

# **Software Requirements Specification**

**Version 3.0**

**08/03/2025**

## **Road Repair and tracking software**

### **Team Details**

<b>Roll Number</b>	<b>Name</b>
122CS0073	Smruti Ranjan Das
122CS0093	Jagadish Nayak
122CS0113	Elizabeth Grace Stanley

## Table of Contents

1.0 Introduction .....	1
1.1 Purpose .....	1
1.2 Scope of Project .....	1
1.3 Definition, Acronyms and Abbreviations .....	2
1.4 Glossary of Terms .....	2
1.5 System Architecture .....	2
1.6 References .....	3
1.7 Overview of Document.....	3
2.0 Overall Description .....	3
2.1 Product Perspective.....	3
2.2 Development Environment and Constraints .....	3
2.3 Assumptions and Dependencies .....	4
3.0 Functional Requirements .....	4
3.1 Road Condition Reporting .....	4
3.2 Repair Tracking and Management.....	5
3.3 Data Management and Analysis .....	5
4.0 Non-Functional Requirements .....	6
5.0 Data Dictionaries.....	6
5.1 Resident Repair Request Management .....	6
5.2 Supervisor Inspection & Priority Assignment .....	7
5.3 Resource & Workforce Management .....	8
5.3.1 Raw Materials Inventory.....	8
5.3.2 Raw Materials Assigned for Repairs .....	9
5.3.3 Machine Availability .....	9
5.3.4 Machines Assigned for Repairs .....	10
5.3.5 Workforce Management .....	11
5.4 Automated Repair Scheduling .....	12
5.5 Work Execution & Progress Tracking .....	12
5.6 Reports & Analytics.....	13
5.7 Public Awareness & Feedback System.....	13
5.8 Emergency Repair Handling.....	14
5.9 Budget & Expense Tracking .....	14

6.0 Data Flow Diagrams .....	15
6.1 Level 0 Data Flow Diagram.....	15
6.2 Level 1 Data Flow Diagram .....	16
6.3 Level 2 Data Flow Diagrams.....	17
6.3.1 Complaints .....	17
6.3.2 Supervisor Assessment.....	18
6.3.3 Resource Management .....	19
6.3.4 Scheduling and Repair Work.....	20
6.3.5 Generating Statistics.....	21
7.0 ER Diagram.....	22
8.0 Structure Chart .....	23
9.0 Use Case Diagrams .....	24
9.1 Road Repair and Tracking System .....	24
9.2 Resident Complaint Management.....	25
9.3 Supervisor Inspection and Prioritization.....	25
9.4 Resource Allocation and Scheduling .....	26
9.5 Repair Execution and Tracking .....	26
9.6 Public Awareness and Feedback.....	27
9.7 Analytics and Reporting .....	27
10.0 Class Diagram .....	28
11.0 Activity Diagrams .....	29
11.1 Road Repair and Tracking System .....	29
11.2 Budget & Expense Tracking.....	31
11.3 Reports & Analytics.....	32

## **1.0. Introduction**

### ***1.1 Purpose***

The Road Repair and Tracking System (RRTS) is designed to streamline and automate the road repair process for city corporations. It will help efficiently manage repair requests, prioritize work based on severity, and allocate resources like manpower, machines, and materials. By digitizing the workflow, the system aims to improve response times, reduce manual errors, and ensure better coordination between different departments involved in road maintenance.

### ***1.2 Scope of Project***

The **RRTS** will support the following functionalities:

#### **1. Road Condition Reporting:**

- Users can submit reports of damaged roads with images and GPS locations.
- Automatic classification of road damage severity.
- Public and government officials can submit reports.

#### **2. Repair Tracking and Management:**

- Assigning repair tasks to contractors.
- Tracking repair status and progress.
- Generating automated notifications for pending tasks.

#### **3. Data Management and Analysis:**

- Maintaining historical data of road repairs.
- Generating statistical reports and insights.
- Exporting data in multiple formats.

#### **4. Communication and Alerts:**

- Sending updates and notifications to users and contractors.
- Allowing users to track their submitted reports.
- Public dashboard to display ongoing repairs.

### **1.3 Definition, Acronyms, and Abbreviations**

- **RRTS:** Road Repair and Tracking System
- **GIS:** Geographic Information System
- **API:** Application Programming Interface
- **UI:** User Interface
- **PWD:** Public Works Department
- **DB:** Database

### **1.4 Glossary of Terms**

- **Ticket:** A logged road repair request.
- **Admin:** A system user responsible for managing and assigning repair tasks.
- **Technician:** A worker assigned to execute road repairs.
- **Repair Request:** A formal request raised by residents for road repairs.
- **Priority Level:** The urgency assigned to a repair request based on severity and locality type.
- **Resource Allocation:** Assignment of manpower, machines, and materials for repairs.
- **Utilization Statistics:** Metrics on the usage of resources over a period.

### **1.5 System Architecture**

The RRTS will follow a three-tier architecture:

1. **Presentation Layer:** User interface for clerks, supervisors, administrators, and the mayor.
2. **Application Layer:** Business logic for processing requests, scheduling, and reporting.
3. **Data Layer:** Database for storing repair requests, resource data, and reports.

## ***1.6 References***

- **IEEE 830-1998:** IEEE Recommended Practice for Software Requirements Specifications.
- City Corporation Road Repair Guidelines, 2023.
- **Software Engineering:** A Practitioner's Approach by Roger S. Pressman.

## ***1.7 Overview of Document***

This document is divided into four sections:

1. ***Introduction:*** Provides an overview of the RRTS.
2. ***Overall Description:*** Describes the system's context, environment, and assumptions.
3. ***Functional Requirements:*** Details the system's inputs, processing, and outputs.
4. ***Non-Functional Requirements:*** Covers performance, usability, and security.

## **2.0 Overall Description**

### ***2.1 Product Perspective***

The RRTS is a standalone system that integrates with the city corporation's existing infrastructure. It will replace manual bookkeeping processes, reducing errors and improving efficiency. The system will interact with users through a web-based interface and store data in a centralized database.

### ***2.2 Development Environment and Constraints***

- ***Frontend:*** React.js + Vite or Next.js, Tailwind CSS
- ***Backend:*** Node.js + Express.js or Nest.js, WebSockets
- ***Database:*** MongoDB
- ***Third-Party Integrations:*** Google Maps API, Firebase Cloud Messaging
- ***Constraints:***
  - Limited budget for development and maintenance.
  - Must comply with city corporation data security policies

- Must be scalable to handle future growth.

### ***2.3 Assumptions and Dependencies***

- Repair requests will be entered manually by clerks.
- The system assumes users have internet access.
- The system depends on GPS services for location-based reporting.
- The system requires integration with existing municipal databases.
- Supervisors will have access to mobile devices for on-site assessments.
- Resource availability data will be updated regularly by administrators.
- The system will operate in a stable network environment.

## **3. Functional Requirements**

### ***3.1 Road Condition Reporting***

<b>Requirement ID</b>	<b>Description</b>	<b>Input</b>	<b>Output</b>
RC-1	The system shall allow users to report road damage with images and location.	Image upload, GPS coordinates, text input.	Stored report in database.
RC-2	The system shall classify road damage based on severity.	Image and description input.	Severity level assigned.
RC-3	The system shall allow government officials to review and validate reports.	Official login, report selection.	Report status updated.

### ***3.2 Repair Tracking and Management***

<b>Requirement ID</b>	<b>Description</b>	<b>Input</b>	<b>Output</b>
RT-1	The system shall assign repair tasks to contractors.	Admin selection, contractor database.	Task assigned.
RT-2	The system shall track the progress of repairs.	Status updates from contractors.	Real-time progress updates.
RT-3	The system shall notify authorities of overdue repairs.	Automated time tracking.	Notification alerts.

### ***3.3 Data Management and Analysis***

<b>Requirement ID</b>	<b>Description</b>	<b>Input</b>	<b>Output</b>
DM-1	The system shall store all repair history in a centralized database.	Reports, repair logs.	Searchable database.
DM-2	The system shall generate reports on repair trends.	User-selected date range.	Statistical reports.
DM-3	The system shall allow exporting of data in CSV and PDF formats.	User export request.	Downloadable file.

## **4. Non-Functional Requirements**

### **1. Usability:**

- The system shall provide an intuitive web-based interface.
- The system shall include a help section for guidance.

### **2. Performance:**

- The system shall handle up to 1,000+ reports simultaneously.
- Response time for any operation should not exceed 5 seconds.

### **3. Compatibility:**

- The system shall be accessible via desktop and mobile devices.
- The system shall be compatible with modern web browsers.

### **4. Reliability:**

- The system shall ensure data backups every 24 hours.

### **5. Security:**

- The system shall encrypt stored and transmitted data.
- The system shall implement role-based access control.

## **5. Data Dictionaries**

### ***5.1 Resident Repair Request Management***

Stores repair requests submitted by residents, including road details and issue type.

<b>Field Name</b>	<b>Data Type</b>	<b>Description</b>
request_id	VARCHAR(20) (PK)	Unique ID for each repair request
resident_id	VARCHAR(20) (FK)	ID of the resident who submitted the request
request_date	TIMESTAMP	Date and time when the request was made

road_name	VARCHAR (100)	Name of the affected road
road_location	GEOMETRY (lat/lng)	Geographical coordinates of the road
issue_type	ENUM ('Pothole', 'Crack', 'Drainage Issue', 'Other')	Type of road damage
severity_level	ENUM ('Low', 'Medium', 'High')	Initial severity level assigned by the resident
image_url	TEXT	URL of the uploaded image of the damaged road
request_status	ENUM ('Pending', 'Inspected', 'Scheduled', 'Completed', 'Rejected')	Current status of the request

## 5.2 Supervisor Inspection & Priority Assignment

Tracks inspections conducted by supervisors, including severity assessment and estimated resources.

Field Name	Data Type	Description
inspection_id	VARCHAR(20) (PK)	Unique ID for each inspection
request_id	VARCHAR(20) (FK)	Request ID being inspected
supervisor_id	VARCHAR(20) (FK)	ID of the assigned supervisor
inspection_date	TIMESTAMP	Date and time of inspection
severity_level	ENUM ('Low', 'Medium', 'High', 'Urgent')	Updated severity level after inspection
priority_level	ENUM ('Low', 'Medium', 'High', 'Urgent')	Priority assigned to the repair work

estimated_materials	TEXT	JSON object storing estimated raw material quantities
estimated_machines	TEXT	JSON object storing estimated machine requirements
estimated_workforce	TEXT	JSON object storing workforce needs

### ***5.3 Resource & Workforce Management***

#### ***5.3.1 Raw Materials Inventory***

Tracks the stock of raw materials, their unit measurements, costs, suppliers, and last update timestamps.

Field Name	Data Type	Description
material_id	VARCHAR(20) (PK)	Unique ID for raw materials
material_name	VARCHAR(100)	Name of the material (e.g., Asphalt, Gravel)
unit_measurement	ENUM ('Ton', 'Cubic Meter', 'Liters')	Measurement unit for the material
stock_quantity	DECIMAL(10,2)	Current available stock
last_updated	TIMESTAMP	Timestamp of last stock update
supplier_name	VARCHAR(100)	Name of the material supplier

### **5.3.2 Raw Materials Assigned for Repairs**

Records materials assigned to repair tasks, tracking usage, remaining stock, and the assigning supervisor.

<b>Field Name</b>	<b>Data Type</b>	<b>Description</b>
assignment_id	VARCHAR(20) (PK)	Unique ID for material assignment
schedule_id	VARCHAR(20) (FK)	ID of the scheduled repair
material_id	VARCHAR(20) (FK)	ID of the raw material being assigned
quantity_used	DECIMAL(10,2)	Amount of material allocated for this repair
assigned_date	TIMESTAMP	Date and time of assignment
assigned_by	VARCHAR(20) (FK)	Supervisor or administrator who assigned materials
remaining_stock	DECIMAL(10,2)	Updated stock after assignment

### **5.3.3 Machine Availability**

Maintains records of all machines, including their availability status, purchase details, and maintenance history.

<b>Field Name</b>	<b>Data Type</b>	<b>Description</b>
machine_id	VARCHAR(20) (PK)	Unique ID for each machine
machine_type	VARCHAR(100)	Type of machine (e.g., Roller, Mixer)

availability_status	ENUM ('Available', 'In Use', 'Under Maintenance')	Current status of the machine
last_maintenance_date	DATE	Last date the machine underwent maintenance
maintenance_due_date	DATE	Next scheduled maintenance date
purchase_date	DATE	Date the machine was purchased
purchase_cost	DECIMAL(10,2)	Cost of the machine
location	VARCHAR(100)	Current location of the machine (e.g., Warehouse, On-site)

#### ***5.3.4 Machines Assigned for Repairs***

Tracks machines allocated to specific repair tasks, their usage period, fuel consumption, and assigned operators.

Field Name	Data Type	Description
assignment_id	VARCHAR(20) (PK)	Unique ID for machine assignment
schedule_id	VARCHAR(20) (FK)	ID of the scheduled repair
machine_id	VARCHAR(20) (FK)	ID of the machine being assigned
assigned_date	TIMESTAMP	Date and time of assignment

assigned_by	VARCHAR(20) (FK)	Supervisor or administrator who assigned the machine
return_date	TIMESTAMP	Expected return date after repair
fuel_consumption	DECIMAL(10,2)	Estimated fuel consumption for the task
operator_id	VARCHAR(20) (FK)	Worker ID of the machine operator

### 5.3.5 Workforce Management

Stores workforce details, including roles, availability, and contact information.

Field Name	Data Type	Description
worker_id	VARCHAR(20) (PK)	Unique ID for each worker
worker_name	VARCHAR(100)	Name of the worker
worker_role	ENUM ('Technician', 'Operator', 'Laborer', 'Supervisor')	Job role of the worker
availability_status	ENUM ('Available', 'Assigned', 'On Leave')	Current availability status
contact_info	VARCHAR(100)	Contact details of the worker
schedule_id	VARCHAR(20) (FK)	ID for the scheduled repair

#### **5.4 Automated Repair Scheduling**

Automates scheduling of repair tasks based on priority, resource availability, and manpower.

<b>Field Name</b>	<b>Data Type</b>	<b>Description</b>
schedule_id	VARCHAR(20) (PK)	Unique ID for the scheduled repair
request_id	VARCHAR(20) (FK)	ID of the repair request
supervisor_id	VARCHAR(20) (FK)	Assigned supervisor ID
start_date	TIMESTAMP	Scheduled start date and time
end_date	TIMESTAMP	Estimated completion date

#### **5.5 Work Execution & Progress Tracking**

Monitors real-time progress of repair tasks and records status updates from field teams.

<b>Field Name</b>	<b>Data Type</b>	<b>Description</b>
progress_id	VARCHAR(20) (PK)	Unique ID for progress tracking
schedule_id	VARCHAR(20) (FK)	ID of the scheduled repair
status_update	ENUM ('Scheduled', 'In Progress', 'Completed', 'Delayed')	Current status of the repair work
update_notes	TEXT	Any additional notes from the field team
updated_by	VARCHAR(20) (FK)	ID of the worker/supervisor who updated the status
update_time	TIMESTAMP	Timestamp of the update

### **5.6 Reports & Analytics**

Generates various reports for city officials on repair statistics, resource utilization, and performance tracking.

<b>Field Name</b>	<b>Data Type</b>	<b>Description</b>
report_id	VARCHAR(20) (PK)	Unique ID for each report
report_type	ENUM ('Completed Repairs', 'Pending Repairs', 'Resource Usage', 'Worker Performance')	Type of report
generated_by	VARCHAR(20) (FK)	ID of the official who generated the report (FK from Supervisor Table)
report_data	JSON	JSON object containing detailed analytics
report_date	TIMESTAMP	Date, time of report generation

### **5.7 Public Awareness & Feedback System**

Collects feedback from residents on completed repair works and provides a public repair status dashboard.

<b>Field Name</b>	<b>Data Type</b>	<b>Description</b>
feedback_id	VARCHAR(20) (PK)	Unique ID for feedback entry
request_id	VARCHAR(20) (FK)	ID of the request being reviewed
resident_id	VARCHAR(20) (FK)	ID of the resident providing feedback
rating	INT (1-5)	Rating given by the resident
comments	TEXT	Resident's comments on the repair quality
feedback_date	TIMESTAMP	Timestamp of feedback submission

### **5.8 Emergency Repair Handling**

Handles critical road damage cases requiring immediate attention and action.

Field Name	Data Type	Description
emergency_id	VARCHAR(20) (PK)	Unique ID for emergency repairs
request_id	VARCHAR(20) (FK)	ID of the related repair request
supervisor_id	VARCHAR(20) (FK)	ID of the assigned supervisor
action_taken	TEXT	Details of the emergency measures taken
status	ENUM ('Pending', 'In Progress', 'Resolved')	Current status of the emergency repair

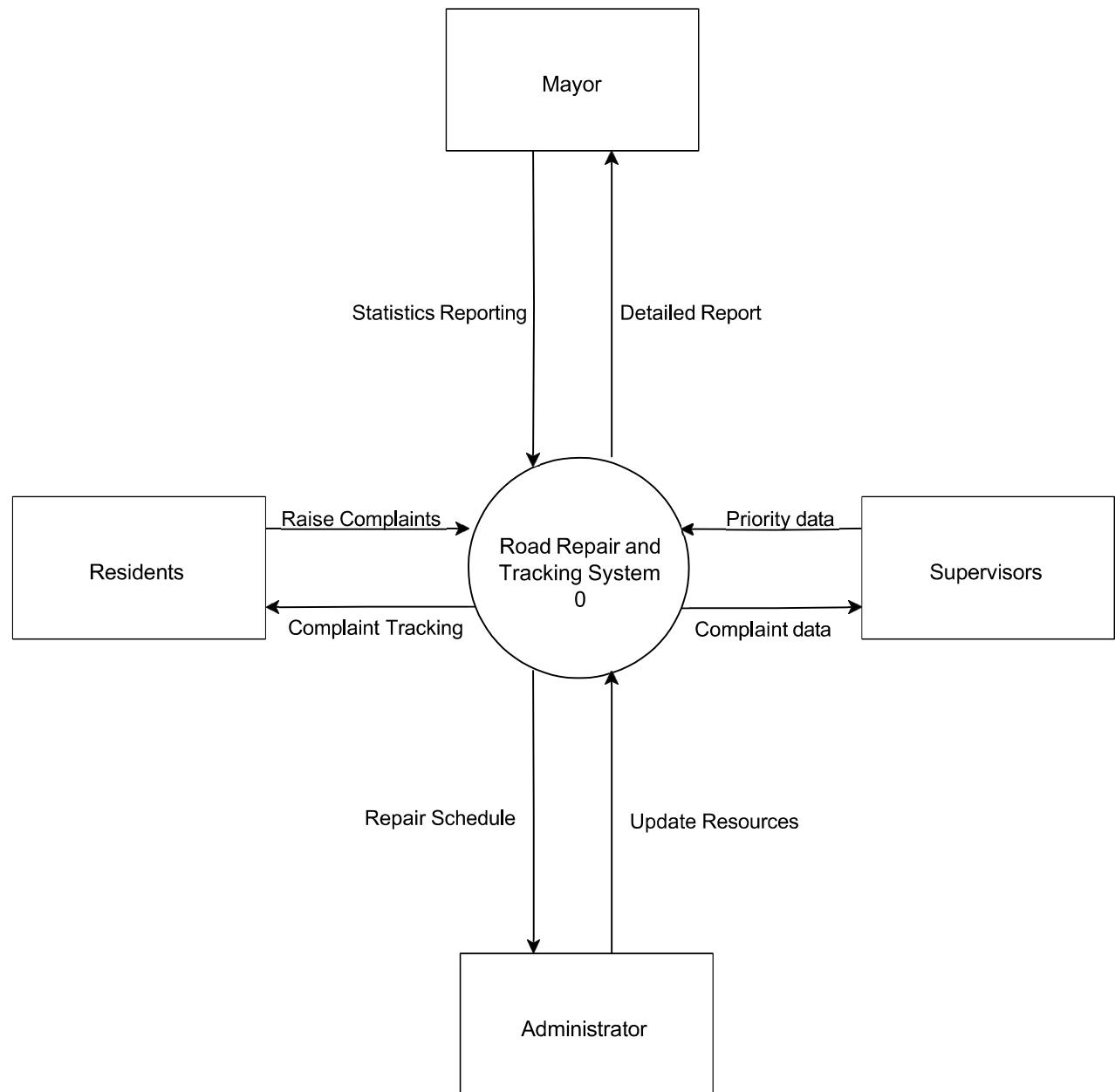
### **5.9 Budget & Expense Tracking**

Tracks financial expenditures related to labor, materials, and machinery for each repair project.

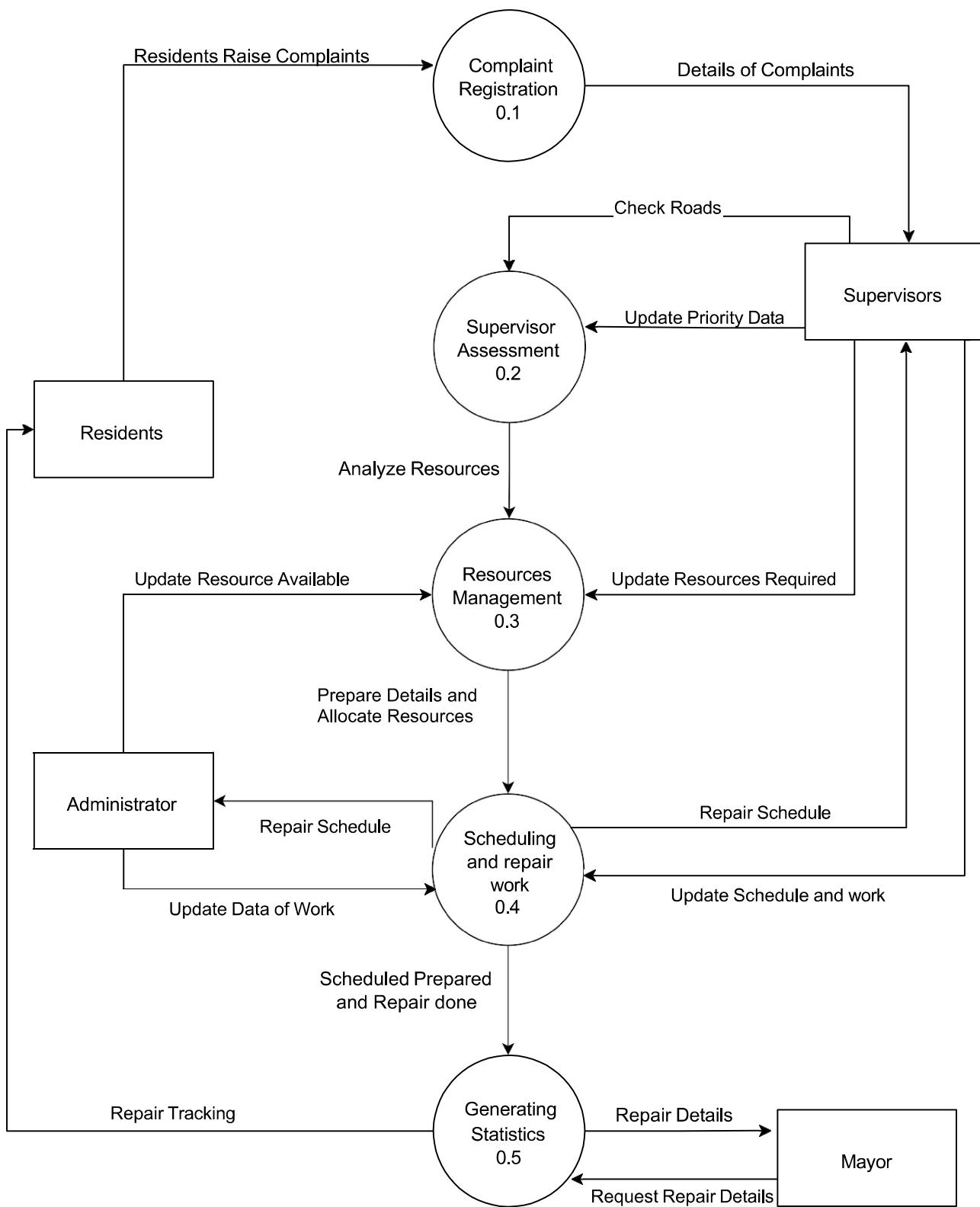
Field Name	Data Type	Description
expense_id	VARCHAR(20) (PK)	Unique ID for each expense entry
schedule_id	VARCHAR(20) (FK)	ID of the scheduled repair
material_cost	DECIMAL(10,2)	Total cost of materials used
labor_cost	DECIMAL(10,2)	Total cost of worker wages
machine_cost	DECIMAL(10,2)	Cost of machinery usage
total_expense	DECIMAL(10,2)	Total repair expense

## 6.0 Data Flow Diagrams

### 6.1 Level 0 Data Flow Diagram

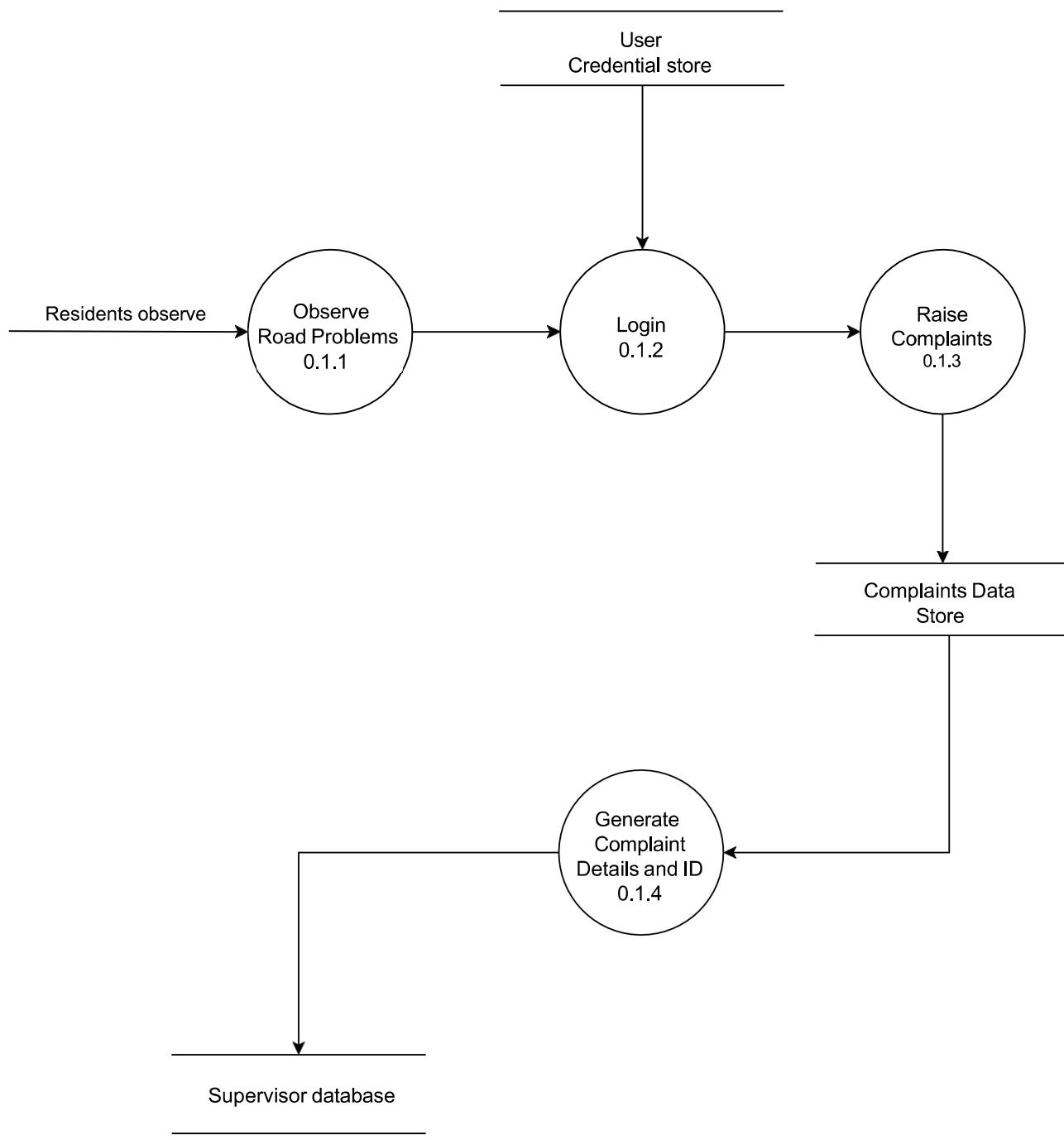


## 6.2 Level 1 Data Flow Diagram

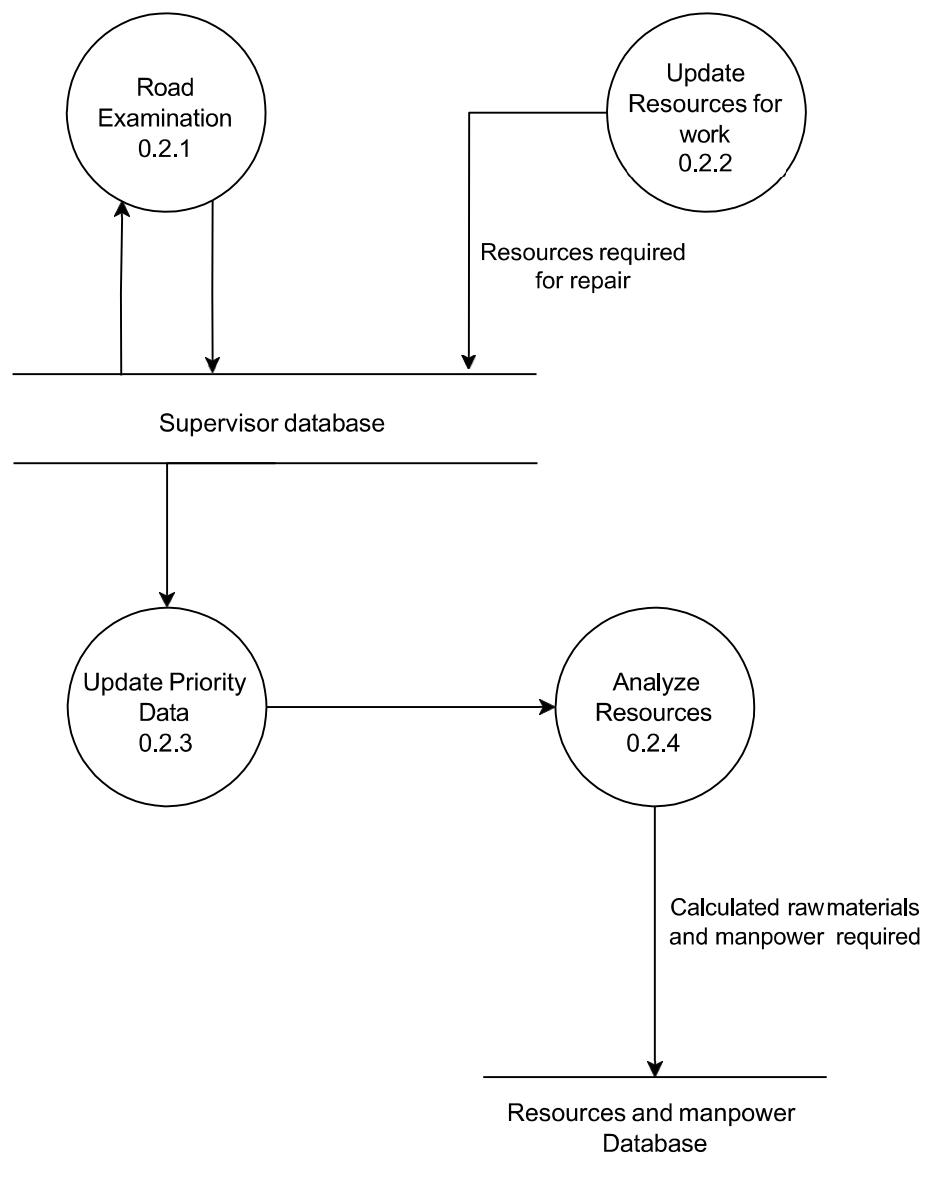


### **6.3 Level 2 Data Flow Diagrams**

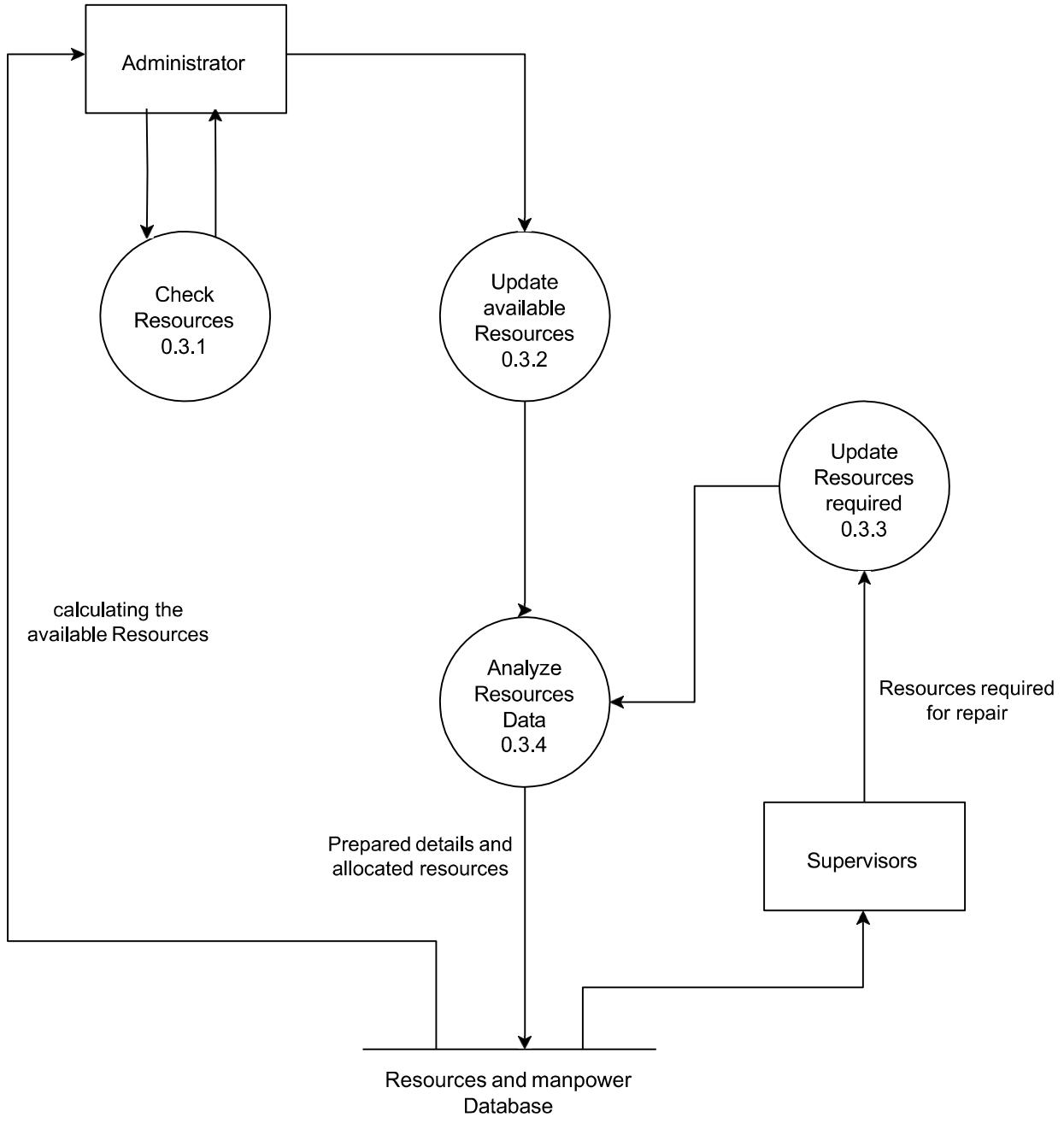
#### **6.3.1 Complaints**



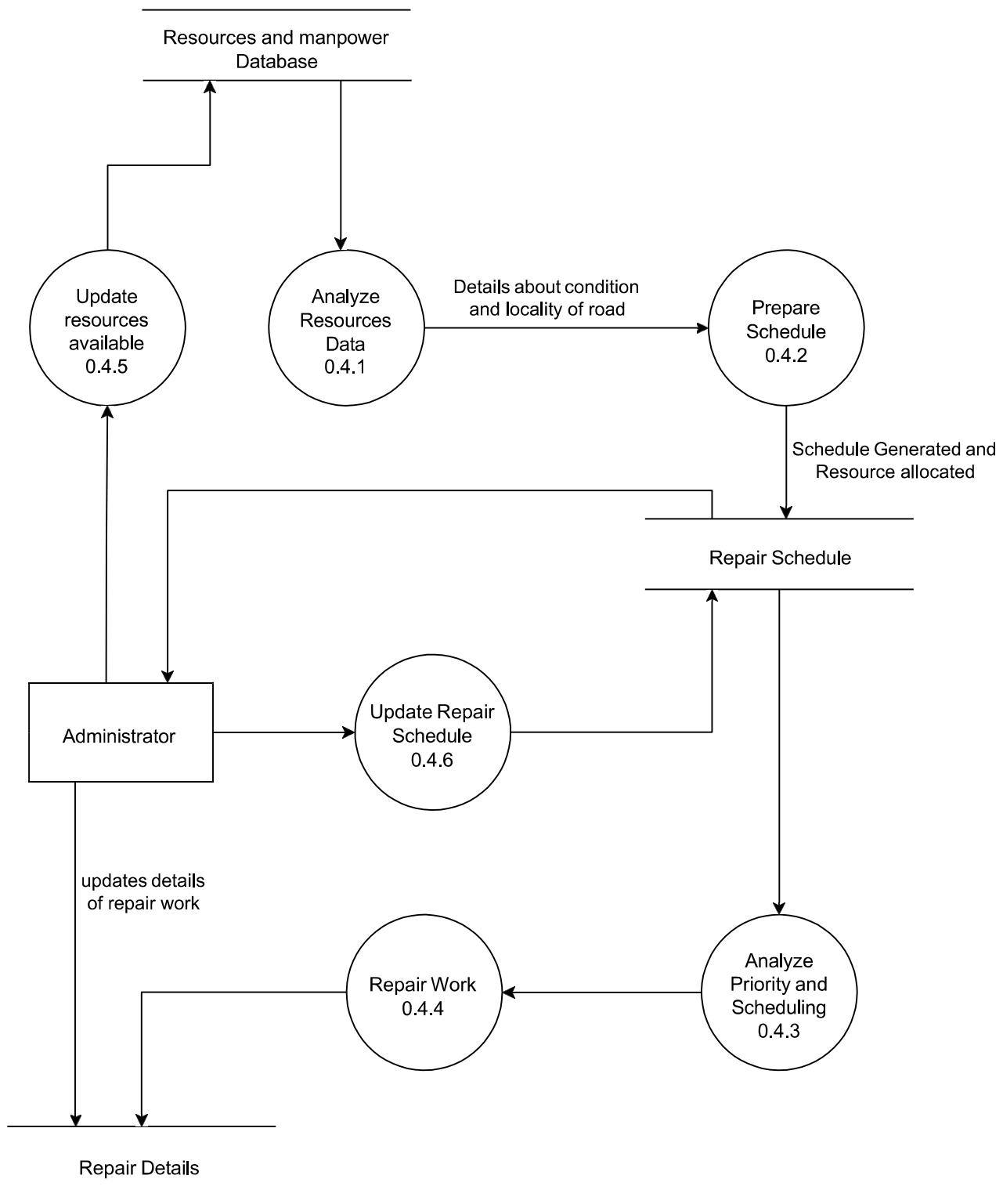
### **6.3.2 Supervisor Assessment**



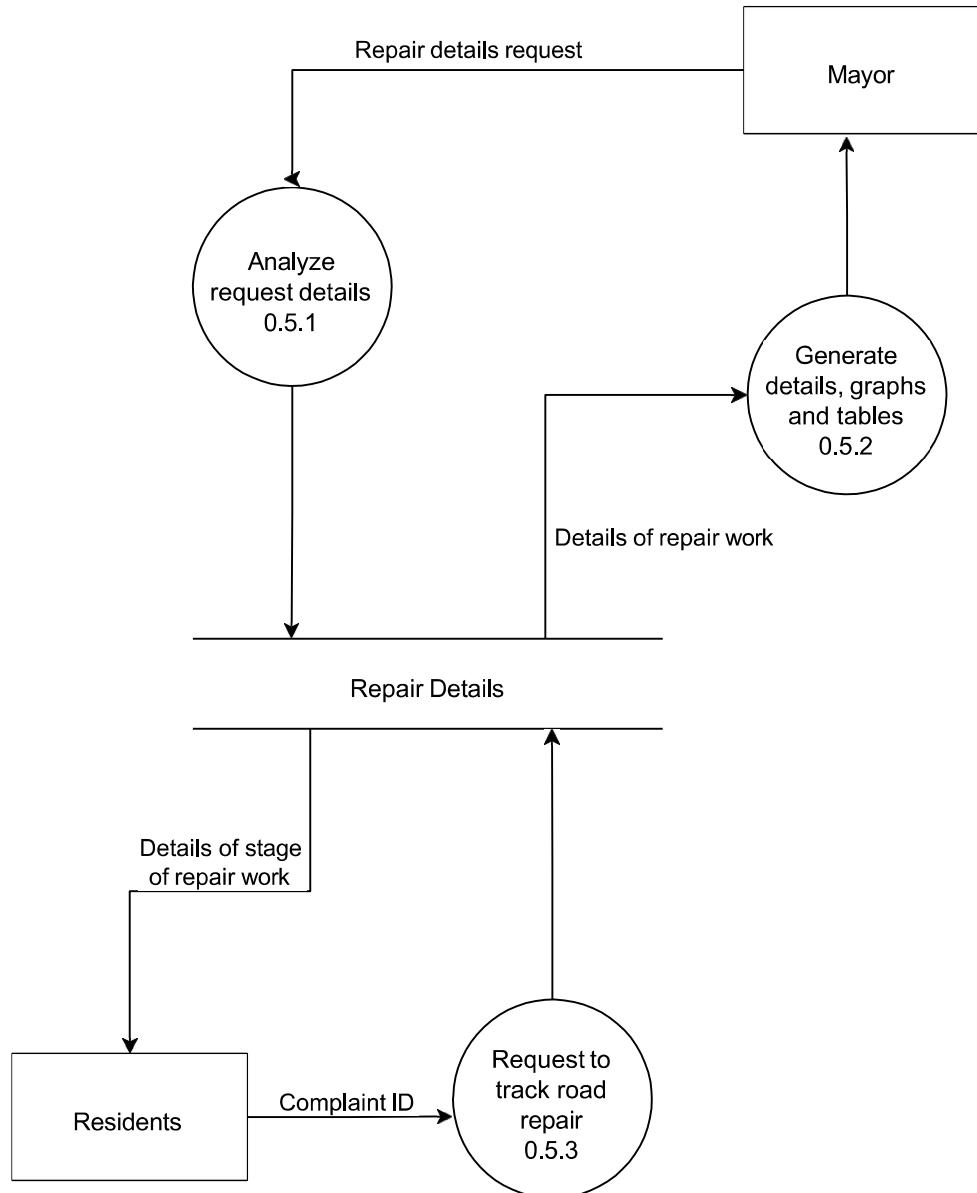
### ***6.3.3 Resource Management***



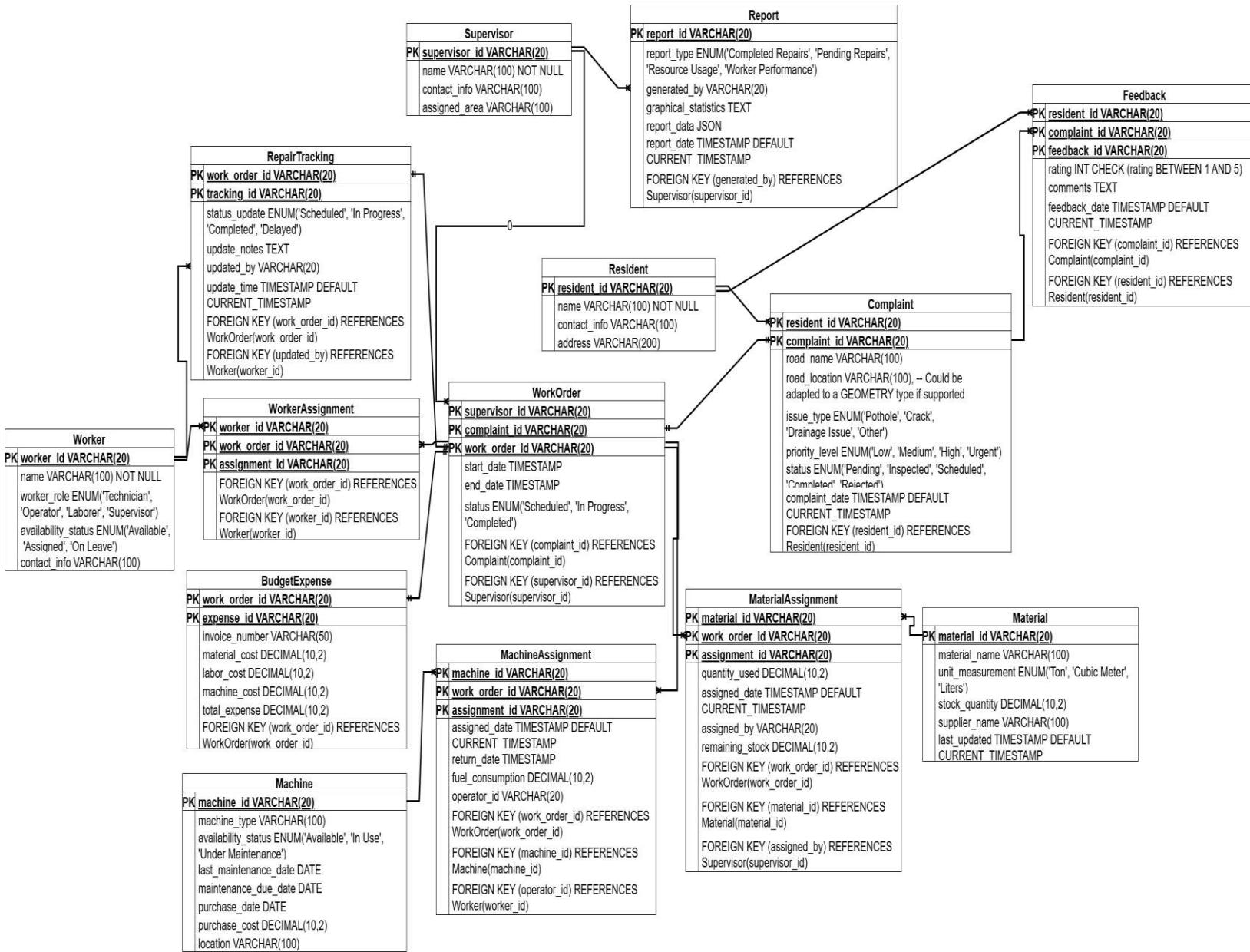
#### **6.3.4 Scheduling and Repair Work**



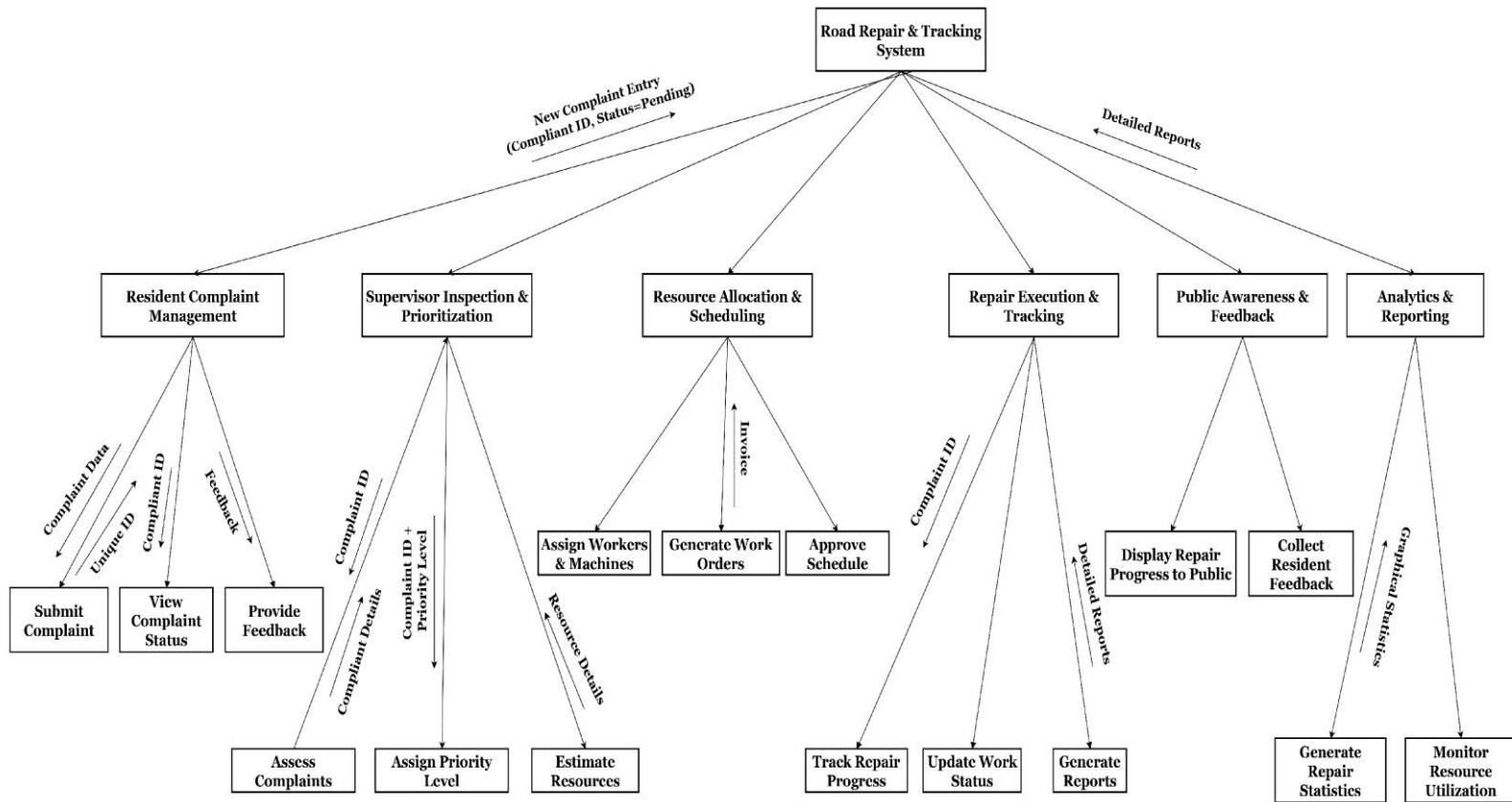
### 6.3.5 Generating Statistics



## 7.0. ER Diagram

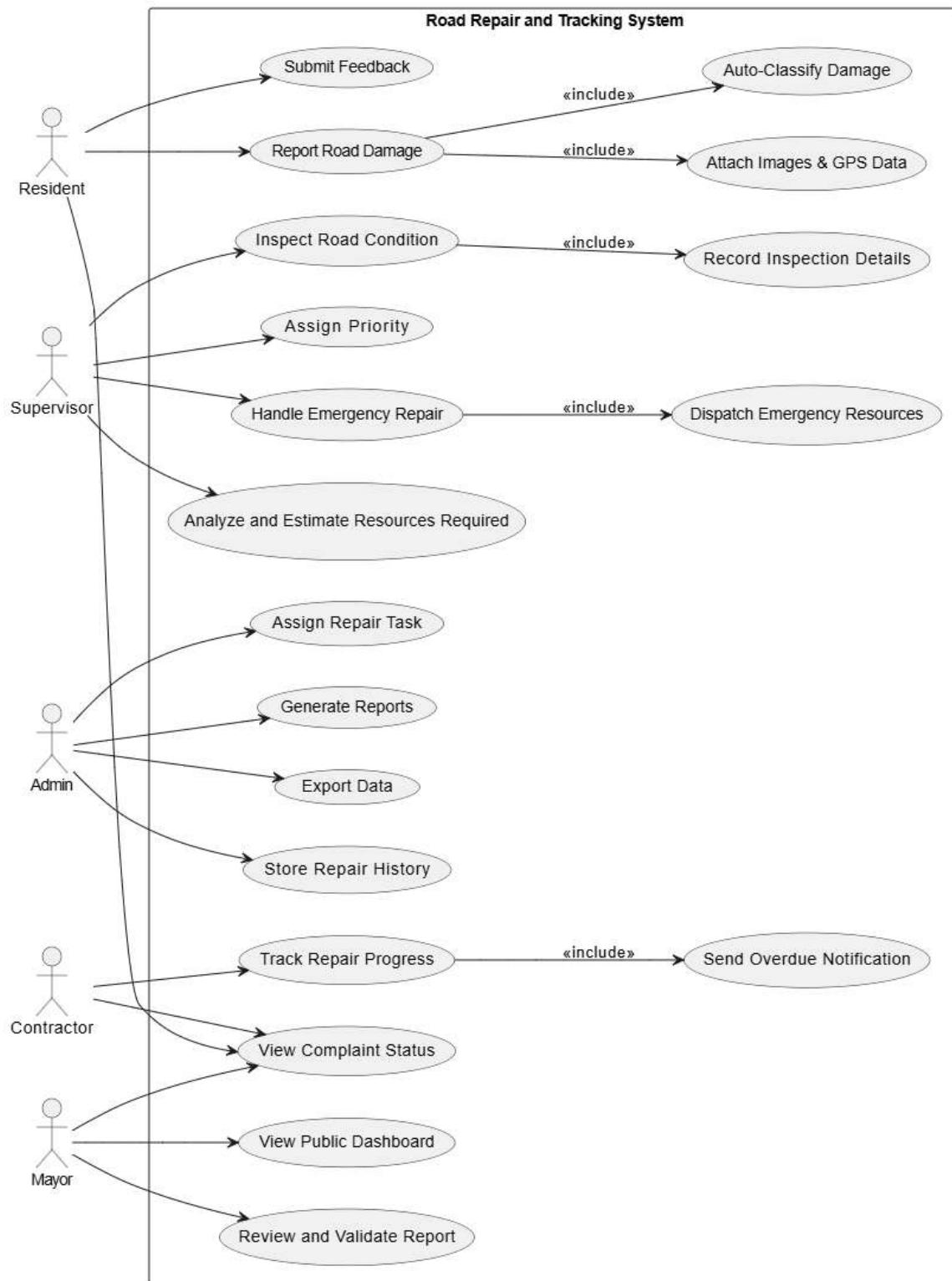


## 8.0. Structure Chart

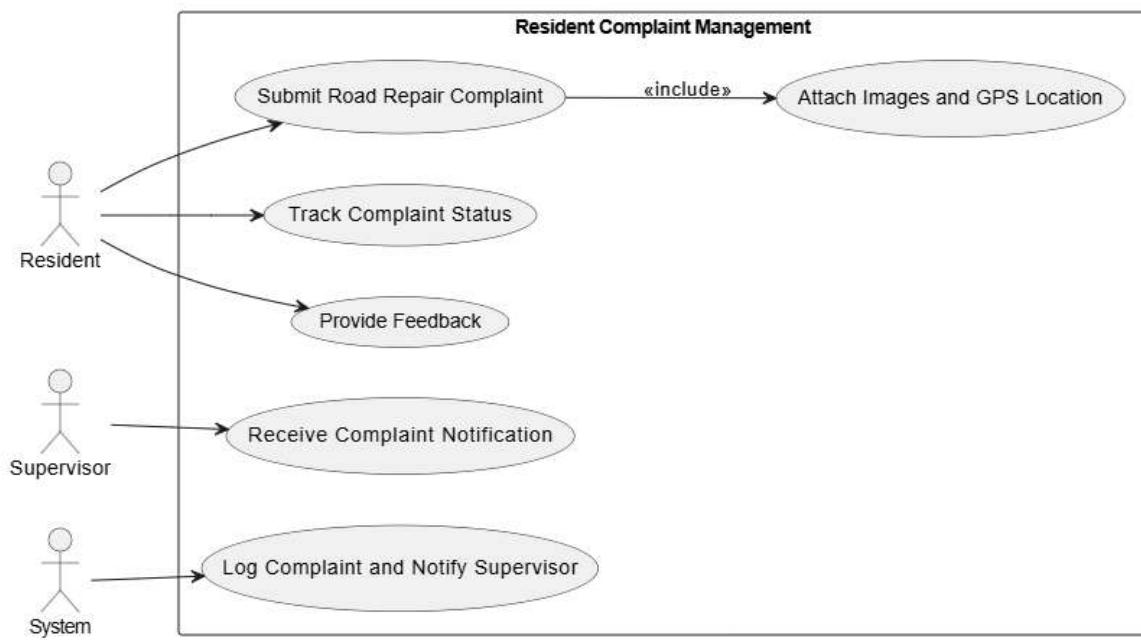


## 9.0 Use Case Diagrams

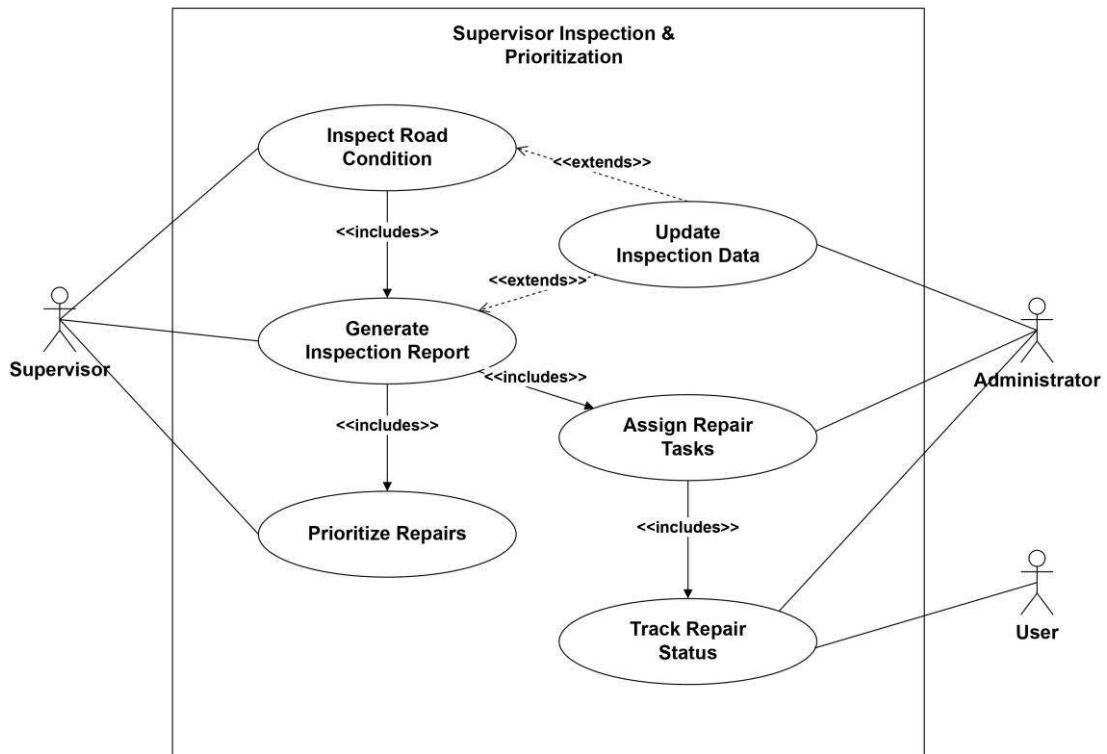
### 9.1 Road Repair and Tracking System



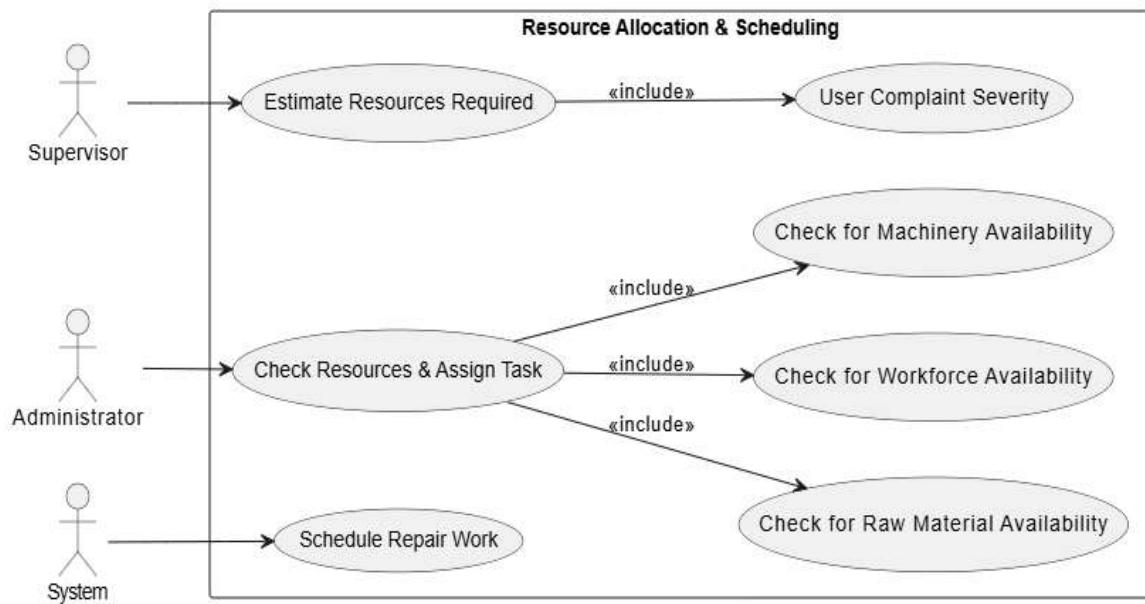
## 9.2 Resident Complaint Management



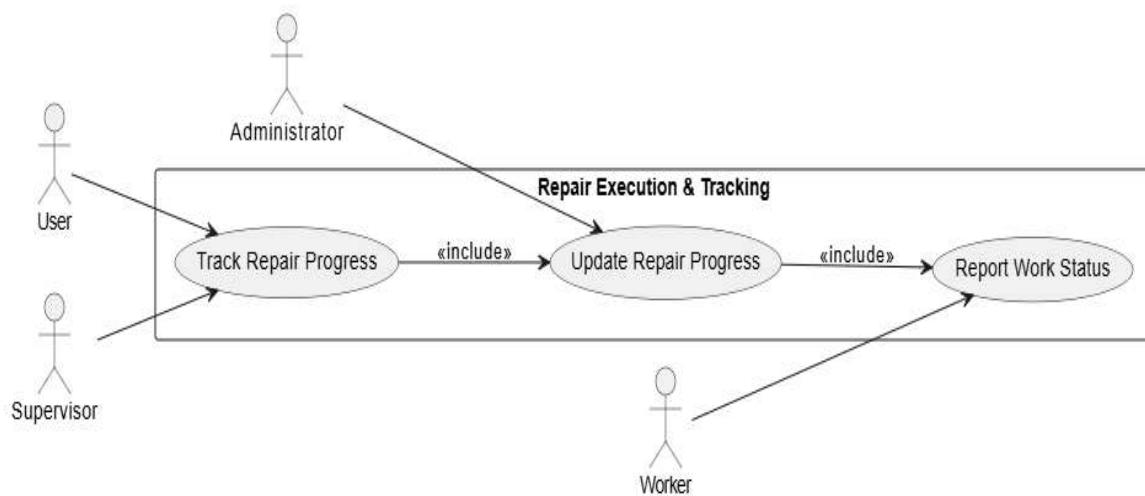
## 9.3 Supervisor Inspection and Prioritization



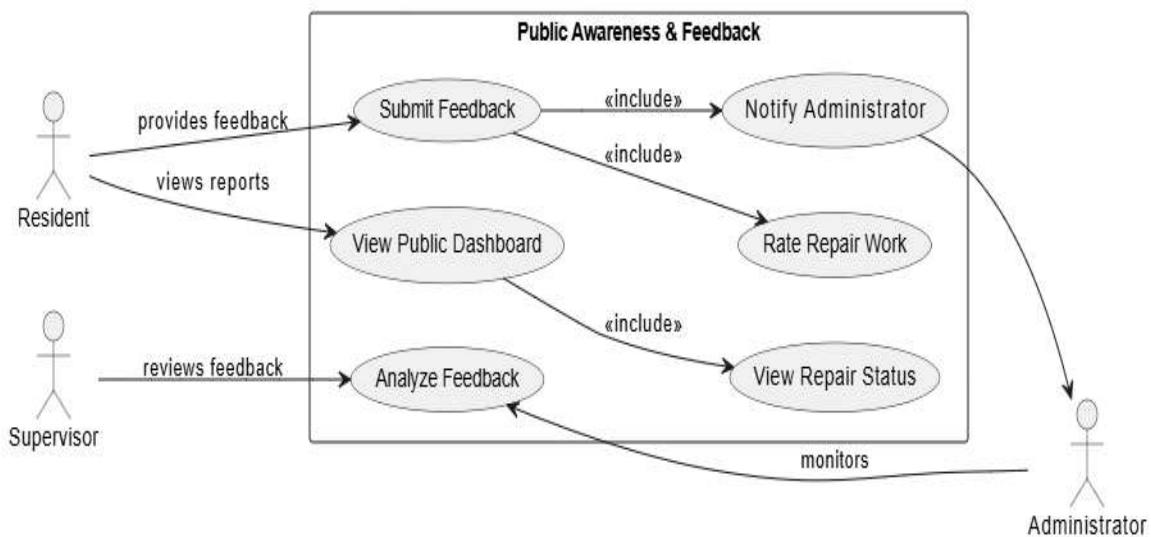
## 9.4 Resource Allocation and Scheduling



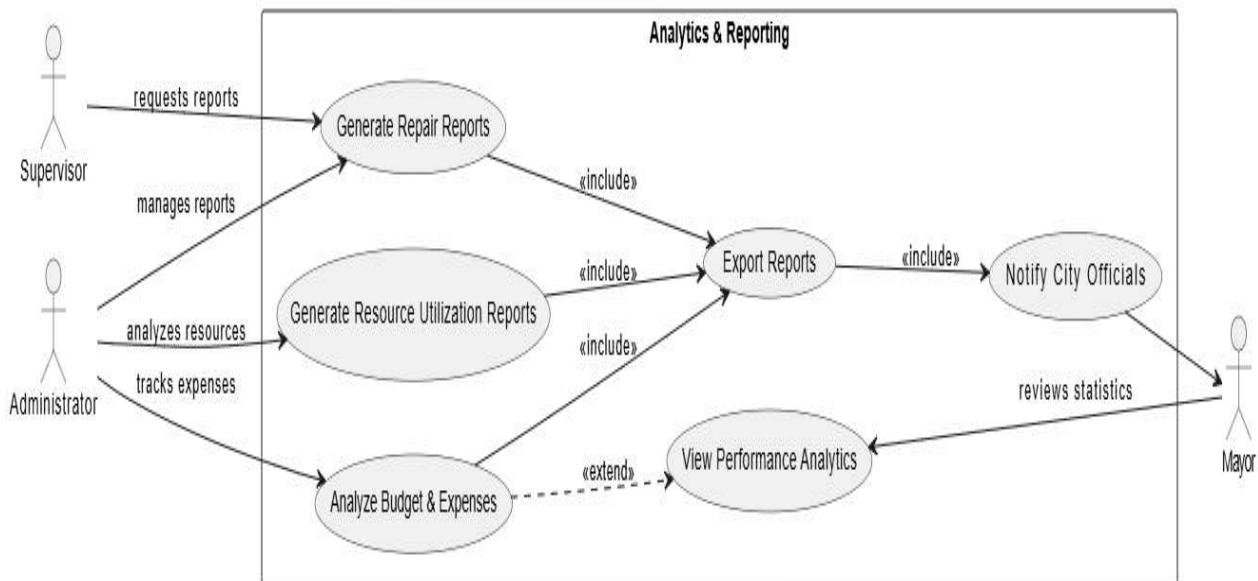
## 9.5 Repair Execution and Tracking



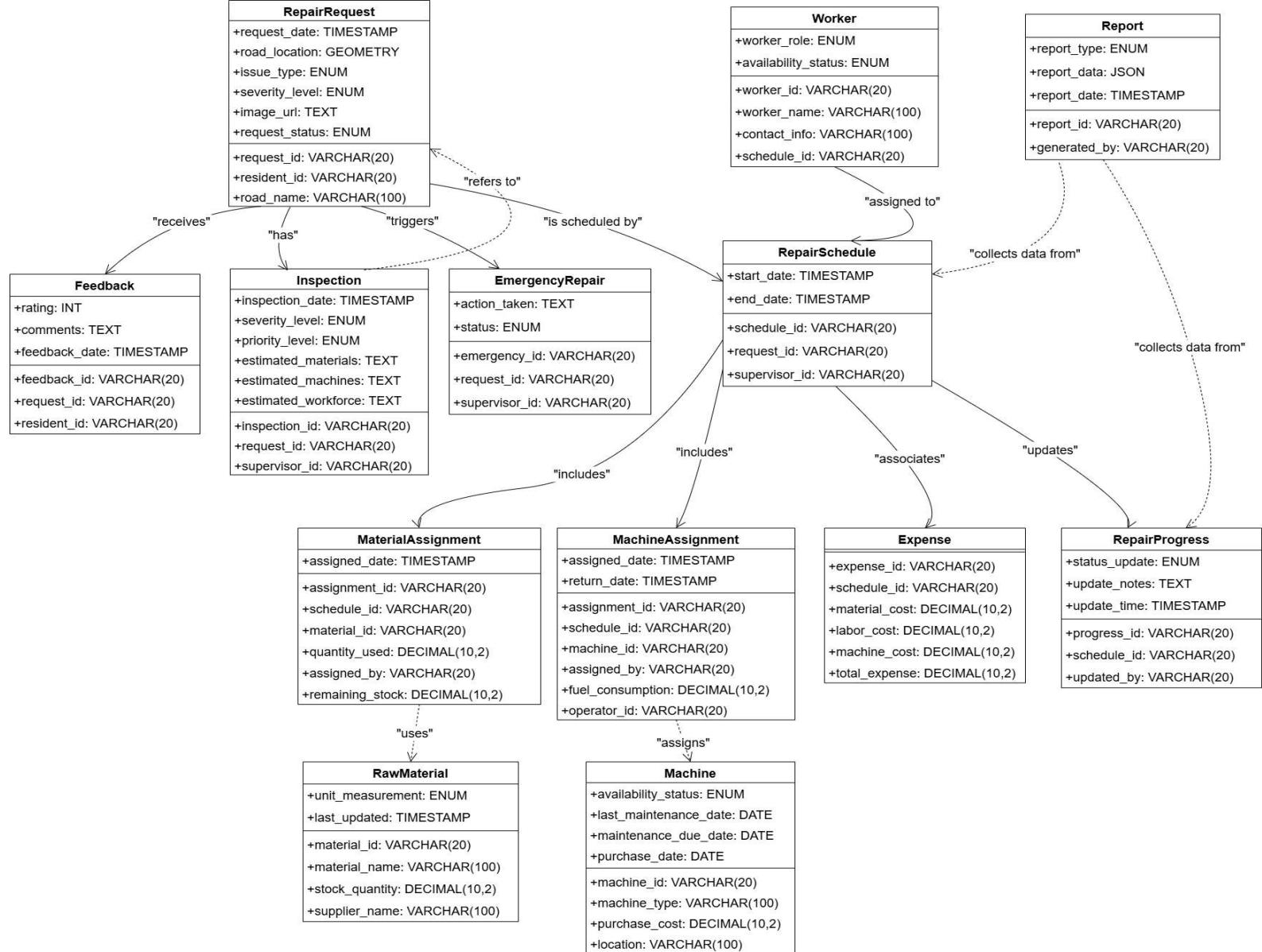
## 9.6 Public Awareness and Feedback



## 9.7 Analytics and Reporting

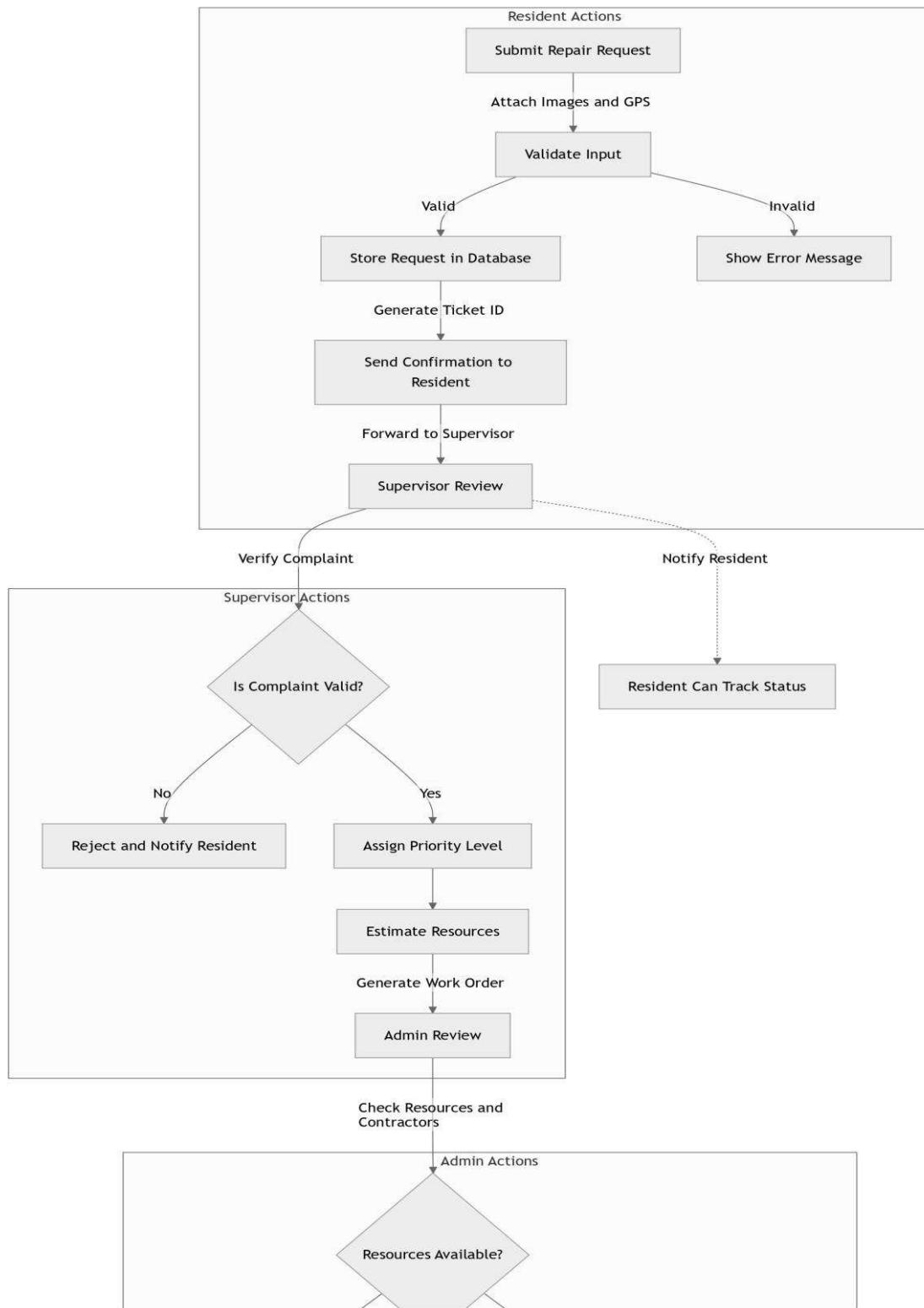


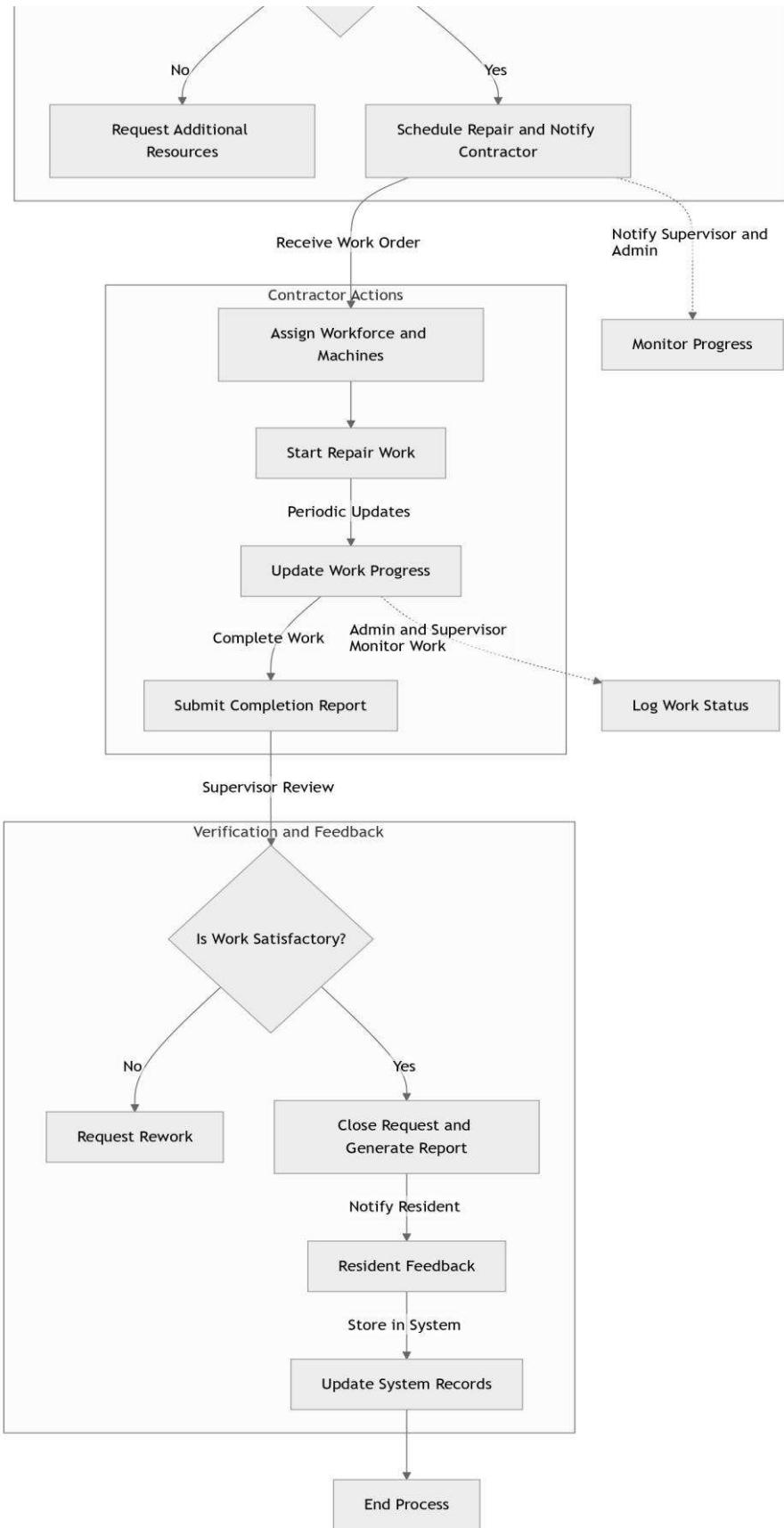
## 10.0 Class Diagram



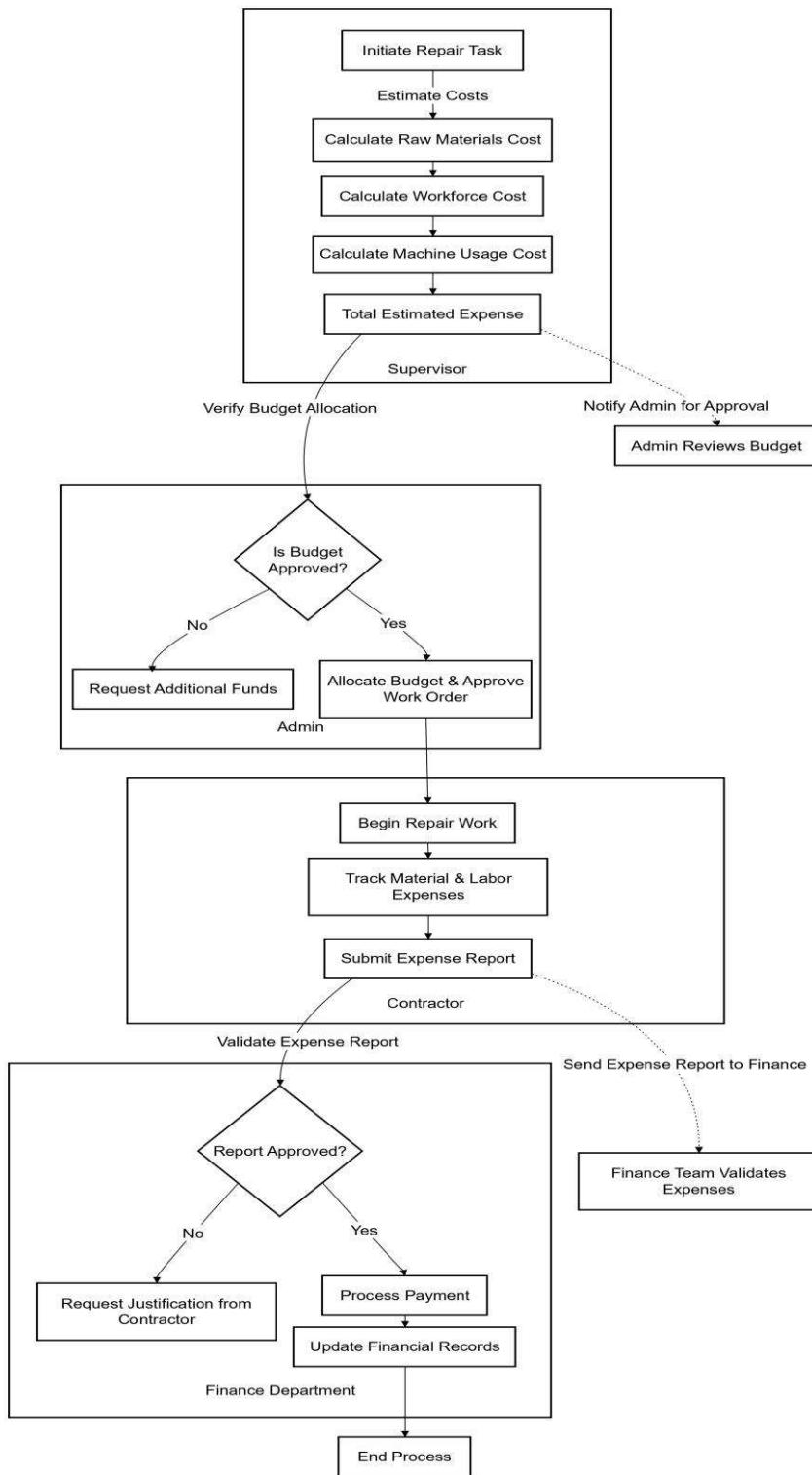
## 11.0 Activity Diagrams

### 11.1 Road Repair and Tracking System





## 11.2 Budget & Expense Tracking



### 11.3 Reports & Analytics

