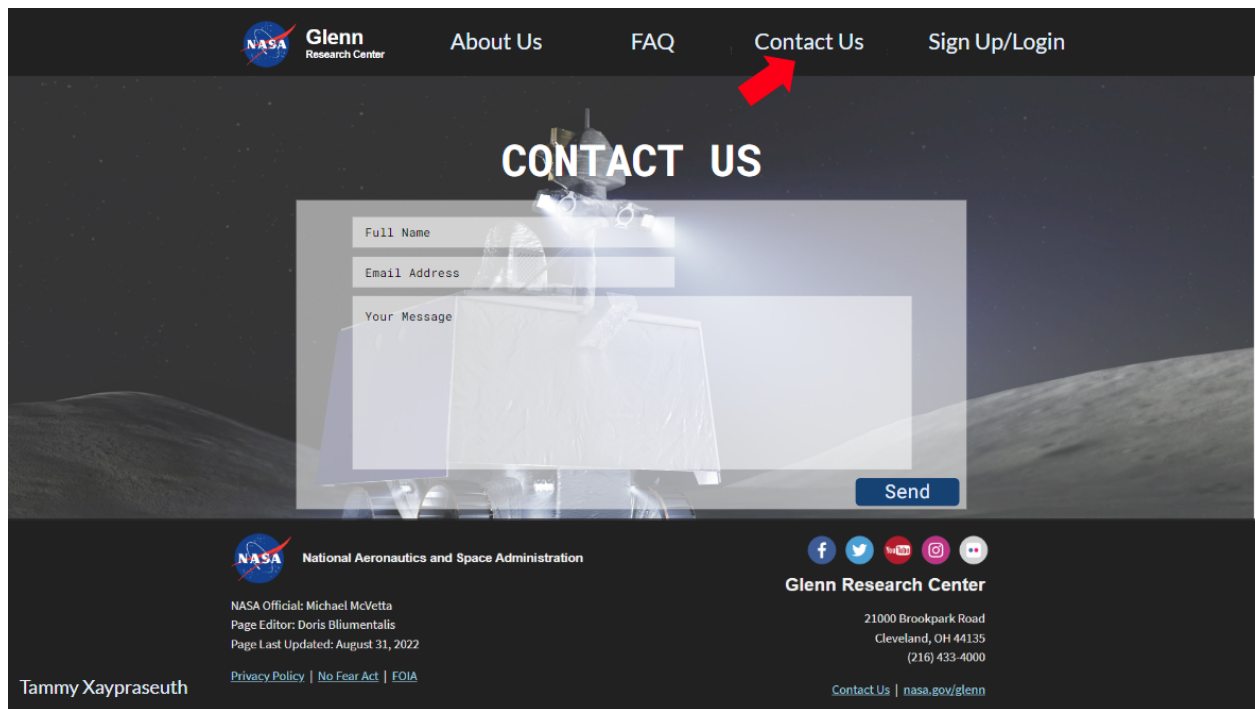
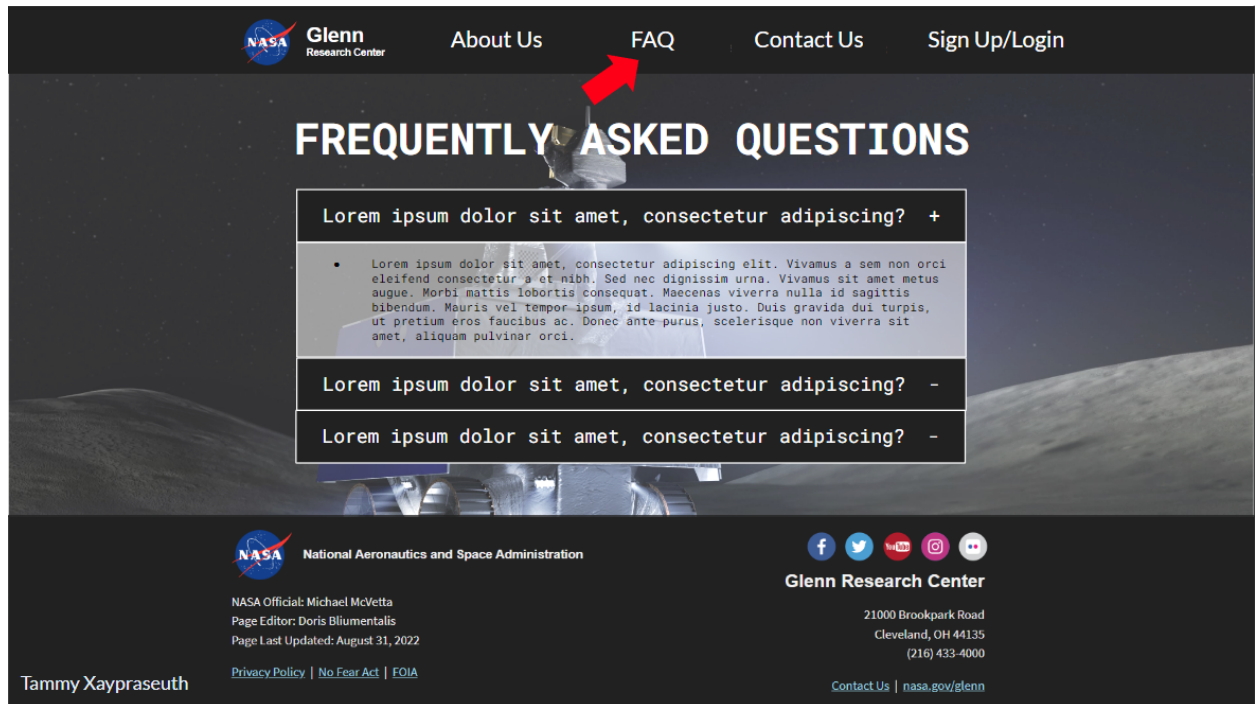


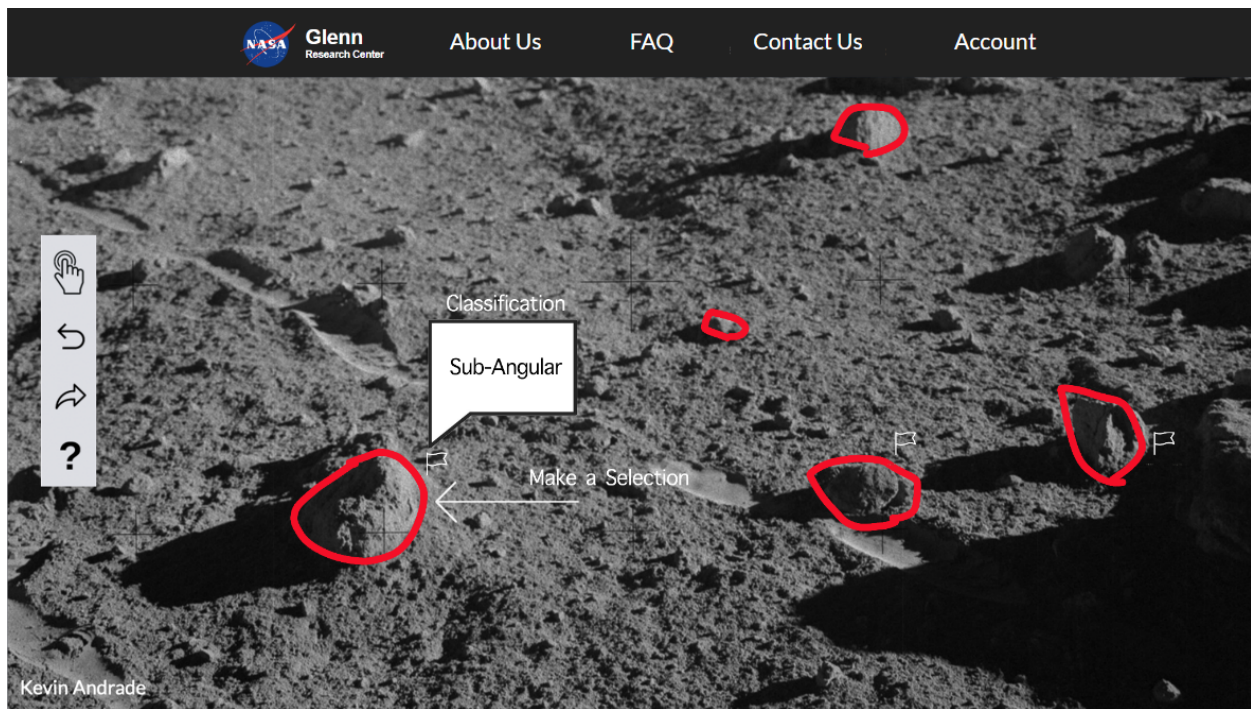
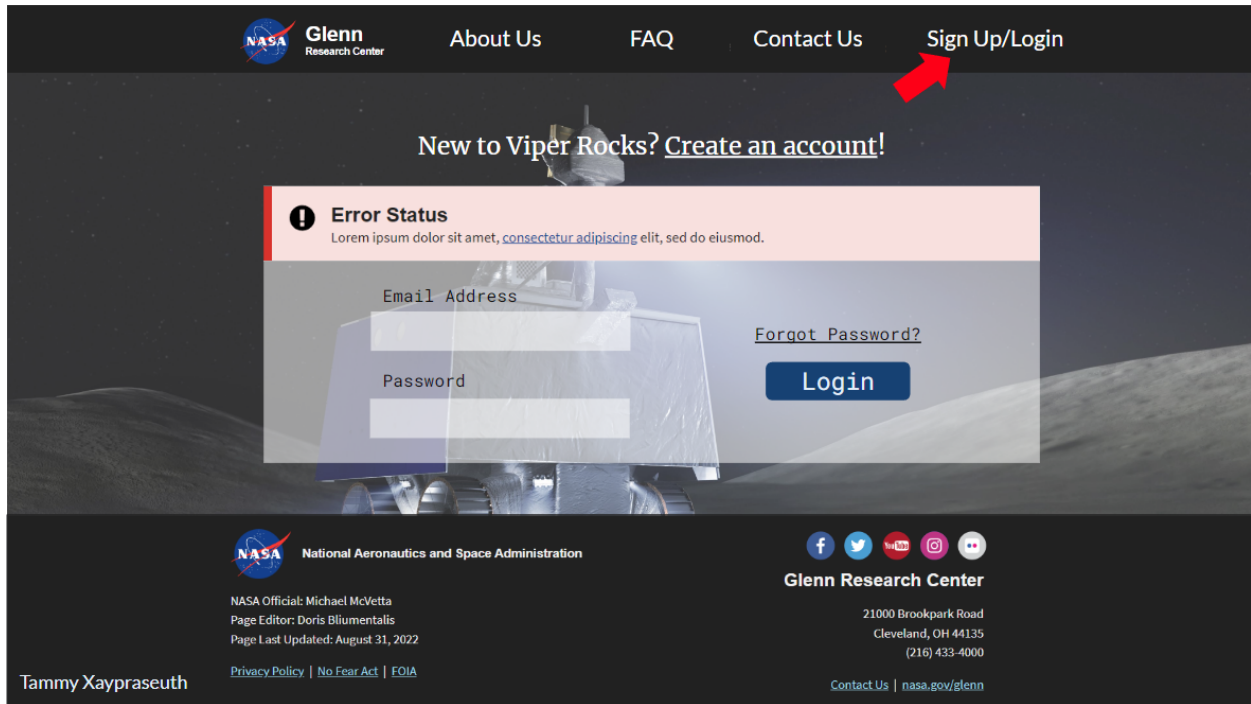
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[Privacy Policy](#) | [No Fear Act](#) | [FOIA](#)

Tammy Xaypraseuth





As per the Americans with Disabilities Act, we will be following this checklist to meet the guidelines:

1. Read the law documentation
2. All media files and maps should have an "alt" tag
3. All your online forms should have descriptive html tags

4. All hyperlinks should have a descriptive anchor text
5. All pages on your website have “skip navigation” links
6. All the text content should be structured using proper heading tags
7. All PDF files should be accessible
8. All videos should have subtitles, transcripts and audio description
9. The color contrast of your web pages should be sufficient according to WCAG
10. All fonts should be accessible
11. All HTML tables should be populated with column headers, row identifiers and cell information
12. All audio files on your website should have a written caption
13. All call to action buttons on your website should have an accessible name and an ARIA label
14. All your website should be accessible with keyboard navigation
15. Have a website accessibility policy page
16. Have easily locatable contact information to allow users to request accessibility information
17. Test your website accessibility according to the Website Content Accessibility Guidelines
18. Automate your website accessibility check to prevent missing critical accessibility issue

We will also reference the USWDS and NASA Guidelines for accessibility for guidance on accessible designs.

3.2 Hardware Interfaces

The following are different input systems that will be kept in mind while developing this web application. Users will need a mobile device or personal computer. If they have a personal computer, they will require a mouse and keyboard or a trackpad.

3.3 Software Interfaces

The following are software interfaces that will be used for this product

- React 18.2.0
- MySQL 8.0
- MongoDB 7.0
- Python 3.12.0

3.4 Communications Interfaces

Users will need an email if they choose to contact the team.

4. Requirements Specification

4.1 Functional Requirements

General Functions	
Requirement No.	Requirement Description
4.1.1	The system shall provide a tutorial for users on how to navigate and utilize the system.
4.1.2	The system shall provide tools for the user to edit their work.
4.1.3	The user shall be able to save their work
4.1.4	The system shall allow users to share their findings on social media.
4.1.5	The system shall show measurements in the metric system by default
4.1.6	The system shall have the option to show the imperial system of measurements

Scoring and Rewards	
Requirement No.	Requirement Description
4.2.1	The system must include a validation mechanism
4.2.2	The system shall allow the creation of groups
4.2.3	The system shall give out rewards to groups
4.2.4	The system shall give out rewards to users
4.2.5	The system shall provide an anonymous survey for users to fill out
4.2.6	The system should have a leaderboard

Scouting Task	
Requirement No.	Requirement Description
4.3.1	The system shall allow the user to tag the rocks
4.3.2	The tags shall indicate the position of a rock
4.3.3	The system shall divide the work distribution
4.3.4	The system shall provide a point of reference for determining what qualifies as a rock.

Sizing Task	
Requirement No.	Requirement Description
4.4.1	The system shall provide tools for the user to estimate the size of a rock
4.4.2	The system shall calculate the size of the rock based on the user input

Classification Task	
Requirement No.	Requirement Description
4.5.1	The system shall display the four different rock classifications: angular, sub-angular, rounded, and sub-rounded
4.5.2	The system shall allow the user to classify the rocks

Account Creation	
Requirement No.	Requirement Description
4.6.1	The system shall allow the user to make an account on the website
4.6.2	The system shall allow the user to make an account using OAuth
4.6.3	The system shall request the user to create a strong password
4.6.4	The system shall ask the user if they are 13 years old or younger (American compliance of COPPA)
4.6.5	The system shall ask the user if they are 16 years old or younger (European compliance of GDPR)

4.2 External Interface Requirements

The VIPER Rocks! application shall receive lunar image data from the VIPER mission.

4.3 Logical Database Requirements

Database	
Requirement No.	Requirement Description
4.1.1	The system shall be able to process user requests and generate responses.
4.1.2	The system shall be able to store and retrieve data from the database.
4.1.3	The system shall restrict data access based on user clearance.
4.1.4	The system shall generate a user report
4.1.5	The system shall generate a tagged image report

4.4 Design Constraints

The web-based application will be compatible with the latest versions of popular operating systems for both mobile devices and desktop computers, including Windows, macOS, iOS, and Android. This allows for easy access and participation in the citizen science project, regardless of device.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

Performance	
Requirement No.	Requirement Description
5.1.1	The system shall be able to handle 1000 concurrent users
5.1.2	The system shall respond to a user request in 2 seconds
5.1.3	The system shall save a user's work in 2 seconds
5.1.4	The system shall be able to handle 1000 number of requests per seconds
5.1.5	The systems mean time before failure (MTBF) shall be 99.9%
5.1.6	The systems mean time to restore (MTR) shall be 2 hours

5.2 Safety Requirements

Safety	
Requirement No.	Requirement Description
5.1.1	The system shall back up data to another database
5.1.2	The system shall deny unauthorized access to the database
5.1.3	The system shall have different account types

5.3 Security Requirements

TBD

5.4 Software Quality Attributes

Safety	
Requirement No.	Requirement Description
5.1.1	The system shall be able to scale to meet increasing demand.
5.1.2	The system shall be easy to maintain and update.

5.5 Business Rules

The system will need to comply with the following rules

- Data Protection Laws
 - COPPA (US): Children are considered to be from ages 12 and under
 - Under this rule collecting data from them must be regulated and notified to a legal parent or guardian
 - GDPR (EU): Children are considered to be from ages 16 and under
 - Under this rule collecting data from them must be regulated and notified to a legal parent or guardian
- 508 Compliance
 - NASA ruling for people of disabilities requiring accommodation for them

The system shall have the following roles

- Citizen Scientists
 - Allowed to complete and submit data to the scientist team
- Viper Rocks Scientist:
 - Allowed to access and grab data from the database

6. Legal and Ethical Considerations

The VIPER Rocks! citizen science project aims to engage the public with lunar science research by collecting and analyzing user-generated data. However, this raises various legal and ethical considerations that must be addressed to ensure the protection of users and the responsible conduct of scientific research.

Privacy:

- The project must clearly inform users about the types of data collected through the application and how it will be used.
- User consent must be obtained explicitly before collecting any personal information.
- Secure data transfer protocols and robust data storage systems must be implemented to prevent unauthorized access.

Security:

- The security of the user's data must be maintained and methods will be implemented.
- The project will implement secure user authentication mechanisms to prevent unauthorized access to accounts and data.

The legal and ethical considerations outlined above are crucial for ensuring the responsible development and operation of the VIPER Rocks! project.

Appendix A: Glossary

VIPER - Volatiles Investigating Polar Exploration Rover

SRS / SRD - Software Requirements Specification (Document)

UI - User Interface

NASA - National Aeronautics and Space Administration

Selenology - Term for lunar geology

GDPR - EU general data protection regulation

COPPA - Children's Online Privacy Protection Act

Appendix B: Analysis Models

Refer to Software Design Document.

Appendix C: To Be Determined List

TBD