

# **Software Requirement Specification**

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**SOFTWARE FOR TRACKING AND MANAGING UPVC  
TUBE-WELL INSTALLATIONS IN VILLAGES**

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## LETTER OF TRANSMITTAL

April 27, 2025

**Ms. Sayma Sultana Chowdhury**

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**Dear Madam,**

I am writing to submit my Software Requirements Specification (SRS) report for the project titled **“Software for Tracking and Managing UPVC Tube-Well Installations in Villages.”** This report outlines the essential functional and non-functional requirements designed to guide the development of a reliable and efficient software system.

The report has been carefully prepared to ensure accuracy, completeness, and ease of understanding. I hope that the contents will meet your expectations and reflect the objectives of the SRS Lab.

Thank you for your time and support throughout this project.

**Sincerely,**

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**Enclosure:** SRS Report.

## EXECUTIVE SUMMARY

This document presents the Software Requirements Specification (SRS) for the project titled **“Software for Tracking and Managing UPVC Tube-Well Installations in Villages.”** The primary objective of this software is to streamline the planning, installation, monitoring, and maintenance of UPVC tube-wells in rural areas through a centralized and user-friendly digital system.

In many rural regions, managing tube-well installations is a complex task due to the lack of proper record-keeping, inefficient communication between stakeholders, and limited access to real-time data. This proposed system addresses these challenges by offering a structured platform where all relevant data—such as installation locations, equipment status, service history, and technician information—can be stored, tracked, and updated efficiently.

The software will offer modules for:

- **Data entry and update** of tube-well installations,
- **Geo-tagging** of locations,
- **Monitoring and reporting** of operational status,
- **Automated alerts** for maintenance needs,
- **User role management** for administrators, engineers, and field workers.

The system is expected to increase transparency, reduce redundancy, improve response times for repairs and maintenance, and ultimately enhance the quality and reliability of rural water supply management.

This SRS outlines all necessary functional and non-functional requirements, system features, constraints, and design assumptions to ensure a clear understanding of the software.

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# Chapter 1

## Introduction

### 1.Introduction

Access to clean and safe drinking water is a fundamental need in rural areas, and UPVC (Unplasticized Polyvinyl Chloride) tube-wells are widely used across villages in Bangladesh as a reliable solution for groundwater extraction. These tube-wells are popular because they are strong, low-cost, and do not rust easily. However, managing the installation, maintenance, and tracking of these tube-wells manually often leads to inefficiencies, data loss, and mismanagement.

This project proposes the development of a **software system** specifically designed to streamline the process of tracking and managing UPVC tube-well installations in villages. The system aims to digitally record information about each installation, including location, installation date, responsible technician, maintenance history, and user feedback. It will provide real-time access to data for authorities and organizations involved in rural water management, ensuring better transparency, planning, and service delivery.

By transitioning from manual record-keeping to a centralized digital platform, the system will not only reduce errors and redundancy but also help decision-makers identify areas lacking access to safe drinking water and plan future installations accordingly. This document outlines the purpose, scope, and requirements of the software system to guide its development and deployment.

## 1.1.Purpose

The purpose of this software is to provide a structured and digital solution for tracking, managing, and maintaining the installation of **UPVC tube-wells** in rural villages. The system is intended to support stakeholders—such as government bodies, NGOs, engineers, contractors, and field inspectors—by enabling them to monitor project progress, allocate responsibilities, and ensure timely and accurate data recording throughout the lifecycle of tube-well projects.

This software aims to:

- Eliminate inefficiencies and errors associated with manual tracking and paper-based records
- Improve transparency and accountability in tube-well installation activities
- Facilitate real-time status updates and reporting for better decision-making
- Provide a reliable database for long-term planning and maintenance of rural water supply infrastructure

By using this system, organizations can ensure the effective utilization of resources, reduce project delays, and contribute to the delivery of clean water to underserved rural populations through properly installed and managed UPVC tube-wells.

## 1.2.Scope

The **Software for Tracking and Managing UPVC Tube-Well Installations in Villages** is designed to serve as a centralized platform to manage the end-to-end process of UPVC tube-well installations in rural areas. It will be used by administrators, engineers, contractors, and field inspectors to ensure that installations are carried out efficiently, correctly, and on time.

The scope of this system includes:

- **Project Registration:** Recording new tube-well installation projects with detailed geographic, demographic, and administrative information.
- **Contractor and Staff Assignment:** Assigning roles and responsibilities to contractors, engineers, and field workers based on region and workload.
- **Progress Monitoring:** Updating the status of installations in real-time, from planning and digging to installation and testing.
- **Quality Inspection:** Logging field inspection reports, photos, and issues identified during site visits.
- **Maintenance Tracking:** Recording and scheduling maintenance or repair activities for installed tube-wells.
- **Reporting and Analytics:** Generating reports for higher authorities and stakeholders on progress, performance, and usage trends.
- **Role-Based Access:** Providing different levels of access and permissions depending on the user's role (admin, engineer, contractor, inspector, etc.).



- **Mobile and Web Interface:** Ensuring accessibility from both web and mobile devices for field and office users.

The system will **not** handle financial transactions or billing functionalities in its initial version. Integration with external GIS or mapping services may be considered in future versions.

This software will significantly aid in increasing the operational efficiency, accountability, and sustainability of tube-well projects, ensuring better water accessibility for rural communities.

### 1.3.Intended Audience

This software is intended for individuals and organizations involved in the planning, implementation, testing, and maintenance of **UPVC tube-well installations** in rural villages. The following groups are the primary users of this document and the system it describes:

- **Local Government Officials** – to oversee installation projects, monitor service coverage, and ensure accountability.
- **Technicians and Field Workers** – to input real-time updates on installation status, inspections, and maintenance tasks.
- **Non-Governmental Organizations (NGOs)** – to track water access improvements in communities they support and collaborate on ongoing projects.
- **Water Resource Planners and Policy Makers** – to analyze installation data and plan future water infrastructure based on community needs.
- **Software Developers and Project Managers** – to understand the software's purpose, functional requirements, and design goals for successful system development.
- **Testers and Quality Assurance Teams** – to validate the system's functionality, performance, and reliability against the specified requirements.

The system is designed with user-friendliness in mind, making it accessible even to users with basic technical skills.

## 1.4. Definitions, acronyms and abbreviations

Term / Acronym	Definition
<b>UPVC:</b>	Unplasticized Polyvinyl Chloride – A durable and corrosion-resistant material used in tube-well pipes.
<b>Tube-Well:</b>	A water well system that uses a long pipe to draw groundwater, typically installed in rural areas for drinking water supply.
<b>NGO:</b>	Non-Governmental Organization – An independent body working for community development, including rural water supply projects.
<b>GIS:</b>	Geographic Information System – A system that captures, stores, analyzes, and presents spatial or geographic data.
<b>SRS:</b>	Software Requirements Specification – A document that describes what the software will do and how it will be expected to perform.
<b>Admin Panel:</b>	A secure backend interface used by authorized personnel to manage data, users, and system content.
<b>Dashboard:</b>	A visual interface showing key metrics, data summaries, and notifications related to tube-well installations and maintenance.
<b>Maintenance: Log</b>	A record of repair or service activities conducted on a specific tube-well.
<b>Stakeholder:</b>	Any individual or group (e.g., government officials, NGO staff, technicians) involved in or affected by the project.
<b>User Role:</b>	A defined access level in the system, such as Admin, Technician, or Viewer, each with specific permissions.

# Chapter 2

## General Description

### 2.Overall Description

This section provides an overview of the entire system. It explains the system in its operational context, showing how it interacts with other potential systems and introducing its core functionalities. It also identifies the different types of stakeholders who will interact with the system and describes the functionality available to each user group. Finally, it outlines the system's key constraints and the assumptions made during the development process.

#### 2.1.Product Perspective

The proposed software is a standalone web-based system designed to support the tracking, management, and reporting of UPVC tube-well installations across rural villages. It aims to digitize and centralize records that are currently maintained manually, ensuring more efficient monitoring and planning. The system may integrate optional GIS-based mapping features for visualizing installation locations.

#### 2.2.Product Functions

Key functionalities of the software will include:

- User authentication and role-based access control
- Adding and editing tube-well installation records
- Geo-tagging of tube-well locations
- Viewing a dashboard of active/inactive installations
- Scheduling and logging maintenance activities  
Report generation and data analytics.
- Notification system for inspections and maintenance

## 2.3. User Characteristics

- 1. Administrator:** Full access to all modules; can manage users and data.
- 2. Field Technician:** Can enter new installation and maintenance data from the field.
- 3. Monitoring Officer:** Can view data, generate reports, and track project progress.
- 4. NGO/Government Officials:** Limited view access to monitor project status.

## 2.4. Design and Implementation Constraints

1. Internet access may be limited in some rural areas, so the system should be optimized for low bandwidth.
2. Data security and privacy regulations must be followed.
3. The system should have multi-language support (e.g., English and Bengali).
4. The application must be responsive and usable on both desktop and mobile devices.

## 2.5. Assumptions and Dependencies

1. Users (like technicians and admin staff) will get proper training to use the software.
2. Field staff will have access to mobile phones or tablets with internet to enter data.
3. Data will be added and updated regularly by the users.
4. Local government or NGOs will support the project and help with data collection.
5. There will be at least some internet connection in the villages for syncing data.

## Chapter 3

### Specific Requirement

#### 3. Specific Requirement:

This section outlines the specific functional and non-functional requirements for the proposed system.

#### 3.1. Functional Requirement:

##### 1. User Management:

ID	Description	Priority
UM-01	Users shall be able to create an account.	High
UM-02	Users shall be able to log in and log out.	High
UM-03	Users shall be able to reset their password.	High
UM-04	Users shall be able to update their profile.	Medium
UM-05	Admins shall be able to delete or deactivate users.	Medium

## 2. Tube-Well Request & Verification:

ID	Description	Priority
TW-01	Villagers shall be able to submit a tube-well installation request.	High
TW-02	System shall allow attaching documents (e.g. land ownership proof, photo).	Medium
TW-03	Supervisor shall verify request details and approve/reject the request.	High
TW-04	Verified requests shall be forwarded for installation scheduling.	High

### 3. Installation Tracking:

ID	Description	Priority
IN-01	Installers shall view assigned installation requests with location and status.	High
IN-02	Installers shall update progress (e.g. digging, pipe setup, testing).	High
IN-03	Supervisors shall approve completed installations.	Medium
IN-04	System shall log the date and time of each update step.	Medium

### 4.Maintenance Management:

ID	Description	Priority
MA-01	Villagers shall be able to report issues with installed tube-wells.	High
MA-02	Maintenance team shall receive alerts for reported issues.	High
MA-03	Team shall update issue status (e.g. in-progress, resolved).	Medium
MA-04	Admin shall view maintenance history per installation.	Medium



## 5.Reporting & Dashboard

ID	Description	Priority
RP-01	Admin shall view reports of total installations, pending requests, etc.	High
RP-02	Dashboard shall show installation status by village/region.	Medium
RP-03	System shall export reports to Excel or PDF.	Medium

## 6.Feedback and Support

ID	Description	Priority
FS-01	Users shall be able to submit feedback or issues.	Medium
FS-02	Admins shall be able to view, respond to, and close feedback tickets.	Medium

## 7. System Requirements

- The system must be responsive and accessible on desktops, tablets, and smartphones.
- The system should be secure and protect user data.
- The system should support multiple roles (admin, technician, viewer).
- The platform must handle large datasets efficiently.

## 8. Future Considerations (Out of Scope for Version 1.0)

- GPS tracking and real-time mapping of tube-wells.
- Integration with water quality sensors.
- SMS or mobile app notifications.
- Multi-language support (e.g., Bangla and English).

## 9. Glossary

- **UPVC Tube-Well:** A plastic-based tube used for groundwater extraction.
- **Maintenance:** Activities to keep the tube-well working properly.
- **Technician:** Person responsible for installing or fixing tube-wells.

## **Non-Functional Requirements**

### **1.Product Requirements**

#### **a)Usability Requirements**

- The software interface must allow a new field officer to log a new tube-well installation record within 5 minutes without any training.
- The platform should offer both English and local language (e.g., Bangla) interface support for ease of use in rural areas.

#### **b) Performance and Efficiency Requirements**

- The system must support at least 500 concurrent users (field staff and admin users) without noticeable performance degradation.
- Loading the installation report of a specific village should take no more than 3 seconds under normal network conditions.

#### **c) Reliability Requirements**

- The software must maintain an uptime of at least 99.5% to ensure uninterrupted access in the field.

- If a record submission fails due to connectivity issues, the system must attempt automatic retries 3 times before showing an alert.

#### **d) Maintainability and Scalability Requirements**

- The codebase should allow new features (e.g., solar pump integration tracking) to be added by modifying no more than 10% of existing modules.
- The system database must scale to store data for up to 50,000 tube-well installations without needing major redesign.

## **2. Organizational Requirements**

#### **a) Development Process Requirements**

- Development should follow Agile methodology with 2-week sprints and review meetings involving stakeholders.
- Each code commit must be peer-reviewed by a senior developer before merging into the main branch.

#### **b) Deployment Requirements**

- The system should support seamless deployment with zero downtime using blue-green or rolling update strategies.
- Every release must undergo automated testing (unit + regression) before being deployed to production.

#### c) Security & Compliance Requirements

- The software must comply with the Digital Security Act of Bangladesh and ensure data encryption during storage and transmission.
- All user sessions should expire automatically after 20 minutes of inactivity for enhanced security.

### 3.External Requirements

#### a) Regulatory Requirements

- The system must support compliance with local government reporting standards for rural water management.
- Each installation report must include mandatory fields (GPS coordinates, depth, materials used) as per

## Department of Public Health Engineering (DPHE) guidelines.

### **b) Interoperability Requirements**

- The software must offer RESTful APIs for integration with external rural infrastructure monitoring systems or mobile apps.
- It must support CSV and Excel export formats for offline government reporting.

### **c) Ethical & Sustainability Requirements**

- The cloud infrastructure hosting the platform should utilize energy-efficient resources where possible.
- Data collection practices must respect community privacy and ensure informed consent from village residents.

## **4.Legislative Requirements**

### **a) Data Protection & Privacy Laws**

- The system must adhere to national data protection regulations, allowing users to request data deletion or correction.
- All sensitive data must be encrypted at rest and in transit using industry-standard encryption algorithms.

**b) Tax & Financial Compliance**

- If financial modules (e.g., maintenance cost logging) are added, they must comply with local financial reporting requirements.

**c) Employment & Labor Laws**

- Any features related to labor hour tracking for installation teams must comply with labor laws and avoid unauthorized surveillance.

**d) Accessibility Compliance**

- The application should comply with WCAG 2.1 guidelines to support field officers with visual or physical impairments.

- The mobile version should support voice input and screen reader compatibility.

#### **e) Intellectual Property & Copyright Laws**

- The system must respect software license agreements of all third-party libraries used.
- Any AI-generated suggestions (e.g., predicting best installation sites) must not violate copyright laws.

## **5.Safety and Security Requirements**

### **1. Cybersecurity & Data Protection Laws**

- The system must implement MFA (Multi-Factor Authentication) for administrative logins and monitor all security-related events.
- Any data breach must be reported to appropriate authorities within 72 hours.

### **2. Fraud Prevention & Financial Security**

- In case financial tracking modules are implemented, the system must use fraud detection algorithms and



comply with anti-corruption guidelines in public projects.

### **3. Workplace Safety & Digital Well-being**

- If field staff tracking features are added, they must provide clear opt-in options and respect user privacy according to national laws.

### **4. Accessibility & Safety for Users**

- The system should be safely usable under low-bandwidth conditions and provide simple, clear error messages and feedback.

### **5. Disaster Recovery & Business Continuity**

- A disaster recovery plan must be in place, ensuring backup restoration within 24 hours of any system failure.
- The system must be hosted on redundant cloud infrastructure with failover capabilities to ensure 99.5% uptime.

## Chapter 4

### Description

#### 4.1. Actors & Stakeholders

##### 4.1.1 Primary Actors (Users)

Actor	Description
<b>Admin:</b>	Manages users, assigns roles, oversees data integrity, and handles reports.
<b>Technician:</b>	Installs tube-wells, records installation and maintenance data in the system.
<b>Data Entry Clerk :</b>	Inputs tube-well and maintenance data collected from field notes.
<b>Viewer/User:</b>	Views tube-well data and reports, typically someone with read-only access.

##### 4.1.2 Stakeholders

Stakeholder	Role in the System
<b>Local Government</b>	Uses reports for infrastructure planning and funding decisions.
<b>NGOs Agencies</b>	Monitor progress of clean water projects and request access to data for analysis.
<b>Village Leaders</b>	Provide location-specific data and approve installation projects.
<b>Software Development Team</b>	Builds, maintains, and updates the software based on these requirements.
<b>End Users (Villagers)</b>	Indirect stakeholders who benefit from improved access to clean water.

## 4.2.Use Case Descriptions

### Use Case 1: Record New Tube-Well Installation

- **Actor:** Technician / Data Entry Clerk
- **Scenario:**  
A technician completes the installation of a UPVC tube-well in a village. The technician or data entry clerk logs into the system and inputs installation details such as village name, GPS coordinates, depth, installation date, and technician name. Once saved, the system assigns a unique ID to the tube-well.
- **Precondition:** User is authenticated and authorized to add entries.
- **Postcondition:** Tube-well record is stored and available for future reference or updates.

### Use Case 2: Schedule and Record Maintenance

- **Actor:** Technician / Admin
- **Scenario:**  
The system notifies the technician that a tube-well is due for maintenance based on usage time or past service records. The technician schedules a visit and, after completing maintenance, updates the system with work done, date, and any parts replaced.
- **Precondition:** Tube-well exists in the system.
- **Postcondition:** Maintenance log is updated and visible in the tube-well's history.

### **Use Case 3: Generate Reports for Local Government**

- **Actor:** Admin / Monitoring Officer/Government Official
- **Scenario:**  
An admin logs in and selects the option to generate reports by village, installation date range, or maintenance status. The system generates a PDF/Excel report which is then shared with local government for planning or funding. Monitoring Officer reviews the report.
- **Precondition:** User has reporting privileges.
- **Postcondition:** Report is generated and exported successfully.

## Chapter 5

### Diagram

#### 5.1.Use case Diagram

##### Use Case Diagram Descriptions :

###### 1.Manage Users

- **Actor:** Administrator
- **Description:** Add, remove, or update users in the system.

###### 2.Upload Data

- **Actor:** Administrator
- **Description:** Upload information about tube-well installations and reports.

###### 3.Monitor Progress

- **Actor:** Administrator
- **Description:** View project progress and summaries.

###### 4.Log Installations

- **Actor:** Field Technician
- **Description:** Enter details of new tube-well installations from the field.

### **5.Update Maintenance Data**

- **Actor:** Field Technician
- **Description:** Add maintenance records for existing tube-wells.

### **6.View Reports**

- **Actor:** Monitoring Officer
- **Description:** View detailed reports and statistics.

### **6.Track Project Status**

- **Actor:** Monitoring Officer
- **Description:** Monitor the current status of installations and repairs.

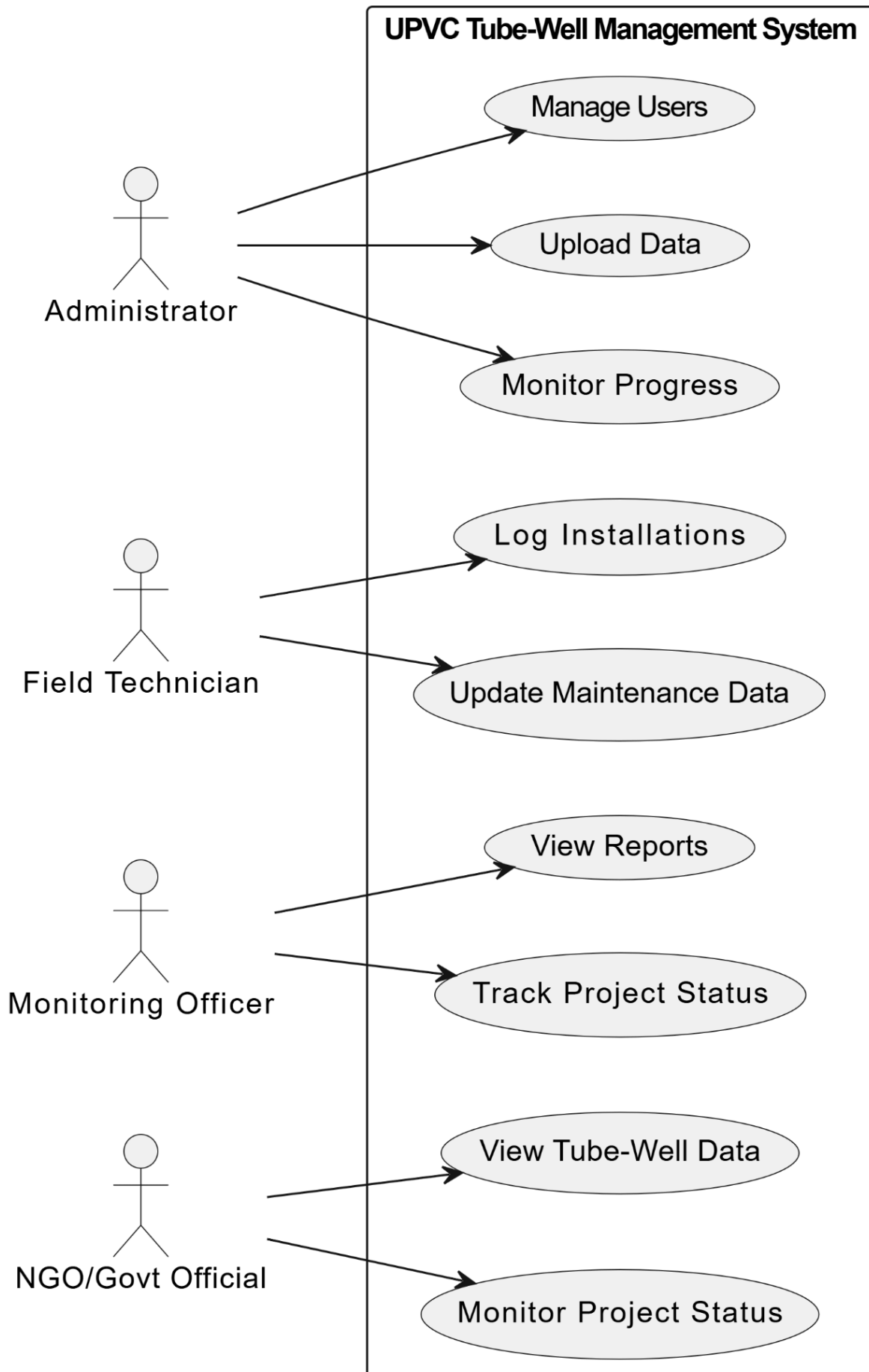
### **7.View Tube-Well Data**

- **Actor:** NGO/Govt Official
- **Description:** Check tube-well data (location, status, etc.).

### **8.Monitor Project Status**

- **Actor:** NGO/Govt Official
- **Description:** See overall progress of the tube-well project.

Here is Use case Diagram:



## 5.2.Activity Diagram Description:

This activity diagram represents the different workflows based on the roles of users in the UPVC Tube-Well Management System. The diagram begins when a user logs into the system. The workflow then branches based on the user's role. Each type of user has distinct responsibilities, and the system routes them accordingly:

### Start

- The process begins with the user logging into the system.

### Decision Point: User Role Check

- The system checks what type of user has logged in. Four roles are defined:
  - **Administrator**
  - **Field Technician**
  - **Monitoring Officer**
  - **NGO/Government Official**

### Admin Role Activities

If the user is an **Administrator**:

- **Manage User Accounts:** Admin can add, remove, or update user roles and permissions.
- **Upload Installation Records:** Admin uploads or updates installation data from field technicians.
- **Monitor Overall Progress:** Admin views overall system statistics, installation data, and generates reports.



## Field Technician Role Activities

If the user is a **Field Technician**:

- **Access Assigned Area Info:** Technician views the region or village assigned for tube-well tasks.
- **Log New Installations:** Records new tube-well installations with details like location, depth, type, etc.
- **Update Maintenance Data:** Updates any maintenance or repair data related to installed tube-wells.

## Monitoring Officer Role Activities

If the user is a **Monitoring Officer**:

- **Access Reports:** Can generate and view detailed reports about installations and maintenance activities.
- **Track Project Status:** Monitors progress by comparing targets and actual installations, maintenance logs, and coverage.

## NGO/Government Official Role Activities

If the user is an **NGO/Government Official**:

- **View Tube-Well Data:** Access tube-well records for policy review or planning.
- **Check Project Overview:** View summarized insights like project coverage, progress in specific areas, etc.

## Fallback for Unknown Roles

If the role doesn't match any predefined type:

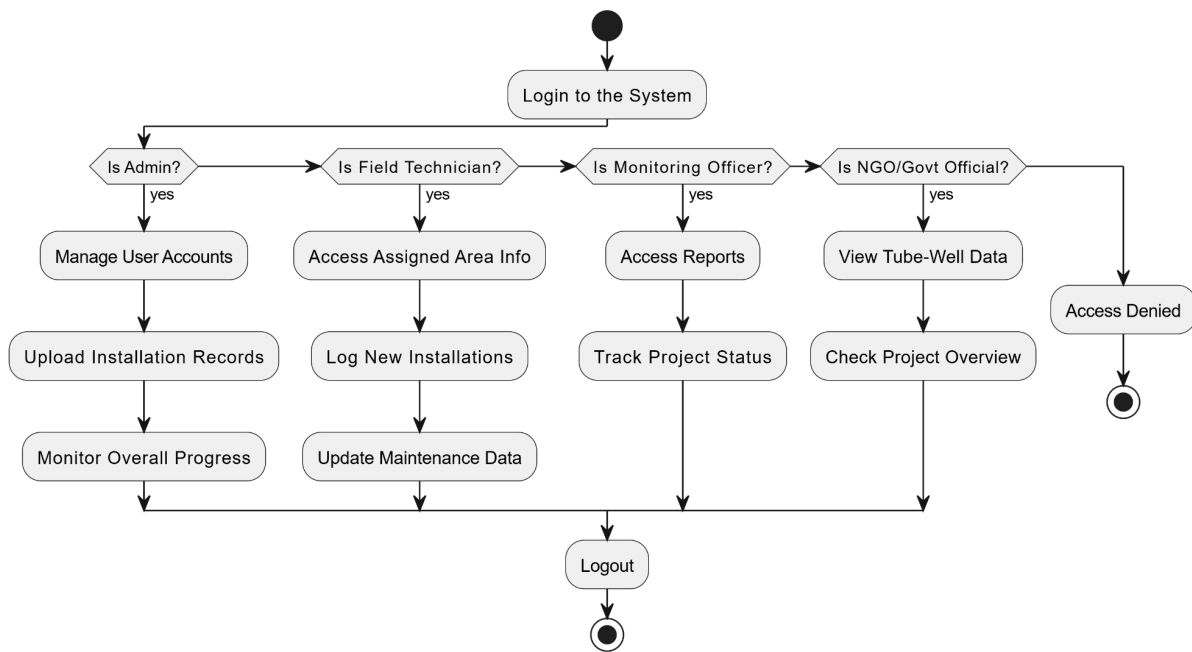
- The system displays **Access Denied** and exits the flow.

## End

- After performing their designated activities, users **log out**, and the flow **ends**.

Here is the Activity Diagram:

Activity Diagram: UPVC Tube-Well Management System



### 5.3.Swimlane Diagram Description:

The Swimlane Diagram for the *Software for Tracking and Managing UPVC Tube-Well Installations in Villages* visually illustrates the flow of responsibilities among four main user roles: **Administrator**, **Field Technician**, **Monitoring Officer**, and **NGO/Government Official**. Each swimlane in the diagram represents a specific user class, and the actions within each lane describe the specific tasks they perform in the system.

#### 1. Administrator

The **Administrator** has full system privileges and performs critical system-wide operations. The administrator begins by logging into the system. Their primary responsibilities include:

- **Managing User Accounts** – creating, editing, or removing user profiles and access rights.
- **Uploading Installation Records** – adding new tube-well installation data into the system.
- **Monitoring Overall Progress** – overseeing the project's implementation and operational status through dashboards and reports.

#### 2. Field Technician

The **Field Technician** operates primarily in the field and inputs real-time data. After logging in, they:

- **Access Assigned Area Info** – retrieve location-specific information for their area of responsibility.
- **Log New Installations** – enter details of new UPVC tube-wells installed in villages.
- **Update Maintenance Data** – submit reports on repair or routine maintenance activities for each installation.

#### 3. Monitoring Officer

The **Monitoring Officer** is responsible for analyzing project metrics and tracking progress. After logging in, they:

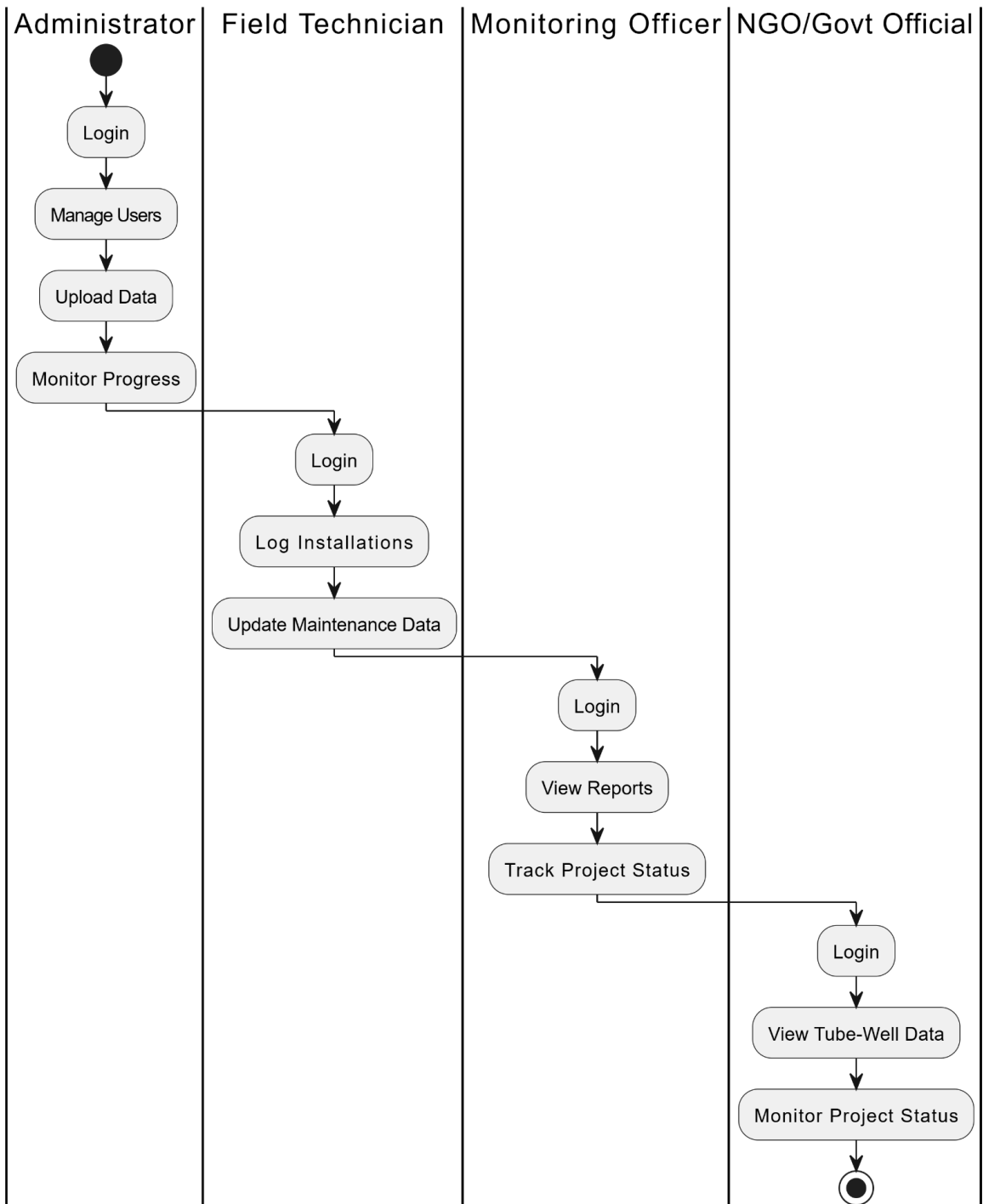
- **Access Reports** – view generated reports on tube-well installation and maintenance.
- **Track Project Status** – monitor the current state and performance of the project in different locations.

#### 4. NGO/Government Official

This role is typically observational. After logging in, the user:

- **Views Tube-Well Data** – can check data such as installation numbers, locations, and basic analytics.
- **Checks Project Overview** – reviews summaries and progress indicators to assess overall project outcomes.

Here is the Swimlane Diagram:



## Chapter 6

### Conclusion

#### 6.1.Conclusion

It is often challenging to represent a real-world system clearly with pen and paper. However, I am pleased to have successfully completed the requirements analysis for the **Software for Tracking and Managing UPVC Tube-Well Installations in Villages** and to present the Software Requirements Specification (SRS) for this project.

This report has been prepared in a straightforward and informative manner, ensuring that readers can easily grasp the core concept and functionalities of the system. It outlines all necessary requirements and provides a solid foundation for future design and development.

I sincerely hope that anyone reviewing this document will gain a clear understanding of the system and its importance in ensuring effective water resource management in rural areas. Furthermore, I believe this report will serve as a helpful guideline and reference for the successful implementation of the software.

#### 6.2.References

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