WORK ZONE DATA EXCHANGE FOR AUTOMATED VEHICLES

# Work Zone Data Exchange (WZDx)

# WZDx v1.1 – Common Core Data Specification Reference Document

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# 1. INTRODUCTION

### 1.1. Background

Up-to-date information about dynamic conditions occurring on roads – such as construction events – can help Automated Vehicles (AVs) navigate safely and efficiently. Many infrastructure owners and operators (IOOs) maintain data on work zone activity. However, a lack of common data standards and convening mechanisms makes it difficult and costly for third parties – including original equipment manufacturers (OEMs) and navigation applications – to access and use these data across various jurisdictions.

In support of AV integration into our nation's transportation system, the Federal Highway Administration (FHWA) and USDOT's Intelligent Transportation Systems Joint Program Office (ITS JPO) are co-leading the Work Zone Data Exchange (WZDx) project. The effort seeks to jumpstart the voluntary adoption of a basic work zone data specification through collaboration with data producers and data users. WZDx will enable collaborative maintenance and expansion of the specification as operational and technological enhancements become available.

Upon finalization of the first iteration of work zone data specification, data producers will utilize the specification to make their respective active work zone data feeds available for use by non-government users. These users will then use the harmonized data in a meaningful way. These two outcomes will result in the establishment of the voluntary date exchange of work zone data (i.e., a minimum viable product (MVP) of harmonized work zone data). This approach is intended to be repeatable leading to the accelerated harmonization of local data.

The following data producers and users (i.e., the WZDx Working Group) voluntarily committed to participating and have been actively involved in the development of the standardized data specification:

Data Producers	Data Users
Pennsylvania Turnpike Authority (also	HERE
representing the Smart Belt Coalition)	Waze
<ul> <li>Michigan Department of Transportation</li> </ul>	Panasonic
<ul> <li>Iowa Department of Transportation</li> </ul>	Toyota
<ul> <li>Colorado Department of Transportation</li> </ul>	Uber
<ul> <li>Kentucky Department of Transportation</li> </ul>	Embark
• iCone	

### 1.2. Purpose

This document was developed through collaboration with the WZDx Working Group to describe a set of "common core" data concepts, their meaning, and their enumeration (as applicable) in order to standardize a data feed specification to be used to publish work zone information.

For purposes of this effort, "common core" is defined as data elements needed for most (if not all) work zone data use cases that could possibly be defined. The data specification includes data elements that data producers (i.e., State transportation agencies and other IOOs) are already producing ("required") as well as those that may not currently be produced ("optional"). This common core is also considered extensible, meaning both required and optional data elements can be added to support specific use cases now and in the future.

### 1.3. Scope

The WZDx data feed will be incrementally enhanced to evolve into a data feed that supports advanced warnings to automated vehicles in and around work zones. The current version, (WZDx v1.1) which is included in this document, will serve as a first step in this effort. It highlights common core elements which serve as a foundation for required data. This version of the data feed addresses data currently supported by existing data feeds published by public and private sector organizations.

### 1.4. Document Organization

The remainder of this document is organized into the following sections:

#### Section 2 Data Tables

- **2.1. Common Core Data Dictionary** This section includes a table of WZDx common core data concepts. Data concepts may reference a single, discrete data element or may refer to a grouping of several data elements (i.e., a data frame):
  - <u>Data Element</u> Discrete data concept that cannot be broken down into smaller units.
  - <u>Data Frame</u> Data concept that describes a portion of a message or data feed that may contain other data elements or data frames.

The data described are intended to have clear and unambiguous meanings.

- **2.2. WZDx Header Data** This section includes a table of header information. Specifically, this includes supplemental data placed at the beginning of the Work Zone Activity records.
- **2.3. Data Frames** This section expands on the description of the data frames listed in the data dictionary (Section 2.1) and identifies values for data elements that contain standardized enumerations. Tables are included for the following data frames:
  - StartDateTime
  - EndDateTime
  - BeginLocation
  - EndLocation
- **2.4. Enumerated Types –** This section includes a table of enumerated data elements.
- **2.5. Enumerated Type Definitions** This section includes definitions for enumerated types including work zone status, status of Time and Location, and Road Restrictions.
- **2.7. Metadata** This section describes the contents of a static file with information about the quality and context of data in the data feed.

#### Section 3. Creating the Specification

• This section provides a sample of how agencies will complete a Work Zone Activity record.

#### Section 4. XML Schema and Examples of XML and JSON files

• This section includes the validated XML schema and examples of XML and JSON files.

# 2. DATA TABLES

### 2.1. Common Core Data Dictionary

The Common Core Data Table (Table 1), and subsequent tables in this document, include the following columns:

- <u>Data Name</u> name of the data concept (either a data element or data frame)
- <u>Data Type</u> identification of the data concept as a data element or data frame and whether it is an enumerated type
- <u>Data Description</u>: description of the data concept
- <u>Conformance</u>: description of the requirement for including data in the data feed file. There are three categories of conformance:
  - Required must be included
  - Optional may be included
  - <u>Conditional</u> associated with two or more data concepts; requires that at least one of the concepts be included in the data feed file
- <u>Notes</u>: comments, guidance, or notes for future consideration

#### Table 1. Common Core Data

Data Name	Data Type	Data Description	Conformance	Notes
identifier Data element		A unique identifier issued by the data feed provider to identify the work zone project or activity	Required	Request that this be a standardized identifier for a future version
subidentifier	Data element	A unique identifier issued by data feed provider that provides additional references to project or activity	Optional	This identifier may be used in more than one feed as a reference to an agency project number or permit ID
StartDateTime	Data Frame	The time and date when a work zone starts	Required	
<b>EndDateTime</b>	Data Frame	The time and date when a work zone ends	Required	
BeginLocation	Data Frame	The LOCATION when work zone impact begins along a single road in a single direction (see BeginLocation The impact typically begins where the first channeling device (e.g., cone or barrel) is located.	Required	The method used for designating impact should be included in a static Metadata file (see Section 2.7)
EndLocation Data Frame		The LOCATION along a single road in a single direction when work zone impact ends and the traffic returns to normal (See EndLocation)	Required	The method used for designating impact should be included in a static Metadata file (see Section 2.7)
wz-Status	Enum	The status of the work zone	Optional	See Enumerated Type Definitions
totalLanes	Data element	The total number of lanes associated with the road segment designated by the BeginLocation and EndLocation	Optional	A segment is a part of a roadway in a single direction designated by a start (BeginLocation) and end (EndLocation)
openLanes	Enum	The laneType that is opened on the road segment designated by the work zone BeginLocation	Optional	
<u>closedLanes</u>	Enum	The laneType that is closed due to the work zone on the road segment designated by the Begin Location and EndLocation	Required	More detailed lane impacts / status will be described in Version 2 of the specification
<u>closedShoulders</u>	Enum	An enumerated type identifying the shoulder lanes that are closed	Optional	To explicitly state that no shoulders are closed, use <i>none</i>
workersPresent	Data element	A flag indicating that there are workers present in the work zone	Optional	
reducedSpdPosted	Data element	The reduced speed limit posted in the work zone	Optional	
RoadRestrictions	Enum	One or more roadRestriction flags indicating restrictions apply to the work zone road segment associated with the work zone bounded by the begin / end locations	Optional	More details may be added to future WZDx versions; these are included as flags rather than detailed restrictions
description	Data element	Short free text description of work zone	Optional	This will be populated with formal phrases in a later WZDx version

Data Name	Data Type	Data Description	Conformance	Notes
issuingOrganizatio	Data element	The organization issuing the data feed	Optional	Will create a list in a future version
n				
timestampEventCr	Data element	The time and date when the activity or event was	Optional	
eation		created		
timestampEventUp	Data element	The time and date when the activity or event was	Optional	
date		updated	-	

# 2.2. WZDx Header Data

The WZDx header defines the content of the file and lists specific file attributes. It is considered supplemental data and is placed at the beginning of the block of data (i.e., the "body") being stored and transmitted.

For the WZDx v1, the body of the data feed comes from the Common Core Data Dictionary. The header data includes the data feed name, body name, and file header information.

- <u>Data Feed Name</u>. The data feed file name is "WZDX". The extension used shall follow the encoding method (e.g., .xml or .json)
- <u>Data Feed Body</u>. The data feed is composed of one or more work zone activity records (named WorkZoneActivity) as defined in the Common Core Data Dictionary
- File Header Information. See table below

Data Element Name	Required	Description
timeStampUpdate	yes	An element that designates the data and time the data feed was last updated
metadataURL	no	A link to the metadata file (WZ-metadata.txt). See Section 2.6 for a description of the file.
versionNo	no	The WZDx version number that was used to create the file

#### Table 2. WZDx Header Element Information

### 2.3. Data Frames

#### 2.3.1. StartDateTime

Definition: The time and date when a work zone starts. All date/time formats shall use *ISO 8601 Data elements and interchange formats – Information interchange – Representation of dates and times* to represent date and time data elements.

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Data Name	Data Description	Conformance	Notes
startDateTime- est	The planned time and date when a work zone starts	Conditional <ul> <li>startDateTime-est or</li> <li>startDateTime-ver or</li> <li>startDateTime-cancelled</li> </ul>	
startDateTime- ver	A verified time and date when the work zone was actually installed	Conditional • startDateTime-est or • startDateTime-ver or • startDateTime-cancelled	
startDateTime- cancelled	Cancellation of a planned start time and date associated with a work zone	Conditional <ul> <li>startDateTime-est or</li> <li>startDateTime-ver or</li> <li>startDateTime-cancelled</li> </ul>	
timeConfidence Level	A confidence level (in percentage) of when the work zone activities will actually start	Optional	For future use

#### 2.3.2. EndDateTime

Definition: The time and date when a work zone ends. All date/time formats shall use *ISO 8601 Data elements and interchange formats – Information interchange – Representation of dates and times* to represent date and time data elements.

Data Name	Data Description	Conformance	Notes
endDateTime- est	The planned time and date when a work zone ends	Conditional <ul> <li>endDateTime-est or</li> <li>endDateTime-ver or</li> <li>endDateTime-cancelled)</li> </ul>	
endDateTime- ver	A verified time and date when the work zone was actually ended	Conditional • endDateTime-est or • endDateTime-ver or • endDateTime-cancelled	
endDateTime- cancelled	Cancellation of a planned end time and date associated with a work zone	Conditional <ul> <li>endDateTime-est or</li> <li>endDateTime-ver or</li> <li>endDateTime-cancelled</li> </ul>	
timeConfidence Level	A confidence level (in percentage) of when the work zone activities will actually end	Optional	For future use

Table 4. EndDateTime Data Frame Ta
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#### 2.3.3. BeginLocation

Definition: The LOCATION when work zone impact begins along a single road in a single direction. Provide method for describing "impact" in metadata file (see Section 2.7).

Data Name	Data Description	Conformance	Notes
roadName	The name of the road on which the work zone applies which is known by the public	Required	Add a business rule that pulls data from a specified list or formal naming conventions, for example, (1) arterials comply with the USPS Street Suffix Abbreviations (USPS Pub 28); (2) all Interstates will be abbreviated as <i>I-#</i> , state route with the state abbreviation and then the number, etc.
roadNum	The road number designated by a jurisdiction such as a county, state or interstate	Optional	Examples I-5, VT 133
roadDirection	The designated direction of the roadName that is impacted by the work zone activity	Required	Example North (for I-5 North)
latitude-est	The estimated latitude along the roadway where the work zone area begins	<ul><li>Conditional</li><li>latitude-est or</li><li>latitude-ver</li></ul>	
latitude-ver	A verified latitude along the roadway where the work zone area begins	<ul><li>Conditional</li><li>latitude-est or</li><li>latitude-ver</li></ul>	Describe verification method in metadata file
longitude-est	The estimated longitude along the roadway where the work zone area begins	Conditional <ul> <li>longitude-est</li> <li>or</li> <li>longitude-ver</li> </ul>	
longitude-ver	A verified longitude along the roadway where the work zone area begins	Conditional <ul> <li>longitude-est</li> <li>or</li> <li>longitude-ver</li> </ul>	Describe verification method in metadata file
milepost-est	The estimated linear distance measured against a milepost marker along a roadway where the work zone begins	Optional If included only one milepost value (-est or -ver is needed)	A milepost or mile marker is a surveyed distance posted along a roadway measuring the length (in miles or tenth of a mile) from the south west to the north east. These markers are typically notated on State and local government digital road networks. Provide link to description of milepost method in metadata file (see Section 2.7).
milepost-ver	An accurately linear distance measured against a milepost	Optional	

 Table 5. BeginLocation Data Frame Table

Data Name	Data Description	Conformance	Notes
	marker along a roadway where the work zone begins	If included only one milepost value (-est or -ver is needed)	
crossStreet	The cross street along the roadway where the work zone area begins	Conditional	Required when Road Classification is arterial

#### 2.3.4. EndLocation

Definition: The LOCATION along a single road in a single direction when work zone impact ends and the traffic returns to normal. Provide method for describing "impact" in metadata file (see Section 2.7).

Data Name	Data Description	Conformance	Notes
latitude-est	The latitude along a roadway where the work zone area ends and the traffic returns to normal	<ul><li>Conditional</li><li>latitude-est or</li><li>latitude-ver</li></ul>	
latitude-ver	A verified latitude along the roadway where the work zone area ends	<ul><li>Conditional</li><li>latitude-est or</li><li>latitude-ver</li></ul>	Describe verification method in metadata file
longitude-est	The longitude along a roadway where the work zone area ends and the traffic returns to normal	Required	
longitude-ver	A verified longitude along the roadway where the work zone area ends	<ul> <li>Conditional</li> <li>longitude-est or</li> <li>longitude-ver</li> </ul>	Describe verification method in metadata file
milepost-est	The measured linear distance along a roadway where the work zone begins	Optional If included only one milepost value (-est or -ver is needed)	Provide link to description of milepost method in metadata file (see Section 2.7)
milepost-ver	An accurately linear distance measured against a milepost marker along a roadway where the work zone begins	Optional If included only one milepost value (-est or -ver is needed)	
crossStreet	The cross street along a roadway where the work zone area ends and the traffic returns to normal	Conditional	Required when Road Classification is arterial

#### Table 6. EndLocation Data Frame Table

# 2.4. Enumerated Types

# Table 7. Enumerated Types Table

Data Element	Used by	Allowed Values	Notes	Source
wz-Status	WorkZoneActivity	See Enumerated Type		
		Definitions (Table 8)		
roadDirection	BeginLocation	<ul><li>northbound</li><li>eastbound</li><li>southbound</li><li>westbound</li></ul>		Adapted from TMDD link- alignment
roadRestriction	RoadRestrictions	<ul> <li>no- trucks</li> <li>travel- peak- hours- only</li> <li>hov-3</li> <li>hov-2</li> <li>no-parking</li> <li>bike-lane</li> <li>ramp</li> <li>reduced-width</li> <li>reduced-height</li> <li>reduced-length</li> <li>reduced- weight         <ul> <li>o axle-load-limit</li> <li>o gross-weight-limit</li> </ul> </li> <li>towing-prohibited</li> <li>permitted-oversize-loads-prohibited (this applies to annual oversize load permits)</li> </ul>	Include one or more flags as needed	See definitions below
laneType	openLanes, closedLanes	<ul> <li>all</li> <li>left-lane</li> <li>right-lane</li> <li>left-2-lanes</li> <li>left-3-lanes</li> <li>right-2-lanes</li> <li>right-3-lanes</li> <li>center</li> <li>middle-lane</li> <li>right-turning-lane</li> <li>left-turning-lane</li> <li>left-exit-lane</li> <li>left-exit-lane</li> <li>left-merging-lane</li> <li>left-merging-lane</li> <li>right-second-exit-ramp</li> <li>right-second-entrance-ramp</li> <li>left-exit-ramp</li> <li>left-exit-ramp</li> <li>left-exit-ramp</li> <li>left-exit-ramp</li> <li>left-exit-ramp</li> <li>left-exit-ramp</li> <li>left-exit-ramp</li> <li>left-exit-ramp</li> <li>left-exit-ramp</li> <li>left-second-entrance-ramp</li> <li>left-second-entrance-ramp</li> <li>left-entrance-ramp</li> <li>left-second-entrance-ramp</li> </ul>		Adapted from TMDD LaneRoadway

		<ul> <li>bike-lane</li> <li>none</li> <li>unknown</li> <li>alternating-flow-lane</li> <li>shift-left</li> <li>shift-right</li> </ul>	
closedShoulde rs	WorkZoneActivity	<ul> <li>outside</li> <li>inside</li> <li>both</li> <li>none</li> <li>unknown</li> </ul>	Adapted from TMDD LaneRoadway

# 2.5. Enumerated Type Definitions

Term	WZ-Status Description
Planned	Planned status is associated with overall project or phase timing and locations. Typically, this information is estimated during planning or early design phases. The WZDx will not generally include planned activities.
Pending	<ul> <li>Pending is used to alert stakeholders that work is scheduled for the near future (e.g., 2-3 weeks). The certainty of starting at this time is greater than 90% (barring weather and other unforeseen circumstances).</li> <li>Time horizon: approximate begin / end dates</li> <li>Location: coverage area and main road name; path (polyline or geofence) around zone area</li> </ul>
Active	Used to alert stakeholder that work zone is in place and active.
Cancelled	<ul> <li>Reported cancellation of a proposed or active WZ; the coverage applies to the work zone activity record.</li> <li>When date/time is estimated, the cancellation may be one or more days associated within the reported scheduled datetimes</li> </ul>
Completed	Work Zone is closed and completed; all work zone impacts are mitigated. This status may be used when a work zone activity is completed earlier than expected.

#### Table 9. Spatial and Time Verification Definitions

Term	WZ-Status Description
DateTime Estimated (-est)	Specific times/dates when work will or is occurring; includes advanced notice of activities or unverified work zone activities. This date/time may be reported in advance, but is not actively verified on day of event.
DateTime Verified (-ver)	Actual reported times/dates when work occurs.
Location Estimated (-est)	Estimated location associated with work zone activities and lane closures. An estimated measurement may be based on an approximation of a location referencing method (e.g., lat/long or milepost), for example: a point relative to a posted milemarker, point on a map, or GPS device that provides less than centimeter accuracy.
Location Verified (-ver)	Actual reported information about work zone locations. Actual location is typically measured by a calibrated navigation or survey system to centimeter accuracy (six decimal places for latitude and longitude).

#### Table 10. RoadRestriction Definitions

RoadRestrictions	Descriptions
no-trucks	Trucks are prohibited from traveling in work zone area
travel-peak-hours-only	Travel restricted to travel peak hours only

hov-3	Travel restricted to high occupancy vehicles of three of more	
hov-2 Travel restricted to high occupancy vehicles of two of me		
no-parking No parking in work zone area		
bike-lane	Bike lane closed in work zone area	
ramp	Ramp closed in work zone area	
reduced-width	Lane width reduced in work zone area	
reduced-height	Height restrictions reduced in work zone area	
reduced-length Vehicle length restrictions reduced in work zone area		
reduced- weight	Vehicle weight restrictions reduced in work zone area	
axle-load-limitVehicle axle-load-limit restrictions reduced in work zone area		
gross-weight-limit	Vehicle gross-weight-limit restrictions reduced in work zone area	
towing-prohibited	Towing prohibited in work zone area	
permitted-oversize-loads- prohibited	"Permitted oversize loads" prohibited in work zone area; this applies to annual oversize load permits.	

# 2.6. Enumerated Value Definitions Derived from ITS Standards

The following tables show the translation from TMDD to the WZDx Enumerated Types (Table 7).

Example of data frame in the TMDD (specified in ASN.1 format)

```
DATA-TYPE "EventLane ::= SEQUENCE {
    lanes-type ITIS.LaneRoadway OPTIONAL,
    link-direction Link-direction OPTIONAL,
    lanes-total-original Link-lanes-count OPTIONAL,
    lanes-total-affected Link-lanes-count OPTIONAL,
    event-lanes-affected SEQUENCE (SIZE(1..64)) OF Link-lane-number OPTIONAL,
    lanes-status ITIS.Closures OPTIONAL,
    ... }"
```

#### 2.6.1. openLanes and closedLanes

Note: LaneRoadway is imported into TMDD from SAE 2540 (ITIS Standard)

LaneRoadway enumerations	Used for openLanes and closedLanes	Description
all-roadways (8192)	all	Indicates that road all lanes are open or closed; if all lanes are closed then road is effectively closed
through-lanes (8193)		Not used
left-lane (8194)	left-lane	The left most lane (inside lane)
right-lane (8195)	right-lane	The right most lane (outside lane)
	left-2-lanes	The two most left lanes
	left-3-lanes	The three most left lanes
	right-2-lanes	The two most right lanes
	right-3-lanes	The 3 most right lanes

center-lane (8196)		Not used
middle-lanes (8197)	middle-lane	The center most lane where are a total of an odd number of lanes
<pre>middle-two-lanes (8198)</pre>	middle-two-lanes	The center most lanes where are a total of an even number of lanes
right-turning-lanes (8199)	right-turning-lane	A right lane where right turns are permissible
left-turning-lanes (8200)	left-turning-lane	A left lane where left turns are permissible
upper-deck-lanes (8201)		Not used
lower-deck-lanes (8202)		Not used
reversible-lanes (8203)		Not used
right-exit-lanes (8204)	right-exit-lane	The right lane where the lane provides an egress with a ramp
left-exit-lanes (8205)	left-exit-lane	The left lane where the lanes where the lane provides an egress with a ramp
right-merging-lanes (8206)	right-merging-lane	The right lane where the lane ends with a gradual merge with the second most lane
left-merging-lanes (8207)	left-merging-lane	The left lane where the lanes ends by a gradual merge with the second most left lane
right-exit-ramp (8208)	right-exit-ramp	The (first) exit ramp with an egress on the right in the direction of flow at an interchange
right-second-exit- ramp (8209)	right-second-exit-ramp	The second exit ramp with an egress on the right in the direction of flow at an interchange
right-entrance-ramp (8210)	right-entrance-ramp	The (first) entrance ramp with an ingress on the right in the direction of flow at an interchange
right-second- entrance-ramp (8211)	right-second-entrance-ramp	The second entrance ramp with an ingress on the right in the direction of flow at an interchange
left-exit-ramp (8212)	left-exit-ramp	The (first) exit ramp with an egress on the left in the direction of flow at an interchange
left-second-exit-ramp (8213)	left-second-exit-ramp	The second exit ramp with an egress on the left in the direction of flow at an interchange
left-entrance-ramp (8214)	left-entrance-ramp	The (first) entrance ramp with an ingress on the left in the direction of flow at an interchange
left-second-entrance- ramp (8215)	left-second-entrance-ramp	The second entrance ramp with an ingress on the left in the direction of flow at an interchange
escape-ramp (8216)		Not used
hard-shoulder (8217)		Not used

soft-shoulder (8218)		Not used
right-shoulder (8219)		Not used
left-shoulder (8220)		Not used
median (8221)		Not used
sidewalk (8222)	sidewalk	The sidewalk or pedestrian way
highways (8223)		Not used
right-hand-parallel- lanes (8224)		Not used
left-hand-parallel- lanes (8225)		Not used
connecting-lanes (8226)		Not used
express-lanes (8227)		Not used
local-lanes (8228)		Not used
toll-lanes (8229)		Not used
electronic-toll-lanes (8230)		Not used
toll-plaza (8231)		Not used
inspection-lane (8232)		Not used
hov-lanes (8233)		Not used
bus-lanes (8234)		Not used
carpool-lanes (8235)		Not used
truck-lanes (8236)		Not used
emergency-lanes (8237)		Not used
passing-lanes (8238)		Not used
climbing-lanes (8239)		Not used
slow-lane (8240)		Not used
service-road (8241)		Not used
cycle-lane (8242)		Not used
tracks (8243)		Not used
bridge (8244)		Not used
overpass (8245)		Not used
elevated-lanes (8246)		Not used
underpass (8247)		Not used
tunnel (8248)		Not used
all-exit-lanes (8249)		Not used
all-entry-lanes (8250)		Not used
either-shoulder (8251)		Not used
shoulder-work (8252)		Not used
	bike-lane	Bike lane
	none	No lanes (open or closed)
	unknown	Unknown which lane is referenced
	alternating-flow-lane	Signal or flagger controls lane flow
	left-shift-lanes	All open lanes shift to the left
	right-shift-lanes	All open lanes shift to the right

#### 2.6.2. closedShoulders

#### Note: LaneRoadway is imported into TMDD from SAE 2540 (ITIS Standard)

LaneRoadway Enumerations	Used for closedShoulders	Description
right-shoulder (8219)	outside	The outer lane or the right most lane.
left-shoulder (8220)	inside	The inner lane or the left most lane
	both	Both inside and outside shoulders
	none	Not needed if field is optional; this is the default value
	unknown	Unknown if shoulder is open, closed or not existing

#### 2.6.3. roadDirection

Note:	Link-alignment	is	imported	from	TMDD
	0				

Link-alignment enumerations	Used for roadDirection	Description
northbound (1)	northbound	Road flow is in the northbound direction
eastbound (2)	eastbound	Road flow is in the eastbound direction
southbound (3)	southbound	Road flow is in the southbound direction
westbound (4)	westbound	Road flow is in the westbound direction
inner-loop (5)		Not used
outer-loop (6)		Not used

### 2.7. Metadata

This section describes the contents of a static file with information about the quality and context of data in the data feed. The files should be made available to data consumers through a link included in the WZDx header data elements (see Section 2.2).

The static file shall be encoded as a comma delimited text file.

Filename: WZ-Metadata.txt

Table 11. wetadata	Table	11.	Metadata
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Data Name	Description	Example
issuingOrganization	The name of the issuing organization. This name should match the name in the WorkZoneActivity record.	"Anyplace public works"
Location-verify- method	The method used to verify the accuracy of the location information	"Survey accurate GPS equipment accurate to 0.1 cm"
WZ-location-method	<ul> <li>The typical method used to locate the begin and end of a work zone impact area. Select the method that most closely represents how begin and end locations are assigned in the WZDX file.</li> <li>channel-device-method</li> <li>sign-method</li> <li>junction-method</li> <li>unknown – when method for locating the begin and end locations of the work zone is not known</li> <li>other – when the method for locating the begin and end locations do not closely match any of the alternatives. An explanation should be included in the metadata when this value is assigned.</li> </ul>	"channel-device-method"
LRS-Type	Describes the type of linear referencing system used for the milepost measurements	"Use of milemarkers posted the roadways. These are registered to a dynamic segmentation of statewide LRS basemap."
LRS-URL	A URL where additional information on the LRS information and transformation information is stored	https://aaa.bbb.com/lrs
Datafeed-frequency- update	The frequency at which the data feed is updated and made available through the data feed. Format shall include value+ units such as 30s, 15m, or 24h where: • s = seconds • m = minutes • h = hours	"30s" "15m" "24h"

Timestamp- Metadata-Update	The time and date when this file was last updated	2016-04-12T00:01:00
Contact-name	The name of a contact responsible for the data feed	Jo Help
Contact-email	The contact's email address	jhelp@anyplacePW.com

# 3. CREATING THE SPECIFICATION

The WZDx-v1 data feed will be specified as an XML file. The file will contain one or more work zone activity entries. A work zone activity entry is defined as a description of work zone characteristics for a road segment along a single roadway in a single direction. The WorkZoneActivity data frame is composed of the common core data dictionary elements (Table 1) and depicted in Figure 1.



### Figure 1: Work Zone Activity Organization

Note: not all optional data elements are included in secondary levels of the hierarchy

### 3.1. Code Examples

The WZDx Activity frame code examples presented below were extracted from existing data feeds generated by several open data sites. These examples use the following sample work zone activity template:

Тад	Value
Identifier	
subidentifier	
StartDateTime	
<ul> <li>startDateTime-est</li> </ul>	
<ul> <li>startDateTime-ver</li> </ul>	
EndDateTime	
<ul> <li>endDateTime-est</li> </ul>	
<ul> <li>endDateTime-ver</li> </ul>	
BeginLocation	
<ul> <li>roadName</li> </ul>	
<ul> <li>roadNum</li> </ul>	
<ul> <li>roadDirection</li> </ul>	
latitude	
<ul> <li>longitude</li> </ul>	
<ul> <li>milepost</li> </ul>	
endLocation	
<ul> <li>latitude</li> </ul>	
<ul> <li>longitude</li> </ul>	
<ul> <li>milepost</li> </ul>	
wz-Status	
totalLanes	
openLanes	
closedLanes	
closedShoulders	
workersPresent	
RoadRestrictions*	
<ul> <li>roadRestriction</li> </ul>	
description	
issuingOrganization	
timeStampEventCreation	
timeStampEventUpdate	

#### Sample Work Zone Activity Template

Three examples of WorkZoneActivity records are shown below. They were derived from on-line data feeds including:

- MassDOT Event Feed <u>Example 1</u>
- iCone Event Feed <u>Example 2</u>
- Caltrans Lane Closure Feed <u>Example 3</u>

#### 3.1.1. Example 1: MassDOT

Тад	Value
Identifier	137097
StartDateTime	startDateTime-ver: 2016-11-03T19:37:00
<ul> <li>startDateTime-ver</li> </ul>	
EndDateTime	endDateTime-est: 2016-11-04T05:30:00
<ul> <li>endDateTime-est</li> </ul>	
BeginLocation	roadName: I-91
roadName	roadDirection: southbound
• roadNum	latitude-est: 42.33865
roadDirection	longitude-est: -72.63399
latitude	
longitude	
milepost	
endLocation	latitude-est: 42.33307
	longitude-est72.6214
<ul> <li>Iongitude</li> <li>milepost</li> </ul>	
	activo
totall apos	
	J right?
	Ingitz
closedShoulders	inside
workersPresent	n/a
RoadRestrictions*	n/a
roadRestriction	1//4
description	I-91 Southbound Exit (20) Rt-5/ Rt-10 Northampton Hadley to Exit
	(19) Rt-9
issuingOrganization	MassDOT
timeStampEventUpdate	2017-11-02T18:57:02

#### 3.1.2. Example 2: iCone

Тад	Value
Identifier	320
StartDateTime	2015-01-07T16:50:56Z
<ul> <li>startDateTime-ver</li> </ul>	
EndDateTime	n/a
<ul> <li>endDateTime</li> </ul>	
BeginLocation	roadName: I-35
<ul> <li>roadName</li> </ul>	roadDirection: Northbound
<ul> <li>roadNum</li> </ul>	latitude-ver: 31.0855180
<ul> <li>roadDirection</li> </ul>	longitude-ver: -97.4030700
latitude	
<ul> <li>longitude</li> </ul>	
milepost	
endLocation	latitude-ver: 31.0855180
latitude	longitude-ver: -97.4030700
<ul> <li>longitude</li> </ul>	
<ul> <li>milepost</li> </ul>	
wz-Status	active
totalLanes	3

openLanes	all
closedLanes	none
closedShoulders	outside
workersPresent	true
RoadRestrictions*	
<ul> <li>roadRestriction</li> </ul>	
description	Long-term deployment near Temple
issuingOrganization	iCone
timeStampUpdate	2018-01-17T22:32:00Z

#### 3.1.3. Example 3: Caltrans

Тад	Value
Identifier	C299CA-0004-2016-04-12-00:01:00
StartDateTime <ul> <li>startDateTime</li> </ul>	startDateTime-ver: 2016-04-12T15:58:00
EndDateTime • endDateTime	endDateTime-est: 2016-04-30T
BeginLocation <ul> <li>roadName</li> <li>roadNum</li> <li>roadDirection</li> <li>latitude</li> <li>longitude</li> <li>milepost</li> </ul>	roadName: CA-299 roadDirection: East latitude-est: 40.635122 longitude-est: -122.733841 milepost-est: 114.190T23:59:00
endLocation <ul> <li>latitude</li> <li>longitude</li> <li>milepost</li> </ul>	latitude-est: 40.67201 longitude-est: -122.654384 milepost-est: 121.633
wz-Status	Active
totalLanes	2
openLanes	right
closedLanes	left
closedShoulders	Inside
workersPresent	True
<ul><li>RoadRestrictions*</li><li>roadRestriction</li></ul>	
description	One lane closed on Route 299 East near Lewiston to French Gulch (0.6 mi west of Crystal Creek Rd) for approximately 30 days.
issuingOrganization	Caltrans
timeStampCreation	2016-04-12T00:01:00
timeStampUpdate	2016-04-19T14:41:04

# 4. XML SCHEMA AND EXAMPLES OF XML AND JSON FILES

See files in separate attachment:

- WXDX XMLSample.xml
- wxdx\_JSONsample.json
- WZDx\_draft01.xsd

# 5. WZ LOCATION METHOD DESCRIPTION AND PRACTICES

The metadata file will include one of five enumerated type values for WZ-location-method field.

For this data element (WZ-location-method), select the value below that most closely represents how begin and end locations are assigned in the WZDX file.

- channel-device-method (see section 5.1) this is the preferred method
- **sign-method** (see section 5.2)
- junction-method (see section 5.3)
- **unknown** when method for locating the begin and end locations of the work zone is not known
- **other** when the method for locating the begin and end locations do not closely match any of the alternatives. An explanation should be included in the metadata when this value is assigned.

### 5.1. channel-device-method (Preferred Method)

Location of first and last channeling device (e.g., cone or barrier) that is part of a "travel impact effect" (taper) or designation of a work zone transition area. For complex work zones with multiple activities, begin and end locations are the first channeling device for first activity up to the last channeling device of the last activity.



#### Simple scenario

#### **Complex Scenario**

This example shows three work zone activity areas that are part of a work zone project. Each activity area is treated as an independent work zone activity record, with its own begin and end location where each lane taper begins and ends.

Note: with the data element "subidentifier", the "owner" can link the three work activities together.



# 5.2. sign-method

Location of first and last work zone-related signs. This may be different from the channelization location. For complex work zones, begin would be the first sign before the first activity and end would be the last sign following the last activity.



# 5.3. junction-method

Location of a Junction (e.g., a cross street or exit/entrance ramp) before and after a work zone. Note that this is similar to the approach used by Waze to designate a road closure event.



#### **Highway Scenario**

