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# Driving Report Concept of Operations

July 2019

**Hawaii Road Usage Charge Demonstration**

*with*



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## Executive Summary

This document provides a Concept of Operations (ConOps) for a demonstration of a manual road usage charge system for Hawaii (HiRUC)—manual, meaning using odometer readings taken manually at safety inspections. This ConOps serves as a basis for the development of the demonstration system.

A ConOps is often the first systems engineering document produced in a systems development process, with the intent of completely describing all system functionality in a non-technical way. A ConOps supports discussions among stakeholders.

The HiRUC demonstration project has the following **goals**:

- ▶ Help vehicle owners visualize how a road usage charge would work
- ▶ Determine level of public acceptance of and preferences for the RUC concept when it is demonstrated in Hawaii
- ▶ Examine the revenue potential and benefits of the new RUC system compared with gas tax revenues.

The **objectives** of part 1 of the demonstration project are to:

- ▶ Demonstrate how existing PMVI and City & County of Honolulu Department of Information Technology (DIT) systems and processes can be leveraged to support RUC
- ▶ Evaluate the technical and operational feasibility, and viability of a RUC system that leverages existing PMVI and DIT capabilities
- ▶ Understand the marginal costs associated with the RUC system
- ▶ Demonstrate ability to handle data securely and protect privacy of vehicle owners
- ▶ Understand operational aspects of a RUC system; identify corresponding issues and provide a quantitative base for recommendations
- ▶ Demonstrate transparency/auditability of system.

The operational concept of the Part 1 Demonstration is to send residents a Driving Report based on their two most recent safety inspections, and get feedback from the residents on those driving reports, as illustrated by the following diagrams:



**No changes** to vehicle registration or renewal



**No changes** to driving



No changes to PMVI



**NEW:** receive a Driving Report in the mail



**NEW:** provide feedback to the demonstration team.

**Table 1: HiRUC Part 1 Operational Concept**

<b>Charging structure:</b>	Flat per-mile rate for all distance driven <ul style="list-style-type: none"> <li>• Will vary by county</li> </ul>
<b>Distance reporting method:</b>	Data collected from PMVI
<b>Driving Reports generated by:</b>	HiRUC Demonstration System
<b>Method for transmitting charging data (e.g. odometer reading, VIN) to HiRUC:</b>	Secure FTP
<b>Frequency of data updates from DIT and PMVI:</b>	monthly (current plan)
<b>Target vehicle population:</b>	All passenger vehicles with good data in the system and EPA-estimated city/highway MPG can be decoded from the VIN
<b>Expected full scale duration:</b>	12 months
<b>Expected outputs:</b>	Compiled (anonymized) driving data Compiled survey responses Compiled list of driving reports generated

The ConOps includes seven operational scenarios that explain the operations of the trial system in detail. These operational scenarios are:

1. Vehicle Registration/Renewal
2. Fleet Identification
3. Road usage
4. Distance (odometer) Data Collection
5. Update HiRUC system with vehicle data
6. Calculate RUC
7. Generate Driving Reports
8. Manage failure conditions

The high-level interactions among these operational scenarios are illustrated in the following figure:

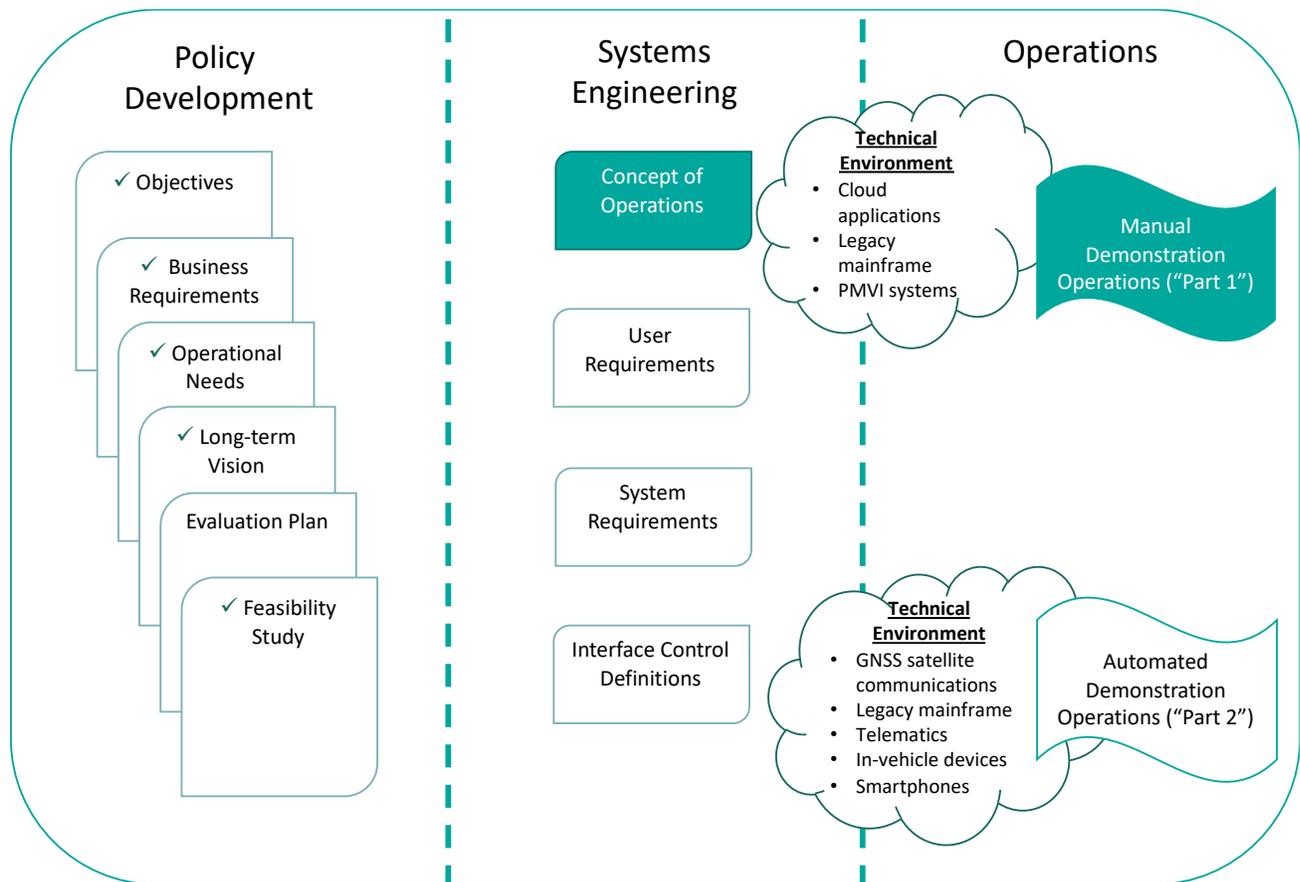
The ConOps concludes with Next Steps in the demonstration process.

# 1. Overview

This document provides a Concept of Operations (ConOps) for a demonstration road usage charge system for Hawaii (HiRUC). This ConOps serves as a basis for the development of the demonstration system.

A ConOps is often the first systems engineering document produced in a systems development process, with the intent of completely describing all system functionality in a non-technical way. A ConOps supports discussions among stakeholders – discussions that should lead to agreement on major design decisions before implementation details are decided. The relationship of the ConOps to other demonstration elements is illustrated in Figure 1.

**Figure 1: Place of the Concept of Operations in Hiruc System Development. A “✓” Indicates this Document or Step is Complete**



This ConOps describes how various system users and demonstration stakeholders will interact with the HiRUC demonstration systems. It includes descriptions of high-level functionality but does not include detailed system specifications or describe the interfaces between systems in technical terms. It is intended to provide a bridge between the broader policy goals that motivated the demonstration and all the technical details that are required for implementation and operations.



The ConOps is a living document that should be updated as final design decisions are made. The ConOps should also be revisited once the demonstration is operational to ensure it reflects lessons-learned from the implementation and launch phases of the project.

The details in the following sections are intended to assist the demonstration team and stakeholders to:

- ▶ Achieve stakeholder agreement on how the system is to be operated, who is responsible for the required demonstration functions, and identifying the necessary lines of communication
- ▶ Define the high-level system approach and highlight advantages over other approaches
- ▶ Define the environment in which the system will operate
- ▶ Derive high-level requirements, especially user requirements
- ▶ Provide the criteria to be used for validation of the completed system.

### 1.1. Demonstration Description

Part 1 of the HiRUC demonstration project is intended to test a methodology for assessing a road usage charge on passenger vehicles using existing State of Hawaii systems, procedures, and data. It leverages the data collection performed during the Periodic Motor Vehicle Inspection (PMVI) process (locally referred to as “safety check”) and does not require motorists to undertake any RUC-specific reporting activities or any equipment to be installed in vehicles.

### 1.2. Goals and Objectives of the HiRUC Demonstration

The HiRUC demonstration project has the following **goals**:

- ▶ Help vehicle owners visualize how a road usage charge would work
- ▶ Determine level of public acceptance of and preferences for the RUC concept when it is demonstrated in Hawaii
- ▶ Examine the revenue potential and benefits of the new RUC system compared with gas tax revenues.

The **objectives** of part 1 of the demonstration project are to:

- ▶ Demonstrate how existing PMVI and City & County of Honolulu Department of Information Technology (DIT) systems and processes can be leveraged to support RUC
- ▶ Evaluate the technical and operational feasibility, and viability of a RUC system that leverages existing PMVI and DIT capabilities
- ▶ Understand the marginal costs associated with the RUC system
- ▶ Demonstrate ability to handle data securely and protect privacy of vehicle owners
- ▶ Understand operational aspects of a RUC system; identify corresponding issues and provide a quantitative base for recommendations
- ▶ Demonstrate transparency/auditability of system.

The HiRUC ConOps is presented in six sections, including this overview. They are:

**Figure 2. Organization of the Concept of Operations.**



The system described in this document is designed to support the goals and objectives of the Hawaii Road Usage Charge demonstration project by:

- ▶ Demonstrating the technical and operational feasibility of RUC by:
- ▶ Incorporating vehicle and mileage data from operational state of Hawaii IT systems (DIT’s Vehicle Registry and HDOT’s PMVI system)
- ▶ Identifying and consolidating vehicle and mileage data per registered vehicle
- ▶ Computing fuel tax and road usage charges according to policy orientations
- ▶ Generating invoices for vehicles on a periodic basis
- ▶ Mailing invoices to registered vehicle owners
- ▶ Promoting understanding and comfort with RUC by:
- ▶ Supporting a simple, cohesive and seamless end-user processes
- ▶ Supporting consistent communications with end users
- ▶ Conforming to data privacy and security policy guidelines
- ▶ Supporting customer service
- ▶ Encouraging engagement and elicit feedback from registered vehicles owners receiving an invoice by:
- ▶ Providing support through the demonstration website and support email
- ▶ Identifying, and when possible resolving, difficulties encountered by registered vehicle owners
- ▶ Fielding surveys
- ▶ Identifying and enabling policy analysis of both financial and public acceptance topics by:



- ▶ Collecting data on the public's level of RUC understanding and acceptance through surveys
- ▶ Collecting and consolidating fuel tax and mileage consumption data
- ▶ Reconciling demonstration data to identify inconsistencies
- ▶ Analyzing and reporting on demonstration data Driving reports



This demonstration is different from an operational system in the following ways:

1. no payments will be made by drivers
2. vehicles without a current “active” registration will not receive a Driving Report, even if they have accrued mileage during the demonstration
3. not all vehicle types are included. For instance, motorcycles, motorhomes, and heavy-duty vans will not receive Driving Reports even though they currently pay gas tax and would likely pay RUC in an operational system.

## 2. The HiRUC (Part 1) Ecosystem

Part 1 of the HiRUC project ecosystem involves interactions between three elements:

- ▶ **Stakeholders** include every group with an interest in the demonstration, such as drivers and vehicle owners, PMVI inspectors, HDOT, City and County of Honolulu Department of Information Technology, Department of Taxation, and Counties
- ▶ **Administrative components**, including the demonstration administration team, who attempt to combine the interests of all stakeholders in the operational demonstration
- ▶ **Technical components**, are the technical systems that the administrative component uses to deliver the demonstration, including the PMVI system, the state’s vehicle registration system, and the HiRUC databases and software components

- Overview
- **The HiRUC Ecosystem**
- The Operational Concept
- HiRUC System Overview
- Key Usage Scenarios
- Summary and Next Steps

### 2.1. Stakeholders

Stakeholders are individuals and organizations that will be impacted by both the conduct and the outcome of the demonstration. Among the key stakeholders in HiRUC are:

- ▶ Drivers
- ▶ Vehicle owners
- ▶ PMVI inspectors
- ▶ HDOT
- ▶ City and County of Honolulu DIT
- ▶ Federal Highway Administration
- ▶ Hawaii County
- ▶ Kauai County
- ▶ Maui County
- ▶ Molokai County
- ▶ Advocacy groups

**Figure 3. Relationship of the Components of the HiRUC (Part 1) Ecosystem**



### 2.2. Administrative Components

The administrative components of the Part 1 demonstration include the HiRUC demonstration administration team, which is responsible for managing demonstration activities such as research, evaluation, and demonstration design, providing customer service to drivers who receive Driving Reports or have questions about RUC policy or the demonstration, and coordinating the technical delivery of the demonstration.



### **2.3. Technical Components**

The technical components of Part 1 of the HiRUC demonstration include DIT databases, PMVI systems (both data collection and data management), HiRUC databases, the HiRUC Driving Report generator, and HiRUC evaluation tools (on-line surveys and website).

### 3. The Concept

Part 1 of the HiRUC demonstration uses existing processes and state databases to collect information about the distance a vehicle has traveled in Hawaii. It uses a database and software tools developed for the demonstration to leverage data collected during the annual PMVI and vehicle registration (or renewal) processes to determine distance driven and estimate fuel consumed and fuel tax paid. Based on this data, *Driving Reports* are prepared for eligible vehicles and mailed to the owner’s address. Eligible vehicles are those vehicles for which data is available to develop high quality driving reports, with the key limitation that each household will only receive one Driving Report in the 12-month Demonstration. Precise eligibility criteria are included in the Business Rules.

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Unlike the “automated distance reporting” that will be tested in Part 2 of the Demonstration, the concept for Part 1 does not require drivers or vehicle owners to install devices in their cars, directly report mileage, or to provide any data *other than what they are already required to do as part of their vehicle registration/renewal and PMVI*. If the system works as designed, drivers will experience no changes at all to the way they interact with their local Department of Motor Vehicles (DMV) or PMVI. They *will* receive a Driving Report in the mail and will be encouraged to provide feedback about their impressions of the report and the RUC concept.



**No changes** to vehicle registration or renewal

**No changes** to driving

No changes to PMVI

**NEW:** receive a Driving Report in the mail

**NEW:** provide feedback to the demonstration team.

#### 3.1. Key Considerations

This section briefly describes technical and operational considerations that are important for understanding how the demonstration will function. These include:

- ▶ Timing of distance calculation
- ▶ Timing of *Driving Report* creation
- ▶ Scalability of interactions between legacy systems and the demonstration systems
- ▶ Data availability for gas tax estimates
- ▶ Driving Reports.

### 3.1.1. Timing of Distance Calculations

The intent of Part 1 of the demonstration is to leverage the PMVI process to create an approximately annual report about the total distance driven by a vehicle. In Hawaii, vehicle owners are required to have their vehicles inspected annually (with exceptions noted below). However, there is no prohibition against inspecting a vehicle early and no real penalty for having it inspected late. And, *new* passenger vehicles like cars, pick-up trucks and vans are not required to be inspected for 2 years.



Since a *goal* of the demonstration is to help vehicle owners visualize how a road usage charge would work and gauge their response to the policy, a fairly consistent length of time is desirable for distance calculation from vehicle to vehicle.

### 3.1.2. Timing of Driving Report Creation

It is envisioned that *Driving Reports* will be created periodically in batches, not on-demand as new odometer data becomes available. As such, some time may elapse between the date of the PMVI inspection and a driver's receipt of their Driving Report in the mail. Precise rules impacting timing of Driving Report creation are contained in the business rules, however, eligible vehicles should generally receive a Driving Report within 30 days, as batches are planned to be created monthly at the time this document is being prepared.

### 3.1.3. Scalability of interactions Between Legacy Systems and the Demonstration Systems

Because an *objective* of the demonstration is to explore the technical and operational feasibility of a RUC system that leverages existing PMVI and DIT capabilities, the demonstration "RUC System" will interact with both PMVI and DIT legacy systems. However, because the demonstration will be short-lived and directs resources to **policy exploration** rather than finessed technical development, the demonstration RUC system will not be directly integrated with either the DIT or PMVI systems. Data transfers will take the form of *offloads* from the state systems and *uploads* via a data loader routine into the RUC system. The frequency of these data transfers will be determined in consultation with HDOT and DIT and will be documented in the demonstration's *Business Rules*. The lack of automation and direct data connections means the exact solution developed for the demonstration is unlikely to be scalable to long-term operations.

### 3.1.4. Data Availability for Gas Tax Estimates

The estimated amount of gas taxes paid will be determined based on:

1. EPA-estimated city/highway combined MPG rating, which will be identified using the vehicle's VIN
2. Total distance driven, based on the two most recent odometer readings at PMVI (only odometer readings from passed inspections within the allowable range of time between inspections)
3. County in which the vehicle is registered, depending on the county's decision to include county fuel tax data





Because the distance driven is the total over a period of time, with no indication of the split between highway driving and in-town driving, and because driver behavior can impact fuel economy, the gas tax estimates will have slightly different degrees of accuracy from driver to driver, vehicle to vehicle.

### 3.1.5. Driving Reports

The *Driving Reports* will be mailed to vehicle owners as a means of outreach and education on transportation funding, engaging people with RUC policy, and soliciting their opinions and feedback. The data used to create a Driving Report should be *robust* and *complete*, and any vehicle for which the data does not meet this threshold will not be eligible to receive a report.

## 3.2. Technical Summary of the Operational Concept

**Table 2. HiRUC Part 1 Operational Concept**

<b>Charging structure:</b>	Flat per-mile rate for all distance driven <ul style="list-style-type: none"> <li>• Will vary by county</li> </ul>
<b>Distance reporting method:</b>	Data collected from PMVI
<b>Driving Reports generated by:</b>	HiRUC Demonstration System
<b>Method for transmitting charging data e.g. odometer reading, VIN) to HiRUC:</b>	Secure FTP
<b>Frequency of data updates from DIT and PMVI:</b>	monthly (current plan)
<b>Target vehicle population:</b>	All passenger vehicles with good data in the system and EPA-estimated city/highway MPG can be decoded from the VIN
<b>Expected full scale duration:</b>	12 months
<b>Expected outputs:</b>	Compiled (anonymized) driving data Compiled survey responses Compiled list of driving reports generated

## 4. System Overview



Figure 7 illustrates the HiRUC demonstration system. Existing systems and processes (e.g., the state’s vehicle registry, PMVI inspection stations, PMVI systems) are shown outside the demonstration’s span of control because – other than providing periodic data updates – they will not change any of their operations to accommodate the demonstration, and drivers will not experience any changes to their interactions with these entities.

Beginning at the left of the diagram, vehicle owners interact with Hawaii’s vehicle registration and annual registration renewal process to (1) register or renew their vehicle and (2) keep their mailing address updated. Information provided through this process includes VIN, owner’s name, and mailing address.

**Figure 4. Icon Representing Vehicle Owners**



**Figure 5. Icon Representing Driving on the Road Network**



Next on the diagram, vehicles use the road network, for which a flat, per-mile charge will be calculated. The amount of road usage is determined from data collected as part of the annual PMVI.

The vehicle owners take their vehicles to a certified PMVI inspection station, where the vehicle’s odometer reading is captured as part of the vehicle’s annual safety inspection. The PMVI inspection station transmits vehicle inspection data, including VIN, odometer reading, the date of the inspection, and whether the vehicle passed or failed inspection to PMVI’s servers.

**Figure 6: Icons Representing PMVI Inspection Stations and PMVI Data Servers**



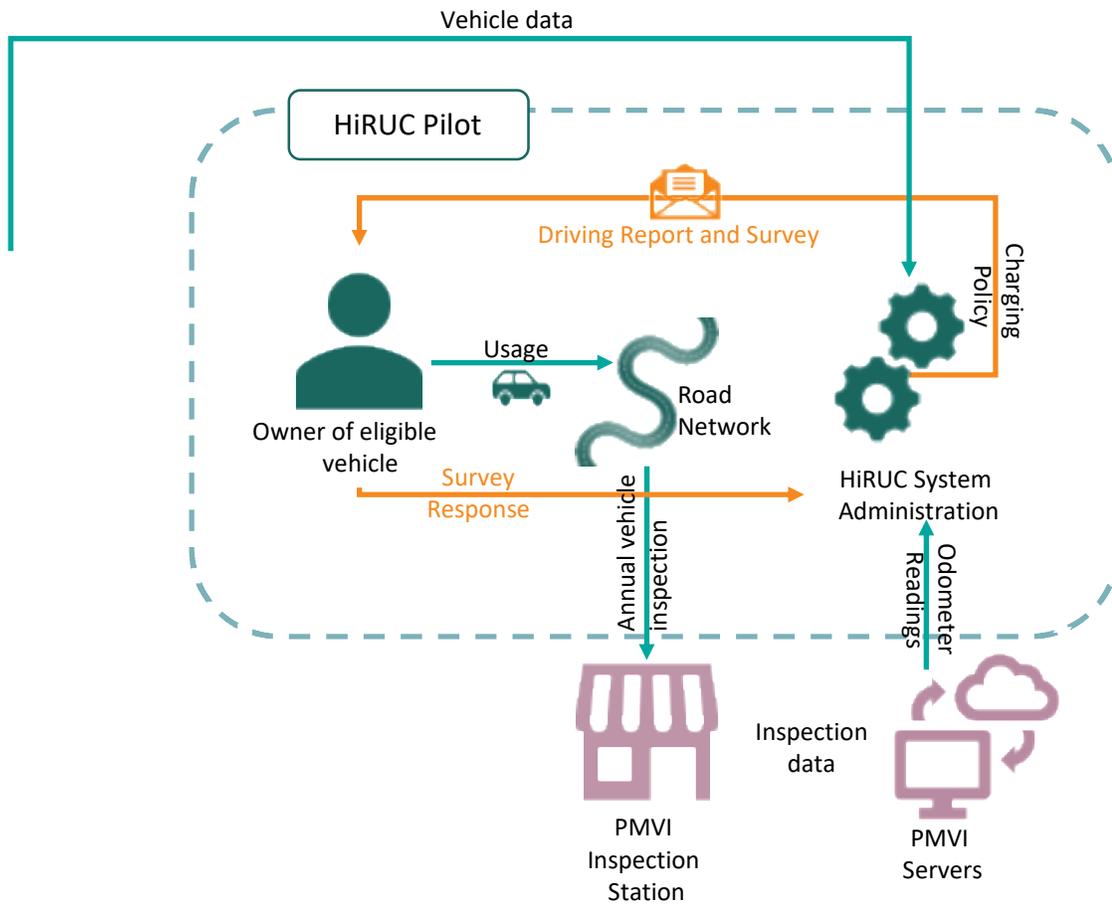
Periodically, both the vehicle registry and PMVI servers send data to the HiRUC System Administration, which combines the data – according to Charging Policy – and creates *Driving Reports*. The *Driving Reports* are mailed to the address recorded in the vehicle’s registration record.

Finally, the vehicle owner provides feedback about the charging policy to the HiRUC System Administration via on-line surveys, telephone calls, or public meetings.

**Figure 7: Driving Reports Will be Sent in the Mail**



Figure 7. HiRUC Demonstration Overview

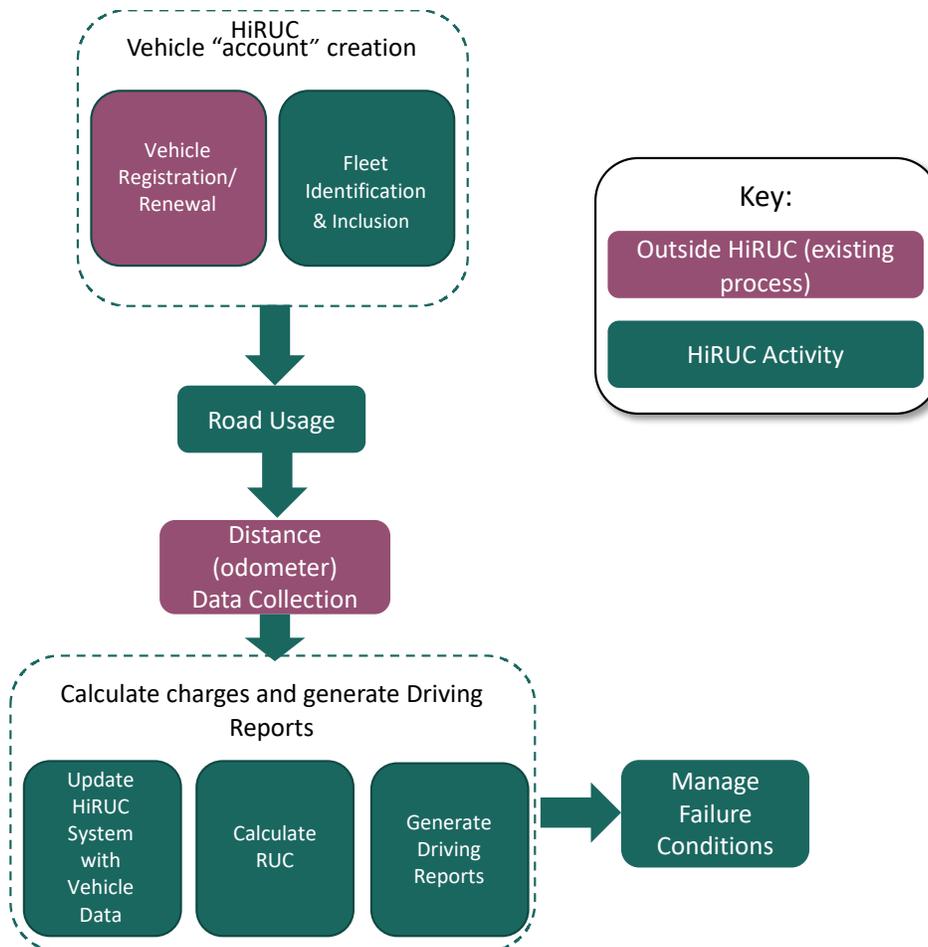


## 5. Usage Scenarios

The primary purpose of this ConOps is to describe how people and organizations might use the system. This section contains high-level usage scenarios that illustrate the actions that would be taken by drivers, PMVI inspection stations, the PMVI system administrators, DIT, and HiRUC system administrators during the key activities required under the HiRUC demonstration. Usage scenarios are provided for each major activity within the HiRUC demonstration system and for key vehicle registration and distance data collection activities that take place via existing state programs. The usage scenarios are illustrated in Figure 9.

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**Figure 8. HiRUC System Usage Scenarios**



The description of each operational scenario is organized around the following components:

- ▶ *Context* – when the scenario would occur
- ▶ *Driver activities* – what the driver would do in the given scenario
- ▶ *PMVI inspection station activities* – what the inspection station would do in the given scenario
- ▶ *PMVI system activities* – what the PMVI system administrators would do
- ▶ *DIT activities* – what DIT administrators would do
- ▶ HiRUC system administration activities – what the HiRUC system would do
- ▶ *Issues* – any likely issues we can forecast at this point in time

### 5.1. Usage Scenario: Vehicle Registration/Renewal

Context:

As part of the demonstration, a Driving Report will be generated for all eligible vehicles registered in Hawaii. The Driving Report will illustrate the cost of a road usage charge (RUC) and compare it to the current estimated cost of the state and county motor fuel excise. The vehicle's DMV registration represents the vehicle's "RUC account" for Part 1 of the demonstration. **Note that this usage scenario takes place outside the HiRUC system and follows established procedures that will not be modified for the demonstration.** However, it is included here because it represents the creation and maintenance of a "RUC account" for motorists.

Driver Activities:

- ▶ Register vehicle or renew vehicle registration following established procedures.

PMVI Inspection Station Activities:

- ▶ No activity.

PMVI System Activities:

- ▶ No activity.

DIT System Activities:

- ▶ Update registration status to "Active" and records registration/renewal date.

HiRUC System Administration Activities:

- ▶ No activity.

Issues:

- ▶ Vehicles that do not have at least two PMVI odometer reads, or have other data issues, will not be eligible to receive Driving Reports. Precise eligibility criteria are defined in the Business Rules.

## 5.2. Usage Scenario: Fleet Identification

Context:

*Driving Report* formats will vary depending on the type of vehicle (electric or not) and whether it is part of a recognized fleet. The varying formats are intended to assist with personalizing the information in the *Report* to make it more useful, and to make the receipt of fleet Driving Reports more convenient and intuitive for fleet managers. Neither DIT nor PMVI identify individual vehicles as being part of a fleet, so this information must be provided to HiRUC system administration by fleet managers to guarantee receipt of a fleet invoice. The HiRUC system administration will use a set of rules (included in the business rules) to determine fleets, but does not guarantee that all eligible fleets will be identified in this manner.

Driver Activities (in this instance, fleet owner activities):

- ▶ In order to guarantee inclusion as a fleet, provide VINs for all vehicles in the fleet to HiRUC system administration.

PMVI Inspection Station Activities:

- ▶ No activity.

PMVI System Activities:

- ▶ No activity.

DIT System Activities:

- ▶ No activity.

HiRUC System Administration Activities:

- ▶ Update database record to indicate fleet membership. The record will indicate that the vehicle is a member of a fleet as well as the specific fleet to which it belongs.

Issues:

- ▶ Only fleet managers who are aware of the demonstration and offer the information to the HiRUC system administration are guaranteed to have their vehicles identified as belonging to their fleets.
- ▶ HiRUC team will work with DOT to reach out to, identify, and determine whether/how government fleets (State, City & County, etc) will be included in the demonstration.
- ▶ If a single registered owner has more than 10 vehicles registered at the same address, they may be considered by the demonstration to be a fleet. Precise rules for identifying fleets are included in the Business Rules.

## 5.3. Usage Scenario: Road Usage

Context:

As part of the demonstration, road usage will be measured for the purpose of generating a *Driving Report*. The *Driving Report* will illustrate the cost of a road usage charge (RUC) and compare it to the current estimated cost of the state and county motor fuel excise. The RUC will be based on distance driven and county of registration.

Driver Activities:

- ▶ Drive.

PMVI Inspection Station Activities:

- ▶ No activity.

PMVI System Activities:

- ▶ No activity.

DIT System Activities:

- ▶ No activity.

HiRUC System Administration Activities:

- ▶ No activity.

Issues:

- ▶ Awaiting confirmation of participation in demonstration by all counties.

#### **5.4. Usage Scenario: Distance (Odometer) Data Collection**

Context:

Distance data is based on the approximately-annual odometer readings that are performed as part of the PMVI process. This scenario describes the activities related to collecting the distance data

Driver Activities:

- ▶ Takes vehicle to PMVI inspection station for annual safety inspection.

PMVI Inspection Station Activities:

- ▶ Inspects vehicle and records vehicle information including VIN, license plate, odometer reading, and whether the vehicle passes or fails inspection.

PMVI System Activities:

- ▶ Update database with new vehicle inspection record.

DIT System Activities:

- ▶ No activity.

HiRUC System Administration Activities:

- ▶ No activity.

Issues:

- ▶ None.

## 5.5. Usage Scenario: Update HiRUC System with Vehicle Data

Context:

As part of the demonstration, the HiRUC system will periodically receive vehicle data from DIT and PMVI. This data will be used to determine distance driven by that vehicle, as well as eligibility of a given vehicle to receive a *Driving Report*.

Driver Activities:

- ▶ No activity.

PMVI Inspection Station Activities:

- ▶ No activity.

PMVI System Activities:

- ▶ Export current PMVI database to a comma-delimited (.csv) file and transmit to HiRUC System Administration.

DIT System Activities:

- ▶ Export current vehicle registry file to a comma-delimited (.csv) file and transmit to HiRUC System Administration.

HiRUC System Administration Activities:

- ▶ Load PMVI data into system and perform data validation
- ▶ Load DIT data into system and perform data validation
- ▶ Assign vehicle segment definition (electric vehicle, fleet vehicle, standard vehicle). Vehicle segmentation described in business rules.

Issues:

- ▶ None.

## 5.6. Usage Scenario: Calculate RUC

Context:

As part of the demonstration, road usage charges will be calculated from measured distance driven for the purpose of generating a *Driving Report*. The *Driving Report* will illustrate the cost of a road usage charge (RUC) and compare it to the current estimated cost of the state and county motor fuel excise. The RUC will be based on distance driven and county of registration.

Driver Activities:

- ▶ No activity.

PMVI Inspection Station Activities:

- ▶ No activity.

PMVI System Activities:

- ▶ No activity.

DIT System Activities:

- ▶ No activity.

HiRUC System Administration Activities:

- ▶ Specify rate(s) for RUC. There is likely to be separate rates by county for counties electing to participate in the demonstration.
- ▶ Based on data provided by DIT and PMVI, identify vehicles eligible to receive a *Driving Report*.
- ▶ Based on data provided by PMVI, calculate the RUC.

Issues:

- ▶ None.

## 5.7. Usage Scenario: Generate Driving Reports

Context:

Once the road usage charges are calculated from measured distance driven, a *Driving Report* will be generated and sent to registered vehicle owners. The *Driving Report* will illustrate the cost of a road usage charge (RUC) and compare it to the current estimated cost of the state and county motor fuel excise. The RUC will be based on distance driven and county of registration.

Driver Activities:

- ▶ The registered vehicle owner receives a *Driving Report* for the aggregate distance driven during the period between their two most recent passed vehicle inspections.
- ▶ If vehicles are registered as part of a defined fleet, charges for all vehicles are reflected on the *Driving Report*.

PMVI Inspection Station Activities:

- ▶ No activity.

PMVI System Activities:

- ▶ No activity.

DIT System Activities:

- ▶ No activity.

HiRUC System Administration Activities:

- ▶ Creates the *Driving Reports* and mails them to vehicle owners. The *Driving Report* layout and specific contents will vary depending on which segment a vehicle belongs to. If a vehicle is part of a defined fleet, all vehicles that are part of the fleet that are eligible to receive a *Driving Report* for the covered period will be listed on a single *Driving Report*.

Issues:

- ▶ None.

## 5.8. Failure Conditions

Technical failure in the demonstration is most likely to occur at the interfaces between DIT-held data, PMVI-held data, and the HiRUC database. The HiRUC systems will need to test the robustness of the data loader and clearly define required data formats for the DIT and PMVI systems.

It should be noted that any technical failures should not be considered failure of the demonstration. Rather, technical failures should be observed, documented and communicated to HiRUC demonstration system administration.

The HiRUC database design incorporates self-diagnostics to monitor for failure and will impose rigorous data validation on imported data to ensure only valid data is used for the demonstration. Data validity criteria are included in the Business Rules. When failures occur, the system should be able to continue functioning, albeit with reduced service or functionality. The failure conditions included here are known possibilities. As-yet unknown failure possibilities may also exist.

### 5.8.1. Failure at HiRUC System

- ▶ Disasters, extended power failures, or widespread IT problems could cause HiRUC's systems to be down for some period of time. Given that Driving Reports will only be generated periodically (e.g., monthly) and no driver should receive more than one report during the demonstration, this eventuality should not be noticed by most drivers and would simply cause a delay in the delivery of driving statements.
- ▶ Redundancy of utilities (uninterruptable power supply and power generators), IT equipment (backup servers), and off-site as well as on-site data backup should be provided by the system.

### 5.8.2. Driver non-compliance with vehicle registration/renewal or PMVI process

- ▶ It is possible that a driver will not comply with existing laws requiring annual vehicle registration renewals or motor vehicle safety inspections. In this case, there will not be adequate data to confirm ownership or calculate distance charges.
- ▶ Any vehicle for which there is not current ("active") vehicle registration or adequate PMVI data to calculate distance driven over approximately one year should be deemed ineligible to receive a *Driving Report*.

## 6. Summary and Next Steps



This document summarized the Concept of Operations for the HiRUC demonstration system.

The next steps in system development are:

- ▶ Finalize System Requirements
- ▶ System Requirements Specifications
- ▶ Business Rules
- ▶ Finalize the Interface Control Definitions between HiRUC, PMVI, and DIT Vehicle Registry
- ▶ Interface Control Document
- ▶ Finalize the Evaluation Plan