



# Data-Exchange Platform (DEP)

## Open House

NOV 16, 2022

Regional Multi-Modal Mobility Program

Founding Partners:



In Partnership With:



# DEP Open House

*Thank you for attending! This event will begin in:*



We will be with you shortly!

For best meeting experience:

- Use headphones
- Put your cell phone on silent
- Use Chat for Questions [RAISE HAND not monitored]

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Amy McElwain  
RM3P Program  
Manager

# Welcome to the DEP Open House

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# Opening Remarks



**Bob Osmond**

RM3P Executive Committee Member  
VITA Chief Information Officer

Bob Osmond was appointed Chief Information Officer (CIO) of the Commonwealth of Virginia by Governor Glenn Youngkin in 2022. Prior to his appointment, Bob led information technology, process improvements, and strategic innovations as Chief of Technology and Business Strategy at VDOT. He played a critical role in establishing the DEP partnership between VDOT and the UMD CATT Lab.



# RM3P Overview



# RM3P Overview

*RM3P's Mission* is to leverage the collaborative use of real-time data to improve travel safety, reliability, and mobility; as well as to give the public effective tools to make better informed travel choices.

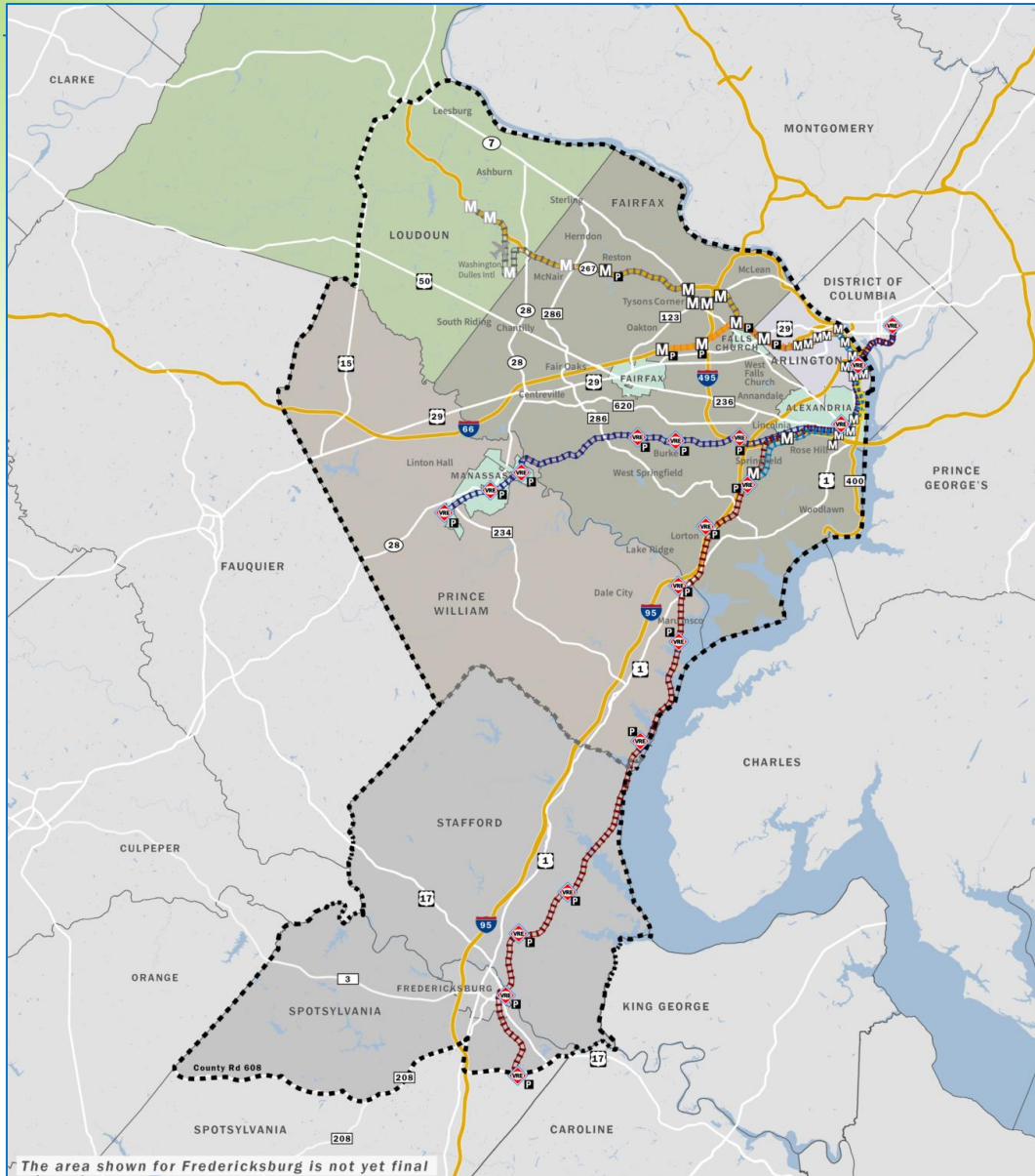
## Regional ICM/RM3P

- ❑ Builds on prior VDOT studies on ICM.
- ❑ The Northern Virginia Transportation Authority (NVTA), responsible for project planning and funding in Northern Virginia, identified ICM as key to meeting the vision of *TransAction*, its long-range strategic plan.
- ❑ NVTA and VDOT jointly developed a plan/approach for RM3P and obtained Innovation Funding.\*
- ❑ RM3P is led by VDOT, NVTA, and the Virginia Department of Rail and Public Transportation (DRPT).
- ❑ Federal funding (ATCMTD grant) enabled the expansion of selected RM3P functions southward to Fredericksburg.

\* The Innovation and Technology Transportation Fund is funded by the Virginia General Assembly.

Regional agency partners and stakeholders actively guided and shaped plans for RM3P service delivery and the framework for cooperative agreements.

# RM3P Overview: Geographic Boundaries



This *data-driven, multi-modal* mobility program, serving Northern Virginia and Metropolitan Fredericksburg, is comprised of 4 active projects:

❑ Data-Exchange Platform (DEP)

❑ Artificial Intelligence-Based Decision Support System (AI-DSS)

❑ Commuter Parking Information System (CPIS)

❑ Dynamic Incentivization (DI)

## Data-Exchange Platform



The Data-Exchange Platform (DEP) will be a reliable, continuously updated, cloud-based data storage and exchange system. It will be used by regional partners and third-party providers to capture, process, and exchange information on real-time and historic multi-modal travel conditions. This platform will feed necessary data to other RM3P program elements and disseminate value-added and mature data by these elements.

## AI-Based Decision Support System



The AI-Based Decision Support System (AI-DSS) will help predict the impact of disruptions to the transportation network and provide coordinated response options to agencies. The automated tool for operators will use travel data to monitor emerging conditions and recommend plans for coordinated, multi-agency responses to congestion, incidents, and events.

## Dynamic Incentivization

Dynamic Incentivization (DI) will be a data-driven system offering the public incentives to modify their travel choices and behaviors in response to real-time travel conditions. The incentives offered will aid in redistributing travel by dynamically managing demand.



## Commuter Parking Information System



The Commuter Parking Information System (CPIS) will provide historical, real-time, and predicted parking availability information, including reliable information about parking space availability at lots serving bus, vanpool, and carpool commuters.



# Game Changer

## Data, Data, & More Data



### Dynamic Incentivization

- Empowers commuters to contribute to the solution.
- Next-generation TDM – real-time & dynamic incentives.
- Reinforces positive changes in behavior with **challenges** and **loyalty** incentive programs.
- Applies a data-driven incentivization system to dynamically manage demand on the network.



### AI-Based Decision Support

- Monitors emerging conditions.
- Predicts the occurrence and impacts of disruptions to the transportation network.
- Provides **coordinated multi-modal response** options to transportation managers.
- Shifts from **reactive** to **proactive** operations for optimized response time and performance.



Cohesive Transportation Systems Management and Operations (TSMO)



**Candice Gibson**  
RM3P Deputy  
Program Manager

# Welcome to the DEP Virtual Ribbon Cutting



RM3P Program  
Principal and VDOT  
Deputy Chief  
Commissioner -  
**Cathy McGhee**

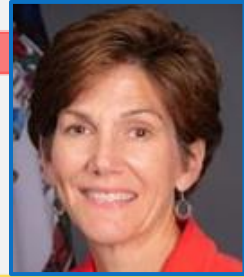
DEP Executive  
Sponsor and VITA  
CIO -  
**Bob Osmond**

RM3P Program  
Manager and DEP  
Project Manager -  
**Amy McElwain**

DEP Project  
Manager and UMD  
CATT Lab Director  
of Operations -  
**Nikola Ivanov**



**Nikola Ivanou**



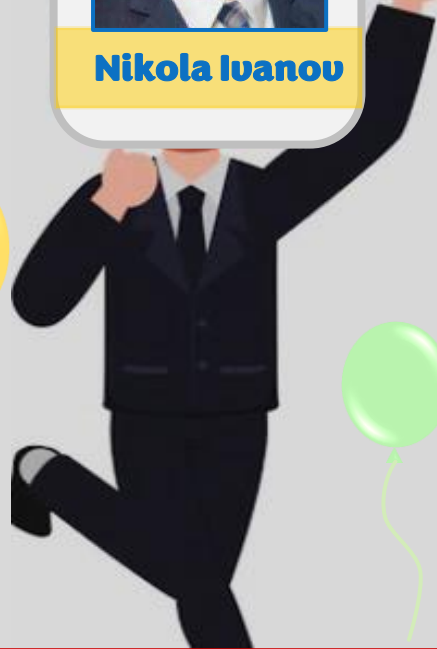
**Cathy McGhee**



**Bob Osmond**

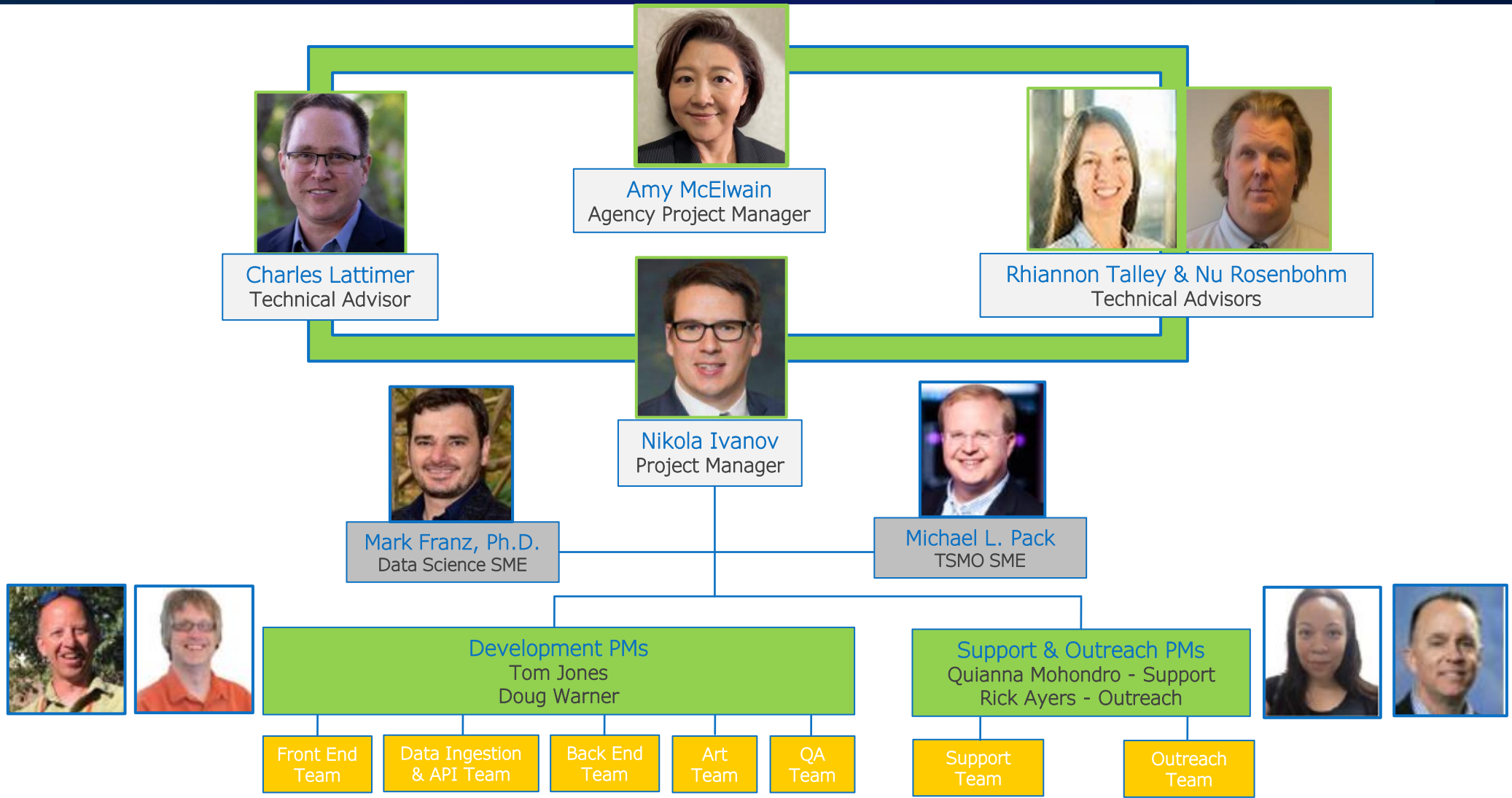


**Amy McElwain**



**DEP LAUNCH**

# DEP Project Team – Look Who’s Behind the Scene





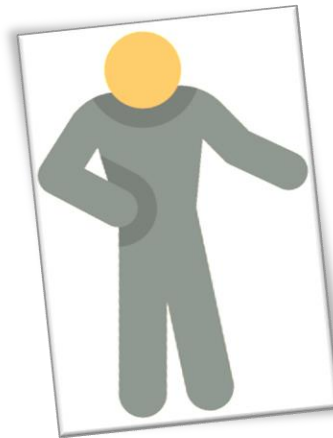
## DEP Guidance Team

Simona Babiceanu, VDOT  
Thomas Burke, Fairfax County  
Timothy Canan, MWCOG  
Mike Farnsworth, then VDOT (retired)  
Dan Goldfarb, then NVTC  
Mohini Nallapaneni, VDOT  
Shane Sawyer, VDOT  
John Shaw, VDOT

## Technical Document Reviewer

Mike Fontaine, VDOT  
Jan-Mou Li, MWCOG

# THANK



## DEP Oversight Committee

Simona Babiceanu, VDOT  
Thomas Burke, Fairfax County  
Timothy Canan, MWCOG  
Mike Farnsworth, then VDOT (retired)  
Allan Fye, NVTC  
Xavier Harmony, NVTC  
Cathy McGhee, VDOT  
Mohini Nallapaneni, VDOT  
Bob Osmond, then VDOT  
Shane Sawyer, VDOT  
John Shaw, VDOT

## Technical Advisors

Nu Rosenbohm, Kapsch  
Rhiannon Talley, VDOT

## Executive Committee

Monica Backmon, NVTA  
Bill Cuttler, VDOT  
Jennifer DeBruhl, DRPT  
Kevin Gregg, VDOT  
Cathy McGhee, VDOT  
Ian Ollis, FAMPO  
Bob Osmond, VITA  
Marcie Parker, VDOT  
Hari Sripathi, VDOT  
Iris Vaughan, FHWA

## Independent Evaluator

Mike Fontaine, VDOT

# THANK



## PM Support Group

Chris Arabia, DRPT  
Tiffany Dubinsky, DRPT  
Leigh Anderson, FAMPO  
Keith Jasper, NVTA  
Mackenzie Love, NVTA  
Halie Mitchell, VDOT  
Paul Szatkowski, VDOT  
Michelle Shropshire, VDOT

## Management Team

Amy McElwain, VDOT  
Candice Gibson, VDOT  
Joel Ticatch, Kapsch  
Imran Inamdar, Kapsch  
Aafiya Shah, Kapsch

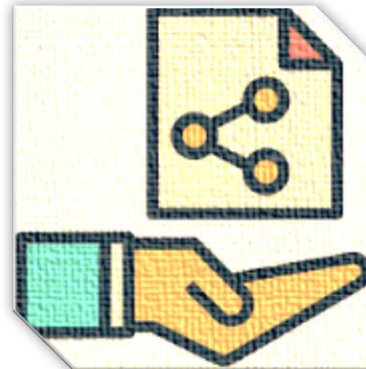
## Data Source Owner Agencies

Virginia Department of Rail and Public Transportation (DRPT)  
VDOT Operations Technology Division  
VDOT Traffic Operations Division  
VDOT Transp. & Mobility Planning  
Virginia Railway Express (VRE)

## Agencies Made Data Open

Transit Agencies – ART, CUE, DASH, Fairfax Connector, FRED, Loudoun Co. Transit, Omni, WMATA, VDOT SmarterRoads  
Capital Bikeshare  
Eco-Counter (Arlington)

# THANK



## Special Recognition

### VRE

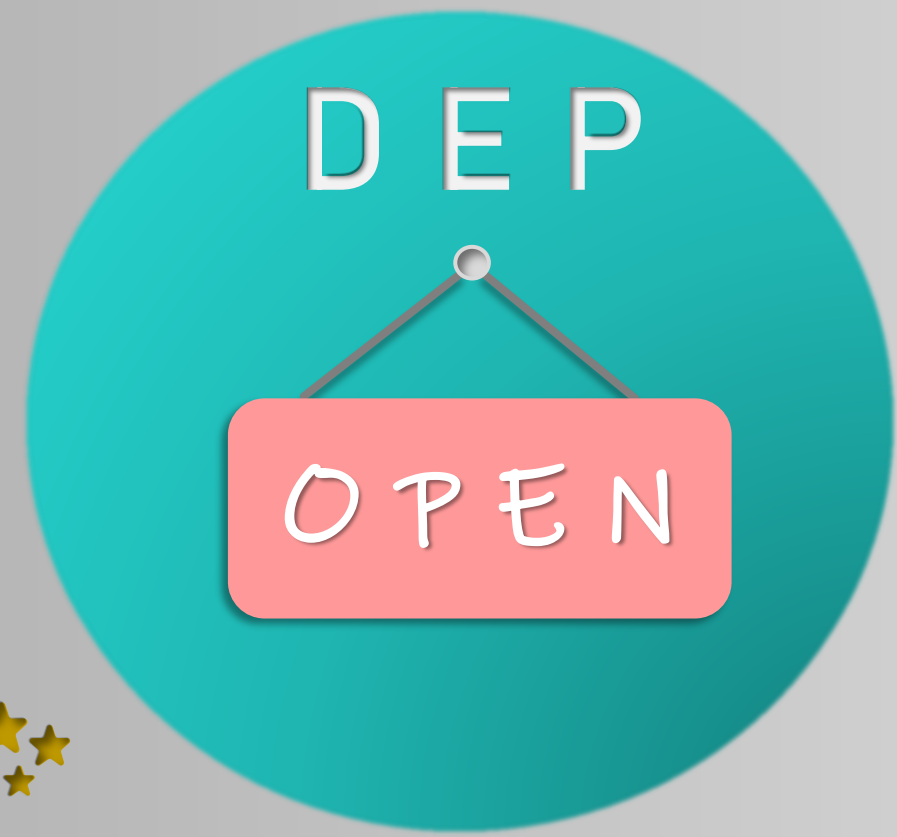
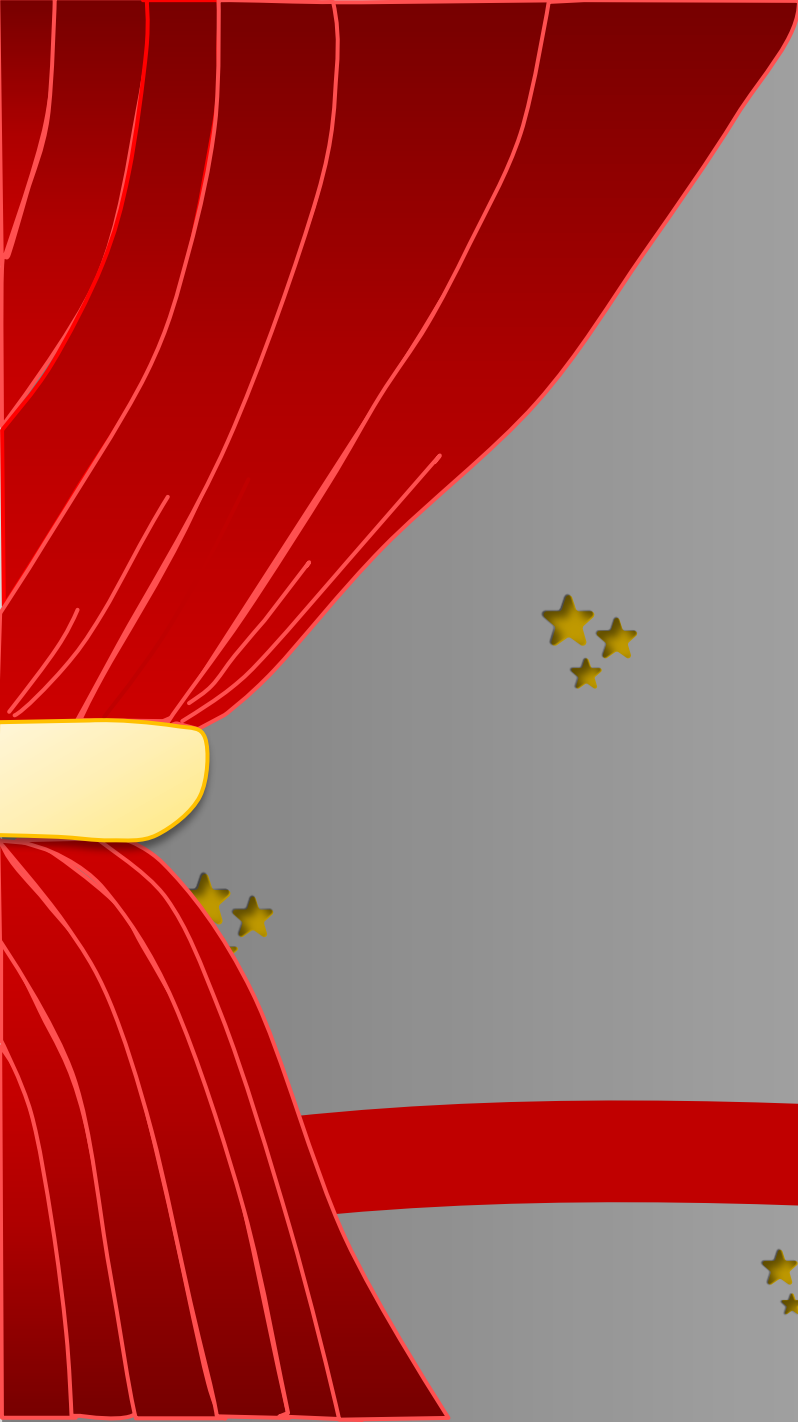
Thank you for your cooperation and support. You were the very first agency to furnish new data to DEP!

### Transurban

Thank you for investing resources to establish a dedicated C2C channel with DEP!

### Arlington County

Thank you for purchasing extra licenses to enable data-sharing with DEP!



OPEN

DEP



# DEP Introduction





# Data-Exchange Platform (DEP)

## Technical Demo

NOV 16, 2022

Regional Multi-Modal Mobility Program

Founding Partners:

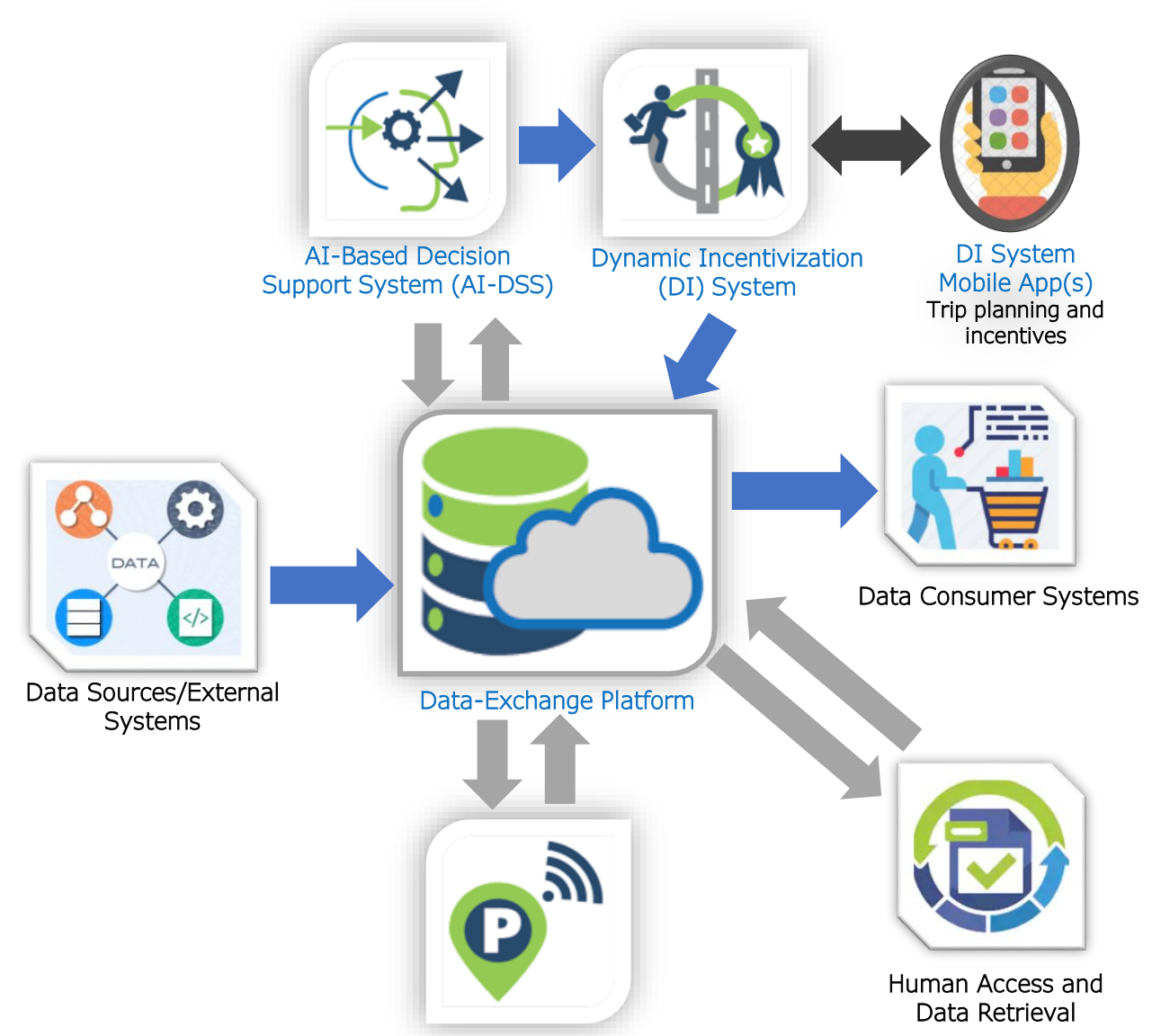


In Partnership With:

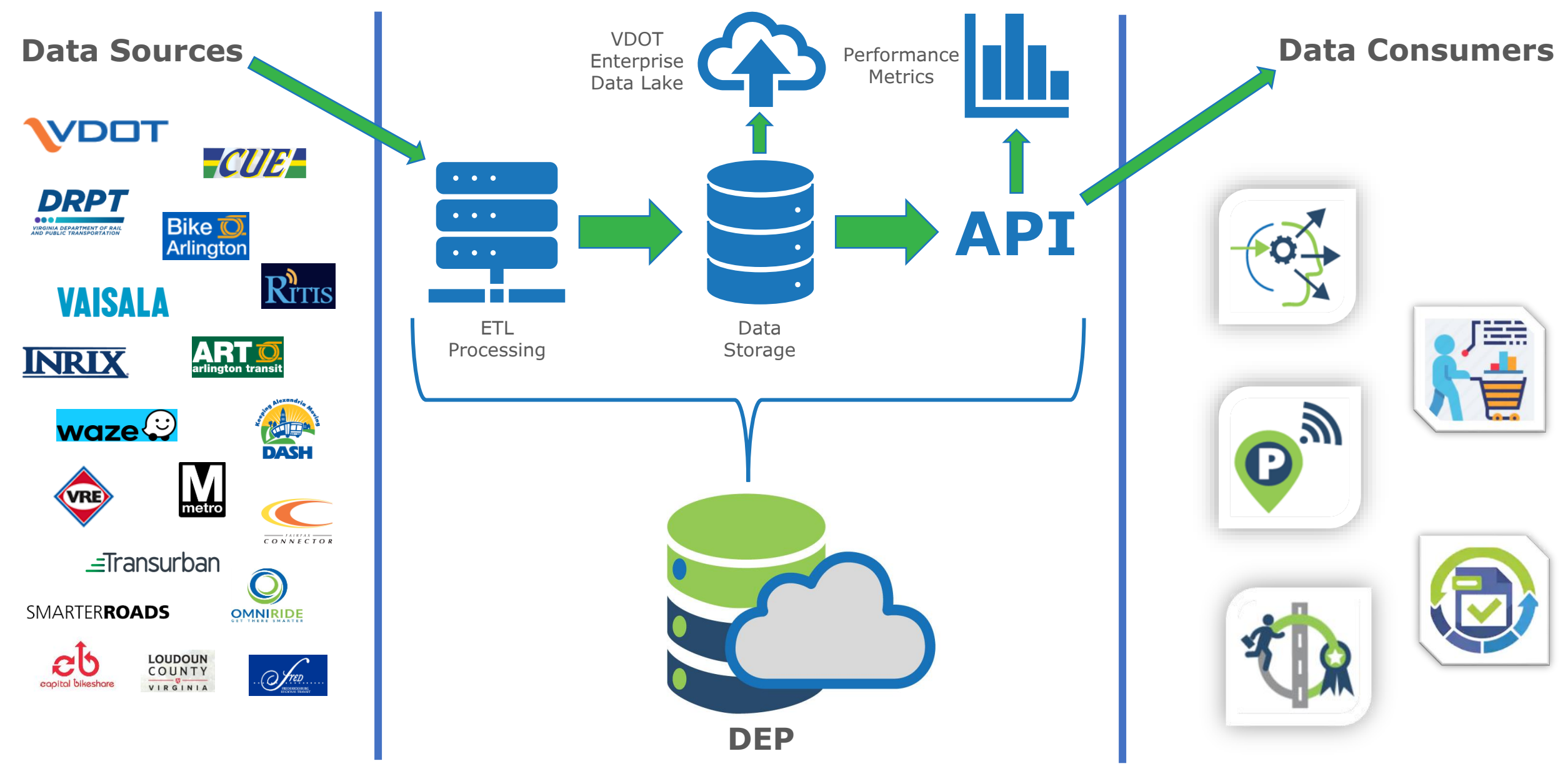


# DEP Background

- Data-Exchange Platform (DEP) is RM3P's data ingestion, data consolidation, data storage and data distribution system.
- Interfaces with all other RM3P systems to provide and receive data.
- Interfaces with other Data Consumers to provide RM3P data



# DEP High Level Architecture





# What is DEP?

- ✓ Expandable data ingestion system.
- ✓ Automated data consolidation and storage system.
- ✓ Powerful API for real-time and near real-time data distribution.
- ✓ Core data exchange platform supporting all other RM3P systems.



# What DEP Isn't?

**X** It is not an analytical tool.

✓ Try RITIS Analytics Tools or upcoming AI-DSS analytical capabilities for operators

**X** It is not designed for mega project download.

✓ Try RITIS Event Query Tool, Detector Tools & PDA Massive Data Downloader.

**X** It is not designed for users to open files using common MS Office suites such as Excel.

✓ Developers need to understand and integrate API with existing software. Coding knowledge is helpful.

**X** It is not a document storage system.

✓ But there are documents explaining about the data

**X** Not all data is available to all.

✓ Some data has license constraints or sharing limitation based on data source owners' instructions.

# Who may Access DEP and When?

*Now*



*RM3P  
Procurement  
Awards*



*After All RM3P Procurement Ends*

- VDOT Users
- Affiliate Agency Users (federal, state, regional and local public transportation agencies)

- AI-DSS Vendors upon award
- DI Vendors upon award
- Smart Parking Vendors upon award

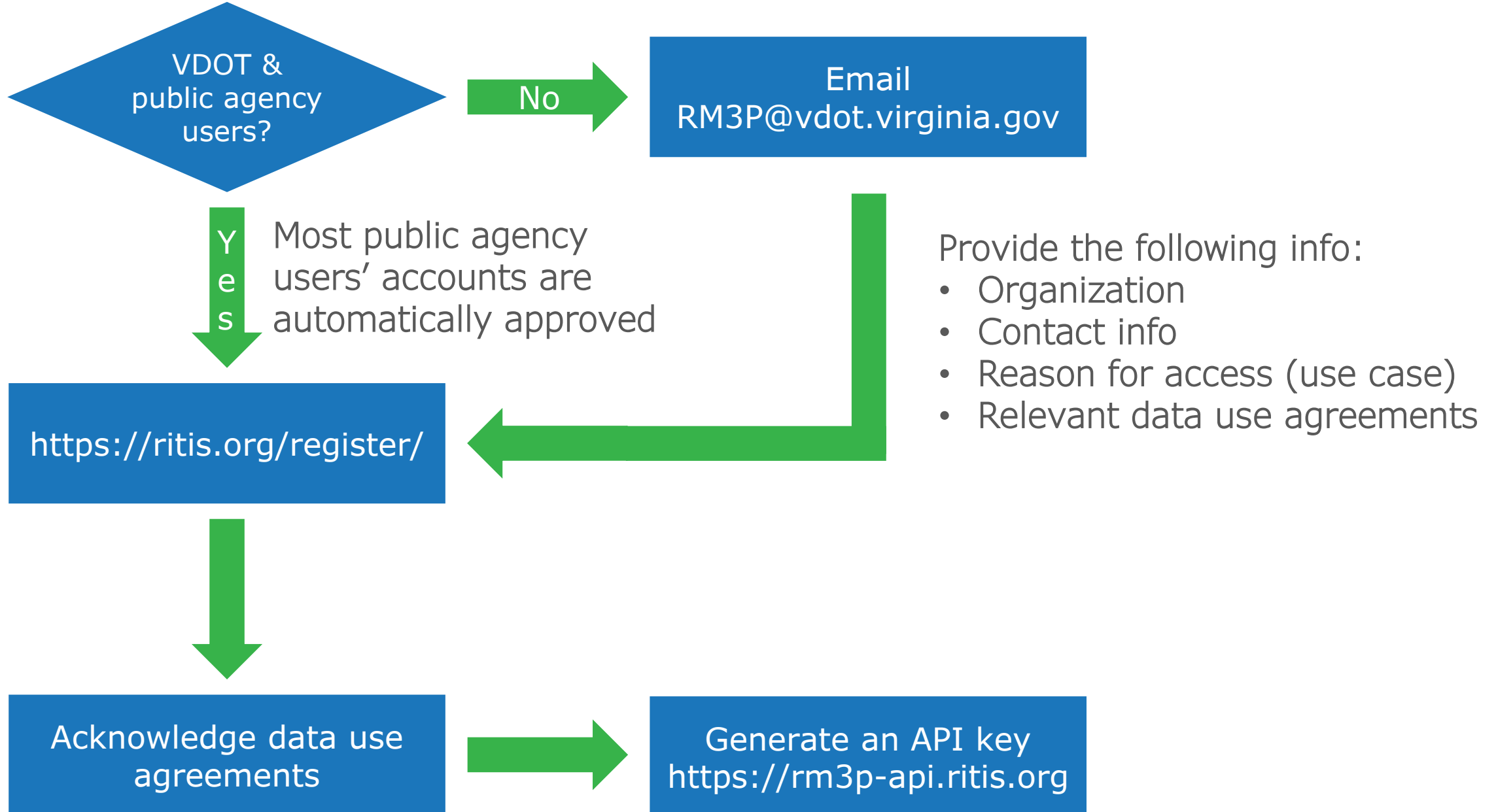
- RM3P Targeted 3rd Party Vendors
- Contractors that use data from DEP to benefit VDOT's projects with proven use case
- Contractors that use data from DEP to benefit affiliate agencies' projects with proven use case
- Other App developers with proven use case
- University research personnel with proven use case

**Support  
Public  
Agencies**

**Support  
RM3P**

**Support repackaging of pertinent data for  
delivery to travelers.  
Support researchers and planners**

# How to get access to DEP



## DEP Reference Page

<https://rm3p-api.ritis.org/rm3p/reference>

## API Key

### RM3P Data Exchange Portal API Reference

- 1. [Overview](#)
  - 1.1. [Authentication](#)
  - 1.2. [Sending requests](#)
    - 1.2.1. [GET](#)
    - 1.2.2. [POST](#)
    - 1.2.3. [Input schema](#)
    - 1.2.4. [How filters are applied](#)
  - 1.3. [Output formats](#)
    - 1.3.1. [ATIS/TMDD Schema](#)
  - 1.4. [Parking Data](#)
    - 1.4.1. [Example POST request to <https://rm3p-api.ritis.org/rm3p/parking>:](#)
    - 1.4.2. [Example parking output:](#)
  - 1.5. [INRIX Speed & Travel Time](#)
    - 1.5.1. [Example response to GET request \[https://rm3p-api.ritis.org/rm3p/dep\\\_speed\\\_tt\\\_tmc\]\(https://rm3p-api.ritis.org/rm3p/dep\_speed\_tt\_tmc\)](#)
    - 1.5.2. [Example response to GET request \[https://rm3p-api.ritis.org/rm3p/dep\\\_speed\\\_tt\\\_xd\]\(https://rm3p-api.ritis.org/rm3p/dep\_speed\_tt\_xd\)](#)
- 2. [Available agencies](#)
- 3. [Filters](#)
  - 3.1. [General filters](#)
  - 3.2. [Id-filters](#)
  - 3.3. [location-filters](#)
  - 3.4. [location-filters/road-filters](#)
  - 3.5. [location-filters/tmc-filter](#)
  - 3.6. [location-filters/xd-filter](#)
  - 3.7. [output-parameters](#)
  - 3.8. [request-headers](#)
  - 3.9. [time-filters](#)
  - 3.10. [time-filters/dow-filter](#)
  - 3.11. [toll-zone-filter](#)
  - 3.12. [type-filters](#)
- 4. [Endpoints](#)
  - 4.1. [Download schemas for RITIS Filter](#)
  - 4.2. [Query historical DMS data](#)
  - 4.3. [Query historical parking data](#)
  - 4.4. [Query the RM3P API](#)
  - 4.5. [RM3P Documentation](#)

### 1.1. Authentication

RM3P Data Exchange Portal is restricted to authorized users. You are logged in as [REDACTED]. Your API Key is [REDACTED].

To authenticate GET requests, add a parameter `api-key` with your API key as the value:

```
https://rm3p-api.ritis.org/rm3p/event/?api-key=your_api_key
```

To authenticate POST requests, add an HTTP header `X-RITIS-Filter-API-Key` with your API key as the value:

```
POST /event HTTP/1.1
Host: https://rm3p-api.ritis.org
X-RITIS-Filter-API-Key: your_api_key
```

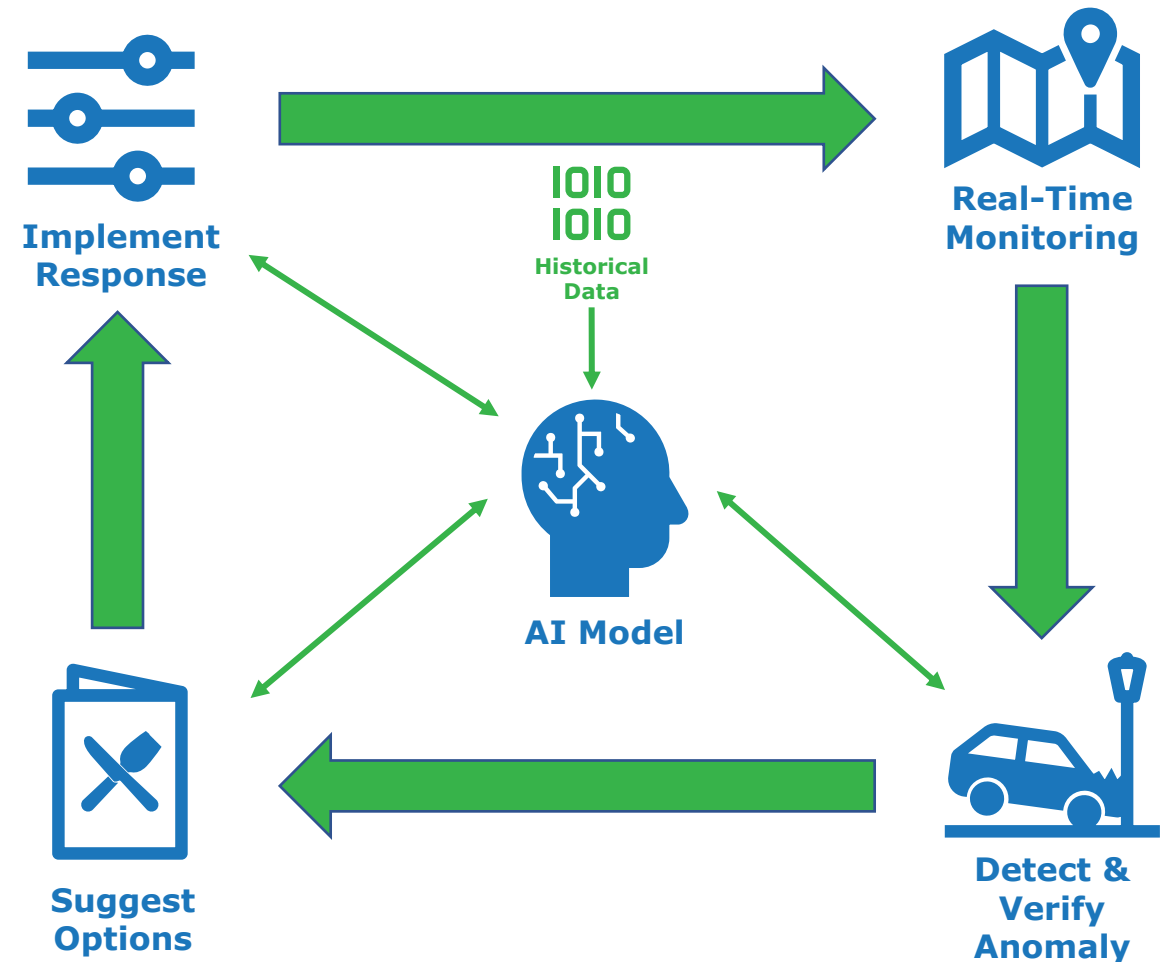
If you need an additional API key for your system, please email us at [dep-support@ritis.org](mailto:dep-support@ritis.org).

# RM3P DEP Use Case Scenario

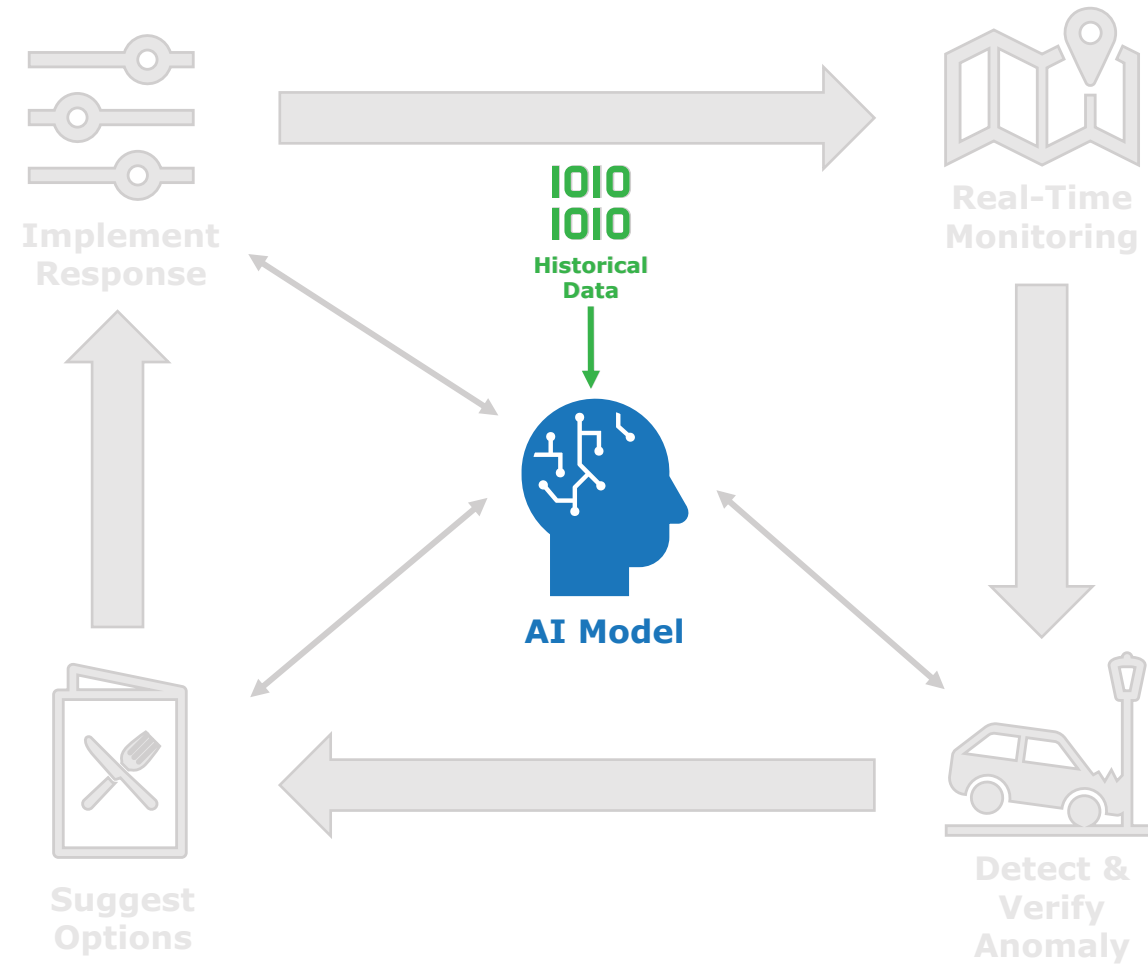
**Goal: Monitor the real-time traffic conditions, detect anomalies, and recommend actions based on available options.**

## Steps:

1. Train an AI model
2. Monitor real-time conditions
3. Detect and verify anomalies
4. Suggest options
5. Implement response



# First, we need to train the AI model



# Let's collect historical data in the region

## Data sets of interest:

- Incident and event data
- Traffic detector data
- Probe vehicle data
- Weather station data





# A note about historical data requests

## DEP API is intended to serve near real-time data.

- Obtaining large archived data sets can be done several different ways:

- VDOT's Enterprise Data Lake



- RITIS Archive Tools

- PDA Massive Data Downloader

- Event Query Tool

- Detector Tools

- etc.



- Custom data requests to [dep-support@ritis.org](mailto:dep-support@ritis.org)

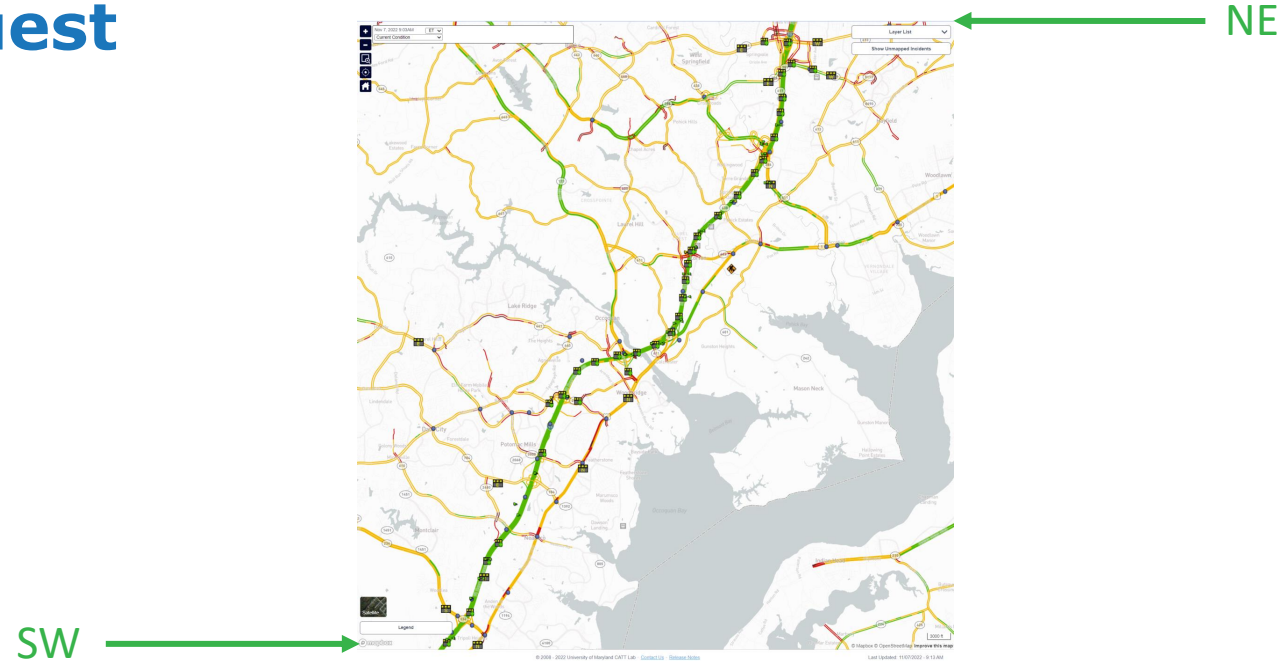
- DEP API limited historical searching

# Requesting Historical Incident and Event Data (GET)

There are two API request types in DEP:

1. GET request
2. POST request

**GET request:**



**<https://rm3p-api.ritis.org/rm3p/event/?system=vdot&road=I-95&sw-lat=38.693348&sw-lon=-77.241247&ne-lat=38.782900&ne-lon=-77.169343&start-time-min=2021-10-01&start-time-max=2021-11-01>**

# Requesting Historical Incident and Event Data (POST)

There are two ways to request data in DEP:

1. GET request
2. POST request

**POST request:**

```
<event-filter xmlns="http://www.ritis.org/schema/filter">
  <systems>
    <system>vdot</system>
  </systems>
  <location-filters>
    <road-filters>
      <road>I-95</road>
    </road-filters>
    <lat-lon-box-filter>
      <sw-lat>38.693348</sw-lat>
      <sw-lon>-77.241247</sw-lon>
      <ne-lat>38.782900</ne-lat>
      <ne-lon>-77.169343</ne-lon>
    </lat-lon-box-filter>
  </location-filters>
  <time-filters>
    <start-time>
      <start>2021-10-01</start>
      <end>2021-11-01</end>
    </start-time>
  </time-filters>
</event-filter>
```



# Incident and Event Data Response

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>  
<ns2:advisoryInformation xmlns:ns2="https://filter.ritis.org/reference/schema/atis_tmdd/ATIS.xsd">
```

```
<messageHeader>  
  <sender>  
    <agencyName>RITIS</agencyName>  
  </sender>  
  <messageID>0</messageID>  
  <timeStamp>2022-11-07T10:02:02.088-05:00</timeStamp>  
  <msgCount>0</msgCount>  
  <localMessageHeader>  
    <totalEvents>233</totalEvents>  
    <filteredEvents>0</filteredEvents>  
  </localMessageHeader>  
</messageHeader>
```

```
<messageHeader>  
  <sender>  
    <agencyName>RITIS</agencyName>  
  </sender>  
  <messageID>0</messageID>  
  <timeStamp>2022-11-07T09:33:45.623-05:00</timeStamp>  
  <msgCount>0</msgCount>  
  <localMessageHeader>  
    <totalEvents>233</totalEvents>  
    <filteredEvents>0</filteredEvents>  
  </localMessageHeader>  
</messageHeader>
```

Total number of events returned in response

```
<responseGroup>  
  <incident>  
    <head>  
      <id>VDOT_INNO4064362-10012021</id>  
      <charSet>utf8</charSet>  
      <issuingAgency>VADOT</issuingAgency>  
      <updateTime>2021-10-01T10:53:21-04:00</updateTime>  
    </head>  
    <location>  
      <locationName>I-95S south @ MM 164.000</locationName>  
      <pointLocation>  
        <crossStreetsPoint>  
          <onStreetInfo>  
            <prefix>I</prefix>  
            <name>95</name>  
          </onStreetInfo>  
          <atStreetInfo>  
            <prefix>MP</prefix>  
            <name>164.00</name>  
          </atStreetInfo>  
          <geoLocation>  
            <latitude>38696983</latitude>  
            <longitude>-77225966</longitude>  
          </geoLocation>  
          <direction>south</direction>  
          <adminAreas>  
            <county>Fairfax (County)</county>  
            <state>Virginia</state>  
          </adminAreas>  
        </crossStreetsPoint>  
        <adminArea>  
          <county>Fairfax (County)</county>  
          <state>Virginia</state>  
        </adminArea>  
      </pointLocation>  
    </location>  
    <typeEvent>  
      <accidentsAndIncidents>disabled vehicle</accidentsAndIncidents>  
    </typeEvent>  
    <description>  
      <text>2021-10-01 06:34:00-04 Motorists was using the phone, shoulder is clear. SSP 933 is clear.</text>  
      <text>2021-10-01 06:32:00-04 SSP 933 has detected a disabled vehicle blocking the right shoulder.</text>  
    </description>
```

# Incident and Event Data Response (continued)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns2:advisoryInformation xmlns:ns2="https://filter.ritis.org/reference/schema/atis_tmdd/ATIS.xsd">
  <messageHeader>
    <sender>
      <agencyName>RITIS</agencyName>
    </sender>
    <messageID>0</messageID>
    <timeStamp>2022-11-07T10:02:02.088-05:00</timeStamp>
    <msgCount>0</msgCount>
    <localMessageHeader>
      <totalEvents>233</totalEvents>
      <filteredEvents>0</filteredEvents>
    </localMessageHeader>
  </messageHeader>
  <responseGroup>
    <incident>
      <head>
        <id>VDOT_INN04064362-10012021</id>
        <charSet>utf8</charSet>
        <issuingAgency>VADOT</issuingAgency>
        <updateTime>2021-10-01T10:53:21-04:00</updateTime>
      </head>
      <location>
        <locationName>I-95S south @ MM 164.000</locationName>
        <pointLocation>
          <crossStreetsPoint>
            <onStreetInfo>
              <prefix>I</prefix>
              <name>95</name>
            </onStreetInfo>
            <atStreetInfo>
              <prefix>MP</prefix>
              <name>164.00</name>
            </atStreetInfo>
            <geoLocation>
              <latitude>38696983</latitude>
              <longitude>-77225966</longitude>
            </geoLocation>
            <direction>south</direction>
            <adminAreas>
              <county>Fairfax (County)</county>
              <state>Virginia</state>
            </adminAreas>
          </crossStreetsPoint>
          <adminArea>
            <county>Fairfax (County)</county>
            <state>Virginia</state>
          </adminArea>
        </pointLocation>
      </location>
      <typeEvent>
        <accidentsAndIncidents>disabled vehicle</accidentsAndIncidents>
      </typeEvent>
      <description>
        <text>2021-10-01 06:34:00-04 Motorists was using the phone, shoulder is clear. SSP 933 is clear.</text>
        <text>2021-10-01 06:32:00-04 SSP 933 has detected a disabled vehicle blocking the right shoulder.</text>
      </description>
    </incident>
  </responseGroup>
</advisoryInformation>
```

```
<head>
  <id>VDOT_INN04064362-10012021</id>
  <charSet>utf8</charSet>
  <issuingAgency>VADOT</issuingAgency>
  <updateTime>2021-10-01T10:53:21-04:00</updateTime>
</head>
```

Event ID

Updated time

# Incident and Event Data Response (continued)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns2:advisoryInformation xmlns:ns2="https://filter.ritis.org/reference/schema/atis_tmdd/ATIS.xsd">
```

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  </localMessageHeader>
</messageHeader>
```

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    </head>
```

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<location>
  <locationName>I-95S south @ MM 164.000</locationName>
  <pointLocation>
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      <onStreetInfo>
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      </onStreetInfo>
      <atStreetInfo>
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        <name>164.00</name>
      </atStreetInfo>
      <geoLocation>
        <latitude>38696983</latitude>
        <longitude>-77225966</longitude>
      </geoLocation>
      <direction>south</direction>
      <adminAreas>
        <county>Fairfax (County)</county>
        <state>Virginia</state>
      </adminAreas>
    </crossStreetsPoint>
    <adminArea>
      <county>Fairfax (County)</county>
      <state>Virginia</state>
    </adminArea>
  </pointLocation>
</location>
```

Location name

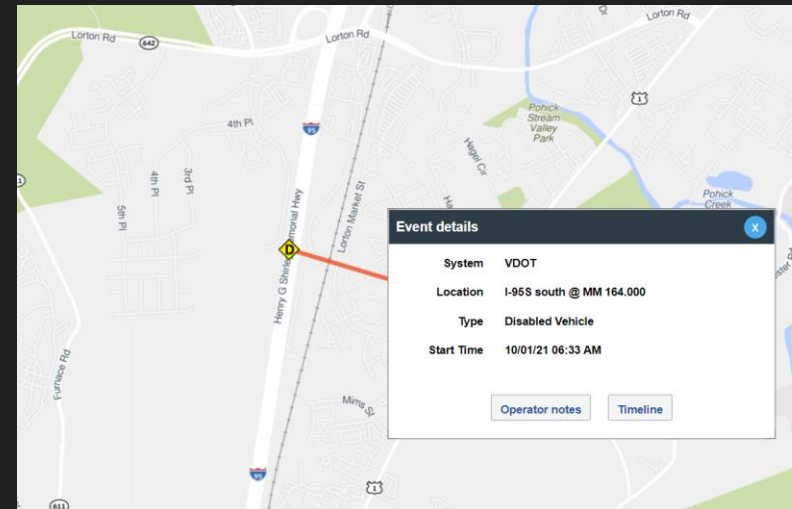
Latitude and Longitude

```
<location>
  <locationName>I-95S south @ MM 164.000</locationName>
  <pointLocation>
    <crossStreetsPoint>
      <onStreetInfo>
        <prefix>I</prefix>
        <name>95</name>
      </onStreetInfo>
      <atStreetInfo>
        <prefix>MP</prefix>
        <name>164.00</name>
      </atStreetInfo>
      <geoLocation>
        <latitude>38696983</latitude>
        <longitude>-77225966</longitude>
      </geoLocation>
      <direction>south</direction>
      <adminAreas>
        <county>Fairfax (County)</county>
        <state>Virginia</state>
      </adminAreas>
    </crossStreetsPoint>
    <adminArea>
      <county>Fairfax (County)</county>
      <state>Virginia</state>
    </adminArea>
  </pointLocation>
</location>
```

```
<typeEvent>
  <accidentsAndIncidents>disabled vehicle</accidentsAndIncidents>
</typeEvent>
<description>
  <text>2021-10-01 06:34:00-04 Motorists was using the phone, shoulder is clear. SSP 933 is clear.</text>
  <text>2021-10-01 06:32:00-04 SSP 933 has detected a disabled vehicle blocking the right shoulder.</text>
</description>
```

# Incident and Event Data Response (continued)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns2:advisoryInformation xmlns:ns2="https://filter.ritis.org/reference/schema/atis_tmdd/ATIS.xsd">
  <messageHeader>
    <sender>
      <agencyName>RITIS</agencyName>
    </sender>
    <messageID>0</messageID>
    <timeStamp>2022-11-07T10:02:02.088-05:00</timeStamp>
    <msgCount>0</msgCount>
    <localMessageHeader>
      <totalEvents>233</totalEvents>
      <filteredEvents>0</filteredEvents>
    </localMessageHeader>
  </messageHeader>
  <responseGroup>
    <incident>
      <head>
        <id>VDOT_INNO4064362-10012021</id>
        <charSet>utf8</charSet>
        <issuingAgency>VADOT</issuingAgency>
        <updateTime>2021-10-01T10:53:21-04:00</updateTime>
      </head>
      <location>
        <locationName>I-95S south @ MM 164.000</locationName>
        <pointLocation>
          <crossStreetsPoint>
            <onStreetInfo>
              <prefix>I</prefix>
              <name>95</name>
            </onStreetInfo>
            <atStreetInfo>
              <prefix>MP</prefix>
              <name>164.00</name>
            </atStreetInfo>
            <geoLocation>
              <latitude>38696983</latitude>
              <longitude>-77225966</longitude>
            </geoLocation>
            <direction>south</direction>
            <adminAreas>
              <county>Fairfax (County)</county>
              <state>Virginia</state>
            </adminAreas>
          </crossStreetsPoint>
          <adminArea>
            <county>Fairfax (County)</county>
            <state>Virginia</state>
          </adminArea>
        </pointLocation>
      </location>
      <typeEvent>
        <accidentsAndIncidents>disabled vehicle</accidentsAndIncidents>
      </typeEvent>
      <description>
        <text>2021-10-01 06:34:00-04 Motorists was using the phone, shoulder is clear. SSP 933 is clear.</text>
        <text>2021-10-01 06:32:00-04 SSP 933 has detected a disabled vehicle blocking the right shoulder.</text>
      </description>
    </incident>
  </responseGroup>
</advisoryInformation>
```



Event type

```
<typeEvent>
  <accidentsAndIncidents>disabled vehicle</accidentsAndIncidents>
</typeEvent>
```

# Incident and Event Data Response (continued)

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>  
<ns2:advisoryInformation xmlns:ns2="https://filter.ritis.org/reference/schema/atis_tmdd/ATIS.xsd">
```

```
<messageHeader>  
  <sender>  
    <agencyName>RITIS</agencyName>  
  </sender>  
  <messageID>0</messageID>  
  <timeStamp>2022-11-07T10:02:02.088-05:00</timeStamp>  
  <msgCount>0</msgCount>  
  <localMessageHeader>  
    <totalEvents>233</totalEvents>  
    <filteredEvents>0</filteredEvents>  
  </localMessageHeader>  
</messageHeader>
```

```
<responseGroup>  
  <incident>  
    <head>  
      <id>VDOT_INNO4064362-10012021</id>  
      <charSet>utf8</charSet>  
      <issuingAgency>VADOT</issuingAgency>  
      <updateTime>2021-10-01T10:53:21-04:00</updateTime>  
    </head>
```

```
<description>  
  <text>2021-10-01 06:34:00-04 Motorists was using the phone, shoulder is clear. SSP 933 is clear.</text>  
  <text>2021-10-01 06:32:00-04 SSP 933 has detected a disabled vehicle blocking the right shoulder.</text>  
</description>
```

```
<location>  
  <locationName>I-95S south @ MM 164.000</locationName>  
  <pointLocation>  
    <crossStreetsPoint>  
      <onStreetInfo>  
        <prefix>I</prefix>  
        <name>95</name>  
      </onStreetInfo>  
      <atStreetInfo>  
        <prefix>MP</prefix>  
        <name>164.00</name>  
      </atStreetInfo>  
      <geoLocation>  
        <latitude>38696983</latitude>  
        <longitude>-77225966</longitude>  
      </geoLocation>  
      <direction>south</direction>  
      <adminAreas>  
        <county>Fairfax (County)</county>  
        <state>Virginia</state>  
      </adminAreas>  
    </crossStreetsPoint>  
    <adminArea>  
      <county>Fairfax (County)</county>  
      <state>Virginia</state>  
    </adminArea>  
  </pointLocation>  
</location>  
<typeEvent>  
  <accidentsAndIncidents>disabled vehicle</accidentsAndIncidents>  
</typeEvent>
```

```
<description>  
  <text>2021-10-01 06:34:00-04 Motorists was using the phone, shoulder is clear. SSP 933 is clear.</text>  
  <text>2021-10-01 06:32:00-04 SSP 933 has detected a disabled vehicle blocking the right shoulder.</text>  
</description>
```



# Incident and Event Data Response (continued)

```
<totalEvents>233</totalEvents>
<filteredEvents>0</filteredEvents>
</localMessageHeader>
</messageHeader>
<responseGroup>
  <incident>
    <head>
      <id>VDOT_INNO4064362-10012021</id>
      <charSet>utf8</charSet>
      <issuingAgency>VADOT</issuingAgency>
      <updateTime>2021-10-01T10:53:21-04:00</updateTime>
    </head>
    <location>
      <locationName>I-95S south @ MM 164.000</locationName>
      <pointLocation>
        <crossStreetsPoint>
          <onStreetInfo>
            <prefix>I</prefix>
            <name>95</name>
          </onStreetInfo>
          <atStreetInfo>
            <prefix>MP</prefix>
            <name>164.00</name>
          </atStreetInfo>
          <geoLocation>
            <latitude>38696983</latitude>
            <longitude>-77225966</longitude>
          </geoLocation>
          <direction>south</direction>
          <adminAreas>
            <county>Fairfax (County)</county>
            <state>Virginia</state>
          </adminAreas>
        </crossStreetsPoint>
        <adminArea>
          <county>Fairfax (County)</county>
          <state>Virginia</state>
        </adminArea>
      </pointLocation>
    </location>
    <typeEvent>
      <accidentsAndIncidents>disabled vehicle</accidentsAndIncidents>
    </typeEvent>
    <description>
      <text>2021-10-01 06:34:00-04 Motorists was using the phone, shoulder is clear. SSP 933 is clear.</text>
      <text>2021-10-01 06:32:00-04 SSP 933 has detected a disabled vehicle blocking the right shoulder.</text>
    </description>
    <startTime>2021-10-01T06:33:32-04:00</startTime>
    <clearTime>2021-10-01T10:53:00-04:00</clearTime>
    <localIncidentInformation>
      <endTime>2021-10-01T10:53:21-04:00</endTime>
      <tmcCode>110-04153</tmcCode>
      <regionalEvent>>false</regionalEvent>
      <lane type="DD2000220002" status="000000000000" direction="111111100000" />
    </localIncidentInformation>
  </incident>
</responseGroup>
```

```
<localIncidentInformation>
  <endTime>2021-10-01T10:53:21-04:00</endTime>
  <tmcCode>110-04153</tmcCode>
  <regionalEvent>>false</regionalEvent>
  <lane type="DD2000220002" status="000000000000" direction="111111100000" />
</localIncidentInformation>
```

Event type

Regional event flag

Lane closure status

```
<localIncidentInformation>
  <endTime>2021-10-01T10:53:21-04:00</endTime>
  <tmcCode>110-04153</tmcCode>
  <regionalEvent>>false</regionalEvent>
  <lane type="DD2000220002" status="000000000000" direction="111111100000" />
</localIncidentInformation>
```

# Requesting Historical Detector Data

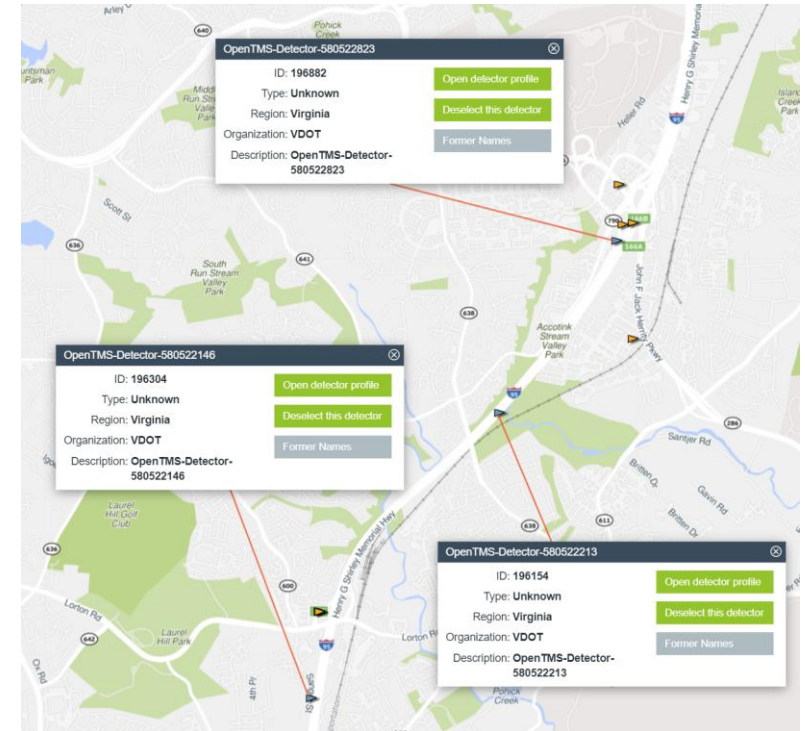
**POST request to:**

**[https://rm3p-api.ritis.org/rm3p/detector/historical\\_detector/](https://rm3p-api.ritis.org/rm3p/detector/historical_detector/)**

```
{
  "ids" : ["783233", "782536", "781808", "781958"],
  "startTime" : "2022-10-01",
  "endTime" : "2022-11-01"
}
```

List of detector IDs of interest

Start and end dates



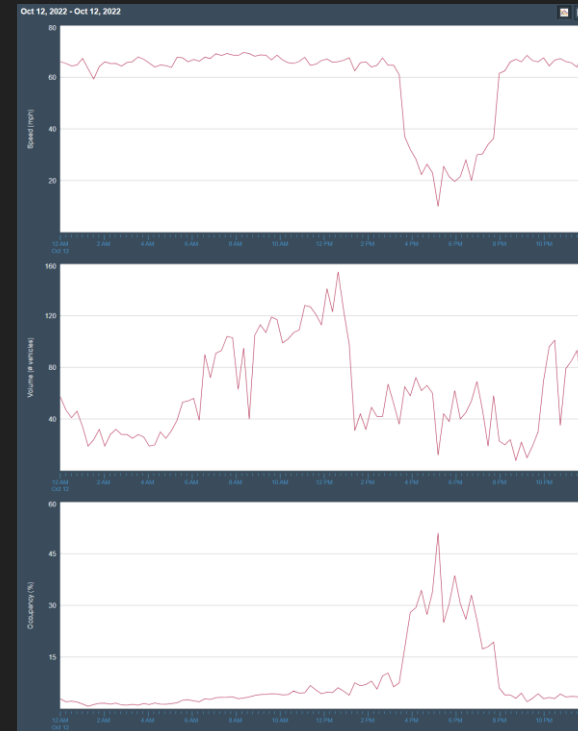
# Detector Data Response

```
<zoneDataItem>
  <measurementStart>2022-10-12T11:45:12.000-04:00</measurementStart>
  <measurementEnd>2022-10-12T11:45:12.000-04:00</measurementEnd>
  <effectiveDate>2022-10-12T11:45:12.000-04:00</effectiveDate>
  <vehicleCount>36</vehicleCount>
  <speed>66</speed>
  <occupancy>3</occupancy>
  <quality>0</quality>
</zoneDataItem>
<zoneDataItem>
  <measurementStart>2022-10-12T11:46:12.000-04:00</measurementStart>
  <measurementEnd>2022-10-12T11:46:12.000-04:00</measurementEnd>
  <effectiveDate>2022-10-12T11:46:12.000-04:00</effectiveDate>
  <vehicleCount>19</vehicleCount>
  <speed>66</speed>
  <occupancy>2</occupancy>
  <quality>0</quality>
</zoneDataItem>
<zoneDataItem>
  <measurementStart>2022-10-12T11:47:12.000-04:00</measurementStart>
  <measurementEnd>2022-10-12T11:47:12.000-04:00</measurementEnd>
  <effectiveDate>2022-10-12T11:47:12.000-04:00</effectiveDate>
  <vehicleCount>42</vehicleCount>
  <speed>66</speed>
  <occupancy>4</occupancy>
  <quality>0</quality>
</zoneDataItem>
<zoneDataItem>
  <measurementStart>2022-10-12T11:48:13.000-04:00</measurementStart>
  <measurementEnd>2022-10-12T11:48:13.000-04:00</measurementEnd>
  <effectiveDate>2022-10-12T11:48:13.000-04:00</effectiveDate>
  <vehicleCount>31</vehicleCount>
  <speed>68</speed>
  <occupancy>3</occupancy>
  <quality>0</quality>
</zoneDataItem>
<zoneDataItem>
  <measurementStart>2022-10-12T11:49:12.000-04:00</measurementStart>
  <measurementEnd>2022-10-12T11:49:12.000-04:00</measurementEnd>
  <effectiveDate>2022-10-12T11:49:12.000-04:00</effectiveDate>
  <vehicleCount>25</vehicleCount>
  <speed>67</speed>
  <occupancy>2</occupancy>
  <quality>0</quality>
</zoneDataItem>
<zoneDataItem>
  <measurementStart>2022-10-12T11:50:12.000-04:00</measurementStart>
  <measurementEnd>2022-10-12T11:50:12.000-04:00</measurementEnd>
  <effectiveDate>2022-10-12T11:50:12.000-04:00</effectiveDate>
  <vehicleCount>28</vehicleCount>
  <speed>68</speed>
  <occupancy>2</occupancy>
  <quality>0</quality>
</zoneDataItem>
```

```
<zoneDataItem>
  <measurementStart>2022-10-12T11:47:12.000-04:00</measurementStart>
  <measurementEnd>2022-10-12T11:47:12.000-04:00</measurementEnd>
  <effectiveDate>2022-10-12T11:47:12.000-04:00</effectiveDate>
  <vehicleCount>42</vehicleCount>
  <speed>66</speed>
  <occupancy>4</occupancy>
  <quality>0</quality>
</zoneDataItem>
```

Measurement timestamp

Measurements



# Requesting Weather Station Metadata

**POST request to:**

**<https://rm3p-api.ritis.org/rm3p/weather>**

```
<weather-filter xmlns="http://www.ritis.org/schema/filter">
  ... <systems>
  ... | ... <system>vdot</system>
  ... </systems>
</weather-filter>
```

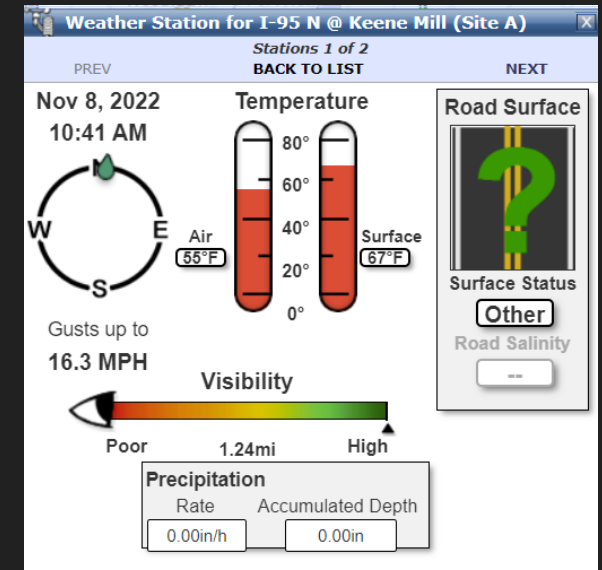
Requesting inventory of  
weather stations for VDOT

# Requesting Weather Station Data

```
<site>  
<head>  
<id>VDOT_3369</id>  
<name>I-95 N @ Keene Mill (Site A)</name>  
<state-site-id>3369</state-site-id>  
</head>  
<stations>  
<station>  
<station-id>0</station-id>  
<station-code>3369</station-code>  
<location>  
<center>  
<ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="3369">  
<ns2:pos srsDimension="2">-77.17864 38.77914</ns2:pos>  
</ns2:Point>  
</center>  
<pointLocation>  
<ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="3369">  
<ns2:pos srsDimension="2">-77.17864 38.77914</ns2:pos>  
</ns2:Point>  
<onAddress>  
<state>Virginia</state>  
<country>USA</country>  
</onAddress>  
</pointLocation>  
</location>  
<rupu-phone>720-684-8596</rupu-phone>  
<rupu-ip>166.154.60.217</rupu-ip>  
<obs-coll-freq>5</obs-coll-freq>  
<sensors>  
<sensor>  
<sensor-id>11</sensor-id>  
<observation-type>Alarm Status</observation-type>  
<elevation-offset>279.0</elevation-offset>  
<observations>  
<observation>  
<timestamp>2022-11-07T22:11:00.000-05:00</timestamp>  
<metric-value>2</metric-value>  
</observation>  
</observations>  
</sensor>  
<sensor>  
<sensor-id>112</sensor-id>  
<observation-type>Level of Grip</observation-type>  
<elevation-offset>279.0</elevation-offset>  
<observations>  
<observation>  
<timestamp>2022-11-07T22:11:00.000-05:00</timestamp>  
<metric-value>82range</metric-value>  
</observation>  
</observations>  
</sensor>  
<sensor>  
<sensor-id>115</sensor-id>  
<observation-type>Ice Layer</observation-type>  
<elevation-offset>279.0</elevation-offset>  
<observations>  
<observation>  
<timestamp>2022-11-07T22:11:00.000-05:00</timestamp>  
<metric-value>0mm</metric-value>  
</observation>  
</observations>  
</sensor>  
</stations>  
</site>
```

Basic station metadata

```
<head>  
<id>VDOT_3369</id>  
<name>I-95 N @ Keene Mill (Site A)</name>  
<state-site-id>3369</state-site-id>  
</head>
```



# Requesting Weather Station Data

```
<site>
<head>
<id>V00T_3369</id>
<name>I-95 N @ Keene Mill (Site A)</name>
<state-site-id>3369</state-site-id>
</head>
<stations>
<station>
<station-id>0</station-id>
<station-code>3369</station-code>
<location>
<center>
<ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="3369">
<ns2:pos srsDimension="2">-77.17864 38.77914</ns2:pos>
</ns2:Point>
</center>
<pointLocation>
<ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="3369">
<ns2:pos srsDimension="2">-77.17864 38.77914</ns2:pos>
</ns2:Point>
<onAddress>
<state>Virginia</state>
<country>USA</country>
</onAddress>
</pointLocation>
</location>
<rupu-phone>720-684-8596</rupu-phone>
<rupu-ip>166.154.60.217</rupu-ip>
<obs-coll-freq>5</obs-coll-freq>
<sensors>
<sensor>
<sensor-id>11</sensor-id>
<observation-type>Alarm Status</observation-type>
<elevation-offset>279.0</elevation-offset>
<observations>
<observation>
<timestamp>2022-11-07T22:11:00.000-05:00</timestamp>
<metric-value>2</metric-value>
</observation>
</observations>
</sensor>
<sensor>
<sensor-id>112</sensor-id>
<observation-type>Level of Grip</observation-type>
<elevation-offset>279.0</elevation-offset>
<observations>
<observation>
<timestamp>2022-11-07T22:11:00.000-05:00</timestamp>
<metric-value>82range</metric-value>
</observation>
</observations>
</sensor>
<sensor>
<sensor-id>115</sensor-id>
<observation-type>Ice Layer</observation-type>
<elevation-offset>279.0</elevation-offset>
<observations>
<observation>
<timestamp>2022-11-07T22:11:00.000-05:00</timestamp>
<metric-value>0mm</metric-value>
</observation>
</observations>
</sensor>
</stations>
</site>
```

Basic station location metadata

```
<location>
<center>
<ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="3369">
<ns2:pos srsDimension="2">-77.17864 38.77914</ns2:pos>
</ns2:Point>
</center>
<pointLocation>
<ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="3369">
<ns2:pos srsDimension="2">-77.17864 38.77914</ns2:pos>
</ns2:Point>
<onAddress>
<state>Virginia</state>
<country>USA</country>
</onAddress>
</pointLocation>
</location>
<rupu-phone>720-684-8596</rupu-phone>
<rupu-ip>166.154.60.217</rupu-ip>
<obs-coll-freq>5</obs-coll-freq>
```

# Requesting Weather Station Data

```
<site>
<head>
<id>VDOT_3369</id>
<name>I-95 N @ Keene Mill (Site A)</name>
<state-site-id>3369</state-site-id>
</head>
<stations>
<station>
<station-id>0</station-id>
<station-code>3369</station-code>
<location>
<center>
<ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="3369">
<ns2:pos srsDimension="2">-77.17864 38.77914</ns2:pos>
</ns2:Point>
</center>
<pointLocation>
<ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="3369">
<ns2:pos srsDimension="2">-77.17864 38.77914</ns2:pos>
</ns2:Point>
<onAddress>
<state>Virginia</state>
<country>USA</country>
</onAddress>
</pointLocation>
</location>
<ipu-phone>720-684-8596</ipu-phone>
<ipu-ip>166.154.60.217</ipu-ip>
<obs-coll-freq>5</obs-coll-freq>
```

```
<sensors>
<sensor>
<sensor-id>11</sensor-id>
<observation-type>Alarm Status</observation-type>
<elevation-offset>279.0</elevation-offset>
<observations>
<observation>
<timestamp>2022-11-07T22:11:00.000-05:00</timestamp>
<metric-value>2</metric-value>
</observation>
</observations>
</sensor>
<sensor>
<sensor-id>112</sensor-id>
<observation-type>Level of Grip</observation-type>
<elevation-offset>279.0</elevation-offset>
<observations>
<observation>
<timestamp>2022-11-07T22:11:00.000-05:00</timestamp>
<metric-value>82range</metric-value>
</observation>
</observations>
</sensor>
<sensor>
<sensor-id>115</sensor-id>
<observation-type>Ice Layer</observation-type>
<elevation-offset>279.0</elevation-offset>
<observations>
<observation>
<timestamp>2022-11-07T22:11:00.000-05:00</timestamp>
<metric-value>0mm</metric-value>
</observation>
</observations>
</sensor>
```

```
<sensors>
<sensor>
<sensor-id>11</sensor-id>
<observation-type>Alarm Status</observation-type>
<elevation-offset>279.0</elevation-offset>
<observations>
<observation>
<timestamp>2022-11-07T22:11:00.000-05:00</timestamp>
<metric-value>2</metric-value>
</observation>
</observations>
</sensor>
<sensor>
<sensor-id>112</sensor-id>
<observation-type>Level of Grip</observation-type>
<elevation-offset>279.0</elevation-offset>
<observations>
<observation>
<timestamp>2022-11-07T22:11:00.000-05:00</timestamp>
<metric-value>82range</metric-value>
</observation>
</observations>
</sensor>
<sensor>
<sensor-id>115</sensor-id>
<observation-type>Ice Layer</observation-type>
<elevation-offset>279.0</elevation-offset>
<observations>
<observation>
<timestamp>2022-11-07T22:11:00.000-05:00</timestamp>
<metric-value>0mm</metric-value>
</observation>
</observations>
</sensor>
```

← Various available sensors at the station

# Requesting Historical Weather Station Data

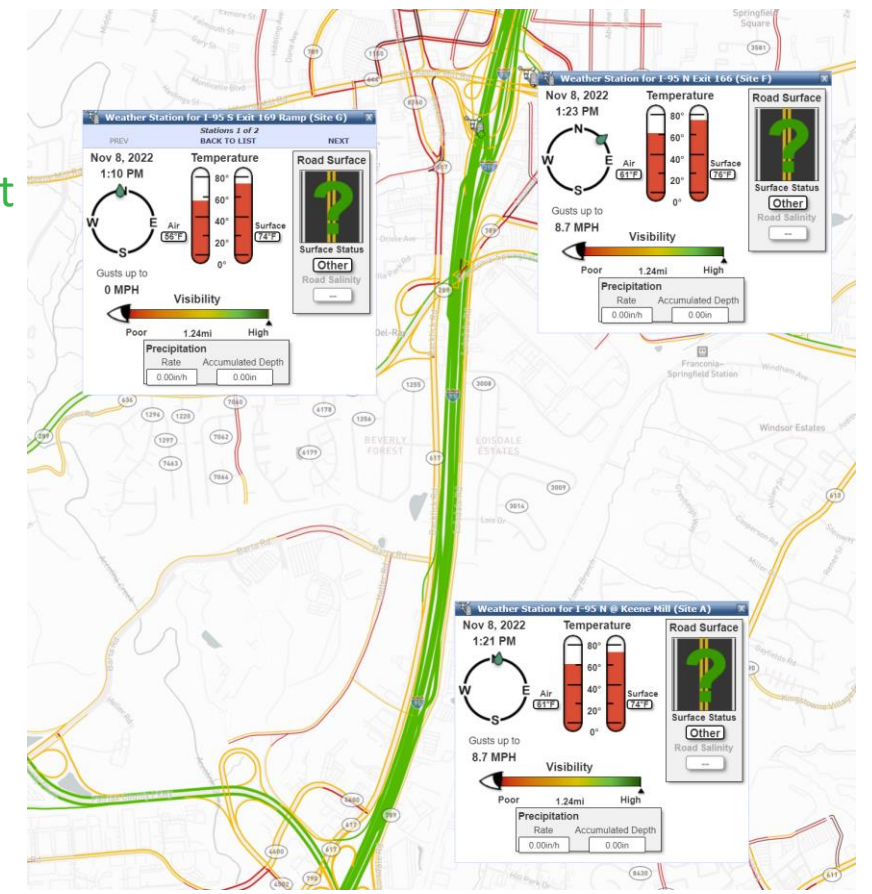
## POST request to:

[https://rm3p-api.ritis.org/rm3p/weather/historical\\_weather](https://rm3p-api.ritis.org/rm3p/weather/historical_weather)

```
{  
  "ids" : ["VDOT_33694", "VDOT_3375"],  
  "startTime" : "2022-01-01",  
  "endTime" : "2022-02-01"  
}
```

List of stations of interest

Date range of interest





# Weather Station Data Response

```
<observation>
  <timestamp>2022-01-26T17:30:00-05:00</timestamp>
  <metric-value>-16°C</metric-value>
</observation>
<observation>
  <timestamp>2022-01-26T17:40:00-05:00</timestamp>
  <metric-value>-16.1°C</metric-value>
</observation>
<observation>
  <timestamp>2022-01-26T17:50:00-05:00</timestamp>
  <metric-value>-16.1°C</metric-value>
</observation>
<observation>
  <timestamp>2022-01-26T18:00:00-05:00</timestamp>
  <metric-value>-15.8°C</metric-value>
</observation>
<observation>
  <timestamp>2022-01-26T18:10:00-05:00</timestamp>
  <metric-value>-15.6°C</metric-value>
</observation>
<observation>
  <timestamp>2022-01-26T18:20:00-05:00</timestamp>
  <metric-value>-15.7°C</metric-value>
</observation>
<observation>
  <timestamp>2022-01-26T18:30:00-05:00</timestamp>
  <metric-value>-15.7°C</metric-value>
</observation>
<observation>
  <timestamp>2022-01-26T18:40:00-05:00</timestamp>
  <metric-value>-15.5°C</metric-value>
</observation>
<observation>
  <timestamp>2022-01-26T18:50:00-05:00</timestamp>
  <metric-value>-15.4°C</metric-value>
</observation>
<observation>
  <timestamp>2022-01-26T19:00:00-05:00</timestamp>
  <metric-value>-15.3°C</metric-value>
</observation>
<observation>
  <timestamp>2022-01-26T19:10:00-05:00</timestamp>
  <metric-value>-15.2°C</metric-value>
</observation>
<observation>
  <timestamp>2022-01-26T19:20:00-05:00</timestamp>
  <metric-value>-15.1°C</metric-value>
</observation>
<observation>
  <timestamp>2022-01-26T19:30:00-05:00</timestamp>
  <metric-value>-15.1°C</metric-value>
</observation>
<observation>
  <timestamp>2022-01-26T19:40:00-05:00</timestamp>
  <metric-value>-15°C</metric-value>
</observation>
```

Measurement for a given sensor and time period

```
<observation>
  <timestamp>2022-01-26T18:10:00-05:00</timestamp>
  <metric-value>-15.6°C</metric-value>
</observation>
```

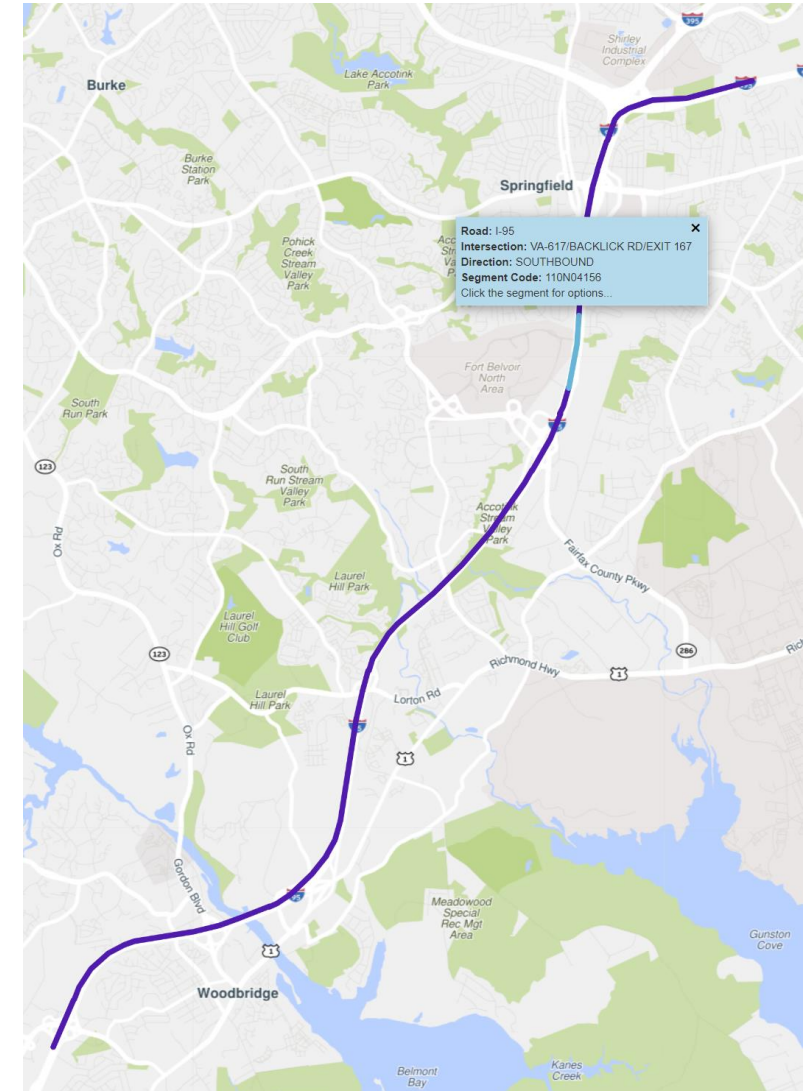
Weather Station for I-95 N @ Keene Mill (Site A)													
Observation Type	Time	Value	Com	Manu	Sens	Clim	Like	Persi	IQR	Barn	Dew	Sea	Preci
<b>Mobile Platform</b>													
Detected Friction	1:21 PM	82%	●	●	●	--	--	--	--	--	--	--	--
<b>Other</b>													
Surface Water Depth	1:21 PM	0.0in	●	●	●	--	--	--	--	--	--	--	--
<b>Pavement Sensor</b>													
Surface Water Depth - Version 2	1:21 PM	0in	●	●	●	--	●	--	--	--	--	--	--
Surface Status	1:21 PM	Other	●	●	●	--	--	--	--	--	--	--	--
Surface Temperature	1:21 PM	73.58°F	●	●	●	●	●	●	●	●	●	--	--
<b>Precipitation Sensor</b>													
Precipitation Indicator	1:21 PM	0.0	●	●	●	--	--	--	--	--	--	--	--
Precipitation Situation	1:21 PM	Other	●	●	●	--	--	--	--	--	--	--	--
Rainfall or Water Equivalent of Snow	1:21 PM	0 <sup>in</sup> /h	●	●	●	--	●	--	--	●	--	--	--
Total Precipitation Past One Hour	1:21 PM	0in	●	●	●	--	●	--	--	--	--	--	--
Total Precipitation Past Three Hours	1:21 PM	0in	●	●	●	--	●	--	--	--	--	--	--
Total Precipitation Past Six Hours	1:21 PM	0in	●	●	●	--	●	--	--	--	--	--	--
Total Precipitation Past Twelve Hours	1:21 PM	0in	●	●	●	--	●	--	--	--	--	--	--
Total Precipitation Past Twenty-Four Hours	1:21 PM	0in	●	●	●	--	●	--	--	--	--	--	--

# Requesting TMC Inventory

**POST request to:**

**<https://pda-api.ritis.org/tmc/search>**

```
⌵  
{  
  "dataSourceId": "inrix_tmc",  
  "state": ["VA"],  
  "road": ["I-95"],  
  "direction": ["SOUTHBOUND"]  
}
```



# TMC Inventory Response

```
{
```

```
"tmc": "110N04663",  
"type": "P1.3",  
"roadNumber": "I-95 (HOV)",  
"roadName": "I-95",  
"firstName": "VA-123/EXIT 160",  
"funcClass": "1",  
"county": "PRINCE WILLIAM",  
"state": "VA",  
"zip": "22191",  
"direction": "SOUTHBOUND",  
"roadClass": "Interstate",  
"nhsFClass": null,  
"startLatitude": 38.67193,  
"startLongitude": -77.24676,  
"endLatitude": 38.66865,  
"endLongitude": -77.26621,  
"length": 1.075919,  
"coordinates": [  
  "-77.24676 38.67193,-77.24711 38.67182,-77.2474 38.67173,-77.24785 38.6716,-77.24896 38.67128,-77.24968 38.67109,-77.25059 38.67089,-77.25166 38.67067,-77.25241 38.67053,-77.25285 38.67045,-77.25304 38.67042,-77.25354 38.67033,-77.25405 38.67024,-77.25481 38.67012,-77.2565 38.66988,-77.25675 38.66985,-77.25755 38.66975,-77.25906 38.66956,-77.25997 38.66945,-77.26318 38.66907,-77.26452 38.6689,-77.26511 38.66882,-77.26538 38.66879,-77.26621 38.66865"  
],  
"linearTmc": 11000123,  
"linearId": 11000123,  
"roadOrder": 12.0,  
"timezoneName": "America/New_York"
```

TMC Code

TMC Metadata

Segment Geometry

# Requesting Historical Probe Data

POST request to:

<https://pda-api.ritis.org/submit/export>

```
{
  "addNullRecords": false,
  "averagingWindow": 0,
  "dataSourceFields": [
    {
      "columns": [
        "SPEED",
        "AVERAGE_SPEED",
        "REFERENCE_SPEED",
        "TRAVEL_TIME_MINUTES",
        "CVALUE",
        "CONFIDENCE_SCORE"
      ],
      "dataSource": "inrix_tmc",
      "qualityFilter": {
        "includeIncalculable": true,
        "max": 1,
        "min": 0,
        "thresholds": [30, 20, 10]
      }
    }
  ],
  "dates": [
    {
      "end": "2022-10-02",
      "start": "2022-10-01"
    }
  ],
  "dow": [0, 1, 2, 3, 4, 5, 6],
  "dsFields": [
    {
      "columns": [
        "SPEED",
        "AVERAGE_SPEED",
        "REFERENCE_SPEED",
        "TRAVEL_TIME_MINUTES",
        "CVALUE",
        "CONFIDENCE_SCORE"
      ],
      "dataSource": "inrix_tmc",
      "qualityFilter": {
        "includeIncalculable": true,
        "max": 1,
        "min": 0,
        "thresholds": [30, 20, 10]
      }
    }
  ],
  "granularity": {
    "type": "minutes",
    "value": 0
  },
  "mergeFiles": true,
  "times": [
    {
      "end": "12:00:00.000",
      "start": "00:00:00.000"
    }
  ],
  "tmcs": ["110P04660", "110P04661", "110P04662",
    "110P04663", "110P04664", "110P04665", "110P04666", "110P04667", "110P04668", "110P04669", "110P04670", "110P04671", "110P04672", "110P04673", "110P04674", "110P04675", "110P04676", "110P04677", "110P04678", "110P04679", "110P04680", "110P04681", "110P04682", "110P04683", "110P04684", "110P04685", "110P04686", "110P04687", "110P04688", "110P04689", "110P04690", "110P04691", "110P04692", "110P04693", "110P04694", "110P04695", "110P04696", "110P04697", "110P04698", "110P04699"],
  "travelTimeUnits": "SECONDS",
  "uuid": "im3p-dep-historic"
}
```

# Requesting Historical Probe Data

```
{
  "addNullRecords": false,
  "averagingWindow": 0,
  "dataSourceFields": [
    {
      "columns": [
        "SPEED",
        "AVERAGE_SPEED",
        "REFERENCE_SPEED",
        "TRAVEL_TIME_MINUTES",
        "CVALUE",
        "CONFIDENCE_SCORE"
      ],
      "dataSource": "inrix_tmc",
      "qualityFilter": {
        "includeIncalculable": true,
        "max": 1,
        "min": 0,
        "thresholds": [30, 20, 10]
      }
    },
    {
      "columns": [
        "SPEED",
        "AVERAGE_SPEED",
        "REFERENCE_SPEED",
        "TRAVEL_TIME_MINUTES",
        "CVALUE",
        "CONFIDENCE_SCORE"
      ],
      "dataSource": "inrix_tmc",
      "qualityFilter": {
        "includeIncalculable": true,
        "max": 1,
        "min": 0,
        "thresholds": [30, 20, 10]
      }
    }
  ],
  "dates": [
    {
      "end": "2022-10-02",
      "start": "2022-10-01"
    }
  ],
  "dow": [0, 1, 2, 3, 4, 5, 6],
  "dsFields": [
    {
      "columns": [
        "SPEED",
        "AVERAGE_SPEED",
        "REFERENCE_SPEED",
        "TRAVEL_TIME_MINUTES",
        "CVALUE",
        "CONFIDENCE_SCORE"
      ],
      "dataSource": "inrix_tmc",
      "qualityFilter": {
        "includeIncalculable": true,
        "max": 1,
        "min": 0,
        "thresholds": [30, 20, 10]
      }
    }
  ],
  "granularity": {
    "type": "minutes",
    "value": 0
  },
  "mergeFiles": true,
  "times": [
    {
      "end": "12:00:00.000",
      "start": "00:00:00.000"
    }
  ],
  "tmc": ["110P04660", "110P04661", "110P04662",
    +04663, "110P04658", "110P04669", "110+04664"],
  "travelTimeUnits": "SECONDS",
  "uuid": "im3p-dep-historic"
}
```

```
"dataSourceFields": [
  {
    "columns": [
      "SPEED",
      "AVERAGE_SPEED",
      "REFERENCE_SPEED",
      "TRAVEL_TIME_MINUTES",
      "CVALUE",
      "CONFIDENCE_SCORE"
    ],
  },
]
```

← Desired measurements

# Requesting Historical Probe Data

```
{
  "addNullRecords": false,
  "averagingWindow": 0,
  "dataSourceFields": [
    {
      "columns": [
        "SPEED",
        "AVERAGE_SPEED",
        "REFERENCE_SPEED",
        "TRAVEL_TIME_MINUTES",
        "CVALUE",
        "CONFIDENCE_SCORE"
      ],
      "dataSource": "inrix_tmc",
      "qualityFilter": {
        "includeIncalculable": true,
        "max": 1,
        "min": 0,
        "thresholds": [30, 20, 10]
      }
    }
  ],
  "dates": [
    {
      "end": "2022-10-02",
      "start": "2022-10-01"
    }
  ],
  "dow": [0, 1, 2, 3, 4, 5, 6],
  "dsFields": [
    {
      "columns": [
        "SPEED",
        "AVERAGE_SPEED",
        "REFERENCE_SPEED",
        "TRAVEL_TIME_MINUTES",
        "CVALUE",
        "CONFIDENCE_SCORE"
      ],
      "dataSource": "inrix_tmc",
      "qualityFilter": {
        "includeIncalculable": true,
        "max": 1,
        "min": 0,
        "thresholds": [30, 20, 10]
      }
    }
  ],
  "granularity": {
    "type": "minutes",
    "value": 0
  },
  "mergeFiles": true,
  "times": [
    {
      "end": "12:00:00.000",
      "start": "00:00:00.000"
    }
  ],
  "tmc": ["110P04660", "110P04661", "110P04662",
    +04663, "110P04658", "110P04669", "110+04664"
  ],
  "travelTimeUnits": "SECONDS",
  "uuid": "im3p-dep-historic"
}
```

```
"dataSource": "inrix_tmc",
"qualityFilter": {
  "includeIncalculable": true,
  "max": 1,
  "min": 0,
  "thresholds": [30, 20, 10]
}
```

← Data source and quality filters

# Requesting Historical Probe Data

```
{
  "addNullRecords": false,
  "averagingWindow": 0,
  "dataSourceFields": [
    {
      "columns": [
        "SPEED",
        "AVERAGE_SPEED",
        "REFERENCE_SPEED",
        "TRAVEL_TIME_MINUTES",
        "CVALUE",
        "CONFIDENCE_SCORE"
      ],
      "dataSource": "inrix_tmc",
      "qualityFilter": {
        "includeIncalculable": true,
        "max": 1,
        "min": 0,
        "thresholds": [30, 20, 10]
      }
    }
  ],
  "dates": [
    {
      "end": "2022-10-02",
      "start": "2022-10-01"
    }
  ],
  "dow": [0, 1, 2, 3, 4, 5, 6],
  "dsFields": [
    {
      "columns": [
        "SPEED",
        "AVERAGE_SPEED",
        "REFERENCE_SPEED",
        "TRAVEL_TIME_MINUTES",
        "CVALUE",
        "CONFIDENCE_SCORE"
      ],
      "dataSource": "inrix_tmc",
      "qualityFilter": {
        "includeIncalculable": true,
        "max": 1,
        "min": 0,
        "thresholds": [30, 20, 10]
      }
    }
  ],
  "granularity": {
    "type": "minutes",
    "value": 0
  },
  "mergeFiles": true,
  "times": [
    {
      "end": "12:00:00.000",
      "start": "00:00:00.000"
    }
  ],
  "tmc": ["110P04660", "110P04661", "110P04662",
    "110P04663", "110P04658", "110P04669", "110+04664"],
  "travelTimeUnits": "SECONDS",
  "uuid": "im3p-dep-historic"
}
```

```
"dates": [
  {
    "end": "2022-10-02",
    "start": "2022-10-01"
  }
],
"dow": [0, 1, 2, 3, 4, 5, 6],
```

Start and end dates, and days of week of interest

# Requesting Historical Probe Data

```
{
  "addNullRecords": false,
  "averagingWindow": 0,
  "dataSourceFields": [
    {
      "columns": [
        "SPEED",
        "AVERAGE_SPEED",
        "REFERENCE_SPEED",
        "TRAVEL_TIME_MINUTES",
        "CVALUE",
        "CONFIDENCE_SCORE"
      ],
      "dataSource": "inrix_tmc",
      "qualityFilter": {
        "includeIncalculable": true,
        "max": 1,
        "min": 0,
        "thresholds": [30, 20, 10]
      }
    }
  ],
  "dates": [
    {
      "end": "2022-10-02",
      "start": "2022-10-01"
    }
  ],
  "dow": [0, 1, 2, 3, 4, 5, 6],
  "dsFields": [
    {
      "columns": [
        "SPEED",
        "AVERAGE_SPEED",
        "REFERENCE_SPEED",
        "TRAVEL_TIME_MINUTES",
        "CVALUE",
        "CONFIDENCE_SCORE"
      ],
      "dataSource": "inrix_tmc",
      "qualityFilter": {
        "includeIncalculable": true,
        "max": 1,
        "min": 0,
        "thresholds": [30, 20, 10]
      }
    }
  ],
  "granularity": {
    "type": "minutes",
    "value": 0
  },
  "mergeFiles": true,
  "times": [
    {
      "end": "12:00:00.000",
      "start": "00:00:00.000"
    }
  ],
  "tmc": ["110P04660", "110P04661", "110P04662",
    "+04663", "110P04658", "110P04669", "110+04664"],
  "travelTimeUnits": "SECONDS",
  "uuid": "im3p-dep-historic"
}
```

```
"granularity": {
  "type": "minutes",
  "value": 0
},
"mergeFiles": true,
"times": [
  {
    "end": "12:00:00.000",
    "start": "00:00:00.000"
  }
],
```

Temporal granularity, and start and end times of day



# Requesting Historical Probe Data

```
{
  "addNullRecords": false,
  "averagingWindow": 0,
  "dataSourceFields": [
    {
      "columns": [
        "SPEED",
        "AVERAGE_SPEED",
        "REFERENCE_SPEED",
        "TRAVEL_TIME_MINUTES",
        "CVALUE",
        "CONFIDENCE_SCORE"
      ],
      "dataSource": "inrix_tmc",
      "qualityFilter": {
        "includeIncalculable": true,
        "max": 1,
        "min": 0,
        "thresholds": [30, 20, 10]
      }
    },
    {
      "columns": [
        "SPEED",
        "AVERAGE_SPEED",
        "REFERENCE_SPEED",
        "TRAVEL_TIME_MINUTES",
        "CVALUE",
        "CONFIDENCE_SCORE"
      ],
      "dataSource": "inrix_tmc",
      "qualityFilter": {
        "includeIncalculable": true,
        "max": 1,
        "min": 0,
        "thresholds": [30, 20, 10]
      }
    }
  ],
  "granularity": {
    "type": "minutes",
    "value": 0
  },
  "mergeFiles": true,
  "times": [
    {
      "end": "12:00:00.000",
      "start": "00:00:00.000"
    }
  ],
  "tmc": ["110P04660", "110P04661", "110P04662",
    +04663, "110P04658", "110P04669", "110+04664"]
}
```

```
"tmcs": ["110P04660", "110P04661", "110P04662",
  +04663", "110P04658", "110P04669", "110+04664"]
"travelTimeUnits": "SECONDS",
"uuid": "rm3p-dep-historic"
```

List of TMCs of interest

Travel time units

UUID to track the job

```
"tmcs": ["110P04660", "110P04661", "110P04662",
+04663", "110P04658", "110P04669", "110+04664"]
"travelTimeUnits": "SECONDS",
"uuid": "rm3p-dep-historic"
```

# Track the request status

## GET request to:

[https://pda-api.ritis.org/jobs/status/?jobId=application\\_1622902841046\\_213123](https://pda-api.ritis.org/jobs/status/?jobId=application_1622902841046_213123)

```
{
  "id": "application_1622902841046_213123",
  "queue": "root.users.hdfs",
  "progress": 100.0,
  "startTime": "Nov 8, 2022 3:52:28 PM",
  "endTime": "Nov 8, 2022 3:53:56 PM",
  "state": "SUCCEEDED"
}
```

```
{
  "id": "application_1622902841046_213123",
  "startTime": "Nov 8, 2022 3:52:28 PM",
  "errorMessage": null
}
```

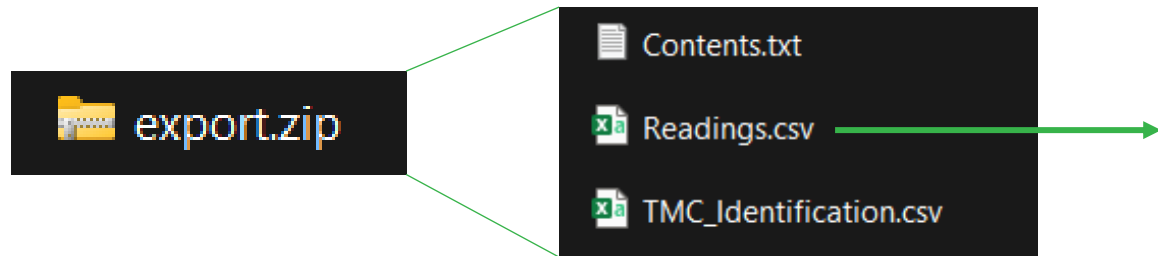
Job % complete

Job state

# Collect Historical Probe Data Results

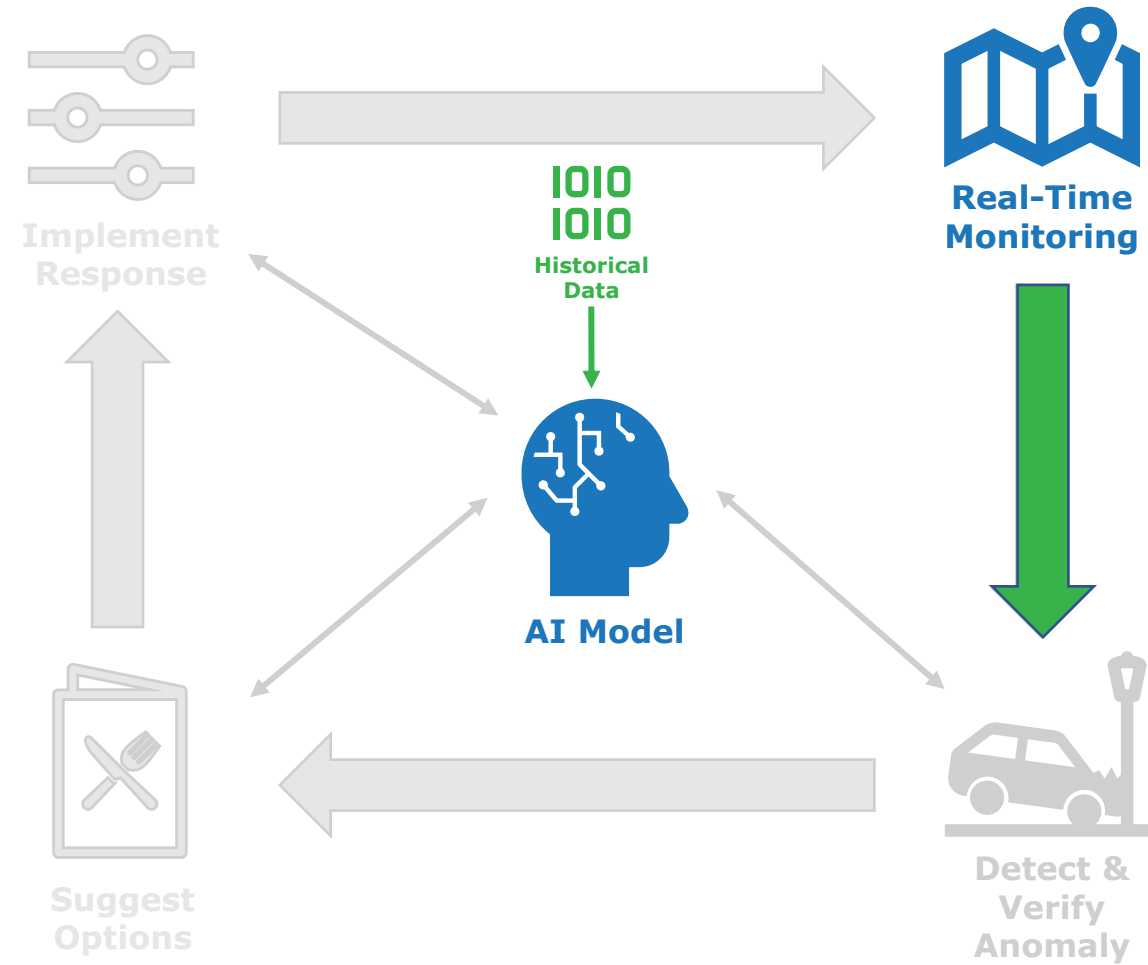
GET request to:

<https://pda-api.ritis.org/results/export?uuid=rm3p-dep-historic>



	A	B	C	D	E	F	G	H
1	tmc_code	measurement_tstamp	speed	average_speed	reference_speed	travel_time_seconds	confidence_score	cvalue
2	110+04669	10/1/2022 0:00	69	69	69	10.75	10	
3	110+04669	10/1/2022 0:01	69	69	69	10.75	10	
4	110+04669	10/1/2022 0:02	69	69	69	10.75	10	
5	110+04669	10/1/2022 0:03	69	69	69	10.75	10	
6	110+04669	10/1/2022 0:04	69	69	69	10.75	10	
7	110+04669	10/1/2022 0:05	69	69	69	10.75	10	
8	110+04669	10/1/2022 0:06	69	69	69	10.75	10	
9	110+04669	10/1/2022 0:07	69	69	69	10.75	10	
10	110+04669	10/1/2022 0:08	69	69	69	10.75	10	
11	110+04669	10/1/2022 0:09	69	69	69	10.75	10	
12	110+04669	10/1/2022 0:10	69	69	69	10.75	10	
13	110+04669	10/1/2022 0:11	69	69	69	10.75	10	
14	110+04669	10/1/2022 0:12	69	69	69	10.75	10	
15	110+04669	10/1/2022 0:13	69	69	69	10.75	10	
16	110+04669	10/1/2022 0:14	69	69	69	10.75	10	
17	110+04669	10/1/2022 0:15	69	69	69	10.75	10	
18	110+04669	10/1/2022 0:16	69	69	69	10.75	10	
19	110+04669	10/1/2022 0:17	69	69	69	10.75	10	
20	110+04669	10/1/2022 0:18	69	69	69	10.75	10	
21	110+04669	10/1/2022 0:19	69	69	69	10.75	10	
22	110+04669	10/1/2022 0:20	69	69	69	10.75	10	
23	110+04669	10/1/2022 0:21	69	69	69	10.75	10	
24	110+04669	10/1/2022 0:22	69	69	69	10.75	10	
25	110+04669	10/1/2022 0:23	69	69	69	10.75	10	

# Now we can monitor the live traffic and look for anomalies



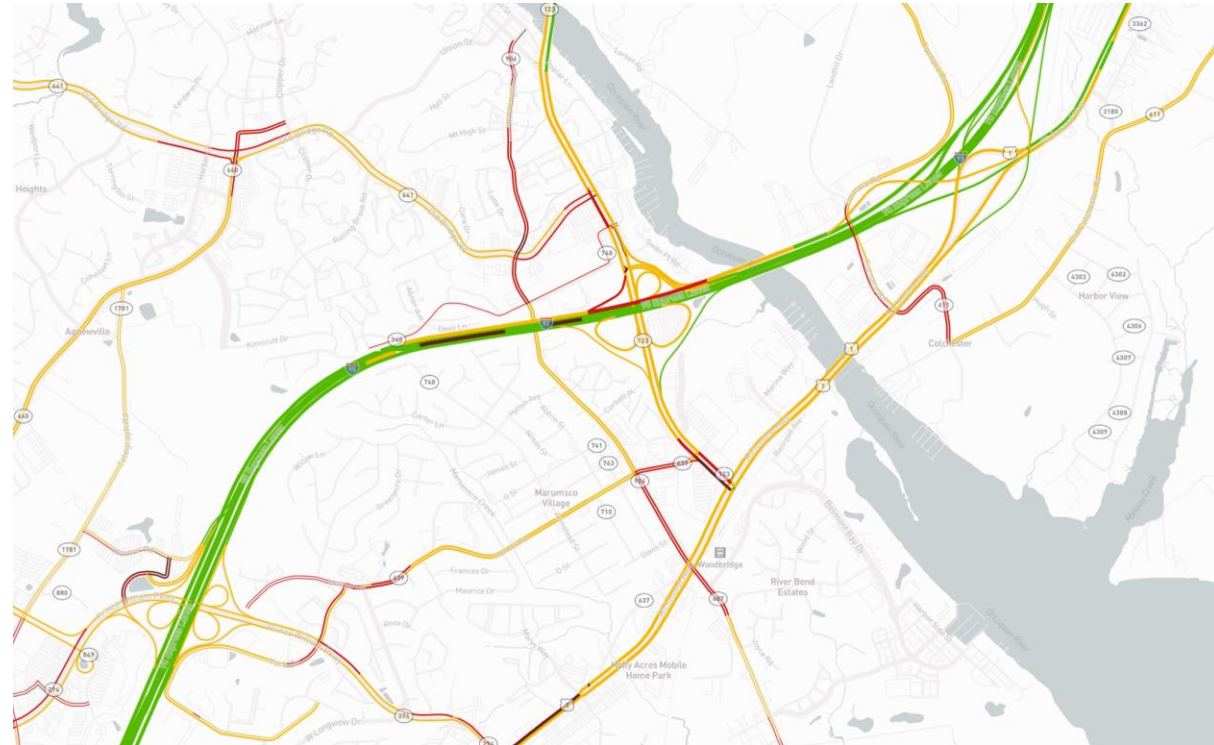
# Detected sudden drop in probe speed data

**GET request to:**

**[https://rm3p-api.ritis.org/rm3p/dep\\_speed\\_tt\\_tmc](https://rm3p-api.ritis.org/rm3p/dep_speed_tt_tmc)**

**OR**

**[https://rm3p-api.ritis.org/rm3p/dep\\_speed\\_tt\\_xd](https://rm3p-api.ritis.org/rm3p/dep_speed_tt_xd)**



# Detected sudden drop in probe speed data

```
{
  "id": "110+19100",
  "speed": 21,
  "tt": 32.75
},
{
  "id": "110+08447",
  "speed": 17,
  "tt": 47.77
},
{
  "id": "110+08448",
  "speed": 22,
  "tt": 70.27
},
{
  "id": "110+08449",
  "speed": 26,
  "tt": 72.3
},
{
  "id": "110+07112",
  "speed": 10,
  "tt": 241.33
},
{
  "id": "110+08443",
  "speed": 7,
  "tt": 53.56
},
{
  "id": "110+08444",
  "speed": 12,
  "tt": 27.93
},
{
  "id": "110+08446",
  "speed": 14,
  "tt": 77.07
},
{
  "id": "110+08440",
  "speed": 59,
  "tt": 358.29
},
```

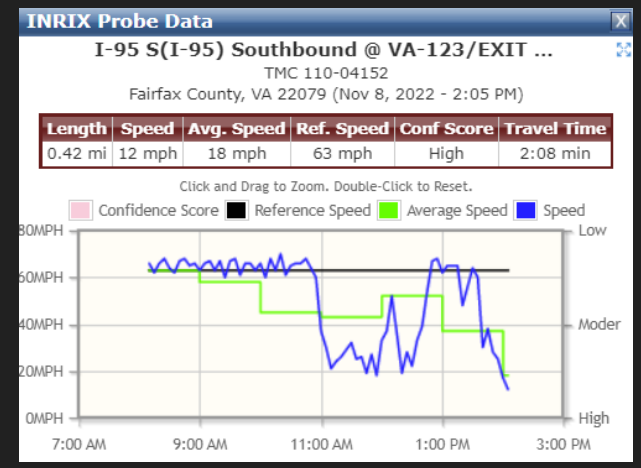
```
{
  "id": "110+08447",
  "speed": 17,
  "tt": 47.77
},
```

Speed drop on a TMC segment

```
{
  "id": "135530519",
  "speed": 22,
  "tt": 18.42
},
{
  "id": "135530514",
  "speed": 23,
  "tt": 11.92
},
{
  "id": "135268375",
  "speed": 9,
  "tt": 13.05
},
{
  "id": "1310477847",
  "speed": 45,
  "tt": 39.78
},
{
  "id": "1310477841",
  "speed": 61,
  "tt": 17.26
},
{
  "id": "135530500",
  "speed": 22,
  "tt": 3.44
},
{
  "id": "135268354",
  "speed": 22,
  "tt": 2.49
},
{
  "id": "135006239",
  "speed": 25,
  "tt": 1.71
},
{
  "id": "1310477834",
  "speed": 24,
  "tt": 134.48
},
```

```
{
  "id": "135530514",
  "speed": 23,
  "tt": 11.92
},
```

Speed drop on an XD segment



# Verify speed drop and determine volume of traffic impacted

## POST request to:

<https://rm3p-api.ritis.org/rm3p/detector/>

```
<detector-filter xmlns="http://www.ritis.org/schema/filter">
  <systems>
    <system>vdot_rm3p</system>
  </systems>
</detector-filter>
```

Volume →

Speed drop →

```
<collection-period-item>
  <detection-time-stamp>2022-11-08T17:00:05.000-05:00</detection-time-stamp>
  <zone-reports>
    <zone-report>
      <detector-id>RM3P_783072</detector-id>
      <zone-data>
        <zone-data-item>
          <zone-number>197418</zone-number>
          <zone-vehicle-count>82</zone-vehicle-count>
          <occupancy>29</occupancy>
          <zone-vehicle-speed>22</zone-vehicle-speed>
          <zone-status>1</zone-status>
        </zone-data-item>
      </zone-data>
    </zone-report>
  </zone-reports>
</collection-period-item>
<collection-period-item>
```

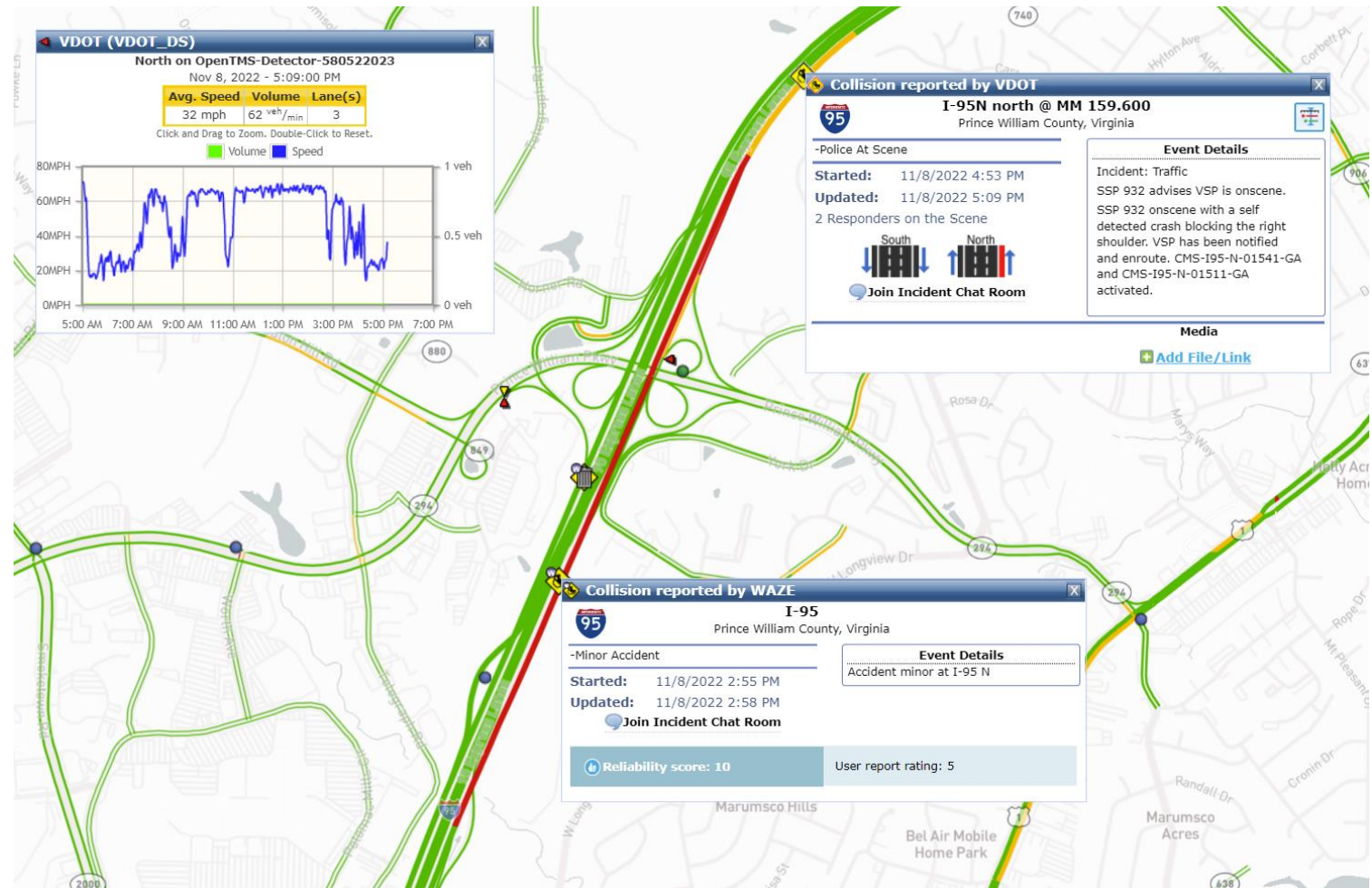
# Verify an Incident using Agency Data

POST request to:

<https://rm3p-api.ritis.org/rm3p/event/>

```
<event-filter xmlns="http://www.ritis.org/schema/filter">  
  <systems>  
    <system>vdot</system>  
  </systems>  
</event-filter>
```

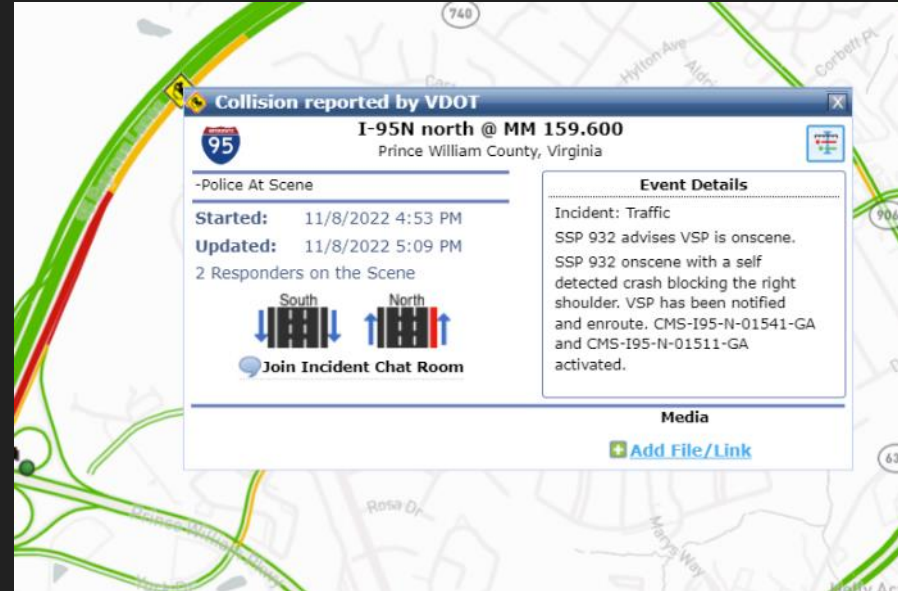
Agency  
Source





# VDOT Recorded Incident

```
<event>
<head>
  <id>VDOT_INN05774248946-11882822</id>
  <charSet>utf8</charSet>
  <issuingAgency>VADOT</issuingAgency>
  <updateTime>2022-11-08T17:09:50-05:00</updateTime>
</head>
<location>
  <locationName>I-95N north @ MM 159.600</locationName>
  <pointLocation>
    <crossStreetsPoint>
      <onStreetInfo>
        <prefix>I</prefix>
        <name>95</name>
      </onStreetInfo>
      <atStreetInfo>
        <prefix>MP</prefix>
        <name>159.60</name>
      </atStreetInfo>
      <geoLocation>
        <latitude>38665140</latitude>
        <longitude>-77273528</longitude>
      </geoLocation>
      <direction>north</direction>
      <adminAreas>
        <city>Marumsc0 Cdp</city>
        <county>Prince William</county>
        <state>Virginia</state>
      </adminAreas>
    </crossStreetsPoint>
    <adminArea>
      <city>Marumsc0 Cdp</city>
      <county>Prince William</county>
      <state>Virginia</state>
    </adminArea>
  </pointLocation>
</location>
<typeEvent>
  <warningAdvice>police at scene</warningAdvice>
</typeEvent>
<description>
  <text>2022-11-08 05:09:00-05 SSP 932 advises VSP is onscene.</text>
  <text>2022-11-08 04:53:00-05 SSP 932 onscene with a self detected crash blocking the right shoulder. VSP has been notified and enroute. CMS-I95-N-01541-GA and CMS-I95-N-01511-GA activated.</text>
</description>
<affectedLanes>
  <lanesAffected>1</lanesAffected>
  <laneTotalCnt>5</laneTotalCnt>
  <types>
    <type>right shoulder</type>
  </types>
  <location>north</location>
  <condition>closed</condition>
  <direction>one Direction</direction>
</affectedLanes>
<startTime>2022-11-08T16:53:55-05:00</startTime>
<localEventInformation>
  <tmcCode>110+04152</tmcCode>
  <regionalEvent>false</regionalEvent>
  <lane type="2000220002" status="0000000002" direction="1111100000" />
  <resource notified="2022-11-08T16:53:00-05:00" arrived="2022-11-08T16:53:00-05:00" name="SSP Wayne McKenzie 932 (546458)" type="freeway service patrols" />
  <resource notified="2022-11-08T16:53:00-05:00" arrived="2022-11-08T17:09:00-05:00" name="VSP - Division 7 Headquarters" type="state police units" />
</localEventInformation>
</event>
```



# Verify an Incident using Crowdsourced Data

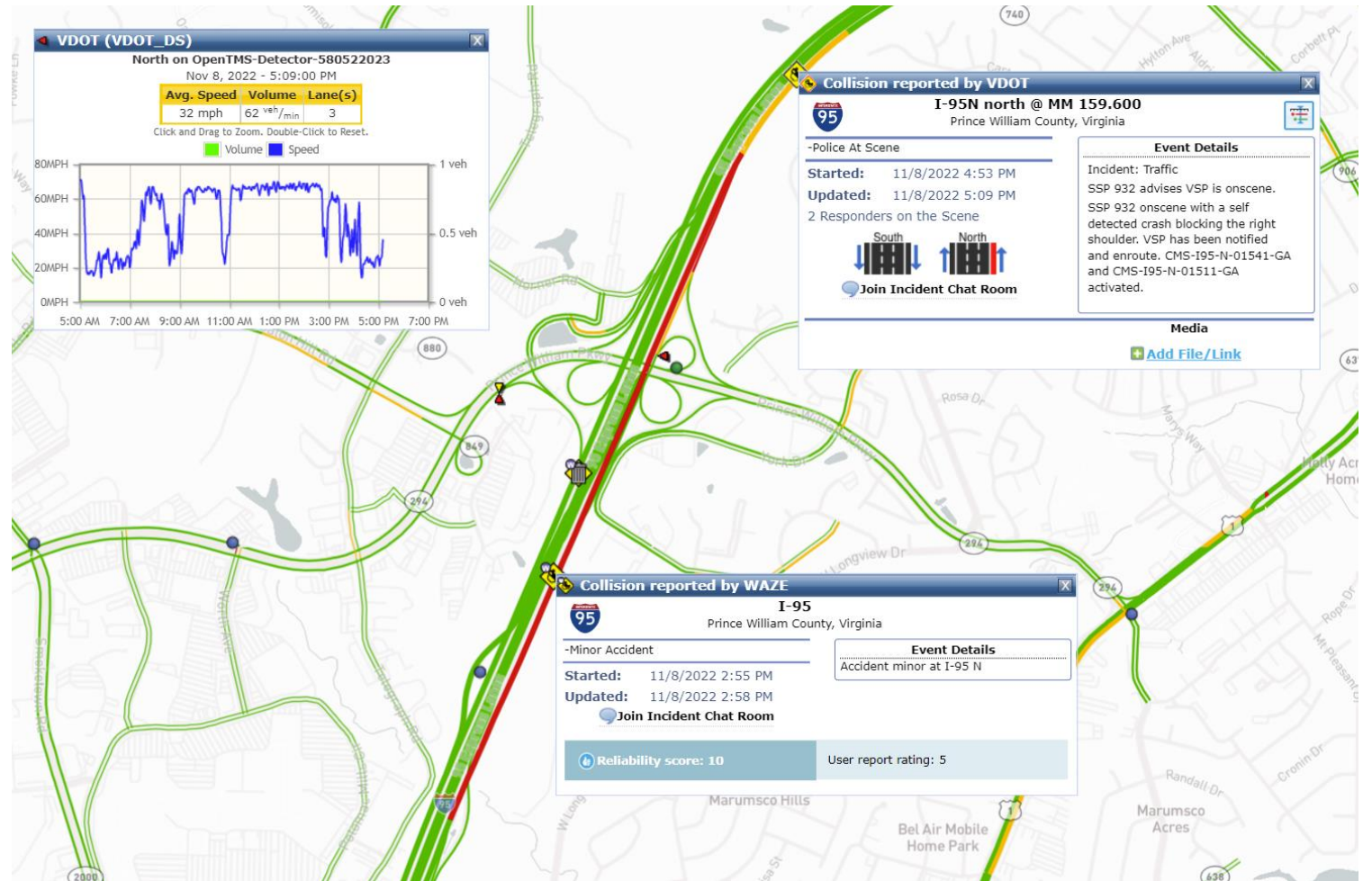
POST request to:

<https://rm3p-api.ritis.org/rm3p/event/>

```
<event-filter xmlns="http://www.ritis.org/schema/filter">
  <systems>
    <system>waze</system>
  </systems>
  <location-filters>
    <state>VA</state>
    <tmc-filter>
      <tmc>110+04151</tmc>
    </tmc-filter>
  </location-filters>
</event-filter>
```

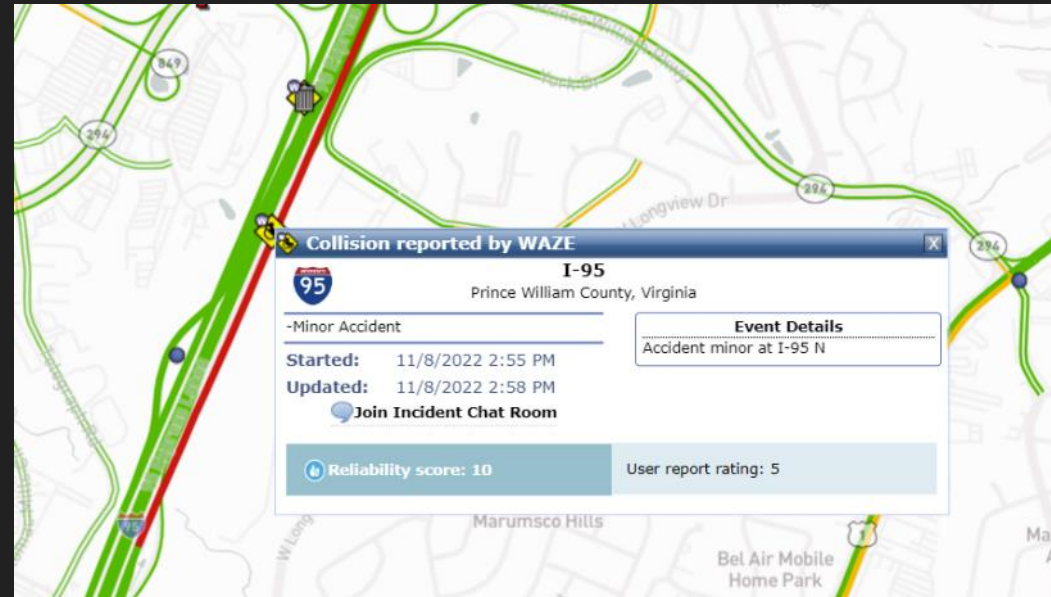
Waze  
Source

Incidents on a specific TMC



# Waze Recorded Incident

```
?xml version="1.0" encoding="UTF-8" standalone="yes" ?
ns2:advisoryInformation xmlns:ns2="https://filter.ritis.org/reference/schema/atis_tmdd/ATIS.xsd">
<messageHeader>
  <sender>
    <agencyName>RITIS</agencyName>
  </sender>
  <messageID>0</messageID>
  <timeStamp>2022-11-08T17:32:38.889-05:00</timeStamp>
  <msgCount>0</msgCount>
  <localMessageHeader>
    <totalEvents>1</totalEvents>
    <filteredEvents>0</filteredEvents>
  </localMessageHeader>
</messageHeader>
<responseGroup>
  <event>
    <head>
      <id>WAZE_f7f68d3f-5566-4cca-8803-fb1f23138d92</id>
      <charSet>utf8</charSet>
      <issuingAgency>Waze</issuingAgency>
      <updateTime>2022-11-08T14:58:34.697-05:00</updateTime>
    </head>
    <location>
      <locationName>I-95</locationName>
      <pointLocation>
        <geoLocationPoint>
          <latitude>38650341</latitude>
          <longitude>-77282745</longitude>
        </geoLocationPoint>
        <adminArea>
          <city>Marumsc0 Cdp</city>
          <county>Prince William</county>
          <state>Virginia</state>
        </adminArea>
      </pointLocation>
    </location>
    <typeEvent>
      <accidentsAndIncidents>incident</accidentsAndIncidents>
    </typeEvent>
    <startTime>2022-11-08T14:55:39-05:00</startTime>
    <localEventInformation>
      <tmcCode>110+04151</tmcCode>
      <regionalEvent>>false</regionalEvent>
    </localEventInformation>
  </event>
</responseGroup>
/ns2:advisoryInformation
```



# Visualize Impacts using CCTV Feeds

**POST request to:**

**<https://rm3p-api.ritis.org/rm3p/device/>**

```
<device-filter xmlns="http://www.ritis.org/schema/filter">
  <type>device_cctv</type>
  <systems>
    <system>vdot</system>
  </systems>
</device-filter>
```



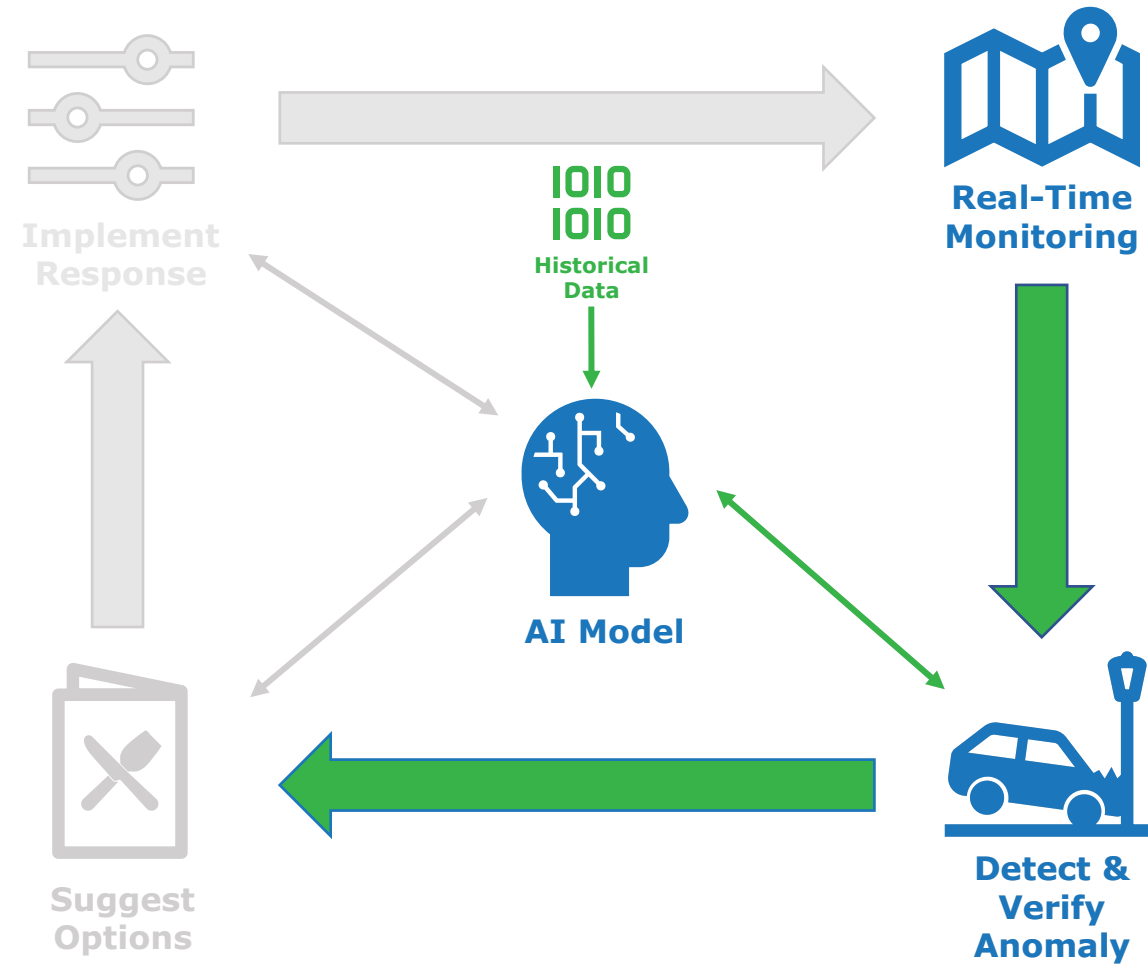
# Visualize Impacts using CCTV Feeds

```
<device>
  <device-type>CCTV</device-type>
  <device-id>VDOT_98992</device-id>
  <device-status>on</device-status>
  <cctv-info>
    <lastUpdate>2022-11-08T19:07:08.301257-05:00</lastUpdate>
    <feedID>98992</feedID>
    <urls>
      <url type="m3u8" access="public">http://s17.us-east-1.skyvdn.com:1935/rtplive/FairfaxVideo0470/playlist.m3u8</url>
      <url type="rtmp" access="public">rtmp://s17.us-east-1.skyvdn.com:1935/rtplive/FairfaxVideo0470</url>
      <url type="rtsp" access="public">rtsp://s17.us-east-1.skyvdn.com:554/rtplive/FairfaxVideo0470</url>
    </urls>
  </cctv-info>
  <location>
    <id>VDOT_98992_0</id>
    <description>I-95 MM 158 NB Exit 158, Route 294 - Prince William Pkwy</description>
    <center>
      <ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="VDOT_98992_0_c">
        <ns2:pos srsDimension="2">-77.278145 38.6565</ns2:pos>
      </ns2:Point>
    </center>
    <pointLocation>
      <ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="VDOT_98992_0_p1">
        <ns2:pos srsDimension="2">-77.278145 38.6565</ns2:pos>
      </ns2:Point>
      <onAddress>
        <road>
          <prefix>I</prefix>
          <route>95</route>
          <direction>north</direction>
          <milemarker>158</milemarker>
        </road>
        <state>Virginia</state>
        <country>USA</country>
      </onAddress>
    </pointLocation>
  </location>
</device>
```

← Stream URLs



# After detecting an anomaly, we evaluate options

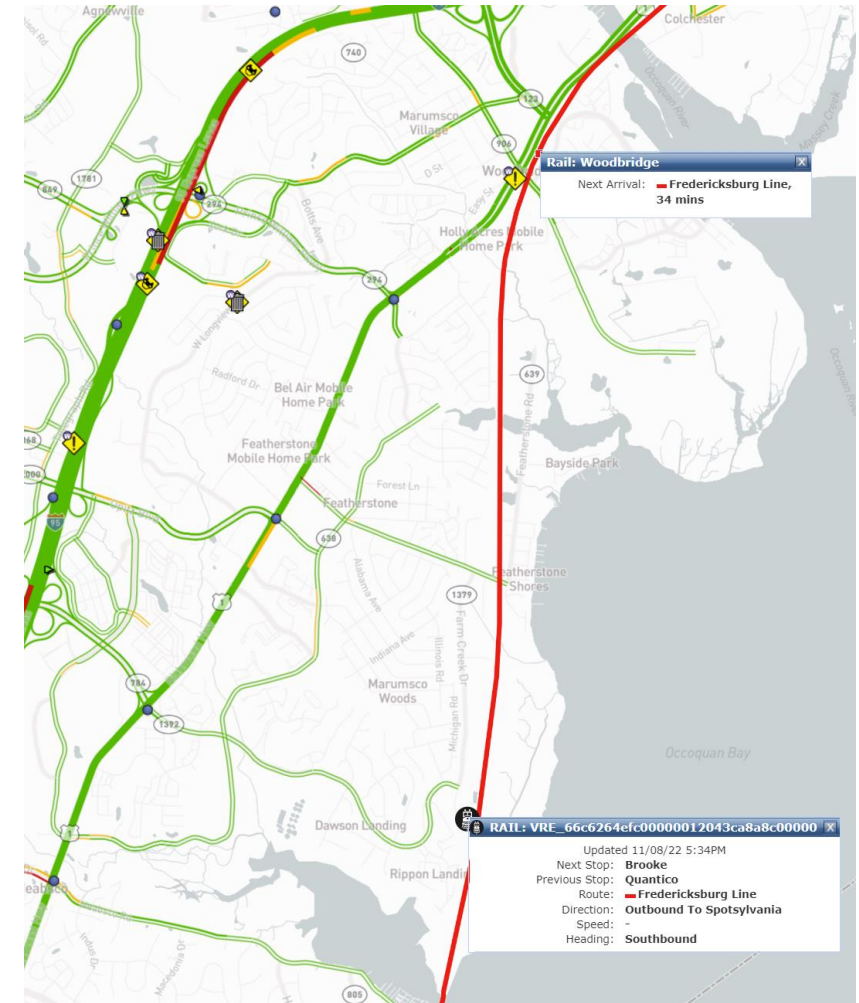


# Available Parking Capacity at VRE Stations

POST request to:

<https://rm3p-api.ritis.org/rm3p/parking/>

```
<parking-filter xmlns="http://www.ritis.org/schema/filter">
  <systems>
    <system>vre</system>
  </systems>
  <id-filters>
    <id>VRE_Woodbridge_Station_0</id>
  </id-filters>
</parking-filter>
```



# Available Parking Capacity at VRE Stations

```
<parkingLot>
  <id>VRE_Woodbridge_Station</id>
  <name>Woodbridge Station</name>
  <totalSpaces>738</totalSpaces>
  <location>
    <id>VRE_Woodbridge_Station_0</id>
    <center>
      <ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="VRE_Woodbridge_Station_0_c">
        <ns2:pos srsDimension="2">-77.24634 38.660179</ns2:pos>
      </ns2:Point>
    </center>
    <pointLocation>
      <ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="VRE_Woodbridge_Station_0_p1">
        <ns2:pos srsDimension="2">-77.24634 38.660179</ns2:pos>
      </ns2:Point>
      <onAddress>
        <road>
          <name>1040 Express Way</name>
        </road>
        <city>Woodbridge</city>
        <zipcode>22191</zipcode>
        <state>Virginia</state>
        <country>USA</country>
      </onAddress>
    </pointLocation>
  </location>
  <status>
    <timestamp>2022-11-08T17:36:21.000-05:00</timestamp>
    <freeSpaces>692</freeSpaces>
    <occupancyPercent>6</occupancyPercent>
    <availability>1</availability>
  </status>
</parkingLot>
```

← Total parking capacity at this VRE station

← Currently free spaces

← Occupied %

← Availability code (color)

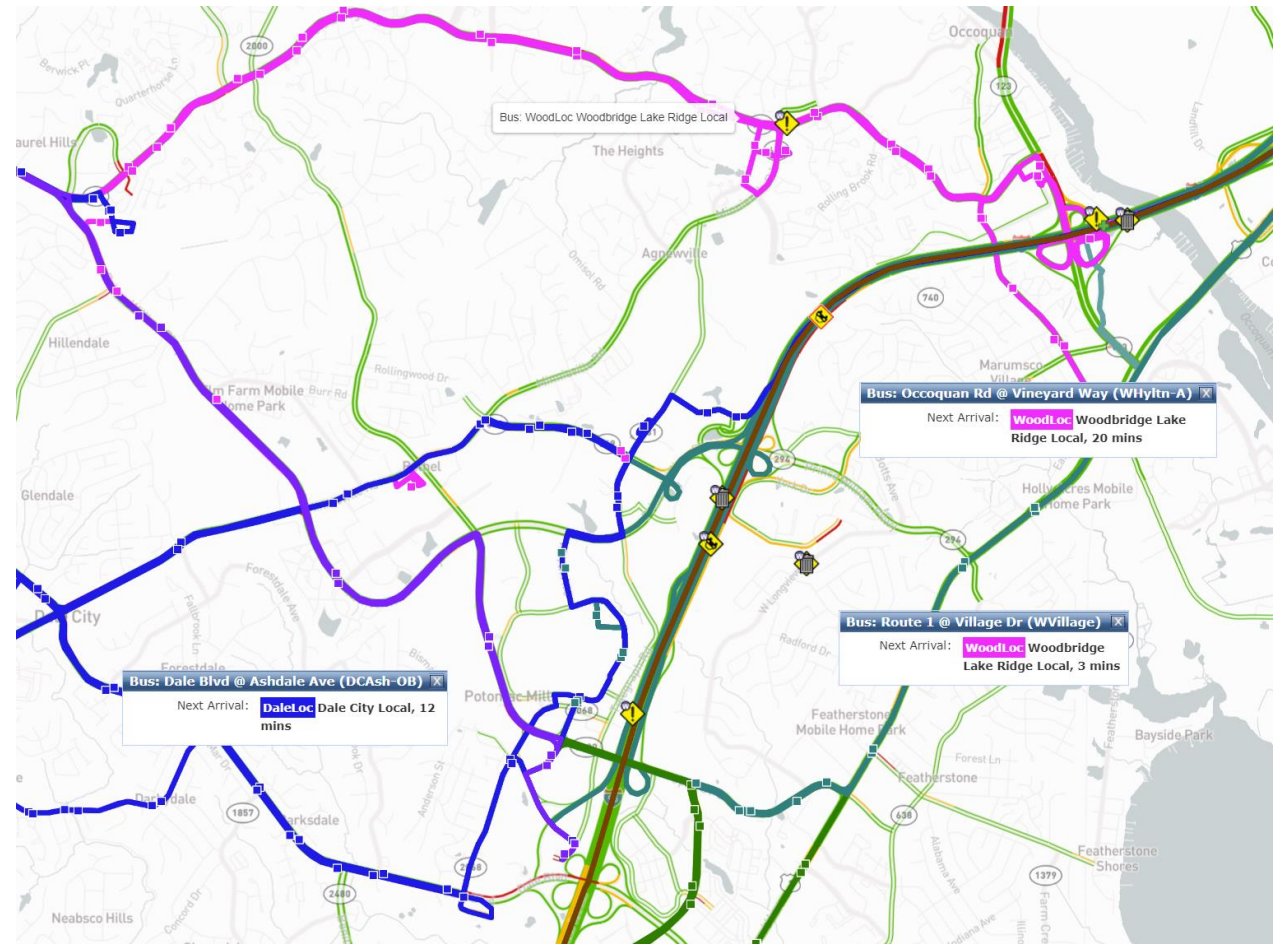


# Local Transit System Status

POST request to:

<https://rm3p-api.ritis.org/rm3p/transit/>

```
<transit-filter xmlns="http://www.ritis.org/schema/filter">
  <systems>
    <system>prtc_va</system>
  </systems>
  <type>stop</type>
</transit-filter>
```



# Local Transit System Status

```
<stop>
<head>
  <id>PRTC_VA_1716</id>
  <agency>PRTC_VA</agency>
  <code>DC0pal</code>
  <name>Dale Blvd @ Opal Ln</name>
  <description>Dale City Omnlink / PRTC Transit Center</description>
  <type>Bus</type>
  <typeId>3</typeId>
</head>
<locationType>stop</locationType>
<location>
  <id>PRTC_VA_1716_0</id>
  <center>
    <ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="PRTC_VA_1716_0_c">
      <ns2:pos srsDimension="2">-77.395422 38.671382</ns2:pos>
    </ns2:Point>
  </center>
  <pointLocation>
    <ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="PRTC_VA_1716_0_p1">
      <ns2:pos srsDimension="2">-77.395422 38.671382</ns2:pos>
    </ns2:Point>
  </pointLocation>
</location>
<schedules>
  <schedule>
    <tripID>PRTC_VA_176005</tripID>
    <routeID>PRTC_VA_3948</routeID>
    <routeLongName>Dale City Local</routeLongName>
    <routeShortName>DaleLoc</routeShortName>
    <routeColor>0000E6</routeColor>
    <description>Dale City Omnlink / PRTC Transit Center</description>
    <arrivalTime>2022-11-08T18:11:21-05:00</arrivalTime>
    <departureTime>2022-11-08T18:11:21-05:00</departureTime>
  </schedule>
  <schedule>
    <tripID>PRTC_VA_176051</tripID>
    <routeID>PRTC_VA_3948</routeID>
    <routeLongName>Dale City Local</routeLongName>
    <routeShortName>DaleLoc</routeShortName>
    <routeColor>0000E6</routeColor>
    <description>Dale City Omnlink / PRTC Transit Center</description>
    <arrivalTime>2022-11-08T18:11:21-05:00</arrivalTime>
    <departureTime>2022-11-08T18:11:21-05:00</departureTime>
  </schedule>
  <schedule>
    <tripID>PRTC_VA_176025</tripID>
    <routeID>PRTC_VA_3948</routeID>
    <routeLongName>Dale City Local</routeLongName>
    <routeShortName>DaleLoc</routeShortName>
    <routeColor>0000E6</routeColor>
    <description>Dale City Omnlink / PRTC Transit Center</description>
    <arrivalTime>2022-11-08T18:42:29-05:00</arrivalTime>
    <departureTime>2022-11-08T18:42:29-05:00</departureTime>
  </schedule>
  <schedule>
    <tripID>PRTC_VA_176071</tripID>
    <routeID>PRTC_VA_3948</routeID>
    <routeLongName>Dale City Local</routeLongName>
    <routeShortName>DaleLoc</routeShortName>
    <routeColor>0000E6</routeColor>
    <description>Dale City Omnlink / PRTC Transit Center</description>
    <arrivalTime>2022-11-08T18:42:29-05:00</arrivalTime>
    <departureTime>2022-11-08T18:42:29-05:00</departureTime>
  </schedule>
  <schedule>
    <tripID>PRTC_VA_176097</tripID>
    <routeID>PRTC_VA_3948</routeID>
    <routeLongName>Dale City Local</routeLongName>
    <routeShortName>DaleLoc</routeShortName>
    <routeColor>0000E6</routeColor>
    <description>Dale City Omnlink / PRTC Transit Center</description>
    <arrivalTime>2022-11-08T19:01:58-05:00</arrivalTime>
    <departureTime>2022-11-08T19:01:58-05:00</departureTime>
  </schedule>
</schedules>
</stop>
```

```
<schedule>
  <tripID>PRTC_VA_176005</tripID>
  <routeID>PRTC_VA_3948</routeID>
  <routeLongName>Dale City Local</routeLongName>
  <routeShortName>DaleLoc</routeShortName>
  <routeColor>0000E6</routeColor>
  <description>Dale City Omnlink / PRTC Transit Center</description>
  <arrivalTime>2022-11-08T18:11:21-05:00</arrivalTime>
  <departureTime>2022-11-08T18:11:21-05:00</departureTime>
</schedule>
```

Current schedule at  
the given station

# Checking Available Bicycles from Capital Bikeshare

**POST request to:**

**<https://rm3p-api.ritis.org/rm3p/bike>**

```
<bike-filter xmlns="http://www.ritis.org/schema/filter">  
  ...<system>capital_bikeshare</system>  
  ...<type>free_bike_status</type>  
</bike-filter>
```

# Checking Available Bicycles from Capital Bikeshare

```
<freeBikeStatuses>
  <header>
    <sender>RITIS Filter</sender>
    <timestamp>2022-11-08T17:59:29.941-05:00</timestamp>
    <totalEntries>173</totalEntries>
    <filteredEntries>0</filteredEntries>
  </header>
  <statuses>
    <status>
      <id>CAPITAL_BIKESHARE_BIKE_02478c834cb3abae4350b5cc538a92f0</id>
      <updated>2022-11-08T17:57:31-05:00</updated>
      <type>electric_bike</type>
      <location>
        <center>
          <ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="CAPITAL_BIKESHARE_BIKE_02478c834cb3abae4350b5cc538a92f0_c">
            <ns2:pos srsDimension="2">-76.986661 38.89977</ns2:pos>
          </ns2:Point>
        </center>
        <pointLocation>
          <ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="CAPITAL_BIKESHARE_BIKE_02478c834cb3abae4350b5cc538a92f0_p1">
            <ns2:pos srsDimension="2">-76.986661 38.89977</ns2:pos>
          </ns2:Point>
          <onAddress>
            <county>District of Columbia</county>
            <countyFull>District of Columbia</countyFull>
            <state>District of Columbia</state>
            <country>USA</country>
          </onAddress>
        </pointLocation>
      </location>
      <reserved>>false</reserved>
      <disabled>>false</disabled>
    </status>
    <status>
      <id>CAPITAL_BIKESHARE_BIKE_03b4fd469e5276e639f55091a03fda2b</id>
      <updated>2022-11-08T17:55:52-05:00</updated>
      <type>electric_bike</type>
      <location>
        <center>
          <ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="CAPITAL_BIKESHARE_BIKE_03b4fd469e5276e639f55091a03fda2b_c">
            <ns2:pos srsDimension="2">-77.034796 38.900308</ns2:pos>
          </ns2:Point>
        </center>
        <pointLocation>
          <ns2:Point xmlns:ns2="http://www.opengis.net/gml/3.2" srsName="EPSG:4326" ns2:id="CAPITAL_BIKESHARE_BIKE_03b4fd469e5276e639f55091a03fda2b_p1">
            <ns2:pos srsDimension="2">-77.034796 38.900308</ns2:pos>
          </ns2:Point>
          <onAddress>
            <county>District of Columbia</county>
            <countyFull>District of Columbia</countyFull>
            <state>District of Columbia</state>
            <country>USA</country>
          </onAddress>
        </pointLocation>
      </location>
      <reserved>>false</reserved>
      <disabled>>false</disabled>
    </status>
  </statuses>
</freeBikeStatuses>
```

← Type of bike available

← Bike's location

← Bike status

# Checking the Current Toll Rates on Express Lanes

**POST request to:**

**<https://rm3p-api.ritis.org/rm3p/toll/>**

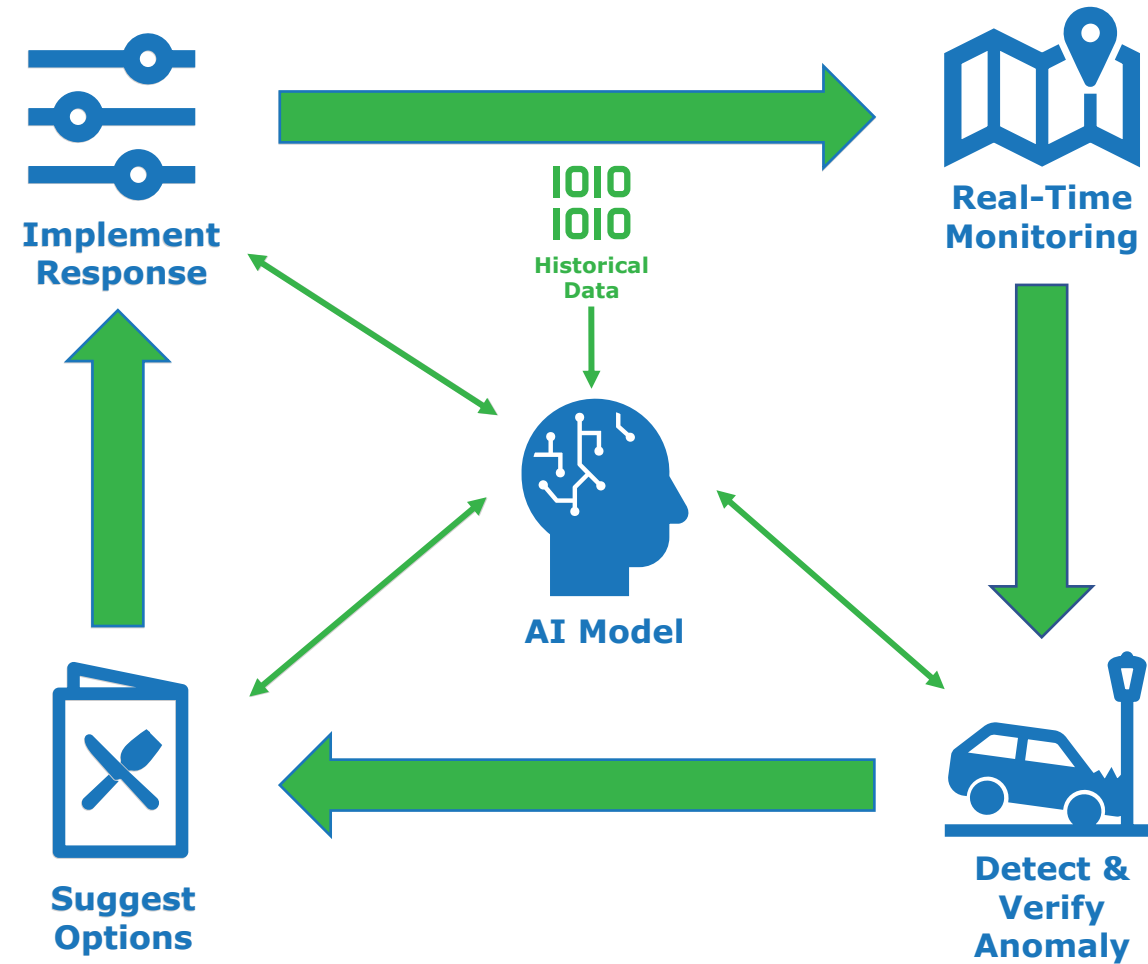
```
<toll-filter xmlns="http://www.ritis.org/schema/filter">
  <systems>
    <system>vdot</system>
  </systems>
</toll-filter>
```

# Checking the Current Toll Rates on Express Lanes

```
<rate>
  <odPair>GARRISONVILLE TO GORDON BLVD VIA I-95</odPair>
  <startZone>1-1 NB TP</startZone>
  <endZone>2N-2 NB TP</endZone>
  <rate>4.75</rate>
  <startTime>2022-06-23T19:53:33-04:00</startTime>
  <endTime>2022-06-23T20:03:33-04:00</endTime>
  <calculatedTime>2022-06-23T20:00:07-04:00</calculatedTime>
  <location>
    <pointLocation>
      <onAddress>
        <road>
          <prefix>I</prefix>
          <route>95</route>
          <name>I-95-SB</name>
        </road>
        <state>Virginia</state>
        <country>USA</country>
      </onAddress>
    </pointLocation>
  </location>
</rate>
```

← Current toll rate

# Implement the response plan, and observe the outcome



# What data is available?



## RM3P Data-Exchange Platform

<https://rm3p.ritis.org/data/sets>

Data Set List (as of 8/31/2022)

Data Source	Data Coverage	Data Types
VDOT OpenTMS	Virginia Statewide - Interstate	<ul style="list-style-type: none"> <li>• Device Status (DMS, Gate Controllers)</li> <li>• Incidents and Events</li> <li>• Special Events</li> <li>• Work Zones</li> <li>• Detectors</li> </ul>
VDOT TMS Wavetronix	Virginia Statewide - Interstate	<ul style="list-style-type: none"> <li>• Detectors</li> </ul>
Waze	Virginia Statewide	<ul style="list-style-type: none"> <li>• Incidents</li> </ul>
INRIX	Virginia Statewide	<ul style="list-style-type: none"> <li>• Historical Speed</li> <li>• Historical Travel Time</li> <li>• Real-time Speed</li> <li>• Real-time Travel Time</li> </ul>
VRE	Manassas Line and Fredericksburg Line	<ul style="list-style-type: none"> <li>• GTFS</li> <li>• GTFS-RT</li> <li>• Parking Occupancy and Capacity</li> </ul>
VDOT Parking	Virginia Statewide	<ul style="list-style-type: none"> <li>• Parking Lot Inventory</li> <li>• Parking Lot Typical Occupancy</li> </ul>
VDOT RWIS	Virginia Statewide	<ul style="list-style-type: none"> <li>• ESS Measurements</li> </ul>
Capital Bikeshare	National Capital Region	<ul style="list-style-type: none"> <li>• Real-Time System Data</li> <li>• Station Metadata and Bike Status</li> <li>• Free Bikes Status</li> </ul>
WMATA	National Capital Region	<ul style="list-style-type: none"> <li>• Rail GTFS</li> <li>• Rail GTFS-RT</li> <li>• Rail Incidents</li> <li>• Station Incidents</li> <li>• Bus GTFS</li> <li>• Bus GTFS-RT</li> <li>• Bus Incidents</li> <li>• Parking Lot Capacity</li> </ul>

PRTC	Prince William & Stafford	<ul style="list-style-type: none"> <li>• GTFS</li> <li>• GTFS-RT</li> </ul>
Arlington Transit	Arlington	<ul style="list-style-type: none"> <li>• GTFS</li> <li>• GTFS-RT</li> </ul>
Alexandria DASH	Alexandria	<ul style="list-style-type: none"> <li>• GTFS</li> <li>• GTFS-RT</li> </ul>
Fairfax Connector	Fairfax	<ul style="list-style-type: none"> <li>• GTFS</li> <li>• GTFS-RT</li> </ul>
Loudoun County Transit	Loudoun	<ul style="list-style-type: none"> <li>• GTFS</li> </ul>
Fredericksburg Regional Transit	Metropolitan Fredericksburg	<ul style="list-style-type: none"> <li>• GTFS</li> </ul>
Transurban	Northern Virginia - I-95/495 Express Lanes	<ul style="list-style-type: none"> <li>• Incidents and Events</li> <li>• Gate Controllers</li> <li>• DMS</li> <li>• Detectors</li> </ul>
SmarterRoads	I-95/495 Express Lanes and I-66 Inside the Beltway	<ul style="list-style-type: none"> <li>• Toll Rates</li> </ul>
City-University Energysaver (CUE) Bus	City of Fairfax	<ul style="list-style-type: none"> <li>• GTFS</li> </ul>
RITIS	Virginia Statewide	<ul style="list-style-type: none"> <li>• CCTV Streams (for human consumption)</li> </ul>
VDOT TMS*	Virginia Statewide	<ul style="list-style-type: none"> <li>• Archived QA/QC-ed Continuous Count Stations</li> </ul>
VDOT*	Virginia Statewide	<ul style="list-style-type: none"> <li>• Bike Facilities Inventory</li> </ul>
Virginia DRPT*	All Virginia public transit agencies and WMATA (for trips originating or terminating in the Commonwealth)/td>	<ul style="list-style-type: none"> <li>• Historic Aggregated Ridership</li> </ul>
Arlington County*	Arlington County	<ul style="list-style-type: none"> <li>• Continuous Counts</li> </ul>

\* Expected by the end of 2022 calendar year



# So, What's Next?!

*More data in the future? Absolutely!*

*But ... it depends on funding and priority of business cases that data enables.*

*Top priority is to support other RM3P elements and ingest data from RM3P*

***Do you have data to share via DEP?***

***Contact [RM3P@vdot.virginia.gov](mailto:RM3P@vdot.virginia.gov)***

*User Support*

*Ensure users receive exceptional service to enable their use cases.*

*Goal: achieve efficient data democratization*

***Do you have a use case to share with others?***

***Contact [RM3P@vdot.virginia.gov](mailto:RM3P@vdot.virginia.gov)***

*Continuous Improvements*

*Performance metrics, user feedback, and technology evolution: improvements*

*Combine data where appropriate to create value and save users' time.*

# Responses to Questions from Open House Chat Room

What would be the DEP API registration process for an existing RITIS user? There seemed no specific option for the purpose at [ritis.org/register](https://ritis.org/register). Thanks.

For existing RITIS users, we will ask them to read and agree relevant terms and conditions to access data that they do not currently have access to from RITIS.

You mentioned training the model. How much technical specific knowledge would be expected from the user for this step? What does "training" mean in this context?

"Training" a model typically means to use a data set to "train" a Machine Learning algorithm. The dataset should have an influence on the model output. The result of correlating the dataset through algorithm with the processed output is normally used to modify the model. Users who use data to train their models will likely use some sort of programming languages such as Python, R, SQL, or SAS to analyze and manage large chunks of data and apply machine learning and deep learning into their work to predict the outcomes for supporting business decision making.

# Responses to Questions from Open House Chat Room

DEP is not a data archive system. In the overall RM3P program, will there be any data reporting system that will capture the impact of travelers' decision-making? Basically to identify, whether RM3P was successful in positively/proactively modify travel choices?

There will be an independent performance evaluation, led by VDOT's Transportation Research Council, on the RM3P program as a whole to assess the net effect of the entire RM3P program and on individual projects and their effect on travel in both the Northern Virginia and Metropolitan Fredericksburg areas (where applicable). Data sources for this evaluation are not limited to what DEP offers. DEP is implementing a proxy server to capture required evaluation metrics on DEP and a dashboard GUI for the evaluators' use. Three other project development vendors will also provide relevant data for the evaluators' use while the evaluators will also collect additional data.

To detect a sudden drop in probe speed data, what would be the latency expected? a minute?

Inrix probe data is refreshed every minute. DEP receives and pushes this data directly to the output APIs without adding additional latency.

# Responses to Questions from Open House Chat Room

Who is managing the "Join incident Chat room" icon and button?

This question is referring to a screen capture from the DEP demo. Those screen captures were not part of DEP, just demonstrating how data from DEP could be used and visualized. "Join incident Chat room" is a feature in RITIS where individuals viewing an incident can create a chat room and coordinate directly within RITIS. It is not a DEP function.

Where is the user agreement located to allow sharing of the CCTV feeds with outside entities?

While not all data is available to all users, VDOT's CCTV feeds are currently available for RITIS users. When public agency users request access to this same CCTV feeds output API via DEP, no additional user agreement will be required. For non-public agency users who request access to CCTV feeds, they will be prompted to follow VDOT's agreement and approval process which can be found online at [https://www.viriniadot.org/newsroom/511\\_video.asp](https://www.viriniadot.org/newsroom/511_video.asp).

# Closing Remarks



**Cathy McGhee**

RM3P Executive Committee Chair  
VDOT Chief Deputy Commissioner

Cathy McGhee was appointed VDOT's Chief Deputy Commissioner in May 2022. With more than 30 years of experience, she carries a wealth of industry knowledge to continue positioning VDOT as a leader in transportation innovation and technology. Cathy is the RM3P Principal and oversees all aspects of RM3P to ensure that the program meets its vision, goals, and objectives.



# Thank You for Your Participation

For any questions, please contact us at:  
[rm3p@vdot.virginia.gov](mailto:rm3p@vdot.virginia.gov)