DRAFT Preliminary Clear Roads Universal In-Cab Communications Protocol

Reviewer comments log
Updated April 27, 2015

Page	Reviewer organization	Reviewer name(s)	Comment numbering code	Comments to document version	Date of comments submitted	Status
2	Federal Highway Administration (FHWA)	Derek Freckleton, Sudharson Sundararajan	FHWA-1 through -39	Version dated January 31, 2014	February 7, 2014	Comment log last updated July 30, 2014 by Jim Talbert, Certified Power, Inc.
7	Delcan Technologies		DELC-1 through -36	Version dated January 31, 2014	February 12, 2014	Most items have been reviewed and resolved; a few are pending.
15	FHWA Road Weather Management Program	Sudharson Sundararajan, Sara Sarkhili	FHWA-40 through -52	Version dated September 2, 2014	September 17, 2014	Items have been reviewed and resolved.
17	Delcan Technologies	Russ Brookshire, Sean Mulligan, Mark Neill	DELC-37 through -43	Version dated September 2, 2014	September 26, 2014	Items have been reviewed and resolved.

Federal Highway Administration (FHWA)

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FHWA-1	FHWA (Sudharson Sundararajan)	Table 1: Glossary of Terms, ASCII	E	Typo	Interchange	Accepted
FHWA-2	FHWA (Sudharson Sundararajan)	Table 1: Glossary of Terms, ASCII	E	Typo	~~readable~~ readable	Accepted
FHWA-3	FHWA (Derek Freckleton)	Section A, introductory paragraphs	T	Are these values for X and Y going to be specified? I believe they should be standardized within the protocol.		Accepted. Awaiting technical guidance as to what these values should be.
FHWA-4	FHWA (Derek Freckleton)	Section A, introductory paragraphs	E	Regarding the ellipsis between last two sentences of first paragraph: *can be stored on-board if communication with the server is interrupted… Must include store-and-forward capability.* This thought seems incomplete.		Will work with drafter to address The system has store-and-forward capability in event the communication with the server is interrupted Last line being removed from final release.
FHWA-5	FHWA (Derek Freckleton)	C.1.2	E	I assume this is "bits per second". May want to specify/define this, if it is not universally understood.	bits per second (bps)	Accepted, but we believe this to be universally understood in the industry Will spell out the acronym for clarity
FHWA-6	FHWA (Derek Freckleton)	C.1.9	T	At this point, is the process repeated? Or is operation carried out at the base baud rate of 19200? If the process is repeated, how many times, and what happens when continued failure is experienced?		Accepted. Awaiting technical guidance in regard to this.
FHWA-7	FHWA (Sudharson Sundararajan)	D.1.1	E	I am guessing the subscriber is being synchronized. Please reword this sentence.		Accepted. "… as defined by the Clear Road DPL. The data parameters shall be synchronized with the…"
FHWA-8	FHWA (Derek Freckleton)	D.1.3 D.1.4	T	These parameters will have great influences on the memory storage capacity requirement referred to on page 3 in the Hardware Compatibility section.		Agreed, report rates currently vary from several seconds to several minutes. Industry can accommodate this.
FHWA-9	FHWA (Derek Freckleton)	D.2.6.1	E	Repeated words (the section title already begins "AVL devices shall…")	~~AVL Device shall provide~~ Provide	Accepted the revised wording.

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FHWA-10	FHWA (Derek Freckleton)	D.2.6.2	E	Reword	~~Any data requested in the Vehicle Configuration message that is redundant/duplicate between the AVL Device and Spreader Controller (i.e. date, time, vehicle speed, battery voltage) shall be negotiated and data from the most appropriate source shall be communicated.~~ Identify any data requested in the Vehicle Configuration message that is redundant/duplicate between the AVL Device and Spreader Controller (i.e., date, time, vehicle speed, battery voltage); identify the most appropriate source; and communicate those data from those sources.	Accepted the revised wording.
FHWA-11	FHWA (Sudharson Sundararajan)	D.2.6.2	T	Regarding: *data from the most appropriate source* How is this source identified?		The AVL device may replace spreader data with its own data. This specification does not force an AVL provider to replace or keep the spreader data, only that the spreader sends the data. The AVL provider can determine if they wish to replace redundant spreader data.
FHWA-12	FHWA (Derek Freckleton)	D.2.7	T	What happens if connectivity with the server is lost?		An AVL device will try to reconnect continuously until a connection is made. The end user must determine a connection is lost by the lack of data received at the expected interval.
FHWA-13	FHWA (Sudharson Sundararajan)	D.2.7	E	Regarding: *within x minutes/seconds* Please update value when available.		The value will be updated before the protocol is released.
FHWA-14	FHWA (Derek Freckleton; Sudharson Sundararajan)	D.3.1	E	Update with correct section number.	See Authentication Procedure in ~~SECTION ???~~ Section K.	Section K is correct
FHWA-15	FHWA (Derek Freckleton)	Section E, introductory paragraph	T	How will this capability to add/revise the requested data to be reported impact the requirement for storage if communication with the server is lost? (Again, referring to page 3)		The spreader control cannot update when data is not received but it is expected that a push message that is not acknowledged by the AVL device will be retransmitted until acknowledge is received allowing the spreader control to then update what is transmitted. Any data stored locally (in cab) will not have the requested new data.

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FHWA-16	FHWA (Derek Freckleton)	E.1.1.2	T	And data type, I would assume.	shall exactly match the spelling, ~~and~~ string length, and data type documented	Accepted the revised wording.
FHWA-17	FHWA (Derek Freckleton)	Section F, introductory paragraph	T	Why "potentially" in this sentence? It seems to me like the reporting interval would be a requirement…	to identify the data parameters that are to be reported, and ~~potentially~~ the intervals at which to report them.	Accepted the revised wording.
FHWA-18	FHWA (Derek Freckleton)	F.1.1, first line of ASCII	T	Should probably define that \r signifies the end of the string, and that this holds true for all ASCII strings.		Carriage return followed by Line feed is used to determine the end of an ASCII string.
FHWA-19	FHWA (Derek Freckleton)	F.1.9, second sentence	T	I feel that this may be an important aspect, in order to make the operator aware of the lost communication. Otherwise, without this knowledge there may be a potential to not get data you thought you were collecting, and the effort is more or less wasted.	~~Optionally, t~~The AVL Device shall sound	The alarms are defined as optional and will vary by AVL provider but it is expected that the alarm will be configurable if of an audible nature.
FHWA-20	FHWA (Sudharson Sundararajan)	Section G, introductory paragraph	E	Suggested deletion	their position in the data strings, their types, sizes and ~~potentially~~ the intervals at which to report them.	Accepted the revised wording.
FHWA-21	FHWA (Derek Freckleton)	G.1.1, parameter DPx_Size	T	What is the purpose of this parameter? Is it just an error checking parameter? Is this parameter necessary?		This is used to verify that the data received is of the appropriate size, it is part of the error checking and is required.
FHWA-22	FHWA (Derek Freckleton)	G.1.1, parameter DP(x+n)_Name	T	Regarding: *will not report* Not? Why do we need to list the data parameters not reported? Couldn't this list potentially be very long?		This is required to notify the end user that on an older spreader control a certain data element is not available. Primarily, this is used for mixed fleets to have 1 configuration of data but some not supported by legacy equipment.
FHWA-23	FHWA (Derek Freckleton)	G.1.4	E	The quotations around the term "geo-stamp" signify that it is not a commonly used term, and therefore should probably be defined somehow. My question after reading this sentence is, what exactly is a geo-stamp?		Agreed geo-stamp shall be defined.
FHWA-24	FHWA (Derek Freckleton)	G.1.6	T	Suggest this issue indicated in red text be resolved…		This will be addressed prior to final release.
FHWA-25	FHWA (Derek Freckleton)	G.1.7	E	Again, this seems important so as to avoid the scenario where an operator thinks they are collecting certain data, but may not be because of a lost connection. I feel that this would be important for them to know. Note: G.1.8 may resolve this comment about the data NOT reported by the spreader. If so, you may disregard it.	~~Optionally, t~~The Spreader Controller shall sound audible and/or visual alarms to alert the operator to lost communication.	This will remain optional. An audible alert could be a distraction to the plow operator. The notification on the spreader control is typically handled as an error and logged. It is important to record this for troubleshooting purposes.

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FHWA-26	FHWA (Derek Freckleton)	Section H, introductory paragraph 1	T	Typo: add a comma after "i.e."	(i.e., AVL Device)	Accepted the revised wording.
FHWA-27	FHWA (Sudharson Sundararajan)	Section H, introductory paragraph 1	E	Sentences seem repetitive.		The paragraph describes 2 types of event triggered data transfers. 1 is triggered by a value change, 2 is triggered by a time, distance, or material dispensed interval.
FHWA-28	FHWA (Sudharson Sundararajan)	Section H, introductory paragraph 2	E	Reword.	For example, ~~T~~the interval triggers can be a set time, distance, or material displacement~~, for example~~.	Accepted the revised wording.
FHWA-29	FHWA (Derek Freckleton)	Section H, introductory paragraph 3	T	Regarding the final sentences: *NOTE: Store and forward capability…* This is in contrast to the requirements specified on page 3 in the Hardware Compatibility parameters. So I am left to assume that this requirement only applies to new equipment?		The intent from the start was to apply to equipment from this point forward and to accommodate legacy equipment where possible. Legacy retrofits could be too costly for the vendor community and the agencies.. This requirement applies to new equipment. Legacy equipment may be supported if spreader vendors wish to update older equipment software.
FHWA-30	FHWA (Derek Freckleton; Sudharson Sundararajan)	H.1.4	T	So, just to clarify, a blank field does not necessarily mean no data, but it does mean that the data has not changed? If that's the case, why not just re-report the data in order to avoid confusion? (Freckleton) *In response:* Probably to minimize data size? (Sundararajan)		Correct, the option to only send changed data reduces the data usage and associated data cost.
FHWA-31	FHWA (Derek Freckleton)	H.1.6	T	In this case, it may be useful to have the data fields report a "Not Available" rather than just not report it. Keep in mind that it is assumed that this data was requested by the user to be reported, right		This section is defining that data which was stored locally due to lost connection to the server must not get a location stamp appended to it by the AVL since the location is not where the data was accumulated.
FHWA-32	FHWA (Derek Freckleton)	Section I, introductory paragraph	E	Reword.	(i.e., changing set rates, pressing Blast~~, etc.~~)	Accepted the revised wording..
FHWA-33	FHWA (Sudharson Sundararajan)	Section I, introductory paragraph	E	Typo.	selectively-populate~~d~~ event data string	"populated" is correct as written.

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FHWA-34	FHWA (Derek Freckleton)	I.1.1, parameter DPx_MaxSize	T	Again, is it just an error checking parameter?		Yes, error checking in part.
FHWA-35	FHWA (Derek Freckleton; Sudharson Sundararajan)	Section K, introductory paragraph	T	This comment may be naïve, but I thought this protocol was for universal application, therefore suggesting that a device may not be "Clear Roads Certified"…? (Freckleton) How is this ensured? Does this portion refer to Clear Road products or the Clear Roads Data Library? (Sundararajan)		The intent is that devices once tested and found compatible on the Test Bed software, will be placed on a Clear Roads Qualified Products List. Agencies will then be able to specify that devices be on the QPL. This step ensures this is the case.
FHWA-36	FHWA (Derek Freckleton)	K.1.2	E	Add a colon at the end of this sentence in order to avoid the impression that this is an incomplete thought.	Upon becoming communication ready:	Accepted the revised wording.
FHWA-37	FHWA (Derek Freckleton)	K.1.4	T	What happens when the system times out?		It is expected that if a spreader times out that it just continues to store data locally until a power cycle occurs but it may change state (start transmitting again) if it receives data from the server at a future time.
FHWA-38	FHWA (Derek Freckleton)	L.1	T	This seems to suggest that the device is able to perform this task AFTER the ignition is turned off. Therefore, the device is understood to have some kind of internal power source in order to perform this task before fully powering down.		It may be internal power or may control the shutdown sequence on a system that has both constant battery and ignition signal.
FHWA-39	FHWA (Derek Freckleton)	L.1 through L.4	G	Is there a reason all of this is in bold font?		Will be corrected before final release of the document.

Delcan Technologies

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DECL-1	Delcan Technologies	Table 1 – RS-232	T	Recommend that specification for RS-232 be referenced.	"A common serial communications standard used for connecting devices such as a computer and a printer. RS-232 defines a specific type of signal, timing, and connector pinouts. The current version of the standard is *TIA-232-F Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange*, issued in 1997."	No issue, just confirm the correct RS-232 gender and pinouts. Does TIA-232-F spec certain pinouts, flow rates, signals that are an issue? Specify that use is only TX, RX and Ground.
DECL-2	Delcan Technologies	Table 1 – ASCII	T	Recommend that specification for ASCII be referenced.	An acronym for the American Standard Code for Information Interchange, ~~"ASCII" usually refers to data that appears as text – letters, numbers and select punctuation marks. ASCII tends to be more human readable than other data types such as binary (all 1's and 0's), or hexadecimal (alphanumeric data with values between 0-9 and A-F), for example.~~ The current version of the standard is *ANSI X3.4-1986 (R1992), Information Systems – Coded Character Sets – 7-Bit American National Standard Code for Information Interchange (7-bit ASCII)*.	Keep this text, but put it in as a footnote. No issue with citing a specific ASCII standard, ANSI perhaps, but confirm.
DECL-3	Delcan Technologies	Section A, paragraph 1	E	X and Y seem to be placeholders during the comment process, and are meant to be replaced with actual values.	"…so that X number of data records or Y number of days' worth of raw data…	Correct, this was a placeholder. Move ahead with X=??? and Y=5 days.
DECL-4	Delcan Technologies	Multiple, starting with Section B, paragraph 1	E	Consistent usage of references to "Spreader Controller". This should be applied throughout the document.	"…between the ~~spreader control~~ Spreader Controller and the attached device…"	OK
DECL-5	Delcan Technologies	Section B, Table	E	Consistent use of "Control Character".	"~~Command~~ Control Character"	OK
DECL-6	Delcan Technologies	Section B, Table	T	Correct hexadecimal value for Carriage Return	~~0x13~~ 0x0D	OK
DECL-7	Delcan Technologies	Section B, Table	T	Correct hexadecimal value for Line Feed	~~0x10~~ 0x0A	OK
DECL-8	Delcan Technologies	Multiple, starting with C.1.1	E	Consistent formatting of example strings by use of double quotes.	"by sending a "%CR_GMBR" message."	OK

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DECL-9	Delcan Technologies	C.1.9	E	Typo	…for 30 ~~seconds. if~~ seconds. If a…"	OK
DECL-10	Delcan Technologies	D.3.1	E	Section reference.	"in ~~SECTION???~~ SECTION K.	OK
DECL-11	Delcan Technologies	Multiple, starting with F.1.1	E	Consistent formatting of control characters by enclosing them within the following symbols <>.	"%VH,CRC,DPSET(x),DPSET(x+1),DPSET(x+2), …~~\r~~<CR>"	OK
DECL-12	Delcan Technologies	Multiple, starting with F1.8	E	If ACK and NAK are intended to indicate the transmission of "ACK<CR>" and "NAK<CR>" respectively, this should be included in Section B.	"Where ACK and NAK are referenced, the string to be transmitted is "ACK<CR>" or "NAK<CR>" respectively."	OK
DECL-13	Delcan Technologies	F.1.3	E	There seem to be only three data elements in DPSET.	"There shall be one DPSET data ~~quartet~~ triplet for each requested data parameter."	OK
DECL-14	Delcan Technologies	F.1.4	E	Sentence seems contradictory.	"The ~~order in which the data parameters are initially defined in the %VH string is not important, however, the~~ order of the data parameters in the %VH string:"	F.1.4.4 – replace "future" with "subsequent" before the %VH.
DECL-15	Delcan Technologies	Section A, Paragraph 1	G	The statement "associated in-cab electronics" is not clear.	"… the ~~associated in-cab electronics~~ AVL device and Spreader Controller must include a minimum amount of on-board memory …"	Add "in-cab electronics" to glossary. Just meant to represent, for example, the spreader and AVL box connected.

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DECL-16	Declan Technologies	D.1	G	Section D.1 describes AVL device provider requirements for an external website and other information. However, this document is the "Clear Roads Universal In-Cab Communications Protocol". Therefore, this type of information should not be present in this document, or should be provided as a reference to the standard that defines these requirements. 16.A: Section D.1 defines operational requirements of a server, not the protocol between an AVL device and Spreader Controller. This is outside of the scope of an AVL/Spreader Controller Protocol and should be removed. Will this section be removed? If section D.1 remains in this document: 16.A: D.1.1 – Is the Clear Roads DPL to be an electronic document which the server must synchronize with? 16.B : D.1.1 – Many DOTs operate their communication network over a VPN which prevents access to an outside, publicly accessible website. If the Clear Roads DPL is to be published on a publicly accessible webpage, how is it anticipated that a server of this type will synchronize with the Clear Roads DPL? 16.C : D.1.1 - What is the list of standard web browsers and their versions that are required to be supported? 16.D : D.1.2. – In D.1.1 the means of accessing the list of available data parameters is listed as a standard web browser however, no such means of access is listed in D.1.2. What is the means of access?	Remove section D.1 or clearly define the method by which this functionality is to be implemented. 16: D.1.5 – Recommendation: Add "in accordance with Section E" at the end of D.1.5.	D.1 needs to remain, but… D.1.1. (16A) That was the intent, however the means is open to creative implementation… What's important is that the user is provided with an up to date revision of the DPL, and SOME MEANS for configuring the fleet with the available data parameters. D.1.1. (16B) It is not the intention of this document to solve this issue. It is intended to provide agencies who choose to adopt this standard with a defined protocol… the means for getting the DPL and synchronizing it is left for the user and AVL provider. D.1.1. (16C) There will not be a list offered, as it would be soon obsolete… The means shall be left open to implementation by the AVL providers and/or users. Suggested revision to D.1.5. is accepted.

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DECL-17	Delcan Technologies	D.2	G	Portions of the section D2 describe communications between the AVL Device and a central server. However, this document is the "Clear Roads Universal In-Cab Communications Protocol". Therefore, this type of information should not be present in this document, or should be provided as a reference to the standard that defines these requirements. 17.A : D.2.2 – How is transfer to the server handled if communications are not available? 17.B :D.2.3 – If vehicle configuration is pushed from the server, it does not need to be downloaded. 17.C : D.2.7 – Specify "x"	Remove section D.2.2, D.2.3 & D.2.7 or clearly define the method by which this functionality is to be implemented. If Section D.2.2, D.2.3, D.2.7 are not removed: D.2.2 – Reword: "Transfer any on-board/stored data from the Spreader Controller to the AVL device in accordance with Section H or I ~~and send it to the server~~." D.2.3 – Reword: "If pushed from the server, receive the *Vehicle Configuration*"	D.2.2. (17A) Need clarification from Delcan: "if communications are not available" Proposed rewording to reference Section H or I (clarify) is accepted. D.2.3. (17B) Will replace "Download" from original text with "Receive and process" D.2.7. (17C) will delete "(to be updated on the Subscriber's portal *within x minutes/seconds*)"
DECL-18	Delcan Technologies	E	T	Section E defines configuration information between an external server and the AVL Device, not between the AVL Device and the Spreader Controller. 18.A: How does the server know that an AVL device has powered up? 18.B: Where is the definition of the message used by the AVL device to alert its server that it has powered up? If no definition, please provide one. 18.C: Where is the definition of the message that is contained in the push update from the server to the AVL device? If no definition, please provide one. 18.D: Is the server allowed to send configuration data at any other time other than AVL device power up?	Remove Section E or clearly define the method by which this functionality is to be implemented.	18.A. The AVL device, as a matter of the power up and authentication process described in Section D.2 will notify the server that it has powered up simply by the fact that it is communicating. 18.B This is left undefined for implementation by the AVL providers. 18.C This is left undefined for implementation by the AVL providers. 18.D The specification supports configuration changes at times other than at power up. But, several clarifications need to be made to the specification to clarify this: H.1.2. and H.1.5. shall be reworded **(changes pending vendor review)**
DECL-19	Delcan Technologies	B	E	The linefeed character is not used, so should be removed from the example in order to prevent confusion on the terminating characters of the protocol.	Remove the "<LF>" character from the example, as it is not used as a terminating character of the later defined protocol.	<LF> is used, but was not defined in the released revision. "\r" shall be replaced with "<CR><LF>" throughout the document.

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DECL-20	Delcan Technologies	F.1.7	T	How a message can time out in this stage of the process, once the Spreader Controller has received the message from the AVL Device, is not clear.	F.1.7 The Spreader Controller shall respond with "NAK~~\r~~<CR>" if the CRC fails or if the message ~~times out~~ contains invalid data.	It is intended that a timeout period be established. A timeout of **30 seconds** shall be added to the F.1.7. requirement. Vendors to confirm/suggest appropriate timeout period. Establish an appropriate timeout period, and consider that additional events could be generated while waiting for the "ACK"… May need to clarify how the device "buffers" new events while waiting for "ACK" up to the point it times out.
DECL-21	Delcan Technologies	F.1.5	T	Represent the negative integer for DPx_Interval as it will be represented in the actual protocol itself. "(-1)" is not a standard definition for a negative number. Either use -1 or (1) to represent a negative number.	DPx_Interval=~~(~~-1~~)~~	OK. Will remove parentheses
DECL-22	Delcan Technologies	F.1.9	T	A "SPREADER COM LOST" event is not the only reason a Spreader Controller might return a "NAK<CR>", including invalid data settings.	After 3 unsuccessful attempts to send the %VH string and receive ACK, the AVL Device will ~~record a "SPREADER COM LOST" event.~~ ignore the %VH and move to the next setting.	The intent of this line was to record that the communication with the Spreader was unsuccessful. It is acknowledged that "COM LOST" doesn't cover all scenarios. This shall be separated into two unique messages. The first shall be "SPREADER COM LOST" (no response from spreader) and the second shall be "SPREADER DATA CORRUPT" (NAK received).
DECL-23	Delcan Technologies	G.1.1	G	DP_FIELD_CNT needs clarification that it is the number of fields about to be returned, whether or not they are %EI or %EU headers, as at the moment the definition can be interpreted that the field count only include %EI headers. G.1.3 clarifies this statement, but the definition should be updated.	DP_FIELD_CNT = integer reflecting number of data parameters (fields) being sent from the Spreader Controller	OK
DECL-24	Delcan Technologies	G.1.4	G	A "geo-stamp" is not a well-defined entity or action and does not appear to be related to the communications between the Spreader Controller and the AVL Device, rather solely to the AVL Device and therefore does not belong in this document.	G.1.4 The AVL Device shall acknowledge receipt of each of the %EH, %EI and %EU strings with "ACK<CR>~~\r~~" ~~and shall attach a "geo-stamp" to all received messages.~~	The term "geo-stamp" shall be added to the glossary, and shall refer to the valid combination of fields from the DPL. Text should read something like "Shall include, at a minimum, LAT, LON and Time".

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DECL-25	Delcan Technologies	G.1.6	G	Remove "TO BE RESOLVED" section of the document.	G.1.6 The Spreader Controller shall resend any string if a NAK is received for it or if no response is received from the AVL Device. ~~TO BE RESOLVED: If a NAK or ACK is not received, should the Spreader Control identify the string in a certain way (perhaps a new % prefix) to signify that it is a re-transmission of the data? This could lend to a "connection quality" indicator, or otherwise prevent duplicate data from being stored or sent by the AVL Device.~~	Vendors to consider and reply. There is potential for the AVL device to have received the first message, sent it on, but never successfully acknowledged back to the spreader that the message was received. DEFINE.
DECL-26	Delcan Technologies	H.1.6	G	This is an extraneous statement and outside of the scope for this document.	Remove H.1.6, or have it as a clarifying note.	OK. Will be left in the document, as it helps clarify for the audience.
DECL-27	Delcan Technologies	I.1	E	This section does not clearly delineate between the string sent by the AVL Device and the expected reply of the Spreader Controller.	Move the description of the %PH string under I.1.2	Will explain during call with Delcan. Should be left as-is. I.1.2. is explaining that the spreader will respond with a string formatted to what was requested by the AVL device in the %PH string in I.1.1. For clarity, it is defined in Section H.
DECL-28	Delcan Technologies	I.1.1	T	Allow the Spreader Controller to NAK a poll request if the poll request is invalid.	Under I.1.1: … "The Spreader Controller will respond with a "NAK<CR>" to any %E request where the data fields being requested are either not available via the Spreader Controller or the number of data fields don't match the number of fields in the Spreader Controller."	**VENDORS to review. Probably need to add references to %VH and the %EH and %EI responses from spreader to AVL device. (HALEY)**
DECL-29	Delcan Technologies	L.2	E	A "geo-stamp" is not a well-defined entity or action and does not appear to be related to the communications between the Spreader Controller and the AVL Device, rather solely to the AVL Device and therefore does not belong in this document.	Remove L.2	The term "geo-stamp" shall be added to the glossary, and shall refer to the valid combination of fields from the DPL. Text should read something like "Shall include, at a minimum, LAT, LON and Time".
DECL-30	Delcan Technologies	L	T	Clearly delineate between required and non-required portions of the standard. The current mechanism of indicating a portion of the standard is not required is not clearly defined, instead is just present in the text of each section.	Clearly delineate between required and non-required portions of the standard.	ANY numbered item is a requirement of the spec. Vendors to review to ensure that ONLY required items are numbered.
DECL-31	Delcan Technologies	Section D	G	This section and several other section references the Data Parameter Library. Does this document currently exist, or is it to be defined at a later time?	If the DPL has not yet been defined, include it as an Appendix or separate section.	DPL does exist, and is currently being developed/finalized by Clear Roads.

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DECL-32	Delcan Technologies	Section E, F, G, H, I	G	Naming Consistency – Section numbering is not consistent across the document. For example, Section I goes from Section Header for I straight to section I.1.1. without I.1 in between.		OK
DECL-33	Delcan Technologies		G	Will there be additional comment periods for stakeholders? We strongly encourage another comment period to review the protocol document once all comments have been addressed and incorporated into the protocol. Many sections have placeholder or insufficient information to provide a complete and thorough evaluation of the document.	Provide additional comment periods.	Yes, additional comment period shall follow this feedback period. PROVIDE TIME??

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DECL-34	Delcan Technologies		G	Clarify device certification process. 35.A: Who conducts device certification testing? 35.B: How much will certification cost? 35.C: How often will certification testing take place? 35.D: The DPL document is a live document. When the DPL document changes, do devices need to be re-certified?		35.A – Clear Roads will host a Test Bed Software system that tests compatibility. Vendors will be able to access the system to do a test and a certificate will be generated to both Clear Roads and the vendor indicating whether the device is compatible or not. Clear Roads will maintain an updated list of compatible projects. Clear Roads will not be reporting on products that attempted the test and did not pass. 35.B – There will be no costs to access the Test Bed Software. 35.C This is left to the vendor to decide. Clear Roads will maintain a list of certified devices by vendor, model number and firmware revision that have successfully passed the certification test, and the DPL revision that was current at the time of the certfication. Vendors are certainly free to revise firmware without recertification, but Clear Roads members may require that all devices being bid must be certified to a certain minimum revision of the DPL if it has evolved to include new features not previously supported by a device. If a device's firmware changes to support new DPL features, it must be recertified in order to be included on the Clear Roads list of certified products for that particular DPL revision. 35.D – Only if the device firmware is revised to accommodate new features added to the DPL. What is implied for the TEST BED SOFTWARE is that future DPL parameters that aren't currently supported by the devices can be added without breaking the "certified" devices.
DECL-35	Delcan Technologies		E	Add a document Revision History		Agreed
DECL-36	Delcan Technologies		E	Add a document Version Number		Agreed

Federal Highway Administration (FHWA), second review

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FHWA-40	FHWA	A – "…associated in-cab electronics must include a minimum of 100kB of non-volatile on-board Memory…" on Page 9 of PDF	T	100 Kb seems like a low number. How long can data be stored when communication is unavailable? Does the latest data set replace previously stored data? It also depends on how long the disconnection lasts; maybe for longer period there is a need for more memory capacity.		100kB was the minimum on-board memory that all targeted in-field hardware would support.
FHWA-41	FHWA	C.1.9 on page 11 of 24 of PDF	T	At this point, is the process repeated? Or is operation carried out at the base baud rate of 19200? If the process is repeated, how many times, and what happens when continued failure is experienced?		The process is specified to repeat for 30 seconds, after which the baud rate will remain at 19200.
FHWA-42	FHWA	E.1.1.2 on page 13 of 24 of the PDF	T	Add data type as well		Data type is noted in the spec E.1.1.2
FHWA-43	FHWA	Section F, introductory paragraph on page 13 of 24 of the PDF	T	Please remove the word "potentially".		Intervals are not required for every data parameter.
FHWA-44	FHWA	Section G, introductory paragraph on page 15 of 24 of the PDF	T	Please remove the word "potentially".		Intervals are not required for every data parameter.
FHWA-45	FHWA	Section H, introductory paragraph 2	E	Reword.	For example, the interval triggers can be a set time, distance, or material displacement	Authors don't see a need to change.
FHWA-46	FHWA	C.1 on page 4	T	Why is the baud rate specified at 19200? The Standard baud rates supported by most serial ports are: 110, 300, 600, 1200,…, 57600, 115200. Why was this specific rate picked?	Suggest providing the rationale or standard reference, if it applies.	19200 was the maximum supported baud rate for all targeted hardware
FHWA-47	FHWA	D.1.6 on page 6	T	This is a great requirement to detect erroneous input and misbehavior action, but what about a requirement for consequent action? What would happen if there is a mismatch?	Suggest adding a requirement for mitigation steps if there is a mismatch in Vehicle Configuration from what has been last observed.	Steps for mitigation are out of scope for this document.

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FHWA-48	FHWA	D.2.6.2 on Page 6	T	Not enough detail is provided w/r to the negotiation process.	Provide more details on the steps for negotiation and determining the "appropriate" source of data. What methodology should be used?	D.2.6.2. is clear about the requirement that the AVL device will handle where requested data is coming from. The specifics on how the AVL device handles this negotiation are out of scope.
FHWA-49	FHWA	D.3.3 on Page 6	T	The requirement refers to "means" for receiving data from AVL but it does not provide any more details on what type of means? This is a vague requirement.	It would be useful to provide more details on what types of means at least at the high-level.	The specification clearly defines the method of serial communication.
FHWA-50	FHWA	Section D	G	How is the GPS data collected, configured, verified, and appended to the data stream?	Provide details about GPS data.	These details are deemed out of scope for this specification.
FHWA-51	FHWA	H on Page 11	T	In the 3rd paragraph, it's noted "If communication between the Spreader Controller and AVL Device is lost, or for any other reason event data strings are stored on-board the Spreader Controller on the internal memory and transmitted at a later time". Is this true regardless of how long the communication loss is? Wouldn't the stored data be outdated after a long time and worthless for being transmitted?	Please clarify.	Data will be stored on-board indefinitely until downloaded or cleared from memory.
FHWA-52	FHWA	General	G	What about data jamming? Any requirements if too much data is received or transmitted that could disable the system? How would too much data or garbled data be processed or handled?	Please clarify if there needs to be any requirement to address data jamming.	In any circumstance where data transfer cannot be completed, the specification clearly outlines how the devices will respond.

Delcan Technologies, second review

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DELC-37	Delcan Technologies	F.1.4.4	E	Reference is made to "Appendix A", but this Appendix does not appear in the document.	Either remove the reference or add the Appendix.	The contents of Appendix A are being developed and will be added at a later date.
DELC-38	Delcan Technologies	F	T	What is the intended response of the Spreader Controller in the event that the AVL sends a Vehicle Configuration Header Message with an unsupported Data Parameter Name?		This is explained in Section G with the %EU strings.
DELC-39	Delcan Technologies	F	T	What is the intended response of the Spreader Controller in the event that the AVL sends a Vehicle Configuration Header Message with an unsupported Reporting Interval?		Section G requires that the spreader controller respond with the DPx_Interval for each parameter. Though it is not specified in this document, it is assumed that the spreader controller will set the reporting interval to the appropriate minimum or maximum value supported by the spreader controller hardware/firmware.
DELC-40	Delcan Technologies	F.1.5	T	For a DPx_Interval = positive integer, how are the units determined? For example, users may want the value associated with the parameter" Gallons of Liquid Sprayed" to be recorded based on a trigger interval measured in seconds, gallons, or miles.	Add another element to the DPSET triplet to define the reporting interval units.	The units of measure for each data parameter are specified in the Clear Roads DPL file, and the interval units are in the same units.
DELC-41	Delcan Technologies	G	T	The heading to this section was confusing. Section G.1.2 through G.1.8 give a good description of how these messages are to be used, so the header can simply give an overview.	"After receiving and acknowledging the Vehicle Configuration Header Message (%VH message) from the AVL Device, the Spreader Controller will send a sequence of responses providing Spreader Controller identification parameters and indicating which parameters of those included in the %VH message will and will not be subsequently reported by the Spreader Controller.	Verbiage will be left as-is for now.
DELC-42	Delcan Technologies	Multiple locations, beginning with H.1.1	E	The delimiter used between data string elements is referenced as "pike". In a Google search no reference was found to this term as being applied to a character. Perhaps it was intended to reference "pipe", but this is a reference to the use of a vertical bar to indicate the pipeline function in command line computer interfaces.	Throughout document, replace "pike" with "vertical bar". In Section B, add "The vertical bar (|) is mapped in ASCII to 0x74."	Proposed change shall be adopted.

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DELC-43	Delcan Technologies	J	T	We compiled the CRC-16 CCITT Code Sample using GCC and received a different result: 0x1BC4 rather than 0x7EBC. The same CRC resulted whether the compiler was set to interpret strings as ASCII or UTF-8.		The CRC results will be corrected in future revisions of the spec.