



Material Delivery Management System (MDMS): Using Technology Through Electronic Ticketing

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2022 Minnesota Construction Summit | Building Together Again

January 11-12, 2022 at the St. Paul RiverCentre

Standard Specification for Material Delivery Management System

AASHTO Designation: M-xxx-yy¹

Technical Subcommittee: No., Name

Release: Group-n (Month-yyvv)

AASHTO

American Association of State Highway and Transportation Officials
444 North Capitol Street, N.W., Suite 249
Washington, D.C. 20001

TS-no

M-xxx-1

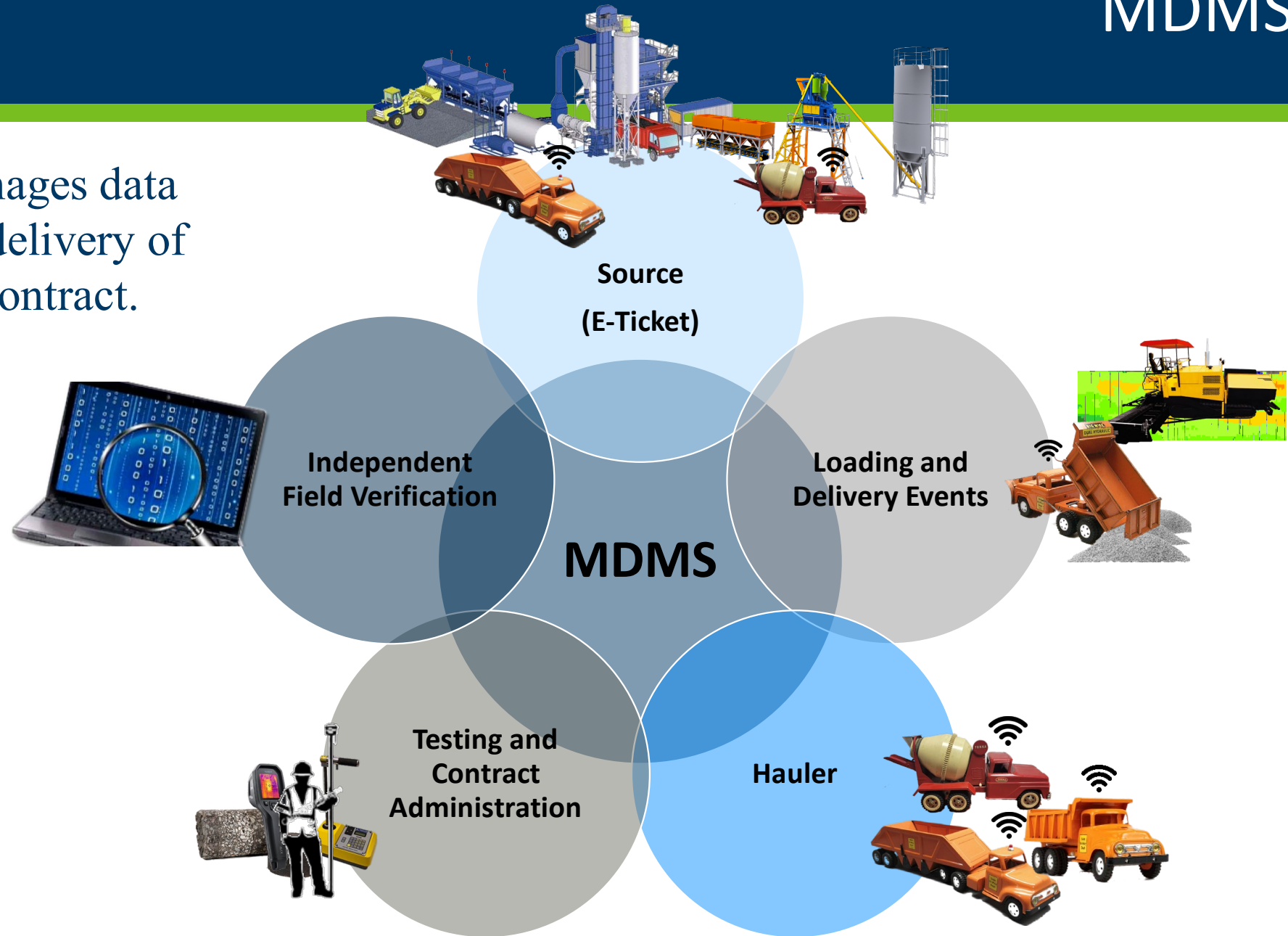
AASHTO



AASHTO Provisional Practice

MDMS

System that manages data associated with delivery of material to a contract.



Extensive Vendors & Users = Varying Field Names, Databases, Uses ...



Image by [Gerd Altmann](#) from [Pixabay](#)

50 State DOTs

19,502
Cities

3,006
Counties

FHWA

Contractors

68,599 Paving Contractors
53,320 Concrete Contractors
47,368 Grading Contractors

Producers

2,066 Ready-Mix Concrete
3,500 Asphalt Production
3,600 Aggregate Producers

640 million acres Federal Lands
326 Tribal Land Areas

Auditors

Consultants

30 +
MDMS
Vendors

Maintenance

Equipment and Solution
Providers

Development of National Standard

AASHTO PPXX

“Standard Practice for Material Delivery Management System”

MnDOT's the Steward:

- Provisional Practice Development
- Expert Task Group

Academia	FHWA
Associations	Industry
Auditors	Labor
Civil Rights	Compliance
Contractors	Suppliers
DOT's	



Sometimes an Analogy Helps . . .

If you had a room full of 20,000 different books

(Varying MDMS Requirements)

You would hire a librarian to organize them

(AASHTO)

The librarian would use the Dewey Decimal system

(AASHTO Standard)

Once the organization was complete . . .

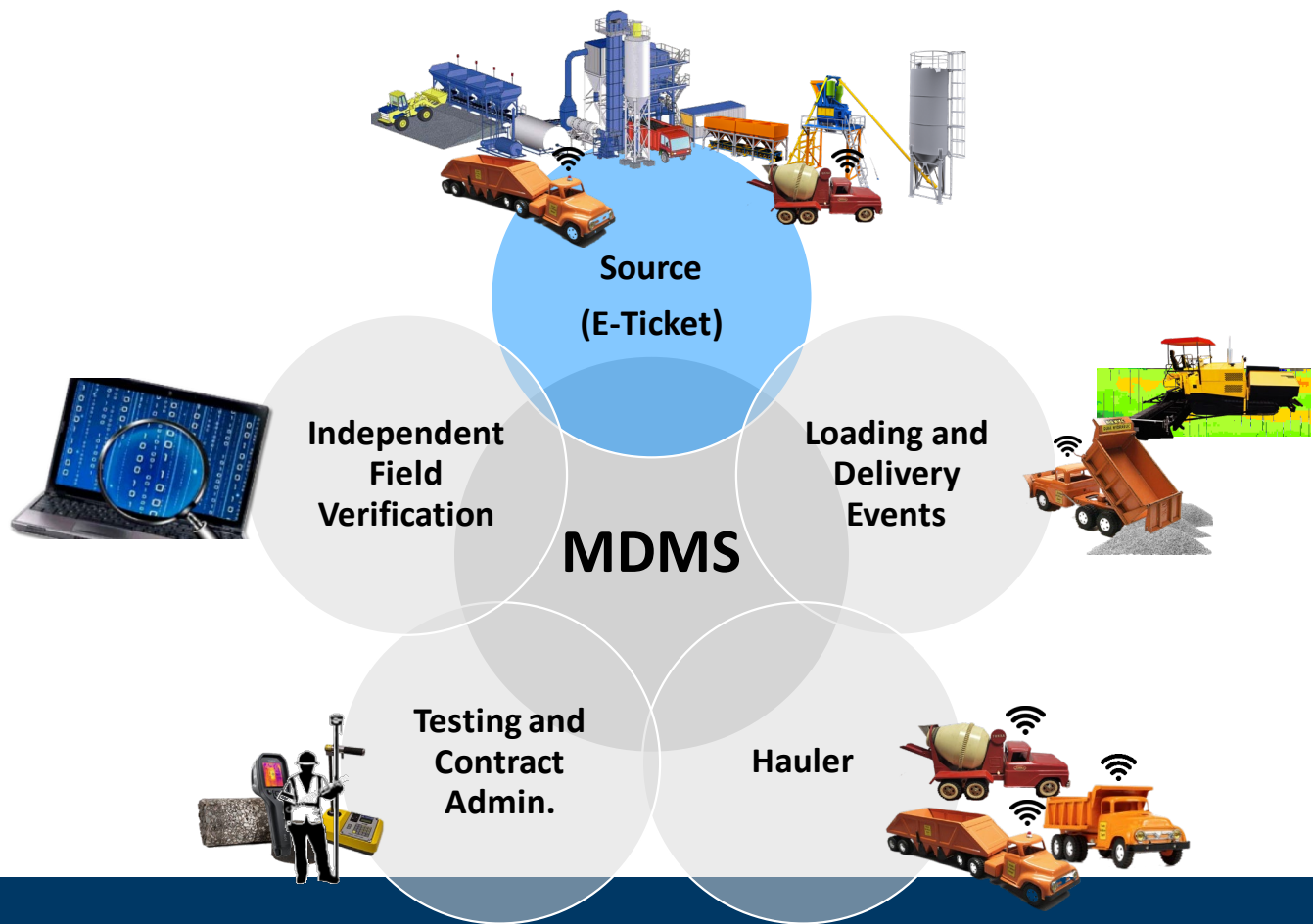
Anyone can walk into that room and find any book using the Dewey Decimal system

(Vendors, States, Suppliers, Contractors, Municipalities, ...)



MDMS Provisional Practice Publication

- AASHTO Data Standards Committee 
- Publication: 2022
- 1st Publication to Include:
 - Aggregate
 - Asphalt
 - Concrete
- Future Publications:
 - Add additional materials over time (e.g., salt, etc.)



Source Data (E-Ticket)

Internet / Satellite Connectivity

Contractor Task

Section: 4.2.2

- Establish Internet (or Satellite Connectivity) at Permanent and Portable Sources
 - Allows viewing of E-Ticket by Construction Staff
- Lessons Learned
 - Setup on Portable Sources Often Overlooked
 - Perch Devices – Low Lying Areas
 - Add Booster Antenna



Truck Identification

Contractor Task

- Ensure Distinct ID for Truck/Trailer ID used in Contractor's MDMS, in all source loadout software, and in hauler data.
- Lessons Learned
 - Inconsistent between Source Loadout Software
 - 16tr ≠ 16TR
 - MTO's
 - Multiple trucks with same #
 - Affects
 - Flow Rates
 - Asset Tracker Assignments
 - Truck Summary Reports



Lesson's Learned

Distinct Truck Identifications (cont.)

- Extremely difficult for suppliers to obtain truck ID's in advance for MTO's.
- MTO truck ID often different than what supplier is using.
- December ETG meeting Discussion:
 - “Facial Recognition of Truck” – artificial intelligence
 - License Plates
 - Not all states require license plates on front of truck where visible when approaching scale
 - Dirty Plates
 - Europe uses 100% license plates
 - Doesn't always ID who needs to get paid by supplier
 - Privacy law issues?

Lesson's Learned

Distinct Truck Identifications (cont.)

- December ETG meeting Discussion (cont.):
 - VIN#
 - Too Long
 - Not easily visible to inspector in field / reduced safety required to read #
 - ID trucks with Cameras
 - QR Code on Windshield
 - Reduced safety – requires inspector to again walk up to truck to scan QR code to determine truck ID
 - Not accepted by all drivers
 - If ID cannot be read by scale operator than it cannot be verbalized

Lesson's Learned

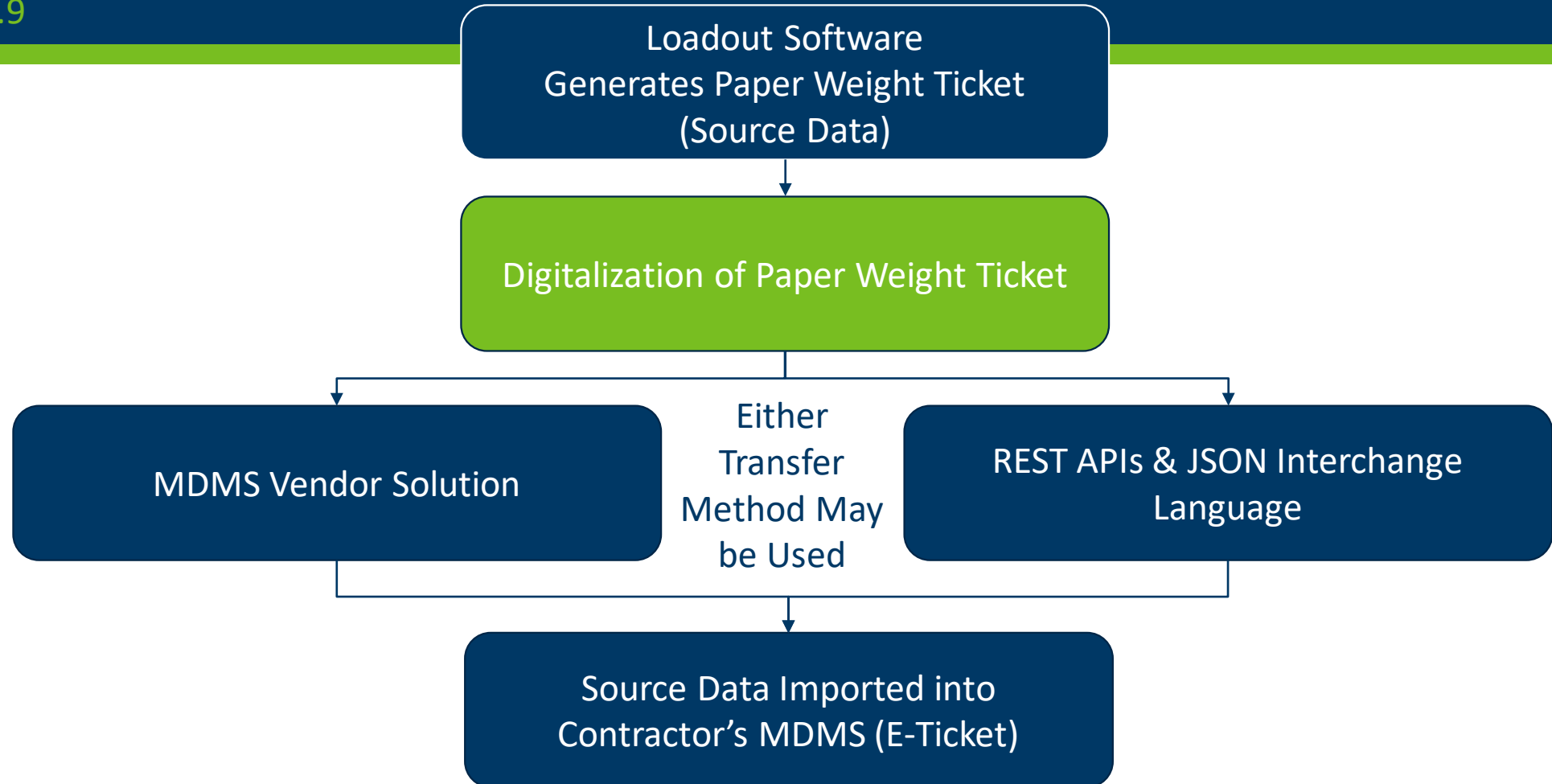
Distinct Truck Identifications (cont.)

- December ETG meeting Discussion (cont.):
 - Include vendor info in truck ID (e.g., license plate + last 4 digits of vendor #)
 - Vendor # associated with truck might not reflect who needs to be paid - this might change per day / load
 - Driver doesn't always know who they are worker for under a given broker.
 - Truck & Trailers might be paid at 2 different rates.
 - Need to ensure that truck ID is easily visualized on trucks.

Set Up Source (E-Ticket) Data Transmittal

Contractor Task

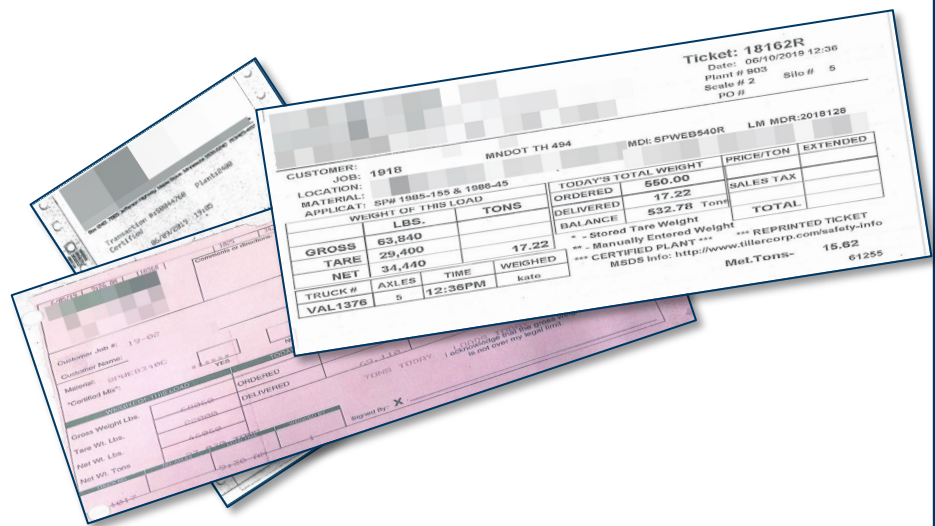
Section: 4.1.1.9



Source Data Availability in Contractor's MDMS User Interface

2 Minutes | Point of Sale to Contractor's MDMS

1 Minute | Contractor's MDMS to Contractor's User Interface



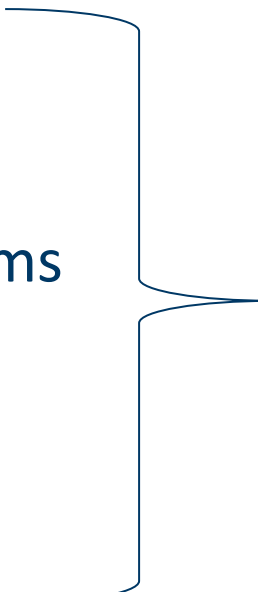
Ticket Number	
Contract Identification	
Agency Project Identification	
Contractor Name	
Source Identification	Gross Weight
Scale ID	Net Weight
Silo ID	Truck Tare Weight
Source Operator Name	Overweight Weight
Source Operator Certification No.	Daily Running Total By Material Code Quantity
Source Notes	Contract Total by Material Code Quantity
Mix Design Identification	Batched Quantity
Material Code	Ingredient Code
Pay Item Identification	Ingredient Source Name
Load Number	Target Batch Ingredient Quantity
Truck Identification	Actual Batched Ingredient Quantity
Trailer Identification	Batched Quantity Percent Variance
Voided Ticket	Total Moisture Factor Percent
Loading Date and Time	Water Added at Source Quantity
	Water Available to Add Quantity
	Drum (Mixing) Revolutions at Source
	Total Drum Revolutions at End of Dump (Discharge)
	Quality Control Signature
	Quality Control Identification
	Quality Control Technical Certification ID

Table 1. Source (E-Ticket) Data Fields

Source Data Transmittal

Lessons Learned

- DOS-Based Systems
 - Upgrading to GEN OS
- Limited Processing Capacity
 - ↑
- Maintenance Updates
 - Affected Data Transfer
- Varying Loadout Software Platforms
 - Extensive Time Resources
 - Each Source Treated Separately



Recommend Using REST API's / JSON
(Section 4.1.1.9.4)

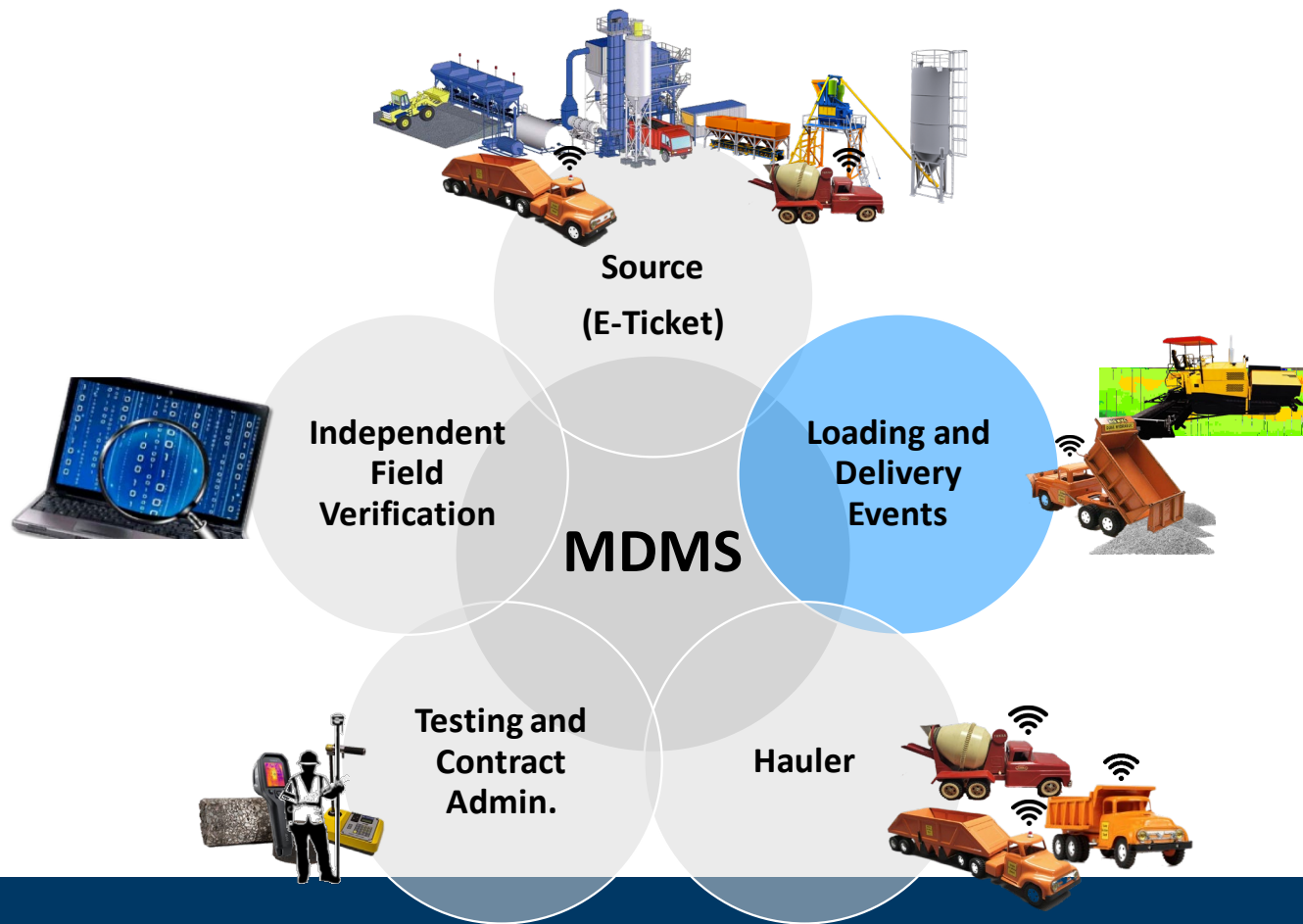


Table 13. Loading & Delivery Event Data Fields

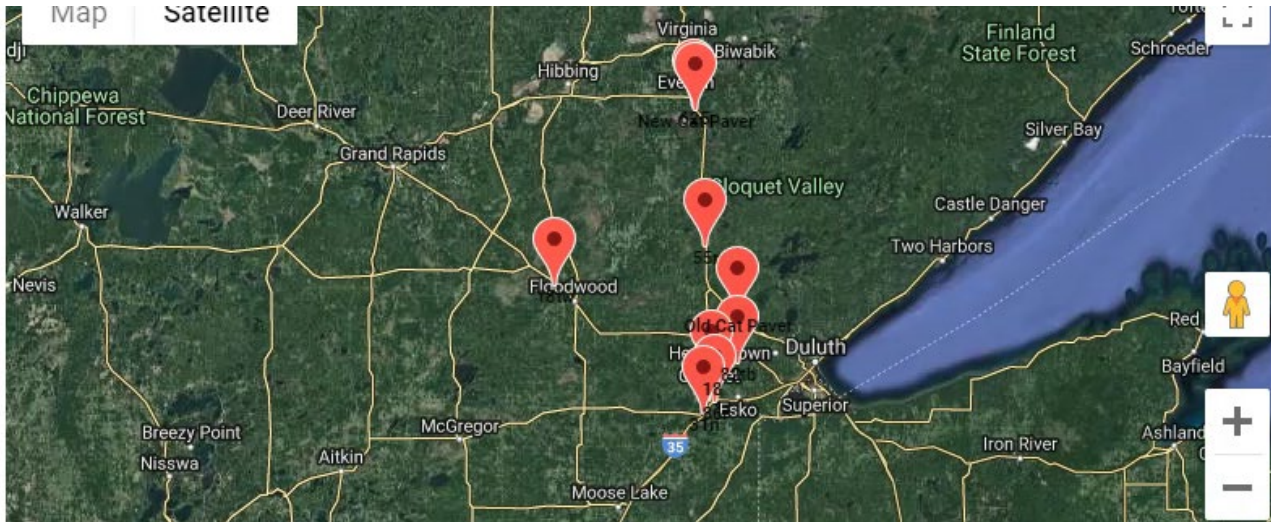
Ticket Number
Source Identification
Loading Date and Time
Geofence Identification
Geofence Type
Date and Time
Event Type
Latitude
Longitude
Spatial Reference Authority
Spatial Reference Identification
Time Span
Machine Identification

Loading and Delivery Event Data

Set Up Real-Time Tracking of Truck Transit Flow

Contractor Task

Section: 4.1.1.6.4, 4.1.1.6.5, 4.1.1.15

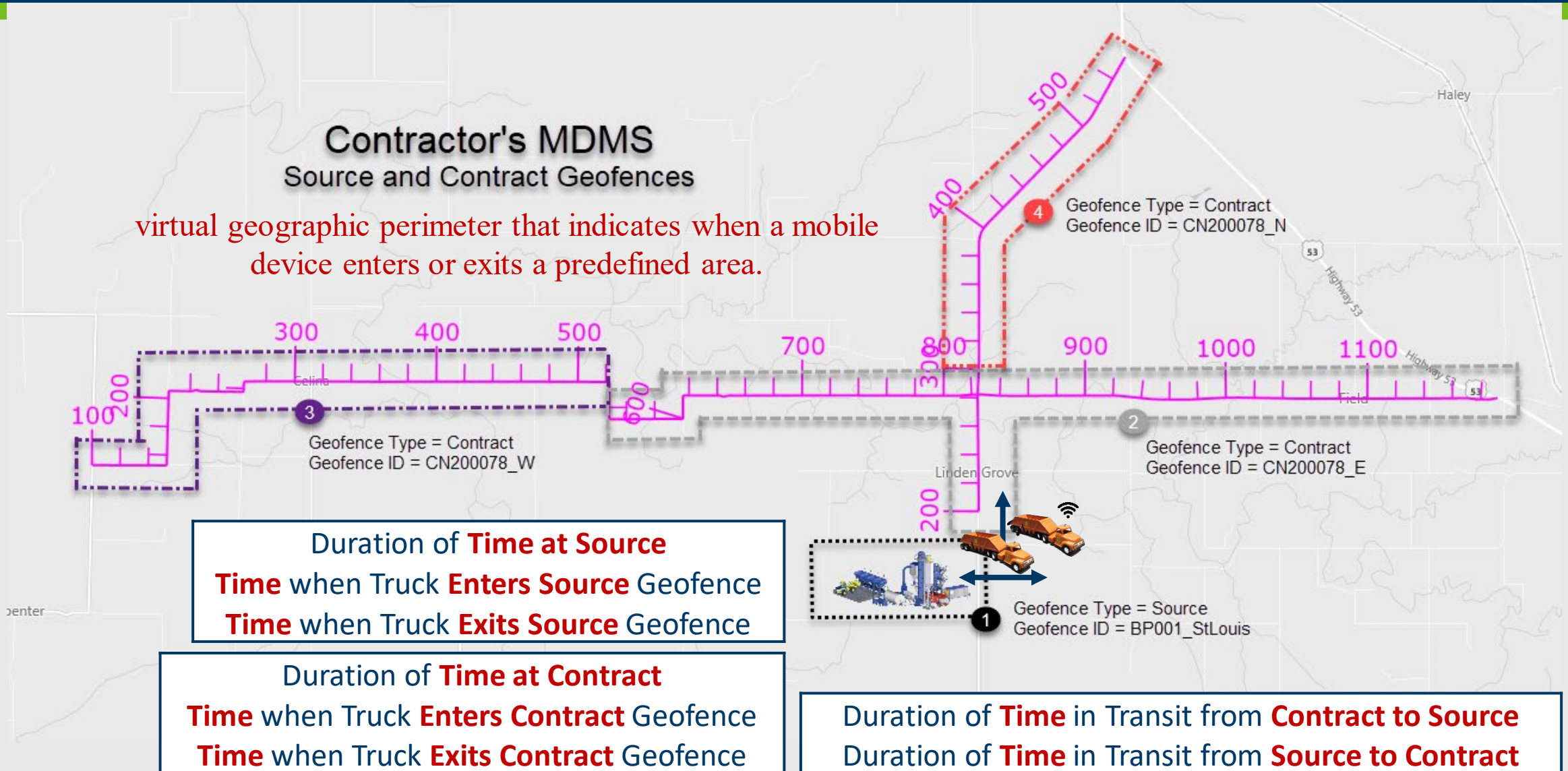


- Breadcrumb Trail
 - Ping Rate ≤ 1 minute
 - Playback
 - Haul Route
- Truck Flow Rates
- Estimated Time of Arrival

...accessible until 90 days after final acceptance of all work

Establishment of Contract and Source Static Geofences

Contractor Task



- Ensure source geofence large enough to include line of trucks entering source.
- Trucks often line up on road before getting loaded.
 - Time spent, in line, outside of plant waiting to be loaded counts towards prevailing wage hours.

4.2.3 Set up source geofence to include road (and/or area) outside of source limits where trucks que before entering source for loading.

Benefits of Source and Contract Geofences and Dump Event Generation of Flow Rates

- Identification of Inefficiencies
 - Which trucks are taking too long to deliver material?
 - Which trucks are not using designated haul routes?
 - Why are given trucks parked?
 - Which haul routes are most optimal at given times of the day?
 - How many trucks are needed for the day?
- Optimization of Paving Operation
 - Control rate mix is coming out of plant
 - Match paver speeds to delivery of material

Time Stamps

Durations

Estimated Arrival Times

Benefits of Source and Contract Geofences and Dump Event Labor Compliance / Civil Rights

Contractor Buy-In = Prevailing Wage Documentation

- Trucking Second Top Expense
- Prevailing Wage Reports = Complex
- Haulers – long shifts – limited time to complete reports
- Contractor's responsibility
 - Accurate Prevailing Wage Reports
 - Truck Hauler Paid Correctly
 - Davis Bacon Law, DBE – Small Business Hours, etc.

Set Up Dump Event Trigger

Contractor Task

Section: 4.1.1.5 & 4.1.1.8

- Ability to trigger dump event for recording:

Duration of time in truck ^{a, b}
Material is dumped (delivered/discharged) ^c
Time
Lat/Long
Time at end of dump (final discharge) ^b
Time at start of dump (discharge) ^b

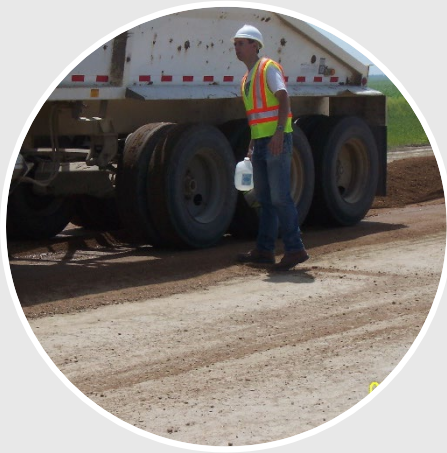
Notes:

- ^a "Duration of time in truck" equals the duration of time between the time at end of dump and the loading time ($\text{TimeInTruck} = \text{TimeAtDumpEnd} - \text{LoadDateTime}$)
- ^b Ready-mixed concrete supplier sends `TimeAtDumpStart`, `TimeAtDumpEnd`, and `TimeInTruck` to Contractor's MDMS.
- ^c End of dump is considered the dump event for ready-mixed concrete applications as determined by drum rotation sensors.



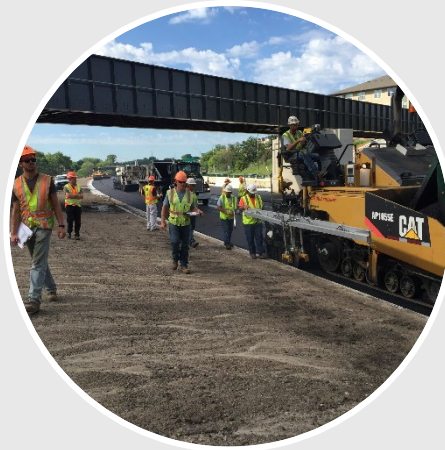
Dump Event Triggering Contractor Task

Aggregate



Automatic or Manual

Asphalt Paving



Automatic

Concrete Paving



Automatic

Ready-Mixed Concrete



Automatic or Manual

Lesson's Learned

Dump Event

- Dump Latitude, Longitude, Date, Time
 - Not Always Recorded Correctly
- Affected By:
 - Geofence Shape = Circular
 - Echelon Paving, Secondary Pavers
 - Geofence Radius = Too large? Too small?
 - Delivery Equipment
 - Paving Crew = Quick Truck Exchange? Slow Truck Exchange?
 - Obstructions of Asset Trackers (on floor, under seat, covered up, unpowered ...)
- Contractor Need = Time and Experience
- Vendor Need = Pilot Projects, Enhance, Optimize

Lesson's Learned

Dump Event (cont.)

Items discussed during December ETG meeting:

- Material transfer vehicle bringing mix to multiple pavers
- Need contingency plan within specification for instances where dump location will not record correctly.
 - 1 Supplier has worked on this for 5+ years and still has cases with 30 to 50% erroneous dumping events

Lesson's Learned

Dump Event (cont.)

Items discussed during meeting (cont.):

- All agreed paving applications much easier than ready mixed concrete.
- A large interest from attendees to still try to capture dump events for ready-mixed concrete
 - Set issues where material is placed
 - Bridge deck time limitations for pouring
 - Dump finished late (mix old) – beyond 90-minute window

Items discussed during meeting (cont.):

- Possible ready-mixed concrete dump trigger event solutions:
 - Power Take Off (PTO) discharge pumps – believe majority of trucks have this sensor
 - Install sensor at end of boom to correlate with truck pumping

Project and Funding Category Geofence

Example Statement of Estimated Quantities

Tab.	Sheet Number	Item Number	Item	Unit	Total Estimated Quantities	SP1007-21 (A) Notes 1, 3	SP1006-29 (A) Notes 2, 3	100% City of Mayer (B) Notes 2, 4	100% City of Watertown (C) Notes 1, 5
C	19	2360.509	Type SP9.5 Wearing Course Mixture (2,C)	Ton	352	194	158	0	0
C	19	2360.509	Type SP 12.5 Wearing course Mixture (3,C)	Ton	21479	21479	6447	0	0
C	19	2360.509	Type SP 12.5 Wearing Course Mixture 4,C)	Ton	602	602	1300	0	0
...	...	...	...	...	...	...	...	...	...

Note 1: Project = Element ID = 122874 = SP1007-21 (Prime Contract)

Note 2: Project = Element ID = 122873 = SP1006-29

Note 3: Funding Category 0001 = (A) 80% STP / 20% State Funds

Note 4: Funding Category 0002 = (B) 100% City of Mayer Funds (See Agreement Number 1036535 with the City of Mayer)

Note 5: Funding Category 0003 = (C) Special Funding (See Agreement Number 1036540 with the City of Watertown)

Contract Contains:
2 Projects
3 Funding Categories

Project and Funding Category Geofence

Example Statement of Estimated Quantities

Tab.	Sheet Number	Item Number	Item	Unit	Total Estimated Quantities	SP3608-48 (A) Notes 1, 4	SP3608-48 (B) Notes 1, 6	SP3606-56 (A) Notes 2, 4	SP3615-06 (A) Notes 3, 4	100% City of International Falls (F) Notes 1, 5
G, O	22-23, 45-49	2360.509	Type SP9.5 Wearing Course Mixture (3,C)	Ton	19279	15464	0	1160	928	1727
...	...	...	...	...	...	...	...		...	...

Note 1: Project = Element ID = 84613 = SP3608-48 (Prime Contract)

Note 2: Project = Element ID = 83665 = SP3606-56

Note 3: Project = Element ID = 135009 = SP3615-06

Note 4: Funding Category 0001 = (A) 80% NHPP Federal / 20% State Funds

Note 5: Funding Category 0002 = (F) 100% City of International Falls

Note 6: Funding Category 0003 = (B) 40% NHPP Federal, 10% State Funds, 50% City of International Falls Fund

Contract Contains:
3 Projects
3 Funding Categories

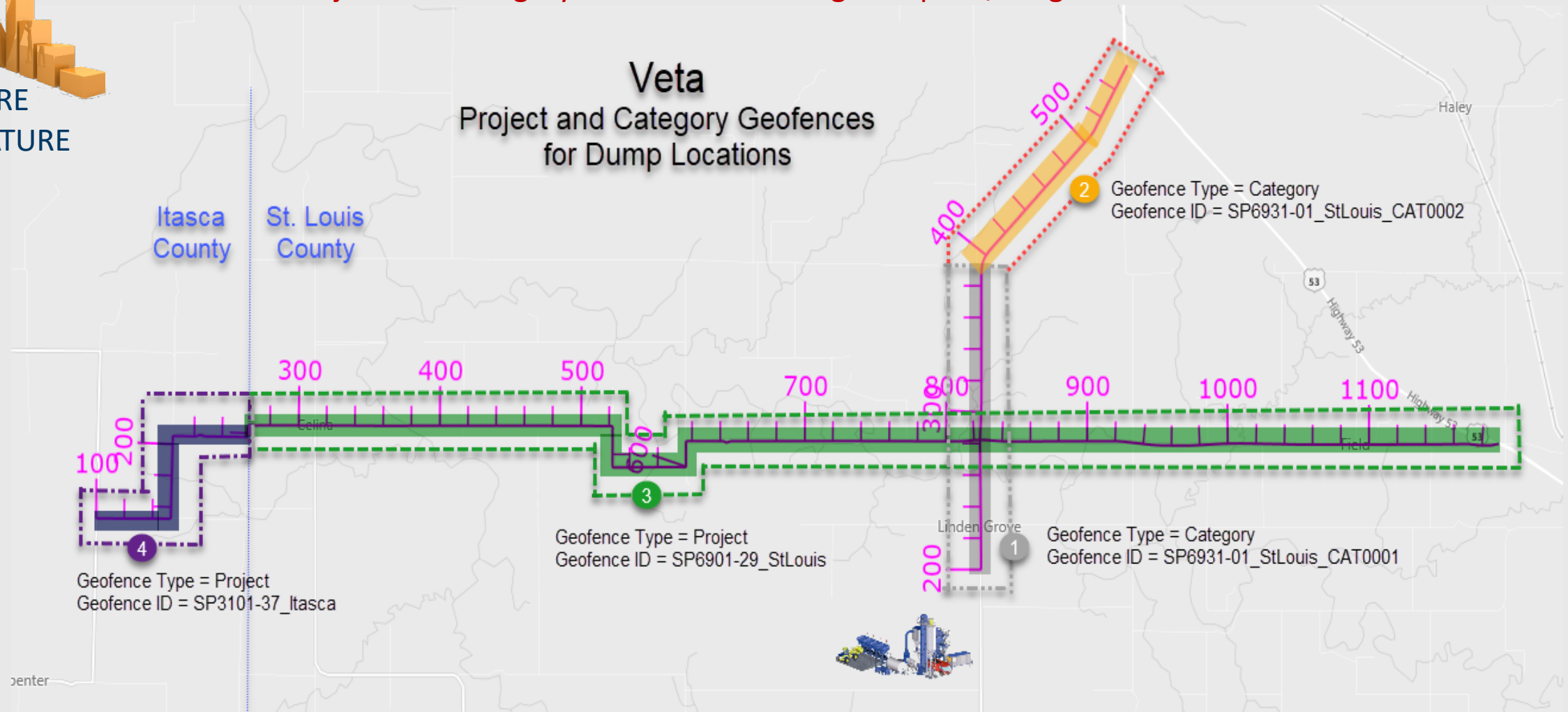
Establishment of Project and (Funding) Category Static Geofences

Agency Task



FUTURE
FEATURE

Record the Project and Category Geofence ID's using Dump Lat/Long



Veta

Standardized intelligent construction data management (ICDM) software that **stores, maps and analyzes geospatial data** resulting from intelligent construction technology (ICT) such as intelligent compaction, paver mounted thermal profiling, dielectric profile method and spot test data (e.g., density, moisture). This software can perform standardized data processing, analysis and reporting to provide project summary results from various ICT manufacturers. In particular, the software can provide statistics, histograms, correlations for these measurements, document coverage area and evaluates the uniformity of the ICT measurements as part of the project quality control operations. The Veta can be the Agency's standardized platform for the MDMS. (Software can be downloaded from www.intelligentconstruction.com). Veta is currently being enhanced to also provide a standardized Agency platform for the Material Delivery Management System (MDMS) – expanded form of E-Ticketing.

Virtual Roadway (BIM)

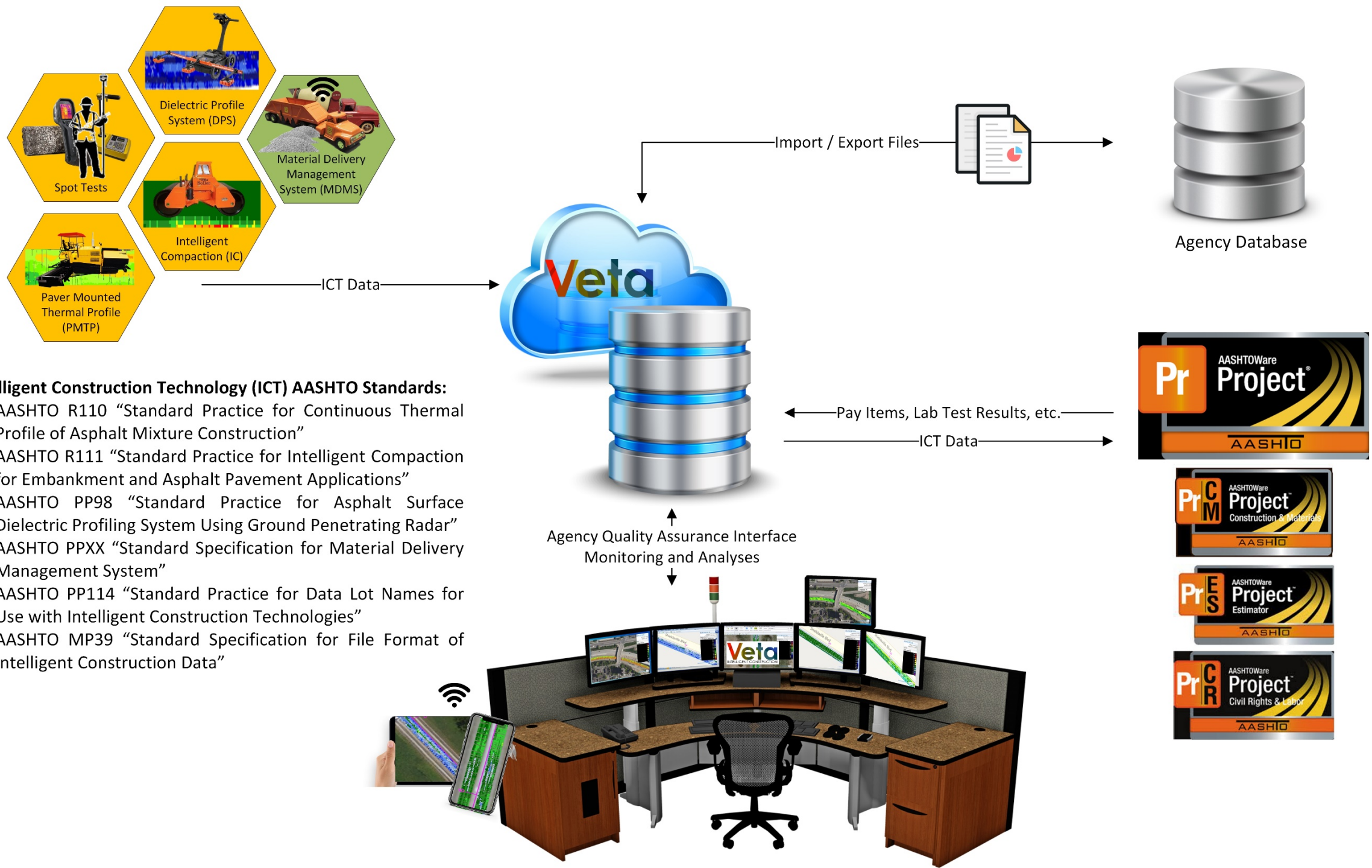
In Veta

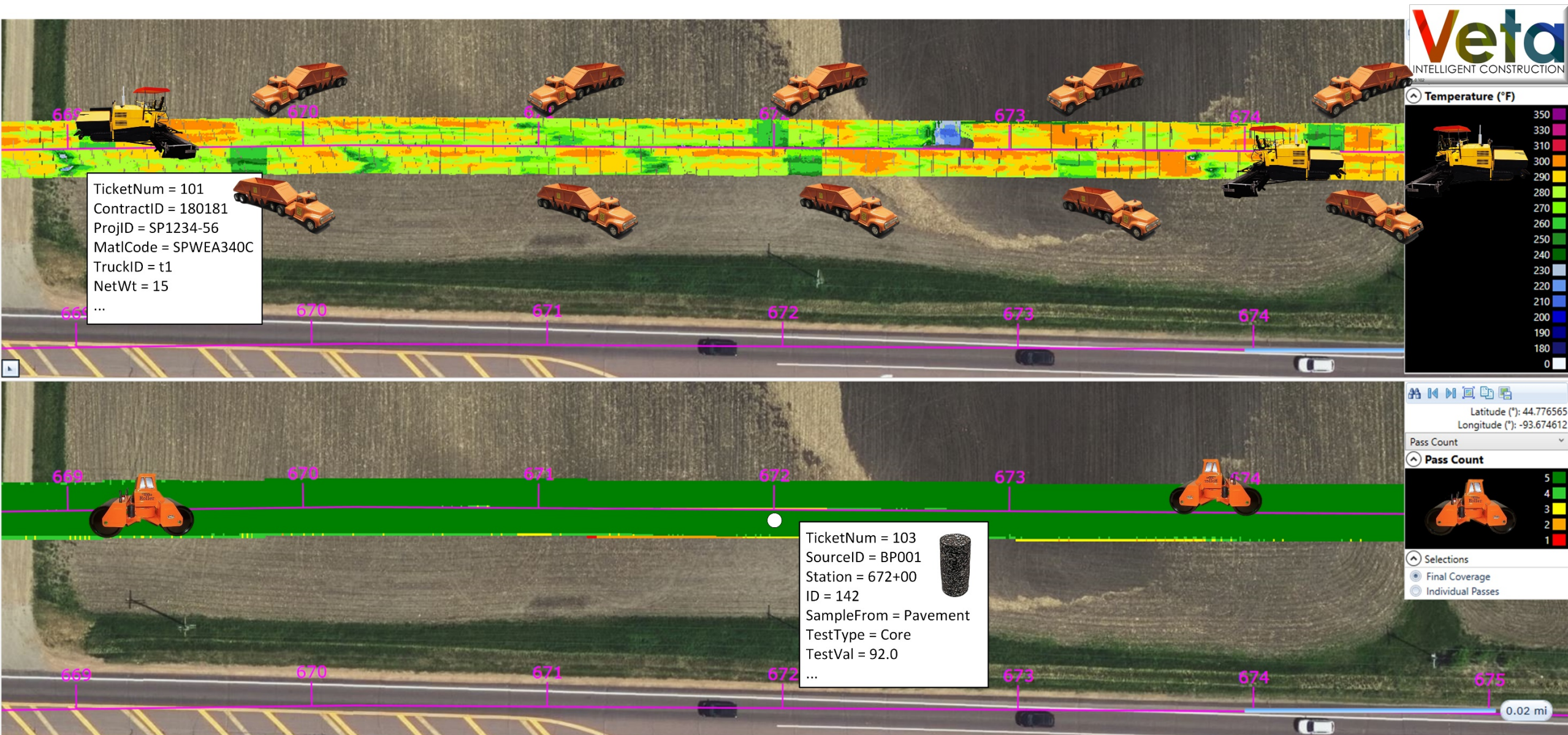
Funded & Under Contract

Funding Approved

Unfunded Needs







Veta
INTELLIGENT CONSTRUCTION

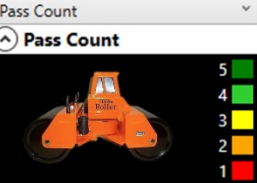
Temperature (°F)



Latitude (°): 44.776565
Longitude (°): -93.674612

Pass Count

Pass Count



Selections

Final Coverage

Individual Passes

0.02 mi

Uniform Truck Count

Cases where No Loadout Scale Tickets Generated

Section: 4.1.2.6

Veta (Agency MDMS System) . . .

- 4.1.2.6.1. Automatically count trucks using truck driver classification (see Table 12) and time when truck enters and exits contract geofence (see Table 13) or regional geofence.
- 4.1.2.6.2. Calculates quantity of material, daily, using independent scale weight (Table 30) multiplied by the number of trucks delivering, or removing, material for given truck driver classification (see Table 12).

Example of Loading & Delivery Event Data

Caterpillar – eRoutes



Main navigation screen summarizing critical information about the job

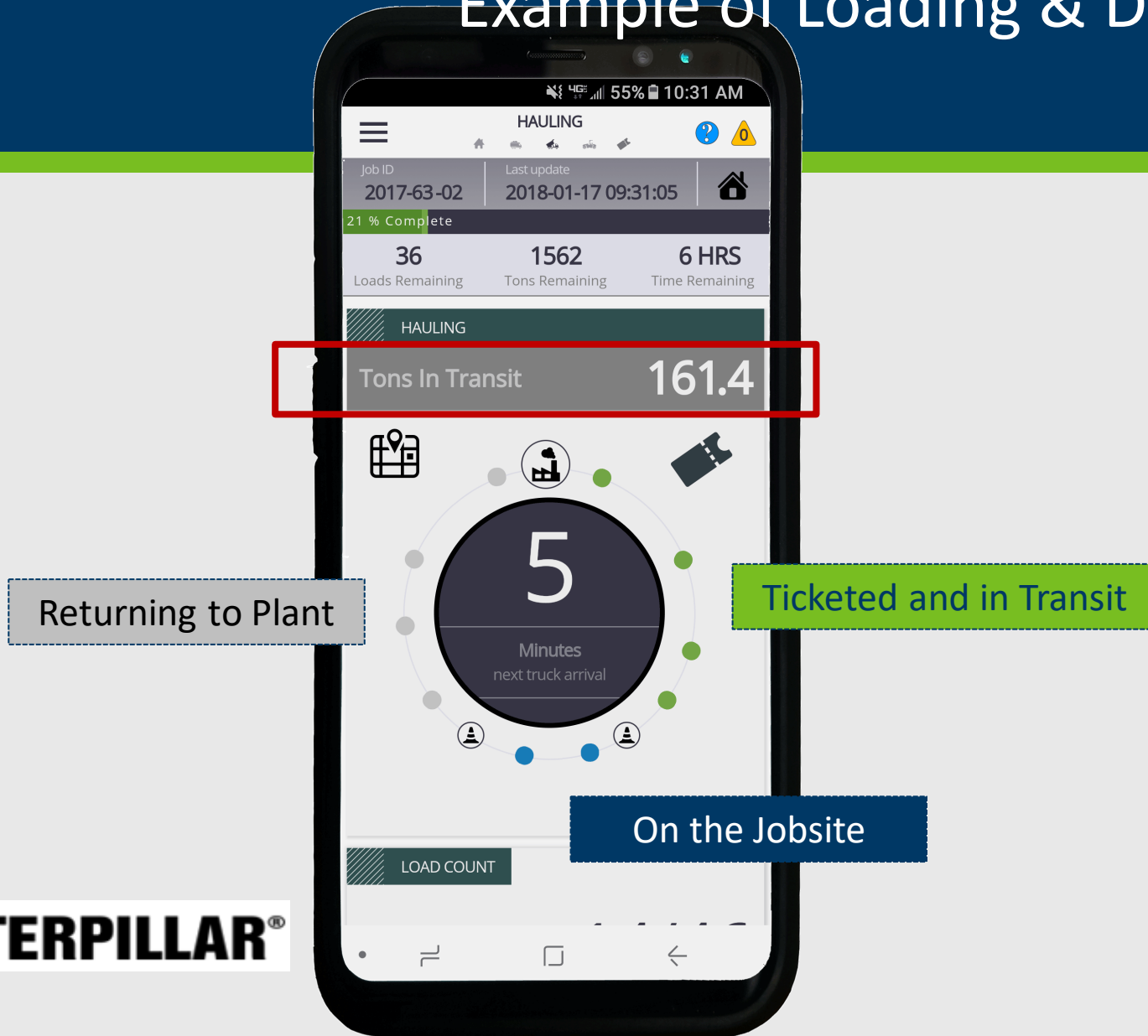
Information includes:

- LIVE truck arrival times at paver
- Trucks at plant, paver, and in transit
- Tons paved, loaded, and in transit
- Ticketed loads

Courtesy of Caterpillar

Example of Loading & Delivery Event Data (cont.)

Caterpillar – eRoutes



Courtesy of Caterpillar

Example of Loading & Delivery Event Data (cont.)

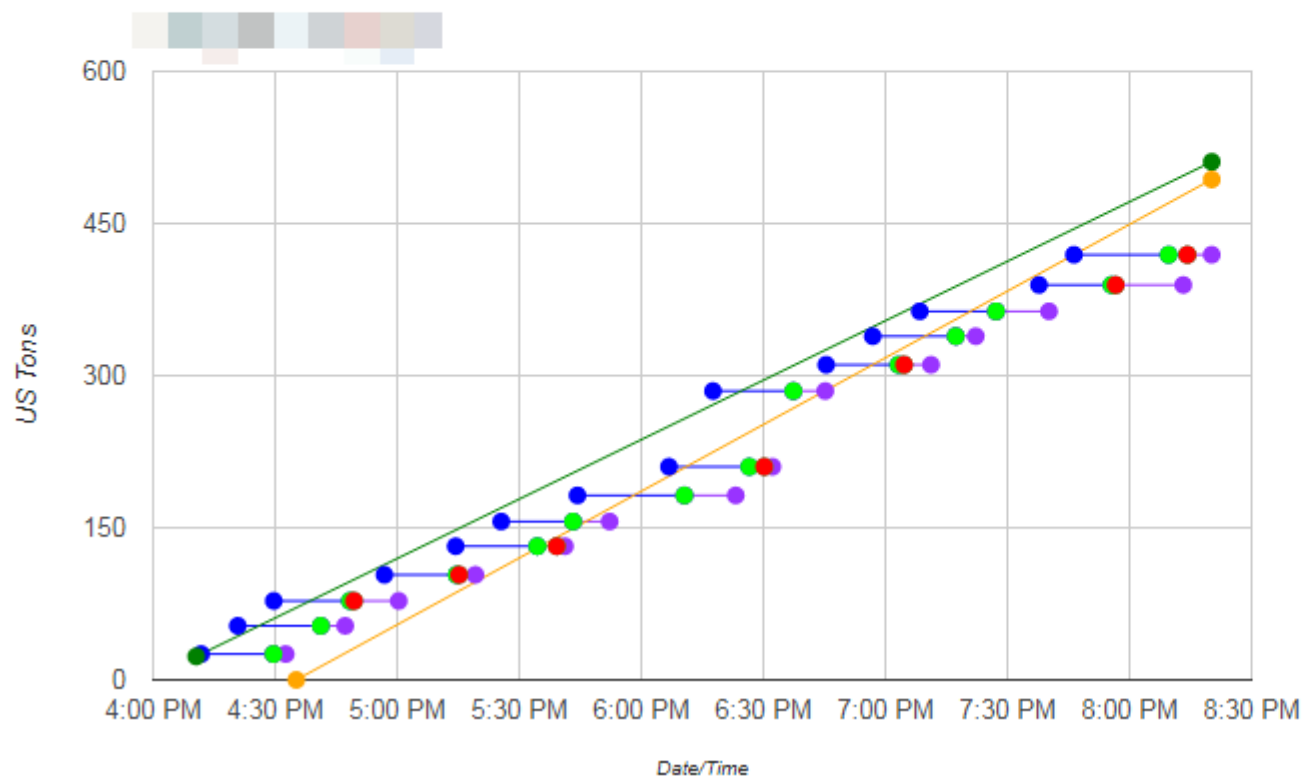
Caterpillar – eRoutes

Truck Summaries

Tickets

Truck ID	Number of Loads	Avg. Net Weight	Avg. Cycle Duration	Min. Cycle Duration	Max. Cycle Duration	Last Cycle Duration	Total Net Weight
172kgm	5	25.78	00:51:15	00:45:00	01:01:00	--	128.88
80tb	5	28.44	00:58:36	00:50:14	01:26:23	01:26:23	142.22
84tb	4	37.02	00:52:40	00:49:00	00:56:00	--	148.07
3 Truck(s)	14	29.94	00:54:17	00:45:00	01:26:23		419.18

▼ Show/Hide Projections



Today's Shifts

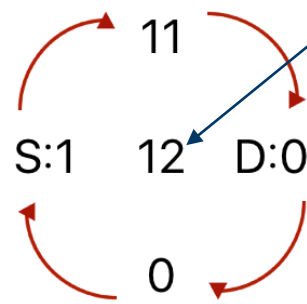
Winona Co Seasonal Paving

Oct 30 6:00 AM
449270378

Ticketed and in Transit

On Jobsite

At Silo



At Destination / Paver

Project: Winona Co Seasonal Paving
Source: Plant 82
Destination: 18
Load Count: 48
Total Tons: 892.77

Shift is 45% complete
(5.66 out of 12.50 hours)

Actual Tons: 0% of Estimated 0

Scale Tickets

Search Ticket Numbers

Filter

30595
Oct 30 2019
10:16:37 AM
Gross UST: 17.62
Net UST: 16.62"

Truck: 187
Plant 82
SPWEB240 58H 34
Phase Code: --

Waste Tons: 0.0
Material Temp: --
Cumulative
Tons: 304.12
Cumulative
Loads: 16
Notes: 0

30594
Oct 30 2019
09:50:30 AM
Gross UST: 21.83
Net UST: 20.83"

Truck: 197
Plant 82
SPWEB240 58H 34
Phase Code: --

Waste Tons: 0.0
Material Temp: --
Cumulative
Tons: 287.5
Cumulative
Loads: 15
Notes: 0

30593
Oct 30 2019
09:50:30 AM
Gross UST: 22.53
Net UST: 21.53"

Truck: 8414
Plant 82
SPWEB240 58H 34
Phase Code: --

Waste Tons: 0.0
Material Temp: --
Cumulative
Tons: 266.67
Cumulative
Loads: 14
Notes: 0

30592
Oct 30 2019
09:47:22 AM
Gross UST: 22.31
Net UST: 21.31"

Truck: 8412
Plant 82
SPWEB240 58H 34
Phase Code: --

Waste Tons: 0.0
Material Temp: --
Cumulative
Tons: 245.14
Cumulative
Loads: 13
Notes: 0

Example of Loading & Delivery Event Data (cont.)
Earthwave - Fleetwatcher

Example of Loading & Delivery Event Data (cont.)

Earthwave - Fleetwatcher

Winona Co Seasonal Paving

Oct 29 6:30 AM - 7:00 PM

Project: Winona Co Seasonal Paving

Project Number: 4492703 78

Source: Plant 82

Destination: 18-188

Load Count: 41

Total Tons: 769.14

Material Type: -

Phase Code: -

Shift Note: N/A

↻ 7 ↻
S: 4 11 D: 0
↻ 0 ↻

LCA Graph

Scale Tickets

Shift is 42% complete (5.27 out of 12.50 hours)

Total Tons 717.74 / Estimated Tons Unavailable.

Scale Tickets: Winona Co Seasonal Paving

21 Tickets X

Full Scale Ticket Details

#29622	Oct 17	08:25	Oct 17	08:58*	S187	SPWEB240 58H 34	16.41
09:00							
#29623	Oct 17	08:30	Oct 17	09:02*	S27	SPWEB240 58H 34	16.92
#29624	Oct 17	08:33	Oct 17	09:08*	S57	SPWEB240 58H 34	17.27
Last Hour							
#29626	Oct 17	09:01	Oct 17	09:24*	8412	SPWEB240 58H 34	21.48
#29628	Oct 17	09:13	Oct 17	09:33*	8414	SPWEB240 58H 34	21.25
#29629	Oct 17	09:17	Oct 17	09:39	S197	SPWEB240 58H 34	20.94
#29632	Oct 17	09:27	Oct 17	09:45	8413	SPWEB240 58H 34	21.4
#29633	Oct 17	09:31	Oct 17	09:49	S187	SPWEB240 58H 34	16.5
#29634	Oct 17	09:34	Oct 17	09:54	S27	SPWEB240 58H 34	17.26
10:00							
#29637	Oct 17	09:47	Oct 17	10:09	8412	SPWEB240 58H 34	21.4
Undumped Loads							
#29625	Oct 17	08:42			B13	SPWEB240 58H 34	17.51
#29636	Oct 17	09:42			S57	SPWEB240 58H 34	17.4
#29638	Oct 17	09:52			8414	SPWEB240 58H 34	21.24
#29639	Oct 17	09:57			S197	SPWEB240 58H 34	20.96
#29640	Oct 17	10:02			8413	SPWEB240 58H 34	21.66
#29642	Oct 17	10:11			S187	SPWEB240 58H 34	16.58
#29643	Oct 17	10:14			S27	SPWEB240 58H 34	16.83

Full Scale Ticket Details

Total:

408.42

Example of Loading & Delivery Event Data (cont.)

Earthwave - Fleetwatcher

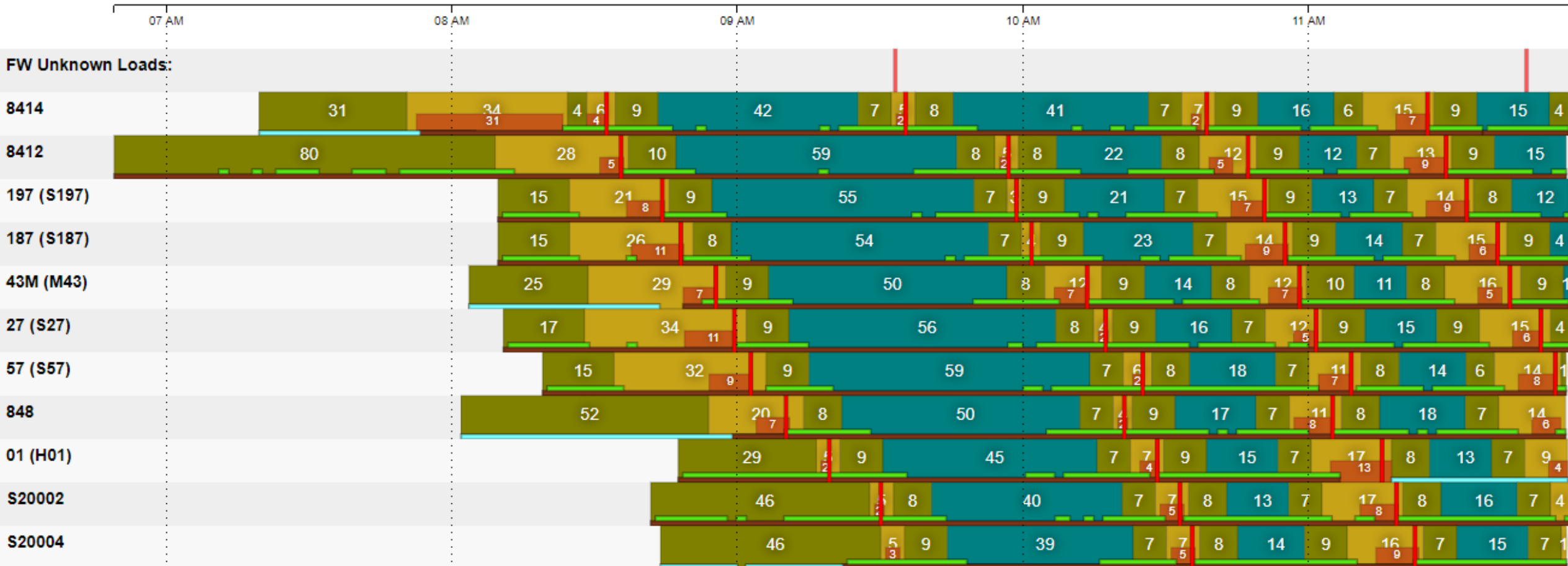
Default Legend

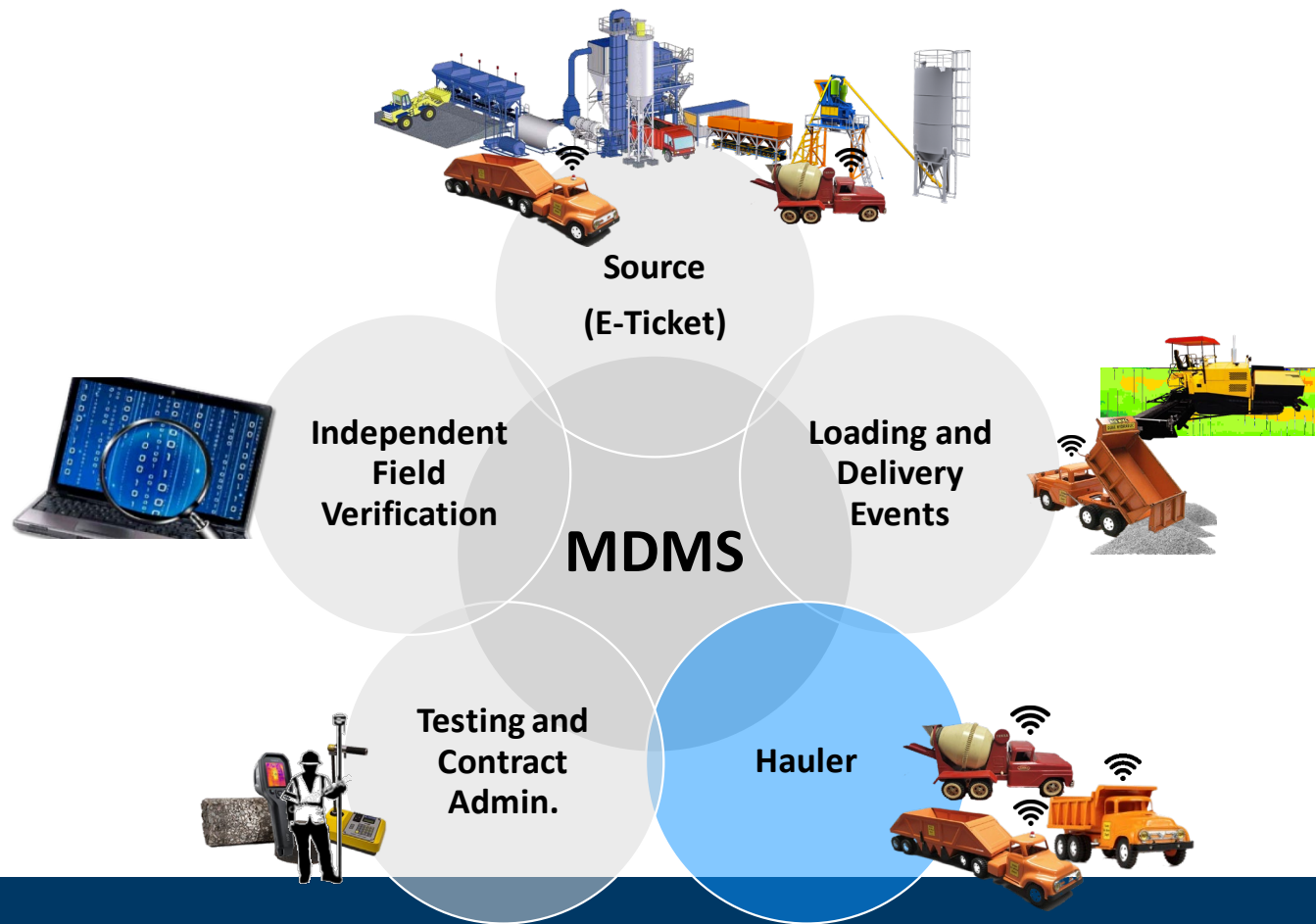
Travel Engine On Moving Transport

Geozone Legend

Plant 82 Winona Co Seasonal Paving Plant 82 Silo

Red Lines = Batching Loads
Black Lines = Truck Exchange (Dump)





Hauler Data

Hauler Data

Section: 4.1.1.4, Table 11



Ability to enter (or import from load-out software) hauler data associated with E-Ticket.

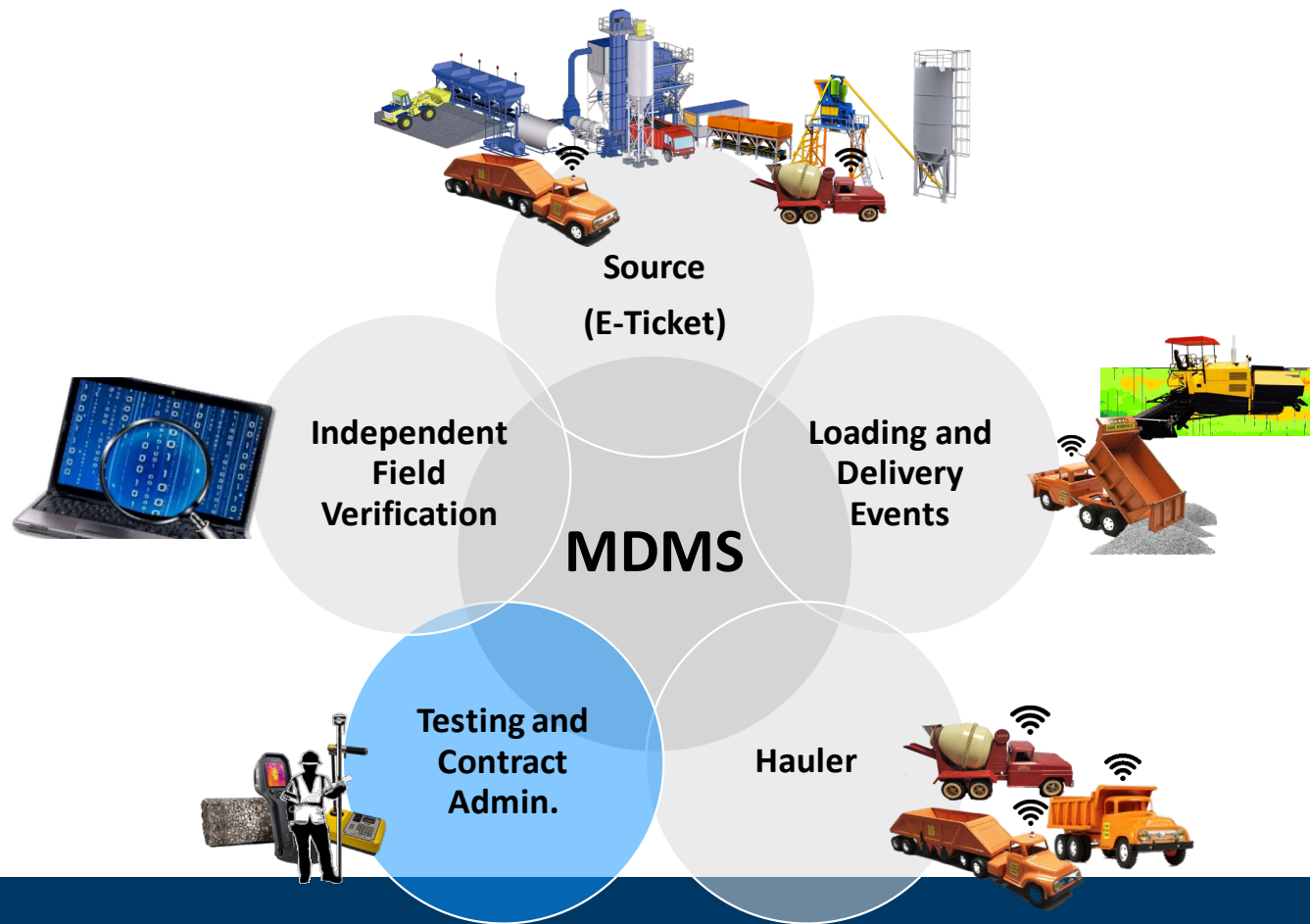
Tractor Trailer Driver
Four or More Axle Unit, Straight Body Truck
Three Axle Units
Two Axle Unit



Contractor Job Number
Hauler Company Name
Broker Name
DOT Number
Truck Identification
Truck Driver Classification
Overweight Permit Number
Maximum Gross Weight
Driver Name

Benefits of Hauler Data

- Decrease time and resources to review and track down information
 - for both Contractor and Agency
- Calculation of Overweight Quantities (Max Gross Weight of Truck, Permit No.)
- Assist with verification of driver's names
 - Companies change out names to avoid prevailing wage laws
- Quickly identify broker names
- Verification of valid DOT numbers. Many DOT numbers are often revoked.
- Monitoring & documentation of labor compliance / civil rights activities (e.g., prevailing wage)



Testing and Contract Administration

Data Entry via User Interface in Veta (Future Feature)

Ticket Number
Source Identification
Loading Date and Time
Entity
Location
Event Type
Date and Time
Station Number
Offset
Identification
Sampled From
Test Type
Test Value
Ingredient Code
Ingredient Source Name
Quantity
Water to Cement Ratio
Water Available to Add Quantity
Pay Item Identification
Pay Item Identification Description
Geofence Identification
Geofence Type
Notes
Recorded By

Testing & Contract Administration Data

Table 18

Load split for dumping at multiple locations.
Manual Load Acceptance
Sample collected at source, or at dump.
Test performed at source, or at dump.
Time at end of dump (final discharge) is manually recorded.
Water and/or admixture additions.



Loads that are split at delivery for use at more than one location, such as for patching, entrances, multiple piers, multiple intersections for curb and gutter, etc.



Data Description	Data Block Value
First split of load split for dumping at multiple locations.	SplitLoad1
Second split of load split for dumping at multiple locations.	SplitLoad2
Third split of load split for dumping at multiple locations.	SplitLoad3
Fourth split of load split for dumping at multiple locations.	SplitLoad4

Section: 4.1.1.5 & 4.1.1.8

Table 22—Lookup Table for Split Loads

Table 23 – Lookup Table for Manual Load Acceptance

Data Description	Data Block Value
Load accepted for placement	Accepted
Load arrived at jobsite but did not dump, or load never arrived at jobsite	NoPay
Load not accepted for placement	Rejected
Part, or all, delivered material was wasted and not used on project. ^a	WastedMatl
Partial Rejected Load ^a	PartialRejected

Table 26 – Lookup Table for Field Ingredients Added

Data Description	Data Block Value
First increment of water and/or admixture additions.	FieldIngredAdded1Qty
Second increment of water and/or admixture additions.	FieldIngredAdded2Qty
Third increment of water and/or admixture additions.	FieldIngredAdded3Qty

Table 27—Lookup Table for “Sampled From” Values



Description	Data Block Value
Behind Paver	BehindPaver
Belt	Belt
Bridge Deck	BridgeDeck
Bridge Substructure	BridgeSubstructure
Bridge Superstructure	BridgeSuperstructure
Grade	Grade
Hopper	Hopper
Other	Other
Screen	Screen
Stockpile	Stockpile
Tank	Tank
Truck	Truck
Truck Box (Bituminous)	TruckBoxBit
Tubes	Tubes
Windrow	Windrow



Table 24 – Lookup Table for Sampling

Data Description	Data Block Value
Sample at dump.	SampleAtDump
Sample at source.	SampleAtSource
Sample when no water and/or admixture additions.	SampleNoFieldIngredAdded
Sample after first increment of water and/or admixture additions.	SampleFieldIngredAdded1
Sample after second increment of water and/or admixture additions.	SampleFieldIngredAdded2
Sample after third increment of water and/or admixture additions.	SampleFieldIngredAdded3



Table 25 – Lookup Table for Testing

Data Description	Data Block Value
Test at dump.	TestAtDump
Test at source.	TestAtSource
Test when no water and/or admixture additions.	TestNoFieldIngredAdded
Test after first increment of water and/or admixture additions.	TestFieldIngredAdded1
Test after second increment of water and/or admixture additions.	TestFieldIngredAdded2
Test after third increment of water and/or admixture additions.	TestFieldIngredAdded3

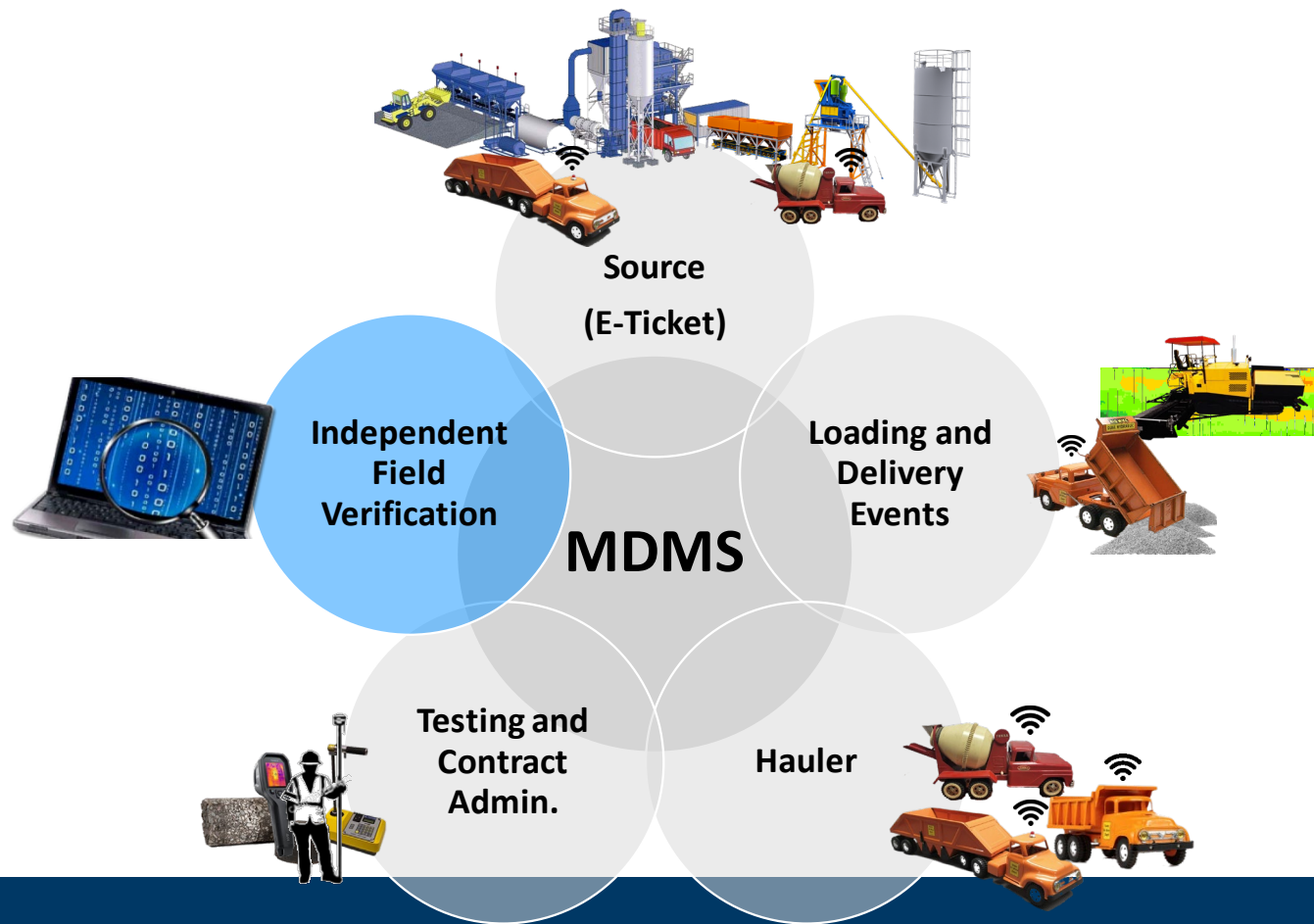


Table 28—Lookup Table for Test Type

Description	Data Block Value
Aggregate Qualities ^c	AggQualities
Air Temperature	AirTemp
Asphalt Mixture ^d	AsphaltMixture
Beam	Beam
Bitumen/Emulsion Properties	BitEmulProperties
Core	Core
Cylinder	Cylinder
DCP	DCP
eF Flux	eF_Flux
Evaporation	Evap
Foaming Expansion Ratio	FoamingExpansionRatio
Foaming Half-Life	FoamingHalfLife
Gradation	Gradation
Grade Temperature	GradeTemp
Low Nuclear Density	LowNuclearDensity
LWD	LWD
Material Temperature	MatlTemp
Maturity Sensor	MaturitySensor
Moisture	Moisture
Non-Nuclear Density	NonNuclearDensity
Nuclear Density	NuclearDensity
Pavement Thickness Plate	PavementThicknessPlate



Description	Data Block Value
Percent Air	PCTAir
Proctor	Proctor
Relative Humidity	RH
Roller Pass Count	RollerPassCount
Sand Cone Density	SandConeDensity
Slump	Slump
SlumpFlow	SlumpFlow
Spread	Spread
Super Air Meter (SAM)	SAM
Surface Texture	SurfaceTexture
Thickness	Thickness
Unit Weight	UnitWt
Visual Stability Index (VSI)	VSI
Wind Speed	WindSpeed
Yield Checks	YieldChecks



Independent Field Verification

Data Entry Via User Interface in Veta (Future Enhancement)

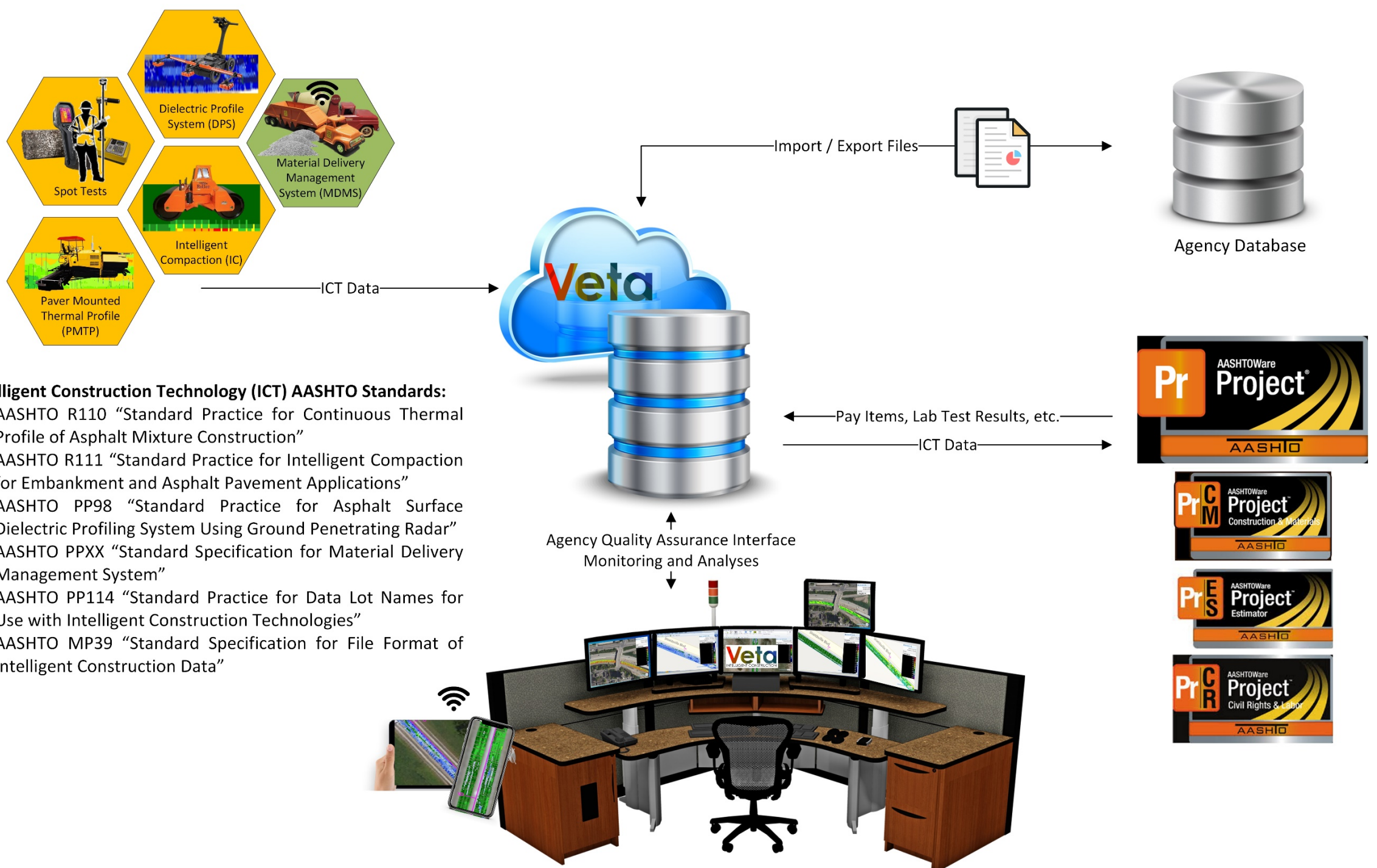
Ticket Number
Source Identification
Loading Date and Time
Latitude
Longitude
Spatial Reference Authority
Spatial Reference Identification
Station
Location
Data Field Name
Verification
Notes
Inspector ID
Date and Time



Incorrect information is stored in data field.	Invalid
Data field is null, and no data is available.	Missing
Not applicable – data field not required/used.	NA
Correct information is stored in data field.	Valid
Data field requires Engineer to enter information.	See Table 32

Table 30. Independent Field Verification Data Fields

Data Transfer



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Thank you again for your time!

