FINAL STATEMENT OF REASONS

UPDATE OF THE INITIAL STATEMENT OF REASONS

Regulation Article 1 (Two Automatic Vehicle Identification Equipment Protocols) was modified for clarity as follows:

- Section 1700.1 referred to "automatic vehicle equipment" in two places has been modified, for the purpose of clarity to "automatic vehicle identification equipment."
- Section 1700.2 changed "toll agencies" to "toll facility operators" to be consistent with California Streets and Highway Code section 27565. Changed "capability to read and process transactions using the 6C protocol" for the purpose of clarity to "capability to read and process transponders on the roadway using the 6C protocol." Also, rephrased and edited "The Title 21 and 6C protocols shall operate simultaneously without degradation to the accuracy or operation of either protocol" for the purpose of clarity to "The Title 21 and 6C protocols shall operate concurrently."
- Section 1700.3 change "toll agencies" to "toll facility operators" to be consistent with California Streets and Highway Code section 27565.

Regulation Article 6 (Summary of New Automatic Vehicle Identification Equipment) was modified for clarity as follows:

- Section 1705.1 was deleted since it had no regulatory effect and was not needed for clarity.
- Section 1705.2(a) changed definition “A fixed-position reader, associated transmit and receive (Tx/Rx) antenna(s), and modulation and demodulation hardware and software” to “A device with associated transmit and receive (Tx/Rx) antenna(s), and modulation and demodulation hardware and software” to be consistent the new technology capabilities.
- Section 1705.2(c) changed definition “Electronic devices that contain information which can be communicated to the reader. The transponders may have the capability to read and write information.” to “Electronic devices that contain information which can be communicated to the reader. The transponders may have the capability to store new or modified data received from a reader” to be consistent the new technology capabilities.

Regulation Article 7 (Introduction) was modified as follows:

- Section 1706.1 was deleted since it had no regulatory effect and was not needed for clarity.

Regulation Article 8 (Reader and Transponder Specifications) was modified for clarity.

- Section 1707.1 deleted “and subsequent amendments and additions” since it references future versions that need to be listed in the regulation. To correct this the following references were added “Or ISO/IEC 18000-6 Second edition 2010-12-01 Information technology—Radio frequency identification for item management—Part 6: Parameters for air interface communications at 860 MHz to 960 MHz. Or ISO/IEC 18000-63 Second edition 2015-10-15 Information technology—Radio frequency identification for item management—Part 63: Parameters for air interface communications at 860 MHz to 960 MHz Type C and updates of Types A and B.
- Added the following reference “Automatic vehicle identification equipment shall be
compliant with the California 6C Electronic Toll collection Standard Version 1.0 dated May 5, 2017” for clarity.

- Corrected “section” to properly state “Article” and deleted “No reader shall operate in such a way as to harm or diminish the performance of any transponder.”
- Deleted “All toll agencies collecting any information shall observe and follow all applicable legal authority, including but not limited to Streets and Highways Code section 31490, regarding the collection and dissemination of personally identifiable, and other private, confidential, and sensitive information.”
- Changed "toll agencies" to "toll facility operators" to be consistent with California Streets and Highway Code section 27565. Added “and suppliers” for clarity.
- Section 1707.2 was deleted since it was not needed for clarity.

Regulation Article 9 (Testing and Certification) was modified for clarity as follows:
- Section 1708.1 change “All automatic vehicle identification equipment specified in Articles 6 through 8 shall be tested and certified by an approved independent third party as directed by CTOC” for the purpose of clarity to “All automatic vehicle identification equipment designated by CTOC as requiring testing and certification shall be tested and certified by a CTOC approved independent third party.”

UPDATE TO FORM 399: ECONOMIC AND FISCAL IMPACT STATEMENT (REGULATIONS AND ORDERS)

The following changes were made at the request of the Department of Finance:

Section A, Estimated Private Sector Cost Impacts, Part 1 the additional boxes a, b and g where checked and note 1 in the attachment was added for clarity. The first paragraph of Note 1 is restating the “Small Business Determination” in the Notice of Proposed Rulemaking under Tab A of the Rulemaking File. The second paragraph was added to address the non-monetary impact of the regulation.

Section A, Estimated Private Sector Cost Impacts, Part 3 number was changed to 5 to indicate the number of businesses impacted by the regulation. Note 2 in the attachment was added because the response was cut off. The form did not provide enough space for the complete response.

Section C, Estimated Benefits, Part 3. Note 3 in the attachment was added because the response was cut off. The form did not provide enough space for the complete response.

Section D, Alternatives to the Regulation, Part 2. Note 4 in the attachment was added because the response was cut off. The form did not provide enough space for the complete response.

Section A, Fiscal Effect on Local Governments, under box 2, note 5 was added for clarity. Box 3, note 6 was added to show the savings by fiscal year. This breakdown is also shown on page 18 of Attachment 1, “Standardized Regulatory Impact Assessment” in the Initial Statement of
Reasons under Tab C of the Rulemaking File.

Section B, Fiscal effect on State Government, box 3 was unchecked and box 4 was checked and note 7 was added. Note 7 is restating part of paragraphs three and four on page 3 of Attachment 1, “Standardized Regulatory Impact Assessment” in the Initial Statement of Reasons under Tab C of the Rulemaking File.

UPDATE TO DOCUMENT OF REFERENCE: CALIFORNIA 6C ELECTRONIC TOLLING STANDARD

Changes that have been incorporated are in response to comments received regarding the document of reference. Most changes are technical in nature to provide clarification and relate to the California 6C Electronic Tolling Standard. The updated document is dated May 5, 2017. A summary of the changes are as follows:

Section 1.1 the last sentence the word “programming” was deleted.

Section 1.2 the following areas of interest were added:

- Transponder Requirements
- Reader Requirements
- Security and Data Integrity Validation

The following areas of interest were deleted:

- Barcode Format
- Transponder Security and Data Integrity Validation
- Transponder Ordering and Delivery (Manifest Information)
- Compatibility with Existing Systems

Section 1.3 the following Definitions, Acronyms, and Abbreviations were added:

ACK Acknowledgement
AFI Application Family Identifier
CRC Cyclic Redundancy Check
DSFID Data Storage Format Identifier
EPC Electronic Product Code
HOV High Occupancy Vehicle
IEC International Electrotechnical Commission
ISO International Organization for Standardization
NAK Negative Acknowledgement
PC Protocol Control
RFID Radio Frequency Identification
TSN Transponder Serial Number
UII Unique Item Identifier, ISO/IEC 18000-6C transponder memory bank 01
XPC Extended protocol control
Section 2.3 the third bullet “Unique Item Identifier” was added.

Section 2.3.1 in the Section column of the Memory Map the Classification Description has been updated to read: “Classification is taken directly from E-Zpass Inter-Customer Service Center Interface File and Reporting Specifications, Appendix C and includes:”

Section 2.4 the second paragraph deleted “and shall not be read or write protected”.

Section 3.1 first paragraph added “All values are measured per the EPC Global Tag Performance Parameters and Test Methods Version 1.1.3 test protocol, limited to the 902 – 928 MHz frequency range and modified as follows:
- Use a horizontally, linearly polarized test antenna;
- With tags mounted on material applicable for the intended location on the vehicle; and
- As described in Section 3.1.3.”

Section 3.1.1 was revised to read “Tags shall have a minimum activation energy (forward link range) resulting in a test read range between 7 m and 12 m.”

Section 3.1.2 was revised to read “Tags shall have a return signal strength (reverse link range) resulting in a test read at minimum of 14 m.”

Section 3.1.3 second paragraph was revised to read “When tilted +/- 15 degree horizontally (see Figure 1) from the installation reference angle defined by the transponder manufacturer, tags shall have a minimum activation energy (forward link range) resulting in a test read range between 5 m and 12 m. For example, when a tag is not installed horizontally level (“crooked”).”

Figure 1 title was revised to read “Tilt from horizontal reference plane = α.”

The third paragraph was revised to read “When tilted +/- 45 degrees vertically (see Figure 2) from the installation reference angle defined by the transponder manufacturer, tags shall have a minimum activation energy (forward link range) resulting in a test read range between 5 m and 12 m. For example, this addresses windshield angles between steeply sloped windshields (sports car) and near vertical windshields (semi-tractor trailers).”

Figure 2 title was revised to read “Tilt from vertical reference plane = Φ.”

The fourth paragraph was revised to read “When rotated +/- 18 degrees from the horizontal plane (see Figure 3) from the installation reference angle defined by the transponder manufacturer, tags shall have a minimum activation energy (forward link range) resulting in a test read range between 5 m and 12 m. For example, this addresses transponder mounting locations on flat windshields versus curved windshields and headlights.”
Figure 3 title was revised to read “Rotation from horizontal reference plane = 0”.

Section 3.2 was added as follows:

3.2 Tag Environmental Conditions
Transponders shall be able to perform under the following environmental conditions:
1. All interior transponders shall be able to be subjected to and operated in 95% humidity, non-condensing environments.
2. All exterior transponders shall operate in 100% humidity, condensing environments.
3. Tags shall be able to operate at temperatures between -40º F and +185º F.
4. Sunlight screening shall be built into both the internal and external transponders to ensure they perform as well under conditions of direct sunlight as in overcast conditions.

Section 3.3 “Barcode format” was moved from Section 4.1.

Section 3.4 “Transponder Ordering and Delivery (Manifest information)” was moved from section 6.

Section 4 Reader Requirements was added.

Section 4.1 was added as follows:

4.1 ISO Commands
The following ISO reader commands are optional:
1. NAK
2. Kill
3. Lock

Section 5.2 and 5.2.1 was added as follows:

5.2 Memory Bank Security
5.2.1 RESERVED MEMORY BANK
1. The Access Password shall have a Lock Status of locked with an Access Password known to and secured by the transponder issuing agency.
2. The Kill Password and its Lock Status shall be configurable by the transponder issuing agency. It is recommended that the transponder issuing agency configure tags to permanently disable the ability to kill their tags.

Section 5.2.2 was formerly numbered 5.1.1

Section 5.2.3 was formerly numbered 5.1.2 and revised to read as follows:

1. The transponder issuing agency shall be the only entity authorized to change the encoded bits on the transponder. UII memory bank shall have a Lock Status of locked.

2. UII Authentication/Validation – The UII memory data should be authenticated with two hashed validation bytes. The UII Validation bytes can be used for transponder
data verification and can also provide some level of transponder authentication. Further details are contained in Section 5.3.

Section 5.2.4 was formerly numbered 5.1.3 and was revised to read as follows:

1. Password – The User memory shall be writable without a password. The User memory bank shall have a Lock Status of unlock.
2. Authentication/Validation – Authentication and validation shall not be used.

Section 5.2.5 was added as follows:

**5.2.5 ENCRYPTION**
Under development.

Section 5.3 was formerly 5.2.

Section 6 was formerly Section 7.

Section 6.1 was formerly Section 7.1 and the following agencies along with the associated information were added to the table:

- North Carolina Turnpike Authority
- Port of Hood River
- McAllen-Hidalgo & Anzalduas

Added at the bottom of the table “For most current list, please contact Caltrans.”

**CHANGES FOR THE THIRD COMMENT PERIOD**

Regulation Article 1 (Two Automatic Vehicle Identification Equipment Protocols) was modified for clarity as follows:

Section 1700.1 deleted “9” and replaced it with “8”.

Section 1700.3 deleted “approved by the California Toll Operators Committee (CTOC)” and added “if a written request is submitted to and approved by the California Department of Transportation (Caltrans).”

Regulation Article 3 (Introduction) was modified for clarity as follows:

Section 1702.1 Third Paragraph, third sentence added the “The California Department of Transportation.”

Section 1702.2(b) in the first sentence, added “by the”.

Regulation Article 4 (Reader Specifications) was modified for clarity as follows:
Section 1703.4(a) in the third sentence added “in”.

Regulation Article 5 (Transponder Specifications) was modified for clarity as follows:

Section 1704.5(f) deleted “of” and added “with”.

Section 1704.6 added “s’ to make “message” plural.

Regulation Article 6 (Summary of New Automatic Vehicle Identification Equipment) was modified for clarity as follows:
Section 1705.1 in the first sentence deleted “9” and replaced it with “8”.

Regulation Article 7 (Introduction) was modified for clarity as follows:
Section 1706.1 in the first sentence deleted “9” and replaced it with “8”. Deleted second paragraph “CTOC or its successor shall act as the standards setting organization with Caltrans having representation in the organization.”

Regulation Article 8 (Reader and Transponder Specifications) was modified for clarity as follows:

Section 1707.1 added “Document Incorporated by Reference:” to the beginning of paragraph “ISO/IEC 18000-6 Second edition 2010-12-01 Information technology—Radio frequency identification for item management—Part 6: Parameters for air interface communications at 860 MHz to 960 MHz.”


Section 1707.1 added “Document Incorporated by Reference:” to the beginning of paragraph “Automatic vehicle identification equipment shall be compliant with the California 6C Electronic Toll Collection Standard Version 1.0 dated May 5, 2017.”

Regulation Article 9 (Testing and Certification) was deleted for clarity as follows:
Section 1708.1 was deleted.

SUMMARY AND RESPONSE TO COMMENTS RECEIVED DURING INITIAL NOTICE PERIOD AND AT PUBLIC HEARINGS
On February 16, 2017, Caltrans conducted a public hearing as designed in the Notice of Proposed Rulemaking published in the California Regulatory Notice Register. The hearing was held in San Francisco. This was also the final date to submit written comments. Caltrans received many comments, both during the comment period and at the public hearings. Public comments relative to the initial notice period and at the hearings are indexed in this Final Statement of Reasons. Transcripts of the public hearing are under Tab E of this Rulemaking File.

Comment 1. “The primary reason offered by the proposal for transitioning away from the current Title 21 protocol is the estimated cost savings by switching from Title 21 tags to the 6C protocol tags which Caltrans envisions will be “commoditized” and available from multiple vendors. However, the case for cost savings is defective, incomplete and misleading because it does not include the true support costs for products to be used in the field that are currently included in the cost of current Title 21 technology, and it also does not include the intellectual property (IP)/licensing fees that will be required to use the 6C protocol or the litigation risk of using unlicensed technology.

“Although the proposal assumes price savings for agencies compared to the current Title 21 technology, there is no reason to believe that commoditized pricing will actually be available for 6C compliant product over the life of the future system. This is particularly true with respect to inevitable licensing fees required because of the ownership/IP issues discussed in more detail below. The proposal completely ignores the licensing fee costs associated with 6C. Moreover, commoditized pricing will require additional support and services over the life of the system that is not reflected in the fiscal impact and economic analysis prepared for this rule making. The current Title 21 pricing structure includes system support but commoditized pricing does not.

“Furthermore, the fiscal and economic analysis (analysis) assumes “sticker” format 6C tags to achieve their low cost. However, that assumption is flawed because stickers cannot be moved from vehicle to vehicle, so more tags are required for families with more than one vehicle. Also, stickers need to be scraped and replaced each time a windshield is changed or a car is sold. Moreover, sticker type tags may be less desirable for some users because they cannot be removed temporarily without replacement, such as might be desired when a car is driven by a teen.
Although it is true that “hard case” portable 6C tags are available, they are considerably more expensive and reduce potential saving over Title 21 tags significantly. By contrast, Title 21 tags with user replaceable batteries are portable and have virtually unlimited life.

“Finally, the fiscal and economic analysis fails to take into account the economics of HOT lane tags that require a hard case, “three position” switch. Over the last several years in California, the trend has been towards a high and higher percentage of three position switch Title 21 tags being used. In fact, over the last four months in California, 2/3 of all Title 21 tag sales have been for the hard case three position switch. The proposal fails to note there are no hard case “three position” switchable 6C tags on the
market today. Those tags, when available, will be significantly more expensive and will inevitably bring added IP litigation risk and/or licensing fees that are not contemplated by the proposal. Accordingly, the Caltrans analysis greatly underestimates the actual cost of providing the new tags that will be in demand, and it erroneously assumes 6C tag demand will comprise of “stickers” when the market shows they won’t.”

Response to Comment 1:
- Costs used in the Statewide Regulatory Impact Assessment (SRIA) are based on market prices paid by the toll agencies that utilize the 6C technology. These prices factor in IP/licensing fees and support costs and the California toll agencies’ projected distributions of different transponder types.
- Caltrans agrees that toll operators may need to order more transponders with the switch to 6C due to the lack of portability with sticker transponders. Costs also include a conservative increase in the number of sticker transponders required due to non-portability and replacement for windshield damage was based on Colorado’s E-470 experiences. However, the significantly lower cost of 6C transponders should still allow for lower procurement costs compared to what they pay today for Title 21 transponders.
- The SRIA includes both sticker and three position switchable tag costs in the economic analysis.
- In the public hearing, as part of his testimony, Samuel Johnson from the Transportation Corridor Agencies provided a three position switchable 6C tag.
- A three position switchable 6C tag has been certified for use in tolling.

Comment 2. “The 6C protocol reflected in the proposal is not an open standard that multiple vendors can provide at the commoditized price Caltrans assumes in their analysis. In developing the proposal, Caltrans should have performed a rigorous IP survey that included a complete vetting of the ownership of the protocol, performance, and security (protection against consumer fraud) features necessary. Even a cursory review would have revealed that one company, Neology Inc, a subsidiary of SMARTTRAC of Holland, claims that its patents are fundamental to any tolling application of the proposed 6C standard. In fact, Neology is aggressively litigating its claims and has sued every company who has sold 6C product in the US tolling market to date apparently resulting in some companies leaving the US market while others have settled for undisclosed amounts to acquire licenses. In addition to the legal claims asserted by Neology, another one of the one of the largest providers of the 6C ASIC used in tag manufacturing, Alien Technologies Corporation, is the target of an active patent infringement suit brought by another holder of 6C related patent claims, Intermec. California toll operators have been led to believe that a switch to the 6C standard would allow multiple vendors to compete for toll tag and tag reader business. In the handful of states that are currently using 6C, there are only 3 bidders for any RFP. These firms are. Neology, which has IP rights to 6C; 3M, which is paying license fees to Neology; and Star Systems International, which is being sued by Neology for IP related damages. Accordingly, the 6C standard is not “open” and will not have a long list of competitors vying to see cheap product to California toll system operators.

“The proposal offers no information that ANY additional licenses will be made available
from Neology or at what cost. As such Caltrans has failed to establish that the 6C standard proposed meets its acknowledged statutory requirement to adopt an “open” standard. Furthermore, several other companies have made claims that they also own patents that are fundamental to 6C operation, including the RFID consortium (http://www.rfidlicensing.com/), Honeywell/Intermec, as well as the companies who participated in development of the proposed ISO standard and own relevant patents incorporated in the standard itself. It is unknown what the cost of licensing all of these patents will be, or if they are even available for licensing, because no IP study has been completed.

“As proposed, the 6C protocol is incomplete and will require new additional specifications that the California Toll Operators Committee (CTOC) is still working on but has not completed. No evidence exists, nor has data been collected, that demonstrates that the new specifications will work in a tolling environment. Moreover, the 6C tags can be easily counterfeited with low cost off the shelf equipment. In today’s environment of increased hacking attacks, basic anti-counterfeiting techniques should be included in any upgrade to prevent consumer fraud. To the extent the proposal is amended to specify security standards, such extensions will likely infringe other patents that have not even yet been identified and invoke additional IP litigation risk and/or licensing costs.

“Fundamental to the proposed transition plan from the current Title 21 tags to 6C tags is the use of dual or multi-protocol readers. These readers may also require patents that cover dual or multi-protocol reader operation. Further, the proposed 6C specifications need significant additional specification sections to function interoperably in the California tolling environment. These specifications are brand new and have not been fielded or verified for effectiveness in toll collection.

“In short, the proposal fails to properly consider what parties or entities may own intellectual property pertaining to the ultimate system that would be deployed under this regulation change, does not know how this would impact availability and cost of tags and readers, cannot establish that the proposed specifications meet the ‘open’ requirement, and have not been demonstrated the specification to be interoperable.”

Response to Comment 2:
- The ISO-18000 Part 63, governing the 6C protocol, is an internationally recognized standard publicly available via multiple websites. Toll operators using the 6C protocol formed the 6C Toll Operators Coalition (6C TOC) in 2012 to develop and make public the 6C protocol.
- Nationally, solicitations for products incorporating 6C continue to receive proposals from multiple bidders, including TransCore, 3M, Neology, STAR, and Kapsch. This offers California greater competition than the one or two bidders CTOC agencies see proposing on Title 21 products and it is in keeping with the requirement in Streets and Highways code section 27565 that toll facility operators should have multiple vendor choices.
- Technology solutions inherently deal with claims regarding intellectual property and any licensing or other cost exposure to the providers of these products is factored into the costs charged to consumers. Public agencies’ practice for including IP
indemnification provisions in their agreements further ensures that the vendors address these matters and price their solutions accordingly. Therefore current 6C transponder bid prices to date do reflect any IP uncertainties and yet these prices are still significantly less expensive than Title 21 transponders or transponders using any other toll protocol. None of the 6C TOC agencies have been sued for using 6C equipment in single or multi-protocol modes and they continue to garner multiple bids on their procurements.

• The 6C protocol is a proven, well defined protocol with standards that has been used successfully to support ETC with equipment from multiple vendors. As reported by the 6C TOC in their support letter, 6C TOC operators so far have over 3.5 million 6C transponders in use and have used 6C equipment to process over 500 million toll transactions generating over $1.2 billion in revenue. As a best practice, ISO and the 6C TOC periodically review their standards to be in line with industry practices and incorporate new features and do so publicly with open participation from both vendors and operators.

• The 6C protocol is an advancement over Title 21 security capabilities with built in security features. The 6C TOC has developed and incorporated a transponder authentication scheme that utilizes information encoded into the transponder chip directly by chip manufacturers. This security feature is implemented in Washington State as cited in the Washington State Department of Transportation’s letter of support. As cited in 3M’s letter of support, the cost to evade security measures and a multilayered defense with the typical use of license plate recognition cameras will deter and catch counterfeiters.

• Colorado and Vancouver, British Columbia have concurrently used the 6C and Title 21 protocols for tolling since 2011 and 2012 respectively. California will be able to leverage years of experience by vendors and operators on multi-protocol operations with 6C and Title 21. Almost all California toll facilities are equipped with multi-protocol readers by providers such as TransCore and 3M. Another sign of 6C’s acceptance and maturity as a protocol in the tolling industry is that 6C is one of three protocols being considered to support a federal mandate for national toll interoperability that was part of the Moving Ahead for Progress in the 21st Century Act (MAP-21). The 6C protocol has passed conformance testing for compliance with the toll industry’s national requirements.

• The implementation of the 6C protocol by January 2019 in California was determined in consultation with all California toll facility operators to ensure they will have enough time to procure, test, and install the necessary equipment to support 6C on their toll facilities.

• Documents incorporated by reference will be included in the 15 day comment period covering any additional specifications needed for 6C implementation.

Comment 3. “Under the MAP-21 requirements, toll industry stakeholders are looking at different long term options for toll interoperability. There are a number of different tolling protocols being evaluated. Currently in the United States, 52% of all RFID toll tags sold are the TDM specification, 34% are SeGo, 8% are Title 21 and only 5% are 6C. In fact, tolling agencies across the country buy more TDM or SeGo tags in one quarter than 6C toll agencies buy in an entire year. If the proposed regulations are
adopted and 6C does not emerge from NIOP over more mainstream technologies such as SeGo or TDM, California drivers will not benefit from NIOP service in other states, and California tolling agencies will then need to use triple protocol readers for the transition plan, with the need for yet new upgrades to infrastructure, reduced and unproven performance, and new patents that may apply to the triple protocol implementation. These will all drive significantly higher costs not reflected in the analysis. If 6C is not chosen as the solution to the federal mandate, and CTOC members do not spend the money necessary for upgraded triple protocol readers, toll operators may face the loss of federal funding or incur other penalties as was mentioned in last year’s Congressional Hearing. The NIOP process is scheduled to complete by the summer of 2017 which begs the question why Caltrans is rushing to adopt new Title 21 specifications now and not after the NIOP process concludes.

“Although they seem to have been dismissed from consideration by the proposal for not being ‘open’ standards, both the SeGo and TDM protocols included in NIOP have an installed base at least an order of magnitude larger than 6C, with new tags being deployed at rate far greater than 6C. While it is true those standards incorporate patents subject to intellectual property claims, unlike the proposed 6C standard, both alternative standards offer a clear path to licensing for all competitors on fair, reasonable and nondiscriminatory terms.”

Response to Comment 3:

• California is fully committed to and an extremely active participant in working with the International Bridge, Tunnel, and Turnpike Association (IBTTA) to achieve national electronic tolling interoperability.
• IBTTA is evaluating three National Protocol options: TDM, SeGo, and 6C, with all three passing conformance testing, which demonstrates their suitability to meet requirements set out by the toll industry.
• Although IBTTA is making progress towards testing and selecting a National Protocol, many complex tasks remain before toll operators could truly become interoperable, including addressing back office technical approaches, financial settlements of transactions, marketing and public outreach, and governance. So although IBTTA has a schedule for the selection of a national protocol, it has yet to formulate an overall schedule for implementation of the chosen protocol with any certainty.
• In addition, the IBTTA national interoperability effort fully recognizes multiple approaches to achieving interoperability and the inclusion of local/regional protocols as stated in IBTTA’s congressional report in 2013 and in congressional testimony in 2015. The decision to transition to 6C now enables California to benefit from cost savings associated with use of the 6C protocol as soon as possible. If the 6C protocol is the chosen national protocol, then California will already be in compliance, and the state’s toll operators will have already been able to experience the cost savings expected from this change for a longer period. In the event another protocol is chosen, the timing will be such that California’s toll operators will have time to phase out the Title 21 protocol before transitioning to dual protocol with the new national protocol. The regulation also includes an option for the toll operators to discontinue the use of the Title 21 protocol prior to the end of the 5-year transition
period.

- California toll roads have multiprotocol readers currently deployed, with the exception of SR 125 and Golden Gate Bridge. Both of these toll facilities will have multiprotocol readers implemented by the January 2019 transition date.

Comment 4. “For the reasons above, and as set forth in Attachment 5, the proposed changes to Title 21 do not meet the requirements under the Administrative Procedure Act.”

Response to Comment 4:
The comments provided in Attachment 5 are addressed in Comments 5 through 9.

Comment 5. “Section 1700.2 would require all California toll agencies to implement the 6C protocol by January 1, 2019. This deadline is unrealistic given that it took three to four years to develop the existing Title 21 protocol, a process which benefitted from significant involvement by the vendor community. Further, this section requires agencies to operate the Title 21 and 6C protocols simultaneously after the deadline. To do so will require multiprotocol readers that have yet to be developed fielded and tested. Moreover, any multiprotocol solution will likely entail additional risk of intellectual property litigation and/or licensing fees not contemplated by the proposal.”

Response to Comment 5:
- The implementation of the 6C protocol by January 2019 in California was determined in consultation with all California toll facility operators to ensure they will have enough time to procure, test, and install the necessary equipment to support 6C on their toll facilities. As noted in the various letters of support and public hearing testimony, the operators are confident that the January 2019 date can be achieved.
- California toll roads have multiprotocol readers currently deployed, with the exception of the State Route 125 South Bay Expressway and the Golden Gate Bridge. Both of these toll facilities will have multiprotocol readers implemented by the January 2019 transition date.

Comment 6. “The proposal would add a new subdivision, section 1701.2 (s), which defines the California Toll Operators Committee. The proposed language has no regulatory effect and thus violates the clarity and necessity standards of the APA. Specifically, a regulation is necessary to “implement, interpret, or make specific” the statutes that the rulemaking agency is responsible for administering. This section should be deleted.”

Response to Comment 6:
The acronym CTOC is defined in section 1701.2 along with the definition of all the other acronyms used in the document to provide clarity.

Comment 7. “Section 1705.1 has no regulatory effect and thus violates the clarity and necessity standards of the APA. Specifically, a regulation is necessary to “implement, interpret, or make specific” the statutes that the rulemaking agency is responsible for administering. The language of this proposed section is descriptive rather than regulatory. Indeed, DOT states this in the ISOR in which it is said that the purpose of
the section ‘is to describe how an AVI system
works.’ Such information may be interesting, but it is not law. This section should be deleted.”

Response to Comment 7:
Section 1705.1 has been removed in the purposed regulatory text.

Comment 8. “Section 1706.1 exceeds the scope of authority granted to the Department by statute in violation of Government Code section 11342.1. It therefore violates the authority and reference standards of Government Code sections 11349 and 11349.1. The proposed regulation also violates the clarity standard of section 11349. It is not consistent with and in conflict with Streets and Highways Code section 27565 in violation of Government Code section 11342.2. Specifically, this section purports to create a new regulatory entity, the California Toll Operators Committee (CTOC), and to endow that committee ‘or its successor’ with the power to set standards for the AVI protocol. The Department makes this intention explicit in its statement in the Initial Statement of Reasons that the section would ‘establish the California Toll Operators Committee, or its successor, together with Caltrans as the body that will set the standards for the AVI protocol’. The language of the proposed regulation, along with the statement of intent in the ISOR, demonstrates unambiguously that the regulation is intended to create the CTOC as an entity with rulemaking power, or using the precise language of the proposed regulation, ‘as the standard setting organization’. The draft regulation says that Caltrans ‘have[e] representation in’ CTOC, which clearly implies that Caltrans will be merely one member of and will have less than full control over CTOC.”

“Streets and Highways Code section 27565 provides that Caltrans shall act ‘in cooperation with the district and all known entities planning to implement a toll facility in this state . . .’ While Caltrans is told to act ‘in cooperation’ with other entities, nothing in the statute authorizes Caltrans to create a new quasi-governmental entity and to grant authority to set standards to this new entity. The proposed regulation, however, does precisely that. This regulation therefore is not authorized by the statute, and is inconsistent with and in conflict with the statute.

“However Caltrans proposes to act ‘in cooperation with’ other entities, it cannot delegate the authority to set standards to any outside entity. Caltrans alone has the power to set standards under Streets and Highways Code section 27565. Any such standards, if they are to be effective, must be adopted by Caltrans, not by the CTOC. Furthermore, such standards must be adopted pursuant to the rulemaking requirements of the Administrative Procedure Act (Gov. Code section 11340.5). CTOC could, perhaps, be established by Caltrans as an advisory organization, but any future action to establish standards for AVI must be taken either by the Legislature, or by Caltrans, acting on its own authority pursuant to the rulemaking provisions of the APA.”

Response to Comment 8:
Caltrans is not delegating its authority or creating a new regulatory agency with the designation of CTOC as the standards setting organization in Section 1706.1. Nothing in the proposed changes removes Caltrans’ responsibilities as they relate to the
administrative law process.

**Comment 9.** “Section 1707.1. represents an effort at unlawful prospective incorporation by reference. The document which is incorporated by reference is “ISO/IEC 18000-6 First edition 2004-08-15 AMENDMENTS 1 2006-06-15 Information technology— Radio frequency identification for item management—Part 6: Parameters for air interface communications at 860 MHz to 960MHz AMENDMENT 1: Extension with Type C”. However, the proposed regulation goes on to incorporate ‘subsequent amendments and additions’.

“By defining the standard to include future amendments to the specifically-identified document, the proposed regulation is effectively creating a regulation which may be amended without compliance with the rulemaking procedures of the APA. Since the regulated public cannot know what “subsequent amendments and additions” will be adopted to the specified standard, the proposed regulation is not explicit as to its requirements. It therefore violates the clarity standard of Government Code sections 11349 and 11349.1.

“Title 1, Cal. Code Regs. section 20 governs incorporation by reference in the adoption of regulations. This section provides that a regulation which incorporates another document by reference must, inter alia, “state that the document is incorporated by reference and identify the document by title and date of publication.” By saying that “subsequent amendments and additions” to the identified document shall be incorporated into the regulation, the proposed rule violates the requirement that the incorporated document be identified by title and date of publication. Section 20 permits the type of prospective incorporation by reference only when “an authorizing California statute or other applicable law requires” such prospective incorporation (emphasis added). There is no such governing statute or law in this case. Thus, to the degree that the proposed regulation employs prospective incorporation by reference, it is illegal and invalid.

“The Initial Statement of Reasons say specifically Caltrans intends to employ prospective incorporation by reference in this case. The ISOR’s rationale for this provision is that ‘referencing the document and future amendments and additions would eliminate the need to make a regulatory change every time the specifications are updated.’ This is certainly true, but unless there is a statute or other applicable law that requires such rulemaking, an agency is prohibited by the APA from employing this approach to rulemaking. While it is perhaps understandable that a state agency would prefer to avoid future rulemaking, it cannot be done legally in this case. Caltrans cannot lawfully provide that standards which have not yet been adopted shall, if and when adopted by another entity, be incorporated into this regulation automatically. Any such future regulatory change must be done according to the APA.

“In order to correct this legal defect, the words ‘and subsequent amendments and additions’ must be deleted from the proposed regulation.”

**Response to Comment 9:**
The reference in Section 1707.1 will be changed to reflect the versions of the ISO standards that can be used. The documents have been incorporated by reference in the

**Comment 10.** (Suggested edits are underlined or strikethrough) Section 1705.1.

Summary.
The compatibility specifications for automatic vehicle identification (AVI) equipment have been developed around two principal components: a reader and a transponder. The minimum role of the reader is to:

1) **Trigger or Activate** a transponder.
2) **Poll Interrogate** the transponder for specific information, and
3) Provide an acknowledge message to the transponder after a valid response to the polling message has been received.

**Response to Comment 10:**
After discussion with stakeholders, it was determined that this section was not needed. Section 1705.1 has been removed in the modified proposed regulatory text.

**Comment 11.** (Suggested edits are underlined or strikethrough) Section 1707.1.


Supplemental toll agency specifications will detail the optional functions, technical specifications, environmental, operational and other specific needs for each site installation.

**Supplemental CTOC specifications will detail the optional functions, technical specifications, environmental, operational and other specific needs for transponder models.**

All readers shall operate with any transponder model that meets the requirements in this section and has passed testing and certification in Article 9. No reader shall operate in such a way as to harm or diminish the performance of any transponder.

All toll agencies collecting any information shall observe and follow all applicable legal authority, including but not limited to Streets and Highways Code section 31490, regarding the collection and dissemination of personally identifiable, and other private, confidential, and sensitive information.

**Response to Comment 11:**
The reference in Section 1707.1 will be changed to reflect the versions of the ISO standards that can be used. The documents have been incorporated by reference in the Notice of Modifications to Text of Proposed Regulation dated March 22, 2017.

**Comment 12.** Section 1700.1 refers to "automatic vehicle equipment" in two places; it should be "automatic vehicle identification equipment".

**Response to Comment 12:**
This change has been incorporated in the regulatory text.

**Comment 13.** In Section 1700.2, change the phrase "capability to read and process transactions using the 6C protocol" to "capability to read and process transponders on the roadway using the 6C protocol." The passage should be more explicit to state 6C protocol tags must be read on the roadway. By only saying 6C transactions, it allows for operators to video toll vehicles using 6C tags, which can increase CSC workload associated with dealing in situations where FasTrak accounts and tags do not match registered license plates.

**Response to Comment 13:**
This change has been incorporated in the regulatory text.

**Comment 14.** Change "agencies" in Section 1700.2 to "toll facility operators" to be consistent with SHC 27565.

**Response to Comment 14:**
This change has been incorporated in the regulatory text.

**Comment 15.** In Section 1700.2, the phrase "shall operate simultaneously" should be written as "shall operate concurrently". This change would avoid the literal interpretation that dual protocol implementation requires firing both protocols at the same time, which is technically infeasible.

**Response to Comment 15:**
This change has been incorporated in the regulatory text.

**Comment 16.** Section 1700.2 contains the passage, "The Title 21 and 6C protocols shall operate simultaneously without degradation to the accuracy or operation of either protocol." It is unclear what is meant by degradation to "accuracy" and "operation" in the passage. Performance of AVI equipment should be established at each toll facility by the toll facility operator, not as part of the regulation. Therefore the suggested text is: “The Title 21 and 6C protocols shall operate concurrently.”

**Response to Comment 16:**
This change has been incorporated in the regulatory text.

**Comment 17.** Change "toll operators" in Section 1700.3 to "toll facility operators" to be consistent with SHC 27565.
Response to Comment:
This change has been incorporated in the regulatory text.

Comment 18. Article 3 is shown as Article "3.0;" it should be "3".

Response to Comment 18:
This change has been incorporated in the regulatory text.

Comment 19. Section 1705.1. Delete "3) Provide an acknowledge message to the transponder after a valid response to the polling message has been received."

A 6C tag does not require an acknowledge message to be read by a reader and may not be necessary in certain types of tolling applications. Because the proposed regulation is describing the reader's minimum requirements, any “acknowledge” requirement should be left out to avoid misinterpretation.

Response to Comment 19:
Section 1705.1 has been removed in the modified purposed regulatory text.

Comment 20. In Section 1705.2(a) the definition of "Reader" includes the terms "fixed- position". There are portable and mobile readers available. In order to preserve the option to use non-fixed-position readers, the definition of reader should be changed to read, "A device with associated transmit and receive (Tx/Rx) antenna(s), and modulation and demodulation hardware and software."

Response to Comment 20:
This change has been incorporated in the regulatory text.

Comment 21. In Section 1705.2(c), the sentence "The transponders may have the capability to read and write information." may be misleading as transponders do not read or write information. A reader can read the information that a tag backscatters and a reader can write information to the memory area in a tag. This sentence should be changed to read, "The transponders may have the capability to store new or modified data received from a reader."

Response to Comment 21:
This change has been incorporated in the regulatory text.

Comment 22. Article 7 is shown as Article "7.0;" it should be "7".

Response to Comment 22:
This change has been incorporated in the regulatory text.

Comment 23. Delete "automatic vehicle identification" in Section 1706.1 and leave "AVI"

Response to Comment 23:
This change has been incorporated in the regulatory text.

**Comment 24.** Delete "California Toll Operators Committee" in Section 1706.1 and leave "CTOC."

**Response to Comment 24:**
This change has been incorporated in the regulatory text.

**Comment 25.** The sentence "The transponders may have the capability to read and write information." appears again in Section 1706.1. As this is a repeat of the same sentence in the definition of Transponders, this sentence should be deleted from this section or delete it from the definition of Transponders and change this section to read, "The transponders may have the capability to store new or modified data received from a reader."

**Response to Comment 25:**
This change has been incorporated in the regulatory text.

**Comment 26.** Article 8 is shown as Article "8.0;" it should be "8".

**Response to Comment 26:**
This change has been incorporated in the regulatory text.


This passage should be changed to read as follows: “The AVI equipment shall be compliant with Type C of the document ISO/IEC 18000-6:2010 - Information technology — Radio frequency identification for item management — Part 6: Parameters for air interface communications at 860 MHz to 960 MHz, and any future CTOC approved versions of said specification, and shall comply with any CTOC accepted modifications thereto.”

**Response to Comment 27:**
The reference in Section 1707.1 will be changed to reflect the versions of the ISO standards that can be used. The documents have been incorporated by reference in the Notice of Modifications to Text of Proposed Regulation dated March 22, 2017.

**Comment 28.** Change the word "will" to "may" in the following sentence in Section 1707.1: "Supplemental toll agency specifications will detail the optional functions, technical specifications, environmental, operational and other specific needs for each site installation."

**Response to Comment 28:**
This change has been incorporated in the regulatory text.

Comment 29. The third paragraph in Section 1707.1 refers to "this section". Should it actually be "this Article"?

Response to Comment 29:
This change has been incorporated in the regulatory text.

Comment 30. In Section 1707.1, delete the sentence "No reader shall operate in such a way as to harm or diminish the performance of any transponder." This requirement's wording of "harm" and "diminish" is undefined and pose interpretation issues. Also "any transponder" is too broad and could mean any protocols. Since the 6C and legacy Title-21 protocols are controlled through FCC licenses regarding interference, this requirement should be removed.

Response to Comment 30:
This change has been incorporated in the regulatory text.

Comment 31. Section 1707.1 contains the following sentence: "All toll agencies collecting any information shall observe and follow all applicable legal authority, including but not limited to Streets and Highways Code section 31490, regarding the collection and dissemination of personally identifiable, and other private, confidential, and sensitive information." This sentence should be deleted because Streets and Highways Code section 27565 already requires operators on federal aid highways to comply with federal and state privacy protections. California toll operators do not store personally identifiable information on transponders.

Response to Comment 31:
This change has been incorporated in the regulatory text.

Comment 32. Delete the following sentence in Section 1707.1: "All toll agencies collecting any information shall observe and follow all applicable legal authority regarding intellectual property." There are already codes and regulations that agencies have to abide by with respect to intellectual property and it is not necessary to repeat. Furthermore, by only stating "intellectual property," it is too broad and can be interpreted as anything, not just related to the 6C protocol.

Response to Comment 32:
After discussion with the commenter, modified language has been incorporated in the regulatory text.

Comment 33. In Section 1707.1, change "toll agencies" to "toll facility operators" to be consistent with SHC 27565.

Response to Comment 33:
This change has been incorporated in the regulatory text.

Comment 34. In Section 1707.2, delete "The antenna placement, polarization and other details will be covered in the supplemental toll agency specifications." This does not
need to be stated in the regulation since toll agencies will address in their procurement documents.

Response to Comment 34:
This section was deleted in the regulatory text.

Comment 35. In Section 1708.1, the sentence "All automatic vehicle identification equipment specified in Articles 6 through 8 shall be tested and certified by an approved independent third party as directed by CTOC." could be misinterpreted to include legacy equipment. This sentence should be changed to read: “All automatic vehicle identification equipment designated by CTOC as requiring testing and certification shall be tested and certified by a CTOC approved independent third party.”

Response to Comment 35:
This change has been incorporated in the regulatory text.

Comment 36. Would the references in Section 1708.1 turn CTOC into a ‘state body,’ as that term is defined in Government Code Section 11121, and subject it to the Bagley-Keene Open Meeting Act?

Response to Comment 36:
No.

Comment 37. “The E-ZPass Interagency Group would like to submit the following comments regarding the Notice of Proposed Rulemaking: California Code of Regulations, Title 21, Public Works, Department of Transportation. The E-ZPass Group is an association of 38 toll operators in 16 states that oversees the E-ZPass® electronic toll collection program. E-ZPass enjoys tremendous brand recognition and high levels of customer satisfaction, and is the world leader in toll interoperability, with more than 33 million E-ZPass transponders in circulation and account holders in every state in the U.S.

“The referenced Notice of Proposed Rulemaking is lacking a recognition of the activities and decisions that are in progress toward the goal of satisfying the congressionally mandated national electronic tolling interoperability and the selection of a national protocol for in-vehicle toll transponders and associated roadside equipment. The E-ZPass Group and its members, along with the California toll operators and others throughout the U.S., have worked for six years through the International Bridge, Tunnel and Turnpike Association (IBTTA) to identify three candidate tolling protocols to advance for testing and evaluation toward a selection of a national tolling protocol. Each protocol had to pass a conformance test of compliance with national requirements established with full industry input, including requirements for open protocol standards to ensure market competition and competitive pricing. The three protocols about to begin laboratory and field testing are the 6C protocol (used by Washington, Colorado, Georgia, Utah, Michigan, and Alabama), the Time-Division Multi-Plexing (TDM) protocol (used for the E-ZPass system within the Northeastern and Midwestern United States), and TransCore's 6B SeGo protocol (used in Florida, Texas, and Oklahoma).
“The timing of an announcement by the state of California on [a] decision to commit to a new statewide tolling protocol is unfortunate given the national protocol testing about to commence. The toll industry has undertaken a very deliberative and requirements-based approach to ensure an objective and impartial evaluation and selection process for a national protocol by year-end. The E-ZPass Group stands behind this process as in the best interest of toll operators nationally in identifying a solution for national tolling interoperability that meets industry requirements, provides economic value, and preserves operational and consumer choices.”

**Response to Comment 37:**
- California is fully committed to and an extremely active participant in working with the International Bridge, Tunnel, and Turnpike Association (IBTTA) to achieve national electronic tolling interoperability.
- IBTTA is evaluating three National Protocol options: TDM, SeGo, and 6C, with all three passing conformance testing, which demonstrates their suitability to meet requirements set out by the toll industry.
- Although IBTTA is making progress towards testing and selecting a National Protocol, many complex tasks remain before toll operators could truly become interoperable, including addressing back office technical approaches, financial settlements of transactions, marketing and public outreach, and governance. So although IBTTA has a schedule for the selection of a national protocol, it has yet to formulate an overall schedule for implementation of the chosen protocol with any certainty.
- In addition, the IBTTA national interoperability effort fully recognizes multiple approaches to achieving interoperability and the inclusion of local/regional protocols as stated in IBTTA’s congressional report in 2013 and in congressional testimony in 2015. The decision to transition to 6C now enables California to benefit from cost savings associated with use of the 6C protocol as soon as possible. If the 6C protocol is the chosen national protocol, then California will already be in compliance, and the state’s toll operators will have already been able to experience the cost savings expected from this change for a longer period. In the event another protocol is chosen, the timing will be such that California’s toll operators will have time to phase out the Title 21 protocol before transitioning to dual protocol with the new national protocol. The regulation also includes an option for the toll operators to discontinue the use of the Title 21 protocol prior to the end of the 5-year transition period.

In addition to the comments listed above, Caltrans received 17 letters in support of this regulation during the initial comment period. These letters are under Tab D of the Rulemaking File.

The following is testimony from the Public Hearing.

**Testimony 1:** “I would like to speak relative to our concerns that this change to the specifications for Title 21 may be premature given a number of factors that I will illustrate here in the next few minutes.
“First, we would like to suggest that perhaps the financial impact is incomplete, in that, some of the factors that have gone into that are yet to be actually resolved; for example, the switchable transponder that has been discussed as being needed in the 6C world, to our knowledge, does not exist today, and it would be curious as to how that analysis of what the financial implications would be -- could be perfected without understanding what the costs associated are of that, given that in today's world about two-thirds of the transponders that are purchased by agencies in California are a three-position, Title 21, HOT-capable transponder.

“Additionally, we're concerned from a cost point of view; in that, there is a number of unknown factors relative to the licensing of the underlying intellectual property and patents that are associated with the 6C protocol. There are today at least two active patent infringement suits relative to readers, tags, and theASIC, which is the Application Specific Integrated Circuit, that is the primary component of either sticker tags or the three-position HOT tag that is working its way through the courts. There are also a number of other companies that have expressed that they have IP that is associated with the 6C protocol and have either offered licensing royalty programs for them or have said that they may do that in the future, and as a manufacturer of tags and readers, that promotes a fair degree of uncertainty given the litigation and the uncertainty about what -- or if licensing programs might be available in order to provide that technology as 6C becomes, perhaps, more prevalent in a state such as California.

“We're also concerned that the MAP-21 initiative which the federal government outlined in legislation a few years ago that calls for national interoperability that the International Bridge Tunnel & Turnpike Authority -- I think I did that right -- IBTTA is working to try and figure out which protocol to use as the national protocol on a go-forward basis. A number of California agencies are participating in that program, and so far there are three nominated protocols: the 6C protocol, the SeGo protocol, and what is commonly referred to as TDM, are the three protocols that are moving forward, but a decision has not been made as to which protocol would be the national protocol, and if, for example, 6C is not chosen, that would place California at a significant disadvantage relative to be able to participate in the MAP-21 initiative, and potentially, place agencies at risk to lose federal funding or be put subject to other sanctions as was discussed last year during the congressional hearing on the MAP-21 Interoperability Initiative that was undertaken in D.C. We’re also concerned that the specification has not been fully vetted and identified upon which vendors would be asked to participate and provide quotations and products for on a go-forward basis.

“So, in summary, for those reasons, we believe that the initiative to amend Title 21 to include 6C is premature and should be delayed until such time as the issues regarding a full intellectual property review of 6C, the identification of the national protocol from a go-forward basis from a MAP-21 perspective have been identified, and the specification has been fully vetted and pulled together. We believe that any legislative action is premature.”

“Thank you.”
Response to Testimony 1:

- Caltrans conducted a SRIA to address the financial and economic impacts of the transition to 6C technology. The assessment included the costs of a switchable transponder. In the public hearing, as part of his testimony, Samuel Johnson from the Transportation Corridor Agencies provided a 6C three position switchable tag.

- The ISO-18000 Part 63, governing the 6C protocol, is an internationally recognized standard publicly available via multiple websites. Toll operators using the 6C protocol formed the 6C Toll Operators Coalition (6C TOC) in 2012 to develop and make public the 6C protocol.

- Nationally, solicitations for products incorporating 6C continue to receive proposals from multiple bidders, including TransCore, 3M, Neology, STAR, and Kapsch. This offers California greater competition than the one or two bidders CTOC agencies see proposing on Title 21 products and it is in keeping with the requirement in Streets and Highways code section 27565 that toll facility operators should have multiple vendor choices.

- Technology solutions inherently deal with claims regarding intellectual property and any licensing or other cost exposure to the providers of these products is factored into the costs charged to consumers. Public agencies’ practice for including IP indemnification provisions in their agreements further ensures that the vendors address these matters and price their solutions accordingly. Therefore current 6C transponder bid prices to date do reflect any IP uncertainties and yet these prices are still significantly less expensive than Title 21 transponders or transponders using any other toll protocol. None of the 6C TOC agencies have been sued for using 6C equipment in single or multi-protocol modes and they continue to garner multiple bids on their procurements.

- The 6C protocol is a proven, well defined protocol with standards that has been used successfully to support ETC with equipment from multiple vendors. As reported by the 6C TOC in their support letter, 6C TOC operators so far have over 3.5 million 6C transponders in use and have used 6C equipment to process over 500 million toll transactions generating over $1.2 billion in revenue. As a best practice, ISO and the 6C TOC periodically review their standards to be in line with industry practices and incorporate new features and do so publicly with open participation from both vendors and operators.

- The 6C protocol is an advancement over Title 21 security capabilities with built-in security features. The 6C TOC has developed and incorporated a transponder authentication scheme that utilizes information encoded into the transponder chip directly by chip manufacturers. This security feature is implemented in Washington State as cited in the Washington State Department of Transportation’s letter of support. As cited in 3M’s letter of support, the cost to evade security measures and a multi-layered defense with the typical use of license plate recognition cameras will deter and catch counterfeiters.

- California is fully committed to and an extremely active participant in working with the International Bridge, Tunnel, and Turnpike Association (IBTTA) to achieve national electronic tolling interoperability.

- IBTTA is evaluating three National Protocol options: TDM, SeGo, and 6C, with all three passing conformance testing, which demonstrates their suitability to meet requirements set out by the toll industry.

- Although IBTTA is making progress towards testing and selecting a National
Protocol, many complex tasks remain before toll operators could truly become interoperable, including addressing back office technical approaches, financial settlements of transactions, marketing and public outreach, and governance. So although IBTTA has a schedule for the selection of a national protocol, it has yet to formulate an overall schedule for implementation of the chosen protocol with any certainty.

- In addition, the IBTTA national interoperability effort fully recognizes multiple approaches to achieving interoperability and the inclusion of local/regional protocols as stated in IBTTA’s congressional report in 2013 and in congressional testimony in 2015. The decision to transition to 6C now enables California to benefit from cost savings associated with use of the 6C protocol as soon as possible. If the 6C protocol is the chosen national protocol, then California will already be in compliance, and the state’s toll operators will have already been able to experience the cost savings expected from this change for a longer period. In the event another protocol is chosen, the timing will be such that California’s toll operators will have time to phase out the Title 21 protocol before transitioning to dual protocol with the new national protocol. The regulation also includes an option for the toll operators to discontinue the use of the Title 21 protocol prior to the end of the 5-year transition period.

**Testimony 2:** “3M is a strong proponent of using the ISO 18000-63, also known as 6C standard, in tolling. As an open international standard, 6C has seen strong momentum in tolling both inside and outside of the United States. The North Carolina Turnpike Association requests the 6C support be added to its latest RFP, and production is estimated to occur at some point in 2017. The State Road & Tollway Authority in Georgia is scheduled to support 6C in production in 2017. The Washington DOT, Utah DOT, and Colorado DOT rolled out 6C support in 2012. Louisiana introduced 6C in 2015. Malaysia has started to convert to 6C in 2016. Vietnam converted to 6C in 2015. The Philippines converted to 6C in 2015. Taiwan converted in 2014, and Turkey converted in 2012. Most Latin American countries have introduced 6C to phase out their legacy tolling protocols. Additionally, several countries and regions in Asia are actively evaluating 6C to replace their current technologies.

“Several factors contribute to this strong trend of global adoption. The proven experience and performance to handle high speed open road tolling or stop-and-go tolling, the availability of mobile reader and tag suppliers leads to the opportunity for ongoing cost reduction and performance enhancements. Significantly reduced tag costs, enable toll agencies to encourage faster and wider adoptions amongst drivers, and therefore, shorten their ROI period. The greatly reduced weight and thickness of these transponders impacts and causes lower mailing costs for the agencies, and passive tags eliminate the headaches and costs around battery replacement. Tag disposal is also no longer an issue.

“3M would like to provide comments for some typical concerns related to the 6C technology. With a plethora of reader and tag suppliers, how do agencies ensure all products meet a certain level of quality? Clearly, different suppliers can introduce different levels of performance and quality, and 3M recommends the California Toll
Operators Committee establish performance and quality measures through discipline testing and analysis and work with independent third-party organizations, such as OmniAir, to use their certification as a requirement for interested suppliers. Pursuing these activities in cooperation with other tolling agencies helps ensure uniformity of requirements which can help ensure a competitive and diverse supply of solutions.

“Another concern that you may hear: Is there significant concern about 6C tag security risks? The 6C is a technology platform. Different types of security schemes can be constructed on top of it. The key is to balance the required level of investment against the potential risks of a security breach. The likelihood of a security breach itself is a balance of how difficult it is to perform that breach and the cost of doing so versus what are the benefits obtained from breaching that and the risks of being caught. In the current age of malicious actors, every toll solution should use RFID technology that has some means of authenticating the tag. A good authentication scheme will significantly raise the cost barrier to counter a counterfeiting attack: for example, the 6C Toll Operators Coalition's authentication scheme utilizes information encoded into the tag chip at the foundry, and the only way to duplicate that information would be to use some type of device that can actually emulate a tag. A blank 6C tag cannot be used to feed the authentication scheme. There is various expensive test equipment available that could perform a tag emulator function, but the cost is significantly more than the value obtained by circumventing a toll transaction; furthermore, it is unclear whether such a piece of test equipment could actually properly interact with the toll system.

“License plate recognition cameras are typically used in toll systems, and a counterfeit tag will not have the appropriate license plate number to tag identifier association. The license plate of the vehicle that was used for a malicious activity can be used to directly identify the perpetrator. Lastly, counterfeiting of the license plate itself is likely to have more economic benefit to a malicious actor than counterfeiting the toll tag since it could be used to evade a broader range of costs associated with the vehicle.

“Overall, 3M considers the security risks associated with 6C tags as low when used with an authentication scheme. Inside the U.S., DOTs in Colorado, Washington, and Utah have been operating 6C since 2012. Globally, India has been distributing more than 2 million 6C tags every year. 3M is not aware of any security incidents associated with the 6C deployment. Another concern is potentially around privacy violations with 6C tags. Since RFID tags provide an identifier, and best practices dictate that no personally identifiable information be encoded into the tag, privacy violations are not a concern. An RFID tag placed onto a vehicle is no different than a license plate. Low cost 6C readers are available in the marketplace, and the range of those products is typically less than the range of human eyesight in reading a license plate.

“Another concern may be with respect to integration costs. There are two major integration-related costs in order to determine this. First, there is the cost of the physical equipment. If existing readers already support 6C, there may not be a need to purchase any new equipment. If not, new readers, antennas as well as labor costs should be budgeted into the financial analysis. Second, there is the cost of the lane-
integration product -- lane-integration project, excuse me.

3M recommends Caltrans consider the following factors that might potentially lower costs. Ensure each stakeholder is motivated to ensure the conversion is a success and put in place capable oversight during the pilot activities. Integrate the new protocol at the lowest layer of the solution architecture in order to minimize or eliminate impact at higher layers. Minimizing the impact on the back end should reduce integration costs.

“Caltrans should actively request existing suppliers to provide their reader interface documentation to help reduce costs. The 6C technology has been successfully integrated into many installations, including those migrating from legacy technologies. Once integration is complete and all solutions are put into place, 3M does not anticipate the maintenance and support costs for 6C will be higher than those of the Title 21 solutions existing today.

“The last concern is with respect to the intellectual property landscape. So each vendor of 6C technology has the opportunity to develop an IP strategy that best fits their business and their customers' needs. Caltrans may consider placing an obligation on suppliers to make any IP held against the technology, available on a fair, reasonable, and nondiscriminatory basis. Caltrans should evaluate the 6C IP landscape, and if there is any concern or uncertainty, Caltrans can consider requesting that suppliers offer indemnification, and/or discuss with the stakeholders to ensure a smooth 6C introduction. 3M can work with Caltrans to balance the risks in a complex but manageable IP landscape. Thank you.”

Response to Testimony 2:

- The California 6C Electronic Toll Standard a document incorporated by reference includes the security features adopted by the 6C Toll Operators Coalition.
- California Toll Facility operators have been consulted and are developing plans for the January 1, 2019 transition and are in agreement with the transition timeframe.
- Technology solutions inherently deal with claims regarding intellectual property and any licensing or other cost exposure to the providers of these products is factored into the costs charged to consumers. Public agencies’ practice for including IP indemnification provisions in their agreements further ensures that the vendors address these matters and price their solutions accordingly. Therefore current 6C transponder bid prices to date do reflect any IP uncertainties and yet these prices are still significantly less expensive than Title 21 transponders or transponders using any other toll protocol. None of the 6C TOC agencies have been sued for using 6C equipment in single or multi-protocol modes and they continue to garner multiple bids on their procurements.

Testimony 3: “I am speaking here this morning also on behalf of TransCore, but I want to focus in on the fiscal analysis and the fiscal impact of this proposal, and sort of putting on my old hat as the Chief Deputy Director of Finance for the State of California, I want to give it that sort of a focus and a lens.

When we read the Caltrans documents and the case for 6C, the entire case is really built upon cost savings, okay? And cost savings relative to the current standard, but as you
dig into the assumptions in that analysis, you see there are a myriad of factors that haven't been taken into consideration, and therefore, when the Department of Finance did the review of your fiscal analysis, they didn't take them into consideration because they are not experts on the matter.

“The Caltrans analysis assumes that the future of 6C standard will be a commodity and will be sold at a commoditized price. The problem with that assumption is while it is true, as I understand it, that the 6C technology can be produced as a sticker very inexpensively, the problem is that a commoditized price simply doesn't reflect the level of support in the field that will be necessary for smooth tolling transactions both for toll operators, and most importantly, quite frankly, for the motoring consumer. Those support prices that are critical in order to keep the system running properly are already built into the existing standard here in California under Title 21 so that is the first glaring hole in the Caltrans fiscal analysis.

“The Caltrans analysis, assuming the commoditized price of the 6C sticker, ignores the fact that the trend in this case has been for some time to go for a three-position switch under Title 21. As far as I know in consulting with the experts on this matter, there are no three-position switches currently for 6C, and those would require a hard case, and the inclusion of a hard case completely changes your fiscal analysis. In fact, in the last four months, the last 120 days here in California, two-thirds of all 6C tags sold in this state have been multiple-position switch hard cases. Your analysis lacks that completely.

“It's already been touched on a couple of times first by Mr. McGraw and then by the gentleman from 3M, the other glaring hole in your proposal, you have done no IP survey, or if you have, you have not made any of those results publically available that we're aware of. There are multiple IP claims that exist in this technology, and as you and as I have been told and understand, you start adding other features and other functionality to the 6C standard you are proposing, you are going to step into realms of further IP issues. What's the point? What am I driving at here? No pun intended. There is going to be a huge component to rolling out 6C that is going to involve licensing fees.

“"We point out in our written comments which are being submitted today that Neology has either sued or is suing just about everybody in this county that is using 6C, and the people that are doing it successfully are paying them licensing fees; yet we see no mention of licensing fees as part of your fiscal analysis; therefore, that's another glaring hole in your assumptions on the cost savings of going forward with 6C.

“So, as we have recommended in the past and we recommend again today, it is critical, absolutely necessary, that the Department of Transportation, who has the authority under the Streets and Highway Code to promulgate these regulations, do a complete IP survey and understand what the licensing fees are going to need to be in order to roll this out because it isn't included in your analysis currently.

“"Furthermore, under the NIOP, what's going on right now with NIOP, Caltrans is jumping to a conclusion on what NIOP is going to choose. If you look at the entire tolling market right now in the United States of America, 52 percent of that market right now is operating under the TDM specification. 34 percent is operating under the SeGo
specification. That right there is 86 percent of the market. 8 percent of the market is operated under the Title 21 specification that we have now here in California. That's obviously a great minority of what the country is using; however, 6C is only 5 percent. So Caltrans now is assuming, apparently, that despite the fact that 6C only has 5 percent of the market, despite the fact that 86 percent of the market are two other standards that have been widely taken up and used all around the country, that 6C is going to be the standard that NIOP chooses, okay? Now, they might if they want to pick the minority specification that isn't being used in very many places, and where it is being used, it's being challenged legally or folks are paying licensing fees, but on the other hand, if NIOP doesn't choose the 6C standard, now we're going to have to have triple protocol readers, especially during the transition period. You are going to have to be able to read the Title 21. You are going to have to be able to read the 6C, and then you are going to have to be able to read whatever it is that NIOP picks.

“Now, triple protocol readers are going to involve even more intellectual property issues and more licensing fees, and none of this, by the way, has been tested in the field. So not only are you proposing a specification that hasn't been properly tested in the field, doesn't reflect all the IP and licensing fee costs that are absolutely going to be a part of this proposal, doesn't reflect -- doesn't include the fact that they are not going to be stickers that are going to be sold. They are going to be hard cases for HOT-lane applications which is the direction that the state is going.

Your financial and economic analysis, all due respect, really has a lot of holes in it. So it may be, at some point in the future, it will make sense to go to another specification other than Title 21, which right now is working just fine. Your case for moving to 6C isn't that Title 21 doesn't work. You can refer to it as legacy technology, but the fact is, it works. It's supported. The problem with your specification is that the analysis is incomplete, and we think for those reasons you should put this matter over, get a more complete fiscal and economic analysis, come back with updated numbers that actually reflect the market that we are going to face in the future, and then at that point, these meetings would be appropriately in order. For that, Mr. Hancock, thank you very much for your time this morning. It's greatly appreciated.”

Response to Testimony 3:
- Costs used in the Statewide Regulatory Impact Assessment (SRIA) are based on market prices paid by the toll agencies that utilize the 6C technology. These prices factor in IP/licensing fees and support costs and the California toll agencies’ projected distributions of different transponder types.
- Caltrans agrees that toll operators may need to order more transponders with the switch to 6C due to the lack of portability with sticker transponders. Costs also include a conservative increase in the number of sticker transponders required due to non-portability and replacement for windshield damage was based on Colorado’s E-470 experiences. However, the significantly lower cost of 6C transponders should still allow for lower procurement costs compared to what they pay today for Title 21 transponders.
- The SRIA includes both sticker and three position switchable tag costs in the economic analysis.
- In the public hearing, as part of his testimony, Samuel Johnson from the Transportation Corridor Agencies provided a 6C three position switchable tag.
Technology solutions inherently deal with claims regarding intellectual property and any licensing or other cost exposure to the providers of these products is factored into the costs charged to consumers. Public agencies’ practice for including IP indemnification provisions in their agreements further ensures that the vendors address these matters and price their solutions accordingly. Therefore current 6C transponder bid prices to date do reflect any IP uncertainties and yet these prices are still significantly less expensive than Title 21 transponders or transponders using any other toll protocol. None of the 6C TOC agencies have been sued for using 6C equipment in single or multi-protocol modes and they continue to garner multiple bids on their procurements. California is fully committed to and an extremely active participant in working with the International Bridge, Tunnel, and Turnpike Association (IBTTA) to achieve national electronic tolling interoperability.

IBTTA is evaluating three National Protocol options: TDM, SeGo, and 6C, with all three passing conformance testing, which demonstrates their suitability to meet requirements set out by the toll industry.

Although IBTTA is making progress towards testing and selecting a National Protocol, many complex tasks remain before toll operators could truly become interoperable, including addressing back office technical approaches, financial settlements of transactions, marketing and public outreach, and governance. So although IBTTA has a schedule for the selection of a national protocol, it has yet to formulate an overall schedule for implementation of the chosen protocol with any certainty.

In addition, the IBTTA national interoperability effort fully recognizes multiple approaches to achieving interoperability and the inclusion of local/regional protocols as stated in IBTTA’s congressional report in 2013 and in congressional testimony in 2015. The decision to transition to 6C now enables California to benefit from cost savings associated with use of the 6C protocol as soon as possible. If the 6C protocol is the chosen national protocol, then California will already be in compliance, and the state’s toll operators will have already been able to experience the cost savings expected from this change for a longer period. In the event another protocol is chosen, the timing will be such that California’s toll operators will have time to phase out the Title 21 protocol before transitioning to dual protocol with the new national protocol. The regulation also includes an option for the toll operators to discontinue the use of the Title 21 protocol prior to the end of the 5-year transition period.

COMMENTS RECEIVED DURING SECOND NOTICE PERIOD

Comment 38. “3M appreciates the opportunity to comment on the Modifications to Text of the Proposed Regulations, and is supportive of these changes with the exception of the following comments.

“Article 8, Section 1707.1 indicates the automatic vehicle identification equipment shall be compliant with the California 6C Electronic Toll Collection Standard Version 1.0. Article 9, Section 1708.1 provides for certification by a CTOC approved independent third party. 3M recommends the addition of further technical detail in the California 6C Electronic Toll Collection Standard Version 1.0 in the following areas:
1.) Section 3.1.1: 3M recommends the addition of the specification of the reference reader RF radiated power level applicable to this requirement.
2.) Section 3.1.2: 3M recommends the addition of the specification of the reference reader RF receiver sensitivity applicable to this requirement.
3.) Section 3.1.3, Tilt from horizontal plane: 3M recommends the removal of the text which mentions the return signal strength read range and proposes changing the absolute distance loss to a relative distance loss in percent referenced to the distance demonstrated in 3.1.1.
4.) Section 3.1.3, Tilt from vertical plane: 3M recommends the removal of the text which mentions the return signal strength read range and proposes changing the percent ‘loss in minimum activation energy’ to a relative distance loss in percent referenced to the distance demonstrated in 3.1.1.
5.) Section 3.1.3, Rotation from horizontal plane: 3M recommends the removal of the text which mentions the return signal strength read range and proposes changing the percent ‘loss in minimum activation energy’ to a relative distance loss in percent referenced to the distance demonstrated in 3.1.1.”

Response to Comment 38:
To address these comments sections 3.1, 3.1.1, 3.1.2 and 3.1.3 have been rewritten in the California 6C Electronic Toll Collection Standard Version 1.0 to provide further technical detail and clarity.

In addition to the comments listed above, Caltrans received 6 letters in support of this regulation during the second comment period. These letters are under Tab G of the Rulemaking File.

COMMENTS RECEIVED DURING THIRD NOTICE PERIOD
The third comment period includes the Notice of Modifications to Text of the Proposed Regulation dated October 6, 2017 and the Corrected Notice of Modifications to Text of the Proposed Regulation dated October 13, 2017. Caltrans received 1 letter and 1 email stating they had no comment and a letter in in support of this regulation during the third comment period. The letters and a copy of the email are under Tab Q of the Rulemaking File.

STATEMENT OF ANTICIPATED BENEFITS OF THE REGULATIONS
Caltrans has determined that this change could reduce toll agency expenditures by as much as $20 million annually. The resultant savings could be used by the toll agencies to help pay down any indebtedness they may have incurred to develop their facilities. They could also be reinvested into desired or needed improvements on the facilities or in the transportation corridors where they are located, which would result in safer, more efficient travel for the public.

STANDARDIZED REGULATORY IMPACT ASSESSMENT
After Caltrans’ gathered, analyzed, and estimated the direct costs (savings) to toll
agencies, representatives from the California Department of Finance (DOF) were consulted. While meeting with Caltrans, DOF determined that the proposed regulatory change resulted in over $50 million worth of impacts occurring within a 12-month period during implementation. As required by Senate Bill 617 (2011), any regulatory change exceeding a $50 million impact—whether results are positive or negative—requires a Standardized Regulatory Impact Assessment (SRIA). This economic impact analysis spans from January 2019 to January 2024 (implementation timeframe from 2019-2023, plus one year after) and is referred to as the proposed scenario in this analysis.

**NECESSITY/PURPOSE/RATIONALE FOR THE REGULATIONS**

In recent years, the state’s toll facility operators have discussed the idea of transitioning away from the Title 21 protocol. The primary reason for this change is to reduce costs. The Title 21 protocol is used primarily in California and British Columbia. Due to the small market demand for Title 21 protocol readers and transponders, there are only two vendors that supply them. This limits competition and results in increased procurement costs. The functional specifications of the Title 21 protocol also make the transponders more expensive. The transponders, which require a battery, are a hard plastic case that mounts on a vehicle windshield using Velcro strips. The transponders may also be equipped with a switch for vehicle occupancy declaration for use on high-occupancy/toll lanes. The costs of Title 21 transponders is, on average, about $15 for one without the switch and $20 for one with a switch.

In the spring of 2014, the state’s toll facility operators began to formally examine the different protocols used for ETC in the United States to determine if one would work best for California. A protocol known as 6C quickly became a leading choice. The 6C protocol is an open standard protocol based on a system that is used by the retail and shipping industries to track objects in supply chains. The 6C protocol is currently used for ETC in six other states (Washington, Utah, Colorado, Georgia, Michigan, and Alabama) and British Columbia.

The 6C protocol was shown to have several benefits that made it attractive. First, the transponders are less expensive than Title 21 protocol transponders. They do not require a battery to operate, so they can be used in a variety of formats, such as stickers. They are also available with occupancy declaration switches. Overall cost savings compared to Title 21 transponders have been estimated to be as much as 90 percent. 6C sticker tags cost approximately $1, on average, while hard case tags (which would be used for switchable tags) are estimated to cost, on average, about $10. Furthermore, because the 6C protocol is more widely used, there are multiple vendors who offer 6C protocol equipment. With California’s potential market size, other vendors have expressed interest in entering the tolling market, including one company already based in California. This could drive procurement costs down further. The other protocols in use for tolling in the United States did not provide the cost savings advantages that 6C does because there are a limited number of manufacturers or because they use batteries like Title 21 transponders and are more expensive than 6C. One of them is proprietary and therefore ineligible for use in California.
Given these potential benefits, the state’s toll facility operators determined that the 6C protocol would be the best option for California and in April 2015 they requested that Caltrans begin the process of modify the California Code of Regulations to adopt the 6C protocol.

**LOCAL MANDATE DETERMINATION**

Caltrans has determined that the regulations do not impose a mandate on any local agency or school district.

**ALTERNATIVES DETERMINATION**

Caltrans has determined that no alternative would be more effective in carrying out the purpose of which the regulations are proposed, would be as effective and less burdensome to the toll facility operators than the adopted regulation, or would be more cost effective to the toll facility operators and equally effective in implementing the regulations.

**REASONS FOR REJECTING ANY PROPOSED ALTERNATIVE THAT WOULD LESSEN THE ADVERSE ECONOMIC IMPACT ON SMALL BUSINESSES**

Caltrans has determined that the regulations do not impact small businesses.

**UPDATED INFORMATION DIGEST**

The updates to the informative digest are covered in the sections “UPDATE OF THE INITIAL STATEMENT OF REASONS”, “SUMMARY AND RESPONSE TO COMMENTS RECEIVED DURING INITIAL NOTICE PERIOD AND AT PUBLIC HEARINGS”, “COMMENTS RECEIVED DURING SECOND NOTICE PERIOD” and “COMMENTS RECEIVED DURING THIRD NOTICE PERIOD” earlier in this document.

**INCORPORATION BY REFERENCE DOCUMENTS**

The following documents have been Incorporated by Reference:


identification for item management—Part 63: Parameters for air interface communications at 860 MHz to 960 MHz Type C.


It would be cumbersome, unduly expensive and impractical to publish these documents in the California Code of Regulations.