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Test Plan for EAC 2005 VVSG Certification Testing  
Dominion Voting Systems Democracy Suite (D-Suite) Version 5.0  
Voting System

EAC Project Number: DVS1601

Version: Revision A

Date: 9/9/16

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U.S. Election Assistance Commission

VSTL

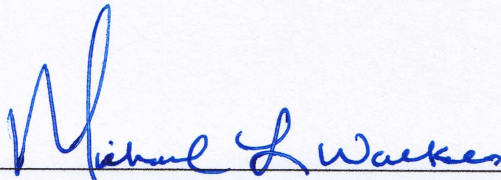
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NVLAP LAB CODE 200908-0

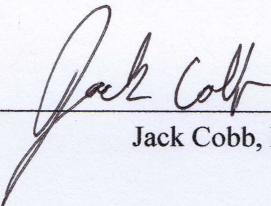
SIGNATURES

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**REVISIONS**

Revision	Description	Date
NR	Initial Release	7/20/16
A	Test Plan updated based on EAC comments	9/9/16

## TABLE OF CONTENTS

<b>1.0</b>	<b>INTRODUCTION</b> .....	<b>1</b>
1.1	References.....	1
1.2	Terms and Abbreviations.....	2
1.3	Testing Responsibilities.....	2
1.3.1	Project Schedule.....	3
1.3.1.1	Owner Assignments.....	3
1.3.1.2	Test Case Development.....	3
1.3.1.3	Test Procedure Development and Validation.....	3
1.3.1.4	Third Party Tests.....	3
1.3.1.5	EAC and Manufacturer Dependencies.....	3
1.4	Target of Evaluation Description.....	3
1.4.1	System Overview.....	4
1.4.2	Block Diagram.....	6
1.4.3	System Limits.....	7
1.4.4	Supported Languages.....	8
1.4.5	Supported Functionality.....	8
1.4.5.1	Standard VVSG Functionality.....	9
1.4.5.2	Manufacturer Extensions.....	9
<b>2.0</b>	<b>PRE-CERTIFICATION TESTING AND ISSUES</b> .....	<b>9</b>
2.1	Evaluation of Prior VSTL Testing.....	9
2.2	Evaluation of Prior Non-VSTL Testing.....	9
2.3	Known Field Issues.....	9
<b>3.0</b>	<b>MATERIALS REQUIRED FOR TESTING</b> .....	<b>9</b>
3.1	Software.....	10
3.2	Equipment.....	18
3.3	Test Materials.....	20
3.4	Deliverable Materials.....	21
<b>4.0</b>	<b>TEST SPECIFICATIONS</b> .....	<b>21</b>
4.1	Requirements (Strategy of Evaluation).....	22
4.1.1	Mapping of Requirements to Equipment Type and Features.....	23
4.1.2	Rational for ‘Not Applicable’ requirements.....	23
4.2	Hardware Configuration and Design.....	24

4.3	Software System Functions.....	24
4.4	Test Case Design .....	25
4.4.1	Hardware Qualitative Design.....	26
4.4.1.1	Mapping of Requirements to Specific Interfaces.....	27
4.4.2	Hardware Environmental Test Case Design .....	27
4.4.3	Software Module Test Case Design and Data .....	27
4.4.4	Software Functional Test Case Design and Data.....	27
4.4.5	System-Level Test Case Design .....	28
4.5	Security Functions .....	28
4.6	TDP Evaluation.....	28
4.7	Source Code Review.....	32
4.8	QA & CM System Review .....	32
<b>5.0</b>	<b>TEST DATA .....</b>	<b>32</b>
5.1	Test Data Recording .....	32
5.2	Test Data Criteria.....	32
5.3	Test Data Reduction.....	33
<b>6.0</b>	<b>TEST PROCEDURES AND CONDITIONS .....</b>	<b>33</b>
6.1	Facility Requirements .....	33
6.2	Test Set-Up .....	33
6.3	Test Sequence .....	33
<b>7.0</b>	<b>TEST OPERATIONS PROCEDURES .....</b>	<b>34</b>
7.1	Proprietary Data.....	34
	 <b>PROJECT SCHEDULE.....</b>	 <b>A-1</b>

## 1.0 INTRODUCTION

The purpose of this Test Plan is to document the procedures that Pro V&V, Inc. will follow to perform full certification testing during a new system campaign for the Dominion Voting Systems Democracy Suite (D-Suite) 5.0 Voting System to the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0. Prior to submitting the voting system for testing, Dominion Voting Systems submitted an application package to the EAC for certification of the D-Suite 5.0 Voting System. The application was accepted by the EAC and the project was assigned the unique Project Number of DVS1601.

At test conclusion, the results of all testing performed as part of this test campaign will be submitted to the EAC in the form of a national certification test report.

## 1.1 References

- Election Assistance Commission 2005 Voluntary Voting System Guidelines (VVSG) Version 1.0, Volume I, “Voting System Performance Guidelines”, and Volume II, “National Certification Testing Guidelines”
- Election Assistance Commission Testing and Certification Program Manual, Version 2.0
- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 2.0
- National Voluntary Laboratory Accreditation Program NIST Handbook 150, 2006 Edition, “NVLAP Procedures and General Requirements (NIST Handbook 150)”, dated February 2006
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2008 Edition, “Voting System Testing (NIST Handbook 150-22)”, dated May 2008
- United States 107<sup>th</sup> Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002
- Pro V&V, Inc. Quality Assurance Manual, Revision 7.0
- Election Assistance Commission “Approval of Voting System Testing Application Package” letter dated November 12, 2015
- EAC Requests for Interpretation (RFI) (listed on [www.eac.gov](http://www.eac.gov))
- EAC Notices of Clarification (NOC) (listed on [www.eac.gov](http://www.eac.gov))
- Dominion Voting Systems Technical Data Package (*A listing of the D-Suite 5.0 documents submitted for this test campaign is listed in Section 4.6 of this Test Plan*)

## 1.2 Terms and Abbreviations

*This subsection lists terms and abbreviations relevant to the hardware, the software, or this Test Plan.*

“ADA” – Americans with Disabilities Act 1990

“CM” – Configuration Management

“COTS” – Commercial Off-The-Shelf

“DRE” – Direct Record Electronic

“EAC” – United States Election Assistance Commission

“EMS” – Election Management System

“FCA” – Functional Configuration Audit

“HAVA” – Help America Vote Act

“ICC” – ImageCast Central

“ICP” – ImageCast Precinct

“ICX” – ImageCast X

“ISO” – International Organization for Standardization

“NOC” – Notice of Clarification

“PCA” – Physical Configuration Audit

“QA” – Quality Assurance

“RFI” – Request for Interpretation

“TDP” – Technical Data Package

“UPS” – Uninterruptible Power Supply

“VSTL” – Voting System Test Laboratory

“VVSG” – Voluntary Voting System Guidelines

## 1.3 Testing Responsibilities

All testing will be conducted under the guidance of personnel verified by Pro V&V, Inc. to be qualified to perform the testing.

### **1.3.1 Project Schedule**

The Project Schedule for the test campaign is located in Appendix A – Project Schedule. The dates on the schedule are not firm dates but planned estimates based on the anticipated project work flow.

#### **1.3.1.1 Owner Assignments**

This information is contained in the Project Schedule presented in Appendix A.

#### **1.3.1.2 Test Case Development**

Pro V&V will utilize baseline test cases for the Functional Configuration Audit (FCA), Usability, and System Integration Tests. These test cases will be augmented with specially designed test cases tailored to the specific design of the D-Suite 5.0. Additionally, specific election definitions will be designed for the Operational Status Check and the Logic & Accuracy Tests.

#### **1.3.1.3 Test Procedure Development and Validation**

Pro V&V will utilize VSTL Test Procedures during the duration of the test campaign. These procedures are developed to the EAC 2005 VVSG standards. The validation of the VSTL Test Procedures is accomplished by Technical Review and Approval. If necessary and where practical, a validation might include execution to attempt to achieve the expected results using the selected tool of the testing methodology. Test Plans, Test Suites, Test Specifications, and Test Cases will be validated prior to execution. This validation will include the following:

- Confirmation of adequate test coverage of all requirements.
- Confirmation that test case results are not ambiguous and have objective pass/fail criteria.
- Confirmation that any automated test suites will produce valid results.

#### **1.3.1.4 Third Party Tests**

Pro V&V will be utilizing third party testing during the performance of hardware testing. All testing will be witnessed by Pro V&V personnel at the third party test site with the exception of Temperature Power Variation in which Pro V&V qualified staff will execute all testing at the third party facility.

#### **1.3.1.5 EAC and Manufacturer Dependencies**

This information is contained in the Project Schedule presented in Appendix A.

### **1.4 Target of Evaluation Description**

The following sections contain a product description and an overview of the design methodology of the D-Suite 5.0 Voting System, as taken from the Dominion Voting Systems technical documentation.



## 1.4.1 System Overview

The D-Suite 5.0 Voting System is a paper-based optical scan voting system with a hybrid paper/DRE option consisting of the following major components: The Election Management System (EMS), the ImageCast Central (ICC), the ImageCast Precinct (ICP), and the ImageCast X (ICX).

### Election Management System (EMS)

The D-Suite 5.0 EMS consists of various components running as either a front-end/client application or as a back-end/server application. A listing of the applications and a brief description of each is presented below.

#### Front-end/Client applications:

- EMS Adjudication: Represents the server and client components responsible for adjudication, including reporting and generation of adjudicated result files from ImageCast Central tabulators and adjudication of write-in selections from ImageCast Precinct and ImageCast Central tabulators.
- EMS Audio Studio: A client application that represents an end-user helper application used to record audio files for a given election project. As such, it is utilized during the pre-voting phase of the election cycle.
- EMS Election Data Translator: End-user application used to export election data from election project and import election data into election project.
- EMS Election Event Designer: A client application that integrates election definition functionality together with ballot styling capabilities and represents a main pre-voting phase end-user application
- ImageCast Voter Activation: An application, installed on a workstation or laptop at the polling place, which allows the poll workers to program smart cards for voters. The smart cards are used to activate voting sessions on ImageCast X.
- EMS Results Tally and Reporting: A client application that integrates election results acquisition, validation, tabulation, reporting, and publishing capabilities and represents the main post-voting phase end-user application.

#### Back-end/Server applications:

- EMS Adjudication Service: Represents a server side application which provides ballot information such as contests, candidates and their coordinates from EMS to the Adjudication application.
- EMS Application Server: Represents a server side application responsible for executing long running processes, such as rendering ballots, generating audio files and election files, etc.

- **EMS Database Server:** Represents a server side RDBMS repository of the election project database which holds all the election project data, including pre-voting and post-voting data.
- **EMS Data Center Manager:** A server application that represents a system level configuration application used in EMS back-end data center configuration.
- **EMS Election Device Manager:** Application used for production and programming of election files, and other accompanying files, for ImageCast X terminals.
- **EMS File System Service:** A client application that acts as a stand-alone service that runs on client machines, enabling access to low level operating system API for partitioning CF cards, reading raw partition on ICP CF card, etc.
- **EMS NAS Server:** Represents a server side file repository of the election project file based artifacts, such as ballots, audio files, reports, log files, election files, etc.
- **Smart Card Helper Service:** A service that is installed on a workstation or laptop at the polling place, and provides required data format for programming smart cards for ImageCast devices, or, for jurisdiction's voting registration system in case of integration.

### **ImageCast Precinct (ICP)**

The ICP device is a hybrid precinct optical scan paper/DRE ballot counter designed to provide three major functionalities: ballot scanning and tabulation, accessible voting, and ballot review and second chance voting. Accessible voting allows voters with disabilities to listen to an audio representation of a ballot and use a hand held controller called an Audio Tactile Interface (ATI) to make vote selections, which are then saved directly to the ICP when the voter casts their Accessible Voting ballot. The Ballot Review feature allows a voter to review their vote selections using an audio or visual representation, which displays or presents the voter with a complete listing of all contests contained on the ballot and an indication of the results which will be recorded for each contest once the voter's ballot is cast. Second Chance voting refers to scenarios in which an error has been detected on the voter's ballot (blank ballot, undervoted ballot, overvoted ballot, misread ballot, cross-over voted ballot), and the ICP notifies the voter by displaying a message or providing an audio visual cue, that one of these situations has been detected, and offers the voter an opportunity to reject and fix their ballot, or to cast the ballot as-is. The ICP scans marked paper ballots, interprets voter marks on the paper ballot and stores and tabulates each vote from each paper ballot. The ICP contains a small touch-screen LCD to allow the poll worker to access diagnostic and configuration settings.

### **ImageCast Central (ICC) Count Scanner**

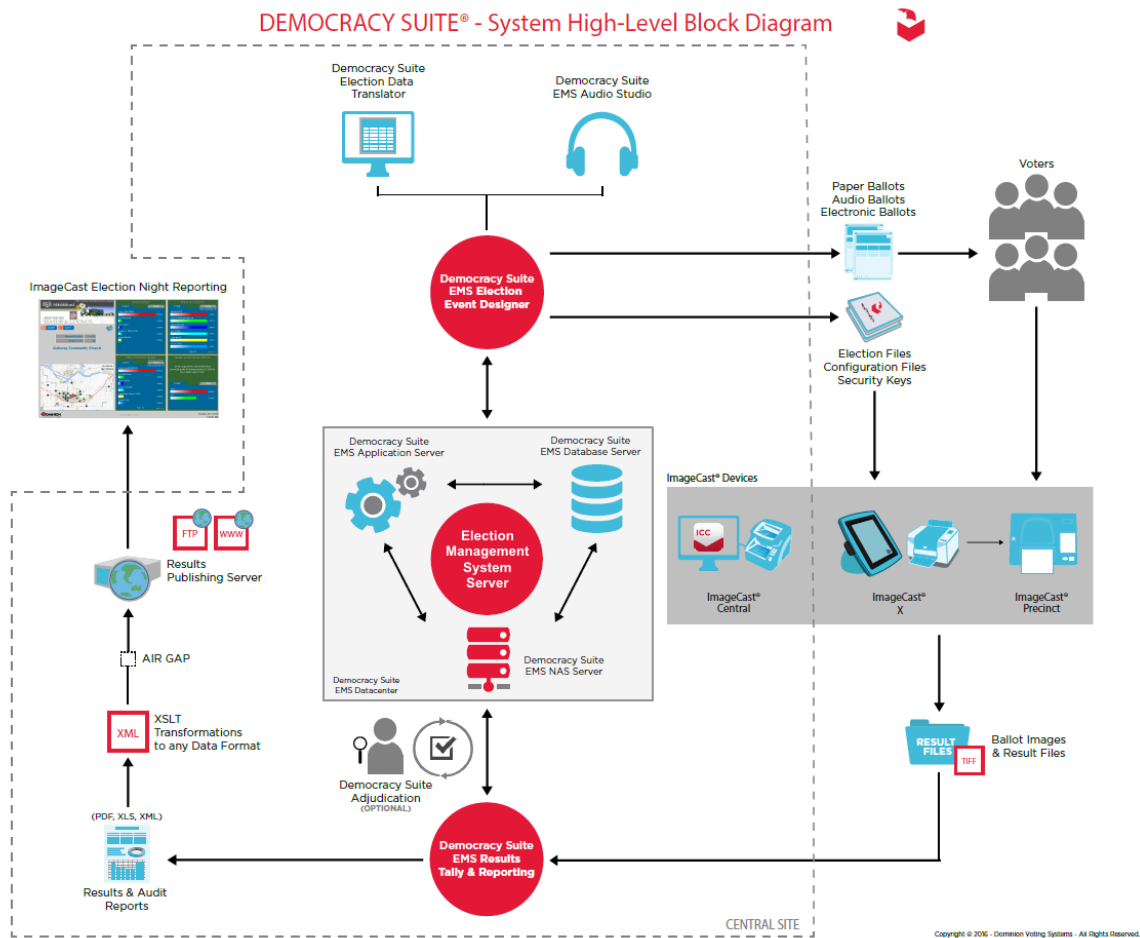
The ICC is a high-speed, central ballot scan tabulator based on Commercial off the Shelf (COTS) hardware, coupled with the custom-made ballot processing application software. It is used for high speed scanning and counting of paper ballots.

## ImageCast X (ICX) Ballot Marking Device (BMD)

The Democracy Suite ImageCast X ballot marking platform is a solution that is used for creation of paper Electronic Mobile Ballots. These ballots can be scanned, reviewed, cast and tabulated at the polling location on an ImageCast Precinct device or later scanned and tabulated by the ImageCast Central optical ballot scanner. The ImageCast X also supports enhanced accessibility voting through optional accessories connected to the ImageCast X unit.

### 1.4.2 Block Diagram

The system overview of the submitted voting system is depicted in Figure 1-1.



**Figure 1-1. D-Suite 5.0 System Overview**

### 1.4.3 System Limits

The EMS platform will be tested in both deployable physical hardware configurations:

- EMS Express hardware configuration - all EMS software components are installed on a single physical PC or laptop. This is a standalone configuration.
- EMS Standard hardware configuration - the EMS server components are installed on a single physical server, in addition to the Universal Power Supply (UPS) and Local Area Network (LAN) switch devices, while the EMS client components are installed on one or more physical PCs or laptops. All system components are interconnected in a client-server local LAN environment.

The system limits that Dominion Voting Systems has stated to be supported by the D-Suite 5.0 are provided in the table below.

**Table 1-1. D-Suite 5.0 System Limits by Configuration**

Characteristic	Configuration Values		Limiting Component
	Standard	Express	
Ballot positions	462	462	Ballot
Precincts in an election	1000	250	EMS
Contests in an election	4000	250	EMS
Candidates/Counters in an election	40000	2500	EMS
Candidates/Counters in a precinct	462	462	Tabulator
Candidates/Counters in a tabulator	10000	2500	Tabulator
Ballot Styles in an election	4000	750	Tabulator
Contests in a ballot style	156	156	Tabulator
Candidates in a contest	462	231	EMS
Ballot styles in a precinct	5	5	Tabulator
Number of political parties	30	30	Tabulator
“vote for” in a contest	30	30	Tabulator
Supported languages in an election	5	5	Tabulator
Number of write-ins	462	462	Ballot

#### 1.4.4 Supported Languages

The submitted voting system supports:

- Alaskan Native
- Aleut
- Athabascan
- Chinese
- English
- Eskimo
- Filipino
- French
- Hindi
- Japanese
- Khmer
- Korean
- Spanish
- Thai
- Vietnamese
- Native American
  - Apache, Jicarilla, Keres, Navajo, Seminole, Towa, Ute, Yuman

Support for all stated languages will be verified; however, only English and Spanish language ballots will be cast during the performance of functional testing. Additionally, one character based language (Chinese) will be tested during System Integration Testing.

#### 1.4.5 Supported Functionality

The D-Suite 5.0 is designed to support the following voting variations:

- General Election
- Closed Primary
- Open Primary
- Early Voting
- Partisan/Non-Partisan Offices
- Write-In Voting
- Primary Presidential Delegation Nominations
- Split Precincts

- Vote for N of M
- Ballot Rotation
- Provisional or Challenged Ballots

#### **1.4.5.1 Standard VVSG Functionality**

The D-Suite 5.0 Voting System shall be evaluated against the relevant requirements contained in the EAC 2005 VVSG, Volumes I and II.

#### **1.4.5.2 Manufacturer Extensions**

There are no manufacturer extensions on testing for this test campaign.

### **2.0 PRE-CERTIFICATION TESTING AND ISSUES**

#### **2.1 Evaluation of Prior VSTL Testing**

The D-Suite 5.0 is a new voting system that has not previously been tested to applicable federal standards in the EAC Program. The Dominion Voting Systems D-Suite 4.14-E system, previously certified by the EAC (Reference NTS Report No. PR036164-01 Rev. C, which is available for viewing on the EAC's website at [www.eac.gov](http://www.eac.gov)) contains various components of the system currently under test; however, in some instances these components have been modified to meet the performance characteristics of the D-Suite 5.0 System. For components that were not modified, the TDP review that was previously performed will be utilized to meet the requirements of the required TDP review. All updated portions of the TDP will be subjected to a full TDP review as part of this test program.

#### **2.2 Evaluation of Prior Non-VSTL Testing**

The D-Suite 5.0 is a new voting system that has not previously been tested to applicable federal standards in the EAC Program.

#### **2.3 Known Field Issues**

There are no known field issues for the D-Suite 5.0 Voting System.

### **3.0 MATERIALS REQUIRED FOR TESTING**

*The following sections list all materials needed to enable the test engagement to occur.*

The materials required for testing of the D-Suite 5.0 Voting System include all materials to enable the test campaign to occur. This includes the applicable hardware and software as well as the TDP, test support materials, and deliverable materials, as described in the following subsections.

### 3.1 Software

This subsection lists the proprietary and COTS software to be provided by the manufacturer as part of the test campaign.

**Table 3-1. Democracy Suite 5.0 EMS Software Component Descriptions**

Software	Version	Filename	Configuration	
			Standard	Express
EMS Election Event Designer (EED)	5.0.5.1	setup.exe: EED_FED_CERT_Setup_x64.msi	X	X
EMS Results Tally and Reporting (RTR)	5.0.5.1	setup.exe: RTR_FED_CERT_Setup_x64.msi	X	X
EMS Application Server	5.0.5.1	setup.exe: APPS_FED_CERT_Setup_x64.msi	X	X
EMS File System Service (FSS)	5.0.5.1	setup.exe: FSSSetup.msi	X	X
EMS Audio Studio (AS)	5.0.5.1	setup.exe: EMSAudioStudioSetup.msi	X	X
EMS Data Center Manager (DCM)	5.0.5.1	DemocracySuiteEMS_DCM.exe	X	X
EMS Election Data Translator (EDT)	5.0.5.1	setup.exe: EDTSetup_x86.msi EDTSetup_x64.msi	X	X
ImageCast Voter Activation (ICVA)	5.0.5.1	setup.exe: ICVASetup.msi	X	X
EMS Adjudication (Adj)	5.0.0.9501	DVS ImageCast Adjudication Client Setup.msi	X	X
EMS Adjudication Service	5.0.0.9407	DVS Adjudication Services Setup.msi	X	X
EMS Election Data Manager (EDM)	5.0.5982.27861	setup.exe: EdmInstaller.msi	X	X
Smart Card Helper Service	5.0.5982.27878	setup.exe: SmartCardServiceSetup.msi	X	X

**Table 3-2. Democracy Suite 5.0 ImageCast Precinct Software Component Descriptions**

Firmware/Software	Version	Filename
Election Firmware	5.0.0.15	cf2xx.sig
Firmware Updater	5.0.0.15	firmUp.enc
Firmware Extractor	5.0.0.15	FirmwareExtract.enc
Kernel (uClinux)	5.0.0.15	image.bin.gz
Boot Loader (COLILO)	20040221	colilo.bin

**Table 3-3. Democracy Suite 5.0 ImageCast Central Software Component Descriptions**

Firmware/Software	Version	Filename
ImageCast Central Application	5.0.0.15	ICCSSetup_v5.0.0.15.exe

**Table 3-4. Democracy Suite 5.0 ImageCast X Software Component Descriptions**

Firmware/Software	Version	Filename
ICX Application	5.0.6018.24783	ICX.apk
ICX Security Certificate	N/A	icx_pkcs12.pfx
ICX Security Certificate Password	N/A	icx_pfx.pwd

**Table 3-5. Democracy Suite 5.0 EMS Client/Server Software Component Descriptions**

Firmware/Software	Version	Filename	Configuration	
			Standard	Express
Microsoft Windows Server	2012 R2 Standard	Physical Media from Microsoft	X	
Microsoft Windows	8.1 Professional	Physical Media from Microsoft	X	X
.NET Framework	3.5	Physical Media from Microsoft	X	X
Microsoft Visual J#	2.0	vjredist64.exe vjredist.exe	X	X
Microsoft Visual C++ 2013 Redistributable	2013	vcredist_x64.exe vcredist_x86.exe	X	X
Java Runtime Environment	7u76	jre-7u76-windows-x64.exe jre-7u76-windows-i586.exe	X	X
Java Runtime Environment	8u77	jre-8u77-windows-x64.exe jre-8u77-windows-i586.exe	X	X
Microsoft SQL Server 2012 Standard	2012 Standard	Physical Media from Microsoft	X	
Microsoft SQL Server 2012 Service Pack 2	2012 SP2	SQLServer2012SP2-KB2958429-x64-ENU.exe	X	
Microsoft SQL Server 2012 SP2 Express with Advanced Services	2012 SP2	SQLEXPADV_x64_ENU.exe		X
Cepstral Voices	6.2.3.801	Allison (English): Cepstral_Allison_windows_6.2.3.801.exe Alejandra (Spanish): Cepstral_Alejandra_windows_6.2.3.801.exe	X	X



Arial Narrow Fonts	N/A	ARIALN.TTF ARIALNB.TTF ARIALNBI.TTF ARIALNI.TTF	X	X
Maxim iButton Driver	4.04	install_1_wire_drivers_x86_v4 04.msi install_1_wire_drivers_x64_v4 04.msi	X	X
Adobe Reader DC	AcrobatDC	AcroRdrDC1501020060_en_U S.exe	X	X
Microsoft Access Database Engine	2010	AccessDatabaseEngine.exe AccessDatabaseEngine_x64.exe	X	X
Open XML SDK 2.0 for Microsoft Office	2.0	OpenXMLSDKv2.msi	X	X

**Table 3-6. Democracy Suite 5.0 EMS Software Platform Unmodified COTS Component Descriptions**

<b>Firmware/Software</b>	<b>Version</b>	<b>Filename</b>
Infragistics NetAdvantage Win Forms 2011.1	2011 Vol.1	NetAdvantage_WinForms_20111.msi
Infragistics NetAdvantage WPF 2012.1	2012 Vol.1	NetAdvantage_WPF_20121.msi
TX Text Control Library for .NET	16.0	TXText Control.NET for Windows Forms 16.0.exe
SOX	14.3.1	sox.exe , libgomp-1.dll, pthreadgc2.dll, zlib1.dll
Log4net	1.2.10	log4net.dll, log4net.xml
NLog	1.0.0.505	NLog.dll
iTextSharp	5.0.5.0	itextsharp.dll
OpenSSL	1.2	openssl.exe, lebeay32.dll, ssleay32.dll
SQLite	1.0.65.0	System.Data.SQLite.DLL (32-bit and 64- bit)
Lame	3.99.4	lame.exe
Speex	1.0.4	speexdec.exe and speexenc.exe
Ghostscript	9.04	gsdll32.dll (32-bit and 64-bit)
PdfToImage.dll	1.2	PdfToImage.dll
SharpSSH package	1.1.1.13	Tamir.SharpSSH.dll, Diffie.Hellman.dll, Org.Mentalis.Security.dll

One Wire API for .NET	4.0.2.0	OneWireAPI.NET.dll
Avalon-framework-cvs-20020806	20020806	avalon-framework-cvs-20020806.jar
Batik	0.20-5	batik.jar
Fop	0.20-5	fop.jar
Microsoft Visual J# 2.0 Redistributable Package-Second Edition(x64)	2.0	vjc.dll , vjsjbc.dll, vjslibcw.dll, vjsnativ.dll , vjssupuilib.dll , vjsvwaux.dll
Entity framework	4.3.1	EntityFramework.dll
Spreadsheetlight	3.4.3	SpreadsheetLight.dll, SpreadsheetLight.xml
Open XML SDK 2.0 For Microsoft Office	2.0.5022.0	DocumentFormat.OpenXml.dll, DocumentFormat.OpenXml.xml

**Table 3-7. Democracy Suite 5.0 ImageCast Precinct Unmodified COTS Component Descriptions**

Firmware/Software	Version	Filename
OpenSSL	1.1.2	Openssl-fips-1.1.2.tar.gz
PNG Reference Library	1.2.24	libpng-1.2.24.tar.gz
Zlib	1.2.3	Zlib-1.2.3.tar.gz

**Table 3-8. Democracy Suite 5.0 ImageCast X (Includes EDM) Unmodified COTS Component Descriptions**

Firmware/Software	Version	Filename
ASP.NET AJAX Control Toolkit	15.1.4.0	AjaxControlToolkit.Installer.15.1.4.0.exe
Entity Framework	6.1.3.net45	entityframework.6.1.3.nupkg
Ionics Zip Library	1.9.1.8	DotNetZipLib-DevKit-v1.9.zip
NLog Library	1.0.0.505	NLog-1.0-Refresh-bin.zip
SQLite	1.0.98.0	sqlite-netFx451-binary-bundle-x64-2013-1.0.98.0.zip
Google Text-to-Speech Engine	3.8.16	ARM: com.google.android.tts_3.8.16-210308160_minAPI15(armeabi-v7a)(nodpi).apk  x86: com.google.android.ttscom.google.android.tts_3.8.16-210308163_minAPI15(x86)(nodpi).apk

**Table 3-9. Democracy Suite 5.0 ImageCast Central Software Build Library Source Code (Unmodified COTS)**

Firmware/Software	Version	Filename
OpenSSL	1.2.3	openssl-fips-1.2.3.tar.gz

**Table 3-10. Democracy Suite 5.0 ImageCast Central Runtime Software Components (Unmodified COTS)**

Firmware/Software	Version	Filename
1-Wire Driver (x86)	4.04	install_1_wire_drivers_x86_v404.msi
1-Wire Driver (x64)	4.04	install_1_wire_drivers_x64_v404.msi
Kofax VRS	4.5 Build 269	Kofax_VRS4_50_269_DR-G1130.iso
Kofax VRS Service Pack 1	4.5.1	vrs45sp1setup.exe
Canon DR-G1130 Driver	1.2 SP4	Physical Media from Canon
Canon DR-G1130 Component Installer	4.50	CI-DR-G1130.exe
Canon DR-M160II Driver	1.2 SP4	Physical Media from Canon
Canon DR-M160II Component Installer	4.50	ci-dr-m160.exe
Visual C++ 2013 Redistributable (x86)	12.0.30501	vc redistrib_x86.exe

**Table 3-11. Democracy Suite 5.0 ImageCast Precinct Modified COTS Software Component Descriptions**

Firmware/Software	Version	Filename
uClinux	20070130	uClinux-dist-20070130.tar.gz
COLILO Bootloader	20040221	Colilo20040221.tar.gz

**Table 3-12. Democracy Suite 5.0 ImageCast X Modified COTS Software Component Descriptions**

Firmware/Software	Version	Filename
Zxing Barcode Scanner	4.7.5	BS-4.7.5.zip
SoundTouch	1.9.2	Soundtouch-1.9.2.tar.gz

**Table 3-13. Democracy Suite 5.0 EMS Software Build Environment Component Descriptions**

Firmware/Software	Version	Filename
Windows 8.1 Professional	8.1	Physical Media from Microsoft

.NET Framework 3.5	3.5	Physical Media from Microsoft
Internet Information Server (IIS)	6	Physical Media from Microsoft
7-Zip	9.20 (64 Bit)	7z920-x64.msi
Visual Studio 2013 Premium	2013.5	vs2013.5_prem_enu.iso
ImgBurn	2.5.7.0	SetupImgBurn_2.5.7.0.exe
Infragistics NetAdvantage Win Forms 2011.1	2011.1	NetAdvantage_WinForms_20111.msi
Infragistics Net Advantage – WPF 2012.1	2012.1	NetAdvantage_WPF_20121.msi
TX Text Control 16.0.NET	16	TX Text Control.NET for Windows Forms 16.0.exe
Speex	1.0.4	speex_win32_1.0.4_setup.exe
Microsoft Visual J#	2.0	vjredist64.exe
iTextSharp	5.0.5	itextsharp-5.0.5-dll.zip
Ghostscript	9.0.4	gs904w32.exe gs904w64.exe
NLog	1.0.0.505	NLog-1.0-Refresh-bin.zip
OneWireAPI.NET	4.0	1-wiresdkver400_beta2.zip
Lame	3.99.4	lame3.99.4-20120130.zip
Sox	14.3.1	sox-14.3.1-win32.zip
Avalon Framework	20020806	avalon-framework-cvs-20020806.jar.zip
Fop	0.20-5	fop-0.20.5.jar
Batik	0.20-5	batik-1.5-fop-0.20-5.jar
SharpSSH	1.1.1.13	SharpSSH.zip
SQLite	1.0.65.0	SQLite-1.0.65.0-binaries.zip
OpenSSL	1.2	openssl-fips-1.2.tar.gz
ActivePerl	5.20.2	ActivePerl-5.20.2.2002-MSWin32-x86-64int-299195.msi
Patch	2.5.9-7	patch-2.5.9-7-bin.zip
ISOnewspaper	30.4	ISOnewspaper30v4_gr.icc.zip
Ogg Vorbis Encoder	2.88	oggenc2.88-1.3.5-generic.zip
Ogg Vorbis Encoder	1.10.1	oggdecV1.10.1.zip
Prism Mvvm	1.1.1	prism.mvvm.1.1.1.nupkg
PDF Printing	2.9.5.2	PDFPrinting.zip
Entity Framework	6.1.3	entityframework.6.1.3.nupkg

WiX	3.10	Wix310.exe
Spreadsheet Light	3.4.3	spreadsheetlight.3.4.3.nupkg
Open XML SDK 2.0 for Microsoft Office	2.0	OpenXMLSDKv2.msi
Acrobat Reader	Acrobat DC	AcroRdrDC1501020060_en_US.exe
Arial Narrow Fonts	N/A	ArialNarrowFonts.zip
PdfToImage	1.2	ConvertPDF_source_1.2.zip

**Table 3-14. Democracy Suite 5.0 ICC Software Build Environment Component Descriptions**

Firmware/Software	Version	Filename
NASM Assembler	2.09.07	nasm-2.09.07-win32.zip
OpenSSL	1.2.3	openssl-fips-1.2.3.tar.gz

**Table 3-15. Democracy Suite 5.0 EDM Software Build Environment Component Descriptions**

Firmware/Software	Version	Filename
Ajax Control Toolkit	15.1.4	AjaxControlToolkit.Installer.15.1.4.0.exe
SQLite	1.0.98.0	sqlite-netFx451-binary-bundle-x64-2013-1.0.98.0.zip
Ionic	1.9.1.8	DotNetZipLib-DevKit-v1.9.zip
Google Text-to-speech Engine – Architecture arm	3.8.16	com.google.android.tts_3.8.16-210308160_minAPI15(armeabi-v7a)(nodpi).apk
Google Text-to-speech Engine – Architecture x86	3.8.16	com.google.android.ttscom.google.android.tts_3.8.16-210308163_minAPI15(x86)(nodpi).apk

**Table 3-16. Democracy Suite 5.0 Adjudication Software Build Environment Component Descriptions**

Firmware/Software	Version	Filename
Microsoft Enterprise Library	5.0	Enterprise Library 5.0.msi
Microsoft Prism	4.0-November 2010	Prismv4.exe
Microsoft Identity Foundation SDK	4.0	WindowsIdentityFoundation-SDK-4.0.msi
Toggle Switch Control Library	1.1.1	ToggleSwitch 1.1.1.zip
Infragistics NetAdvantage Ultimate 2013.1	2013.1	NetAdvantage_dotNet_20131_WithSamplesAndHelp.zip
iTextSharp	5.5.1	itextsharp-all-5.5.1.zip

CLR Security	June 2010	clrsecurity_june10.zip
OpenSSL	1.0.2e	openssl-1.0.2e-i386-win32.zip
Community MSI Extensions	1.4	msiext-1.4.zip
TreeViewEx	3.0.0.0	TreeViewEx.dll

**Table 3-17. Democracy Suite 5.0 ICL Software Build Environment Component Descriptions**

Firmware/Software	Version	Filename
SharpZipLib	0.86.0	SharpZipLib_0860_Bin.zip
Microsoft Visual Studio 2013 Installer Projects Extension	2013	VSI_bundle.exe
Visual Basic Power Packs	12.0	vb_vbpowerpacks.exe

**Table 3-18. Democracy Suite 5.0 ImageCast Precinct Election Firmware Compiler Descriptions**

Firmware/Software	Version	Filename
g++ (GNU C++ compiler)	gcc3.4.0-20040603	m68k-uclinux-tools-c++-gcc3.4.0-20040603.sh

**Table 3-19. Democracy Suite 5.0 ImageCast Precinct Firmware Build Environment Component Descriptions**

Firmware/Software	Version	Filename
Ubuntu 10.04 LTS – Long-term support	10.04	ubuntu-10.04.2-desktop-amd64.iso
Toolchain Installation Script	N/A	Toolchain.sh
m68k uClinux tools base gcc	3.4.0-20040603	m68k-uclinux-tools-base-gcc3.4.0-20040603.sh
m68k uClinux tools c++ gcc	3.4.0-20040603	m68k-uclinux-tools-c++-gcc3.4.0-20040603.sh
m68k uClinux tools gdb	20040603	m68k-uclinux-tools-gdb-20040603.sh
OpenSSL	1.1.2	Openssl-fips-1.1.2.tar.gz

**Table 3-20. Democracy Suite 5.0 ImageCast X Firmware Build Environment Component Descriptions**

Firmware/Software	Version	Filename
Ubuntu 14.04.4	14.04.4	ubuntu-14.04.4-desktop-amd64.iso

### 3.2 Equipment

This subsection lists the proprietary and COTS equipment to be provided by the manufacturer as part of the test campaign.

For COTS equipment, every effort will be made to verify that the COTS equipment has not been modified for use. This will be accomplished by performing research using the COTS equipment manufacturer’s websites based on the serial numbers and service tag numbers for each piece of equipment. Assigned test personnel will evaluate COTS hardware, system software and communications components for proven performance in commercial applications other than voting. For PCs, laptops, and servers, the service tag information will be compared to the system information found on each machine. Physical external and internal examination will also be performed when the equipment is easily accessible without the possibility of damage. Hard drives, RAM memory, and other components will be examined to verify that the components match the information found on the COTS equipment manufacturer’s websites.

**Table 3-21. Voting System Equipment**

<b>Component</b>	<b>Serial Number</b>
<i>Proprietary Hardware</i>	
ImageCast Precinct Optical Scanner PCOS-320C	AAFAJFM0061, AAFAJFN0030, AAFAJGI6764, AAFAJEL0352
ImageCast Precinct Optical Scanner PCOS-320A	AANAGCP0347, AANAGCP0002
ICP Ballot Box BOX-330A	AAUCCFX0083, AAUCCGI0011
ICX Samsung Tablet	[DVS-Samsung ICX-001], RF2GB01W0GD, RF2GB01V4HF, RF2GB01V5RL
ICX Inline EMI Filter	[DVS-EMIFILTER-001] thru [DVS-EMIFILTER-003]
<i>COTS Hardware</i>	
ICX aValue 15” Tablet (SID-15V)	0E14AF00014, B03G005400006, B03G005400008, 9E274118, 1D274118
ICX aValue 21” Tablet (SID-21V)	0E14AF00027, B03G005500019, 03G005500009, 0039BZ2D, 0039B209
Dell OptiPlex 7440 All In One	HVNRFB2, HVNQFB2, HVNPFB2
Dell PowerEdge R630	4Z07T52
Canon imageFormula DR-G1130 Scanner	GF301092, GF304418
Canon DR-M160II Scanner	GX316655, GX319338, GX319353
Dell Precision T3420 PC	HS0VFB2, HS0TFB2, HS0RFB2, HS0SFB2
HP LaserJet Pro Printer M402dn	PHBQF20342, PHBQF20345, PHBQC12619, PHBQC19613, PHBQC12519, PHBQD18790, PHBQC12616
Dell OptiPlex 9030 All-In-One	CF73S52

**Table 3-22. Voting System Support Equipment**

<b>Component</b>	<b>Serial Number</b>
<i>COTS Hardware</i>	
Dell Ultrasharp 24" Monitor U2414H	1PVZ152, 62VZ152
Dell Monitor KM632	FYNTY12, CKX6Y12, CN-0524N3-72461-59H-6U5U
Dell Monitor P2414Hb	CN-0524N3-74261-5AH-2DNU, CN-0524N3-74261-5AH-2DAU
ABLENET Jelly Bean Twist 10033400	[DVS-ablenet-001] thru [DVS-ablenet-014]
Tecla ShieldDos KDL-02001	[DVS-Tecla-001] thru [DVS-Tecla-006]
Brother Laser Printer HL-L2300D	U63878K5N281729
Dell DVD Multi Recorder GP60NB60	[DVS-Dell-001]
Dell Latitude E7450 Laptop	30GFH72, 369FH72
Maxim iButton Programmer DS9490R# with DS1402	[DVS-Maxim-001] thru [DVS-Maxim-005]
APC Smart-UPS SMT1500	3S1536X06436, 3S1536X06475, 3S1536X06461, 3S1536X06485, 3S1536X06484, 3S1536X06322, 3S1536X07467, 3S1536X06484, 3S1536X06272, 3S1536X06201, 3S1536X07305, 3S1504X00395, 3S1504X00396
Dell X1008 Network Switch	4R8XX42, 26SXX42, 63SXX42
Dell X1018 Network Switch	6TN7Y42
Dell X1026 Network Switch	83D9Y42
Enabling Devices Sip and Puff	[DVS-enabling devices-001] - [DVS-enabling devices-002]
Cyber Acoustics Headphones ACM-70	[DVS-cyber acoustics-001] - [DVS-cyber acoustics-005]
4-Way Joystick Controller S26	PME QC 1550 12, [DVS-JOY-001], [DVS-JOY-002]
Enablemart # 88906 Rocker (Paddle) Switch	[DVS-paddle-001]
Dell PowerConnect 2808 Network Switch	3S2P0Z1
IOGEAR SDHC/microSDHC 0U51USC410 Card Reader	8632, 8633
Lexar USB 3.0 Dual-Slot Reader	24020845007435
Hoodman Steel USB 3.0 UDMA Reader 102015	[DVS-hoodman-001]
ATI Handset	98862010101-035, 98862010103-075, 00659010100-046, 98862010100-232
ATI-USB Handset	02440010100-011, [DVS-ATIUSB-001], [DVS-ATIUSB-002]



ACS PC-Linked Smart Card Reader ACR39U	RR374-006272, RR374-010356, RR374-010365
Lexar Professional CF Card Reader Workflow CFR1	24050361400108, 24050361401994, 24050361401991, 24050361401990
CORCOM Filter P/N#: 15EMC1	[DVS-CorcomEMIFilter-001]
Delta Filter P/N#: 16PDCG5C	[DVS-DeltaEMIFILTER-001]

### 3.3 Test Materials

*This subsection lists the test materials required to execute the required tests throughout the test campaign.*

**Table 3-23. Required Test Materials**

<b>Material</b>	<b>Description(s)</b>
Tamper Proof Security Seals	Adhesive tamper proof security seal, Novavision Part# XSG21-08RESN
Printer Cartridges	Brother TN-630, HP LaserJet CF226X
Smart Cards	Programmable Smart Cards
ImageCast Precinct Cleaning Sheets	Cleaning Sheets for ImageCast Precinct tabulator Part# CSHT-100B
Stereo Breakout Cable	3.5mm stereo male plug to dual 3.5mm mono female plugs
3.5mm Stereo Cable	3.5mm stereo male plug to 3.5mm stereo female plug
Compact Flash Cards	SanDisk Ultra 4Gb Compact Flash cards
iButton Security Tokens	iButton Security Token with lanyards
Permanent Markers	Fine Tip Sharpie Permanent Markers
Ethernet Cables	Cat5e Ethernet Cables
ICP Paper Rolls	Replacement Thermal Paper Rolls for the ImageCast Precinct tabulator
Sip & Puff Disposable Straws	Disposable straws for use with the Sip & Puff input device
Ballot Stock	Ballot Paper Stock for printing ballots
A/C Power Cables	3-Prong A/C Power Cables
USB Thumb drives	4.0 GB USB Thumb drives

### 3.4 Deliverable Materials

*This subsection lists the materials identified by the manufacturer as materials deliverable to the end user for the system being tested.*

**Table 3-24. Voting System Deliverables**

Material	Version	Description
ImageCast Precinct Firmware	5.0.0.15	ICP Software
ImageCast Central Count	5.0.0.15	ICC Software
ImageCast X	5.0.6018.24783	ICX Software
EMS Adjudication	5.0.0.9501	EMS Software
EMS Adjudication Service	5.0.0.9407	EMS Software
EMS Application Server	5.0.5.1	EMS Software
EMS Audio Studio	5.0.5.1	EMS Software
EMS Data Center Manager	5.0.5.1	EMS Software
EMS Election Data Translator	5.0.5.1	EMS Software
EMS Election Event Designer	5.0.5.1	EMS Software
EMS File System Service	5.0.5.1	EMS Software
EMS Results Tally and Reporting	5.0.5.1	EMS Software
Smart Card Helper Service	5.0.5982.27878	EMS Software
ImageCast Voter Activation	5.0.5982.27878	EMS Software
EMS Election Device Manager	5.0.5982.27861	EMS Software
Democracy Suite System Overview	5.0::29	TDP Document
Democracy Suite Configuration Management Plan	5.0::253	TDP Document

### 4.0 TEST SPECIFICATIONS

Certification testing of the Dominion D-Suite 5.0 Voting System submitted for evaluation will be performed to ensure the applicable requirements of the EAC 2005 VVSG and the EAC Testing and Certification Program Manual, Version 2.0 are met. Additionally, all EAC Request for Interpretations (RFI) and Notices of Clarification (NOC) relevant to the system under test will be incorporated in the test campaign. A complete listing of the EAC RFIs and NOCs is available on the EAC website.

#### **4.1 Requirements (Strategy of Evaluation)**

To evaluate the D-Suite 5.0 test requirements, each section of the EAC 2005 VVSG will be analyzed to determine the applicable tests. The EAC 2005 VVSG Volume I Sections, along with the strategy of evaluation, are described below:

##### Section 2: Functional Requirements

The requirements in this section shall be tested during the FCA and System Integration Test. This evaluation will utilize baseline test cases as well as specifically designed test cases and will include predefined election definitions for the input data.

##### Section 3: Usability and Accessibility Requirements

The requirements in this section shall be tested during the Usability and Accessibility Testing. This evaluation will utilize baseline test cases as well as specifically designed test cases and will include predefined election definitions for the input data. **Pro V&V will review the results of Summative Usability Testing performed on the ICP and ICX components by Dominion, to verify that the submitted test results are in Common Industry Format.**

##### Section 4: Hardware Requirements

The requirements in this section shall be tested and/or evaluated by personnel verified by Pro V&V to be qualified to perform the testing.

##### Section 5: Software Requirements

The requirements in this section shall be tested utilizing a combination of review and functional testing during the Source Code Review, TDP Review, and FCA.

##### Section 6: Telecommunications Requirements

The requirements in this section shall be tested utilizing baseline test cases as well as specifically designed test cases.

##### Section 7: Security Requirements

The requirements in this section shall be tested during the Source Code Review, Security Tests, and FCA.

##### Section 8: Quality Assurance Requirements

The requirements in this section shall be tested throughout the test campaign. This testing will utilize a TDP Review in conjunction with the Source Code Review and PCA to determine compliance to the EAC 2005 VVSG requirements and the requirements stated in the Dominion technical documentation. The review of the Quality Assurance documentation will focus on Dominion's adherence to its stated QA processes.

## Section 8: Configuration Management Requirements

The requirements in this section shall be tested throughout the test campaign. This testing will utilize a TDP Review in conjunction with the Source Code Review and PCA to determine compliance to the EAC 2005 VVSG requirements and the requirements stated in the Dominion technical documentation. The review of the Configuration Management documentation will focus on Dominion's adherence to its stated CM processes.

Throughout the test campaign, Pro V&V personnel shall maintain a test log identifying the system and equipment under test and any records of deviations to the test plan along with the rationale for performing the deviations. Pro V&V shall also utilize an internal bug tracking system to record and track all issues and/or discrepancies noted during the test campaign.

### **4.1.1 Mapping of Requirements to Equipment Type and Features**

This information shall be included in the EAC online matrix tool (VRT).

### **4.1.2 Rationale for 'Not Applicable' Requirements**

The D-Suite 5.0 is a paper-based system that supports a closed network. Therefore, all EAC 2005 VVSG requirements, with the exceptions listed below, will be evaluated as part of this test campaign.

- Volume I, Section 6.2.6 (Telecommunications Requirements)
- Volume I, Section 7.52-7.54 (Telecommunications and Data Transmission)
- Volume I, Section 7.6 (Use of Public Networks)
- Volume I, Section 7.7 (Wireless Communications)
- Volume I, Section 7.9 (Voter Verifiable Paper Audit Trail Requirements)

The rationale for not evaluating the D-Suite 5.0 to the indicated sections is described in following table. Specific requirements that are excluded from this test campaign are identified in the EAC online matrix tool.

**Table 4-1. Not Applicable Requirements**

<b>EAC 2005 VVSG Version 1 Volume I, Section</b>	<b>Rationale for ‘Not Applicable’</b>
6.2.6	These requirements are written for use of public networks. The D-Suite 5.0 does not utilize public networks.
7.5.2-7.5.4	These requirements are written for use of public networks. The D-Suite 5.0 does not utilize public networks.
7.6	D-Suite 5.0 does not support transmission over public networks.
7.7	No wireless technology is utilized in this system.
7.9	This system does not contain a Voter Verifiable Paper Audit Trail (VVPAT).

#### 4.2 Hardware Configuration and Design

The D-Suite 5.0 Voting System is a paper-based optical scan voting system that consists of the following major components: the EMS, the ImageCast Central (ICC), the ImageCast Precinct (ICP), and the ImageCast X (ICX). The Democracy Suite is comprised of one proprietary hardware component (ICP), one COTS hardware component (ICC), and one integrated COTS component (ICX). All EMS functions are managed by proprietary software running on COTS PCs/laptops/servers, which is excluded from hardware testing.

ICP – The ICP component will be subjected to the full suite of hardware and electrical testing required by the EAC 2005 VVSG as well as Usability, Security, Maintainability, Availability, and Accuracy Testing.

ICX – The ICX component will be subjected to the full suite of hardware and electrical testing required by the EAC 2005 VVSG as well as Usability, Security, Maintainability, Availability, Safety, and Accuracy Testing.

ICC – The ICC component is unmodified COTS equipment and will be exempt from non-operational hardware testing. The ICC will be subjected to Temperature/Power Variation Testing in conjunction with the ICP and ICX in addition to being utilized in functional and system level testing such as accuracy, volume and stress, and system integration during the test campaign.

#### 4.3 Software System Functions

The Democracy Suite Election Management System (EMS) consists of a set of applications responsible for all pre-voting and post-voting activities used in election definition and management process. The Democracy Suite EMS applications are as follows:

- EMS Election Event Designer
- EMS Results Tally and Reporting
- EMS Audio Studio

- EMS Adjudication Application
- EMS Adjudication Service
- EMS File System Service
- EMS Election Data Translator
- Smart Card Helper Service
- ImageCast Voter Activation
- EMS Data Center Manager
- EMS Application Server
- EMS Database Server
- EMS NAS Server
- EMS Election Device Manager

The D-Suite 5.0 voting system consists of one central count tabulator, one ballot marking device which run software applications, and one precinct tabulator which runs a firmware application.

#### 4.4 Test Case Design

Test cases are designed based on the manufacturer's design specifications and the relevant technical requirements set forth by the VVSG. Test cases shall be based on the following aspects of the voting system:

- Hardware qualitative examination design
- Hardware environmental test case design
- Software module test case design and data
- Software functional test case design
- System level test case design

Test cases shall provide information regarding the sequence of actions to be performed for the execution of a test, the requirements being met, the test objective, test configuration, equipment needed, special requirements, assumptions, and pass/fail criteria. Once the test cases are finalized, they will be validated and published for use in the test campaign. The validation of the test case will be accomplished by technical review and approval. This validation will include the following: confirmation of adequate test coverage of all requirements; confirmation that test case results are not ambiguous and gave objective pass/fail criteria; and confirmation that any automated test suites will produce valid results.

#### 4.4.1 Hardware Qualitative Examination Design

A list of hardware tests, and the components which will be subjected to each hardware test are listed below:

##### Electrical Tests:

- Electrical Power Disturbance – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP
- Electromagnetic Radiation – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP
- Electrostatic Disruption – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP
- Electromagnetic Susceptibility – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP
- Electrical Fast Transient – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP
- Lightning Surge – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP
- Conducted RF Immunity – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP
- Magnetic Fields Immunity – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP
- Electrical Supply – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP, ICC (DR-G1130 & DR-M160II)

##### Environmental Tests:

- Bench Handling – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”), ICP
- Vibration – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP
- Low Temperature – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP
- High Temperature – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP
- Humidity – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP
- Temperature Power Variation – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP, ICC (DR-G1130 & DR-M160II),
- Acoustic – ICX (Samsung Note Pro, A-Value 15”, & A-Value 21”) including HP Printer, ICP

#### **4.4.1.1 Mapping of Requirements to Specific Interfaces**

This information shall be contained in the EAC online matrix tool.

#### **4.4.2 Hardware Environmental Test Case Design**

No previous examinations have been performed on the D-Suite 5.0. The voting system hardware shall be subjected to the tests specified in Section 4.4.1. Testing will be performed by personnel verified by Pro V&V to be qualified to perform the test. Pro V&V will utilize a third-party test facility for performance of the electrical and environmental tests. All pre/post-tests shall be conducted by Pro V&V personnel.

#### **4.4.3 Software Module Test Case Design and Data**

Pro V&V shall review the manufacturer's program analysis, documentation, and module test case design and shall evaluate the test cases for each module with respect to flow control parameters and entry/exit data. As needed, Pro V&V shall design additional test cases to satisfy the coverage criteria specified in Volume II, Section 7.2.1.

Component Level Testing will be implemented during the FCA for each component and subcomponent. During the Source Code Review, Compliance Builds, and Security Testing, Pro V&V will utilize limited structural-based techniques (white-box testing). Additionally, specification-based techniques (black-box testing) will be utilized for the individual software components.

Pro V&V shall define the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performs as expected, the results will be accepted. If the system does not perform as expected, an analysis will be performed to determine the cause. The test will be repeated in an attempt to reproduce the results. If the failure can be reproduced and the expected results are not met, the system will have failed the test. If the results cannot be reproduced, the test will continue. All errors encountered will be documented and tracked through resolution.

#### **4.4.4 Software Functional Test Case Design and Data**

Pro V&V shall review the manufacturer-submitted test plans and data to verify that the individual performance requirements specified in the EAC 2005 VVSG and the TDP are reflected in the software. As part of this process, Pro V&V shall review the manufacturer's test case design and prepare a detailed matrix of system functions and the test cases that exercise them. Pro V&V shall also prepare a test procedure describing all test ballots, operator procedures, and the data content of output reports. Pro V&V shall define abnormal input data and operator actions and then design test cases to verify that the system is able to handle and recover from these abnormal conditions. During this review, emphasis shall be placed on those functions where the manufacturer data on module development, such as the system release notes and comments within the source code, reflects significant debugging problems, and on functional tests that resulted in high error rates.

Pro V&V shall define the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performs as expected, the results will be accepted.



If the system does not perform as expected, an analysis will be performed to determine the cause. The test will be repeated in an attempt to reproduce the results. If the failure can be reproduced and the expected results are not met, the system will have failed the test. If the results cannot be reproduced, the test will continue. All errors encountered will be documented and tracked through resolution.

#### 4.4.5 System-Level Test Case Design

System Level testing will be implemented to evaluate the complete system. This testing will include all proprietary components and COTS components (software, hardware, and peripherals) in a configuration of the system's intended use. For software system tests, the tests shall be designed according to the stated design objective without consideration of its functional specification. The system level hardware and software test cases shall be prepared independently to assess the response of the hardware and software to a range of conditions.

#### 4.5 Security Functions

The objective of the Security Testing is to evaluate the effectiveness of the voting system in detecting, preventing, recording, reporting, and recovering from security threats. To evaluate the integrity of the system, Pro V&V shall develop specifically designed test cases in an attempt to defeat the access controls and security measures documented in the system TDP. A threat matrix shall be created to determine the risks and vulnerabilities. An evaluation of the system shall be accomplished by utilizing a combination of functional testing, source code review, and Fortify Static Code Analyzer. All findings will be reported to the EAC and Dominion Voting Systems.

#### 4.6 TDP Evaluation

In order to determine full compliance with the EAC 2005 VVSG, three phases of TDP review shall be conducted:

- Initial TDP Review: The first review is performed to determine whether the TDP submitted is complete enough to perform TDP review. This is an abbreviated review. Each document is read to determine whether it provides enough description of the submitted voting system components and whether it at least generically addresses VVSG requirements. The results of the review are used in determining contractual requirements for the test campaign.
- Compliance Review: This review is conducted on a document-by-document basis to determine if every Federal, State, or manufacturer-stated requirement has been met based on the context of each requirement. This review does not address consistency or completeness of documents. The review is more complex than the initial TDP review. Results of the review of each document are entered on the TDP Review Checklist and are reported to the manufacturer for disposition of any anomalies. This process is ongoing until all anomalies are resolved. Any revised documents during the TDP review process are compared with the previous document revision to determine changes made, and the document is re-reviewed to determine whether subject requirements have been met.

- Consistency/Completeness Review: The third TDP review is completed after the review for compliance has been performed (the Consistency/Completeness TDP Review may overlap the Compliance Review in part). This review is to ensure the information included in the TDP documents is consistent across documents, especially in component naming, software and firmware versioning, and the hardware, software, and firmware included with the voting system submitted for testing. Any revisions to a document during the TDP review process which affect other documents must also be revised. As with the other TDP reviews, the TDP Review Checklist is utilized to report any anomalies to the manufacturer for resolution, if required. The TDP review continues until all anomalies have been satisfactorily resolved.

A listing of all documents contained in the D-Suite 5.0 TDP is provided in Table 4-2.

**Table 4-2. TDP Documents**

<b>Document Number</b>	<b>Description</b>	<b>Version</b>
<i>Adjudication Documents</i>		
2.05	Democracy Suite Adjudication Software Design and Specification	5.0::50
2.08	Democracy Suite Adjudication System Operation Procedures	5.0::93
2.09	Democracy Suite Adjudication System Maintenance Manual	5.0::36
<i>D-Suite Documents</i>		
2.02	Democracy Suite System Overview	5.0::29
2.06	Democracy Suite System Security Specification	5.0::452
2.07	Democracy Suite System Test and Verification	5.0::127
2.10	Democracy Suite Personnel Deployment and Training Requirements	5.0::76
2.11	Democracy Suite Configuration Management Process	5.0::253
2.12	Democracy Suite Quality Assurance Program	5.0::102
2.13	Democracy Suite System Change Notes	5.0::21
<i>EMS Documents</i>		
2.03	Democracy Suite EMS Functional Description	5.0::297
2.05	Democracy Suite EMS Software Design and Specification	5.0::249
2.08	Democracy Suite EMS System Operations Procedures	5.0::653
2.09	Democracy Suite EMS System Maintenance Manual	5.0::91
---	Democracy Suite EMS System Installation and Configuration Procedure	5.0::34
<i>ImageCast Central Documents</i>		
2.03	Democracy Suite ImageCast Central Functionality Description	5.0::110
2.05	Democracy Suite ImageCast Central Software Design and Specification	5.0::62

2.08	Democracy Suite ImageCast Central System Operation Procedures	5.0::146
---	Democracy Suite ImageCast Central Installation and Configuration Procedure	5.0::41
<i>ImageCast Precinct Documents</i>		
2.03	Democracy Suite ImageCast Precinct Functionality Description	5.0::147
2.04	Democracy Suite ImageCast Precinct System Hardware Specification	5.0::115
2.04.1	Democracy suite ImageCast Precinct System Hardware Characteristics	5.0::68
2.05	Democracy Suite ImageCast Precinct Software Design and Specification	5.0::124
2.08	Democracy Suite ImageCast Precinct System Operation Procedures	5.0::239
2.09	Democracy Suite ImageCast Precinct System Maintenance Manual	5.0::98
<i>ImageCast X Documents</i>		
2.03	Democracy Suite ImageCast X Functionality Description	5.0::25
2.05	Democracy Suite ImageCast X Software Design and Specification	5.0::42
2.08	Democracy Suite ImageCast X System Operation Procedures	5.0::88
2.09	Democracy Suite ImageCast X System Maintenance Manual	5.0::31
---	Democracy Suite ImageCast X Installation and Configuration Procedure	5.0::11
<i>User Guides</i>		
---	Democracy Suite ImageCast Adjudication User Guide	5.0::50
---	Canon imageFORMULA DR-G1130 DR-G1100 User Manual	---
---	Canon imageFORMULA DR-M160II User Manual	---
---	Democracy Suite Election Device Management User Guide	5.0::11
---	Democracy Suite EMS Audio Studio User Guide	5.0::63
---	Democracy Suite EMS Election Data Translator User Guide	5.0::47
---	Democracy Suite EMS Election Event Designer User Guide	5.0::90
---	Democracy Suite EMS Mobile Ballot Production User Guide	5.0::20
---	Democracy Suite EMS Results Tally and Reporting User Guide	5.0::60
---	Democracy Suite ImageCast Central User Guide	5.0::71
---	Democracy Suite ImageCast Precinct User Guide	5.0::37
---	Democracy Suite ImageCast Voter Activation User Guide	5.0::18
---	ImageCast X Ballot Marking Device User Guide	5.0::61
---	Dell Latitude E7450 Owner's Manual	---
---	SID-15V-Z37-A1R User Manual	Rev. 1.0
---	SID-21V-Z37-A1R User Manual	Rev. 1.0

---	Samsung GALAXY Note PRO Android Tablet User Manual	---
<i>Supplementary Documents</i>		
---	AT4 Wireless Test Report No. (NIE) 39698RSE.001 (Tecla Shield)	---
---	Cyber Acoustics ACM-70B Stereo Headphones Product Sheet	---
---	Democracy Suite ImageCast C++ Coding Standard	5.0::14
---	Democracy Suite C# Automated Code Review Process	5.0::9
---	Dell Latitude E7450/Latitude 7450 Regulatory Compliance Sheet	---
---	Dell OptiPlex 9020 AIO Regulatory Compliance Sheet	---
---	Dell OptiPlex 9030 AIO Regulatory Compliance Sheet	---
---	Dell Networking X-Series Specification Sheet	Ver. 1.9
---	Dell OptiPlex 9020 All-in-One Technical Specification Sheet	---
---	Dell OptiPlex 9030 All-in-One Technical Specification Sheet	---
---	Dell B2360d and B2360dn Brochure	---
---	Dominion Voting Systems Java Coding Standards	1.0
---	Dominion Voting Systems JavaScript Coding Standards	1.0
---	Democracy Suite ImageCast Device Configuration Files	5.0::53
---	Democracy Suite ImageCast Printing and Finishing Specification	5.0::45
---	Democracy Suite ImageCast Total Results File Format	5.0::16
---	Democracy Suite ImageCast Precinct Election Definition Files	5.0::28
---	Democracy Suite ImageCast Precinct Extracting Firmware Contents	5.0::14
---	Democracy Suite ImageCast Precinct Firmware Update Procedure	5.0::25
---	Democracy Suite ImageCast Precinct Level One (L1) Maintenance Manual	5.0::39
---	Democracy Suite ImageCast Precinct Technical Guide	5.0::23
---	Canon imageCLASS LNP6230dw Technical Specification Sheet	---
---	YEDU.E95462 Uninterruptible Power-supply Equipment Sheet	---
---	Dell Latitude E7440 Regulatory Compliance Sheet	Rev. A09
---	Dell PowerEdge R630 Regulatory Compliance Sheet	Rev. A10
---	Dell Precision T1700 MT Regulatory Compliance Sheet	Rev. A09
---	Dell PowerConnect 2808 Product Safety. EMC, and Environmental DataSheet	---
---	Dell PowerConnect 2816 Product Safety. EMC, and Environmental DataSheet	---
---	LAVA STS Product Family User Manual	Rev. A01
---	APC Smart-UPS 230V Product Information Sheet	---

---	SAMSUNG Android Tablet Health and Safety and Warranty Guide	---
<i>Build Documents</i>		
---	Democracy Suite EMS Software Build Document	2.3.1_3
---	Democracy Suite ImageCast Precinct Firmware Build and Install	5.0::40
---	ImageCast X Build	5.0.6

#### 4.7 Source Code Review

Pro V&V will review the submitted source code to the EAC 2005 VVSG and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V shall verify that the submitted documentation is sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met.

#### 4.8 QA & CM System Review

The Dominion Voting Systems Quality and Configuration Management Manuals shall be reviewed for their fulfillment of Volume I, Sections 8 and 9, and the requirements specified in Volume II, Section 2. The requirements for these sections establish the quality assurance and configuration standards for voting systems to which manufacturers must conform and require voting system manufacturers to implement a quality assurance and configuration management program that is conformant with recognized ISO standards. As part of the review process, the Dominion TDP documents will be reviewed to determine if the stated policies are being followed.

### 5.0 TEST DATA

The following subsections provide information concerning test data recording, criteria, and reduction.

#### 5.1 Test Data Recording

All equipment utilized for test data recording shall be identified in the test data package. The output test data shall be recorded in an appropriate manner as to allow for data analysis. For source code and TDP reviews, results shall be compiled in reports and submitted to Dominion for resolution.

#### 5.2 Test Data Criteria

The D-Suite 5.0 Voting System shall be evaluated against all applicable requirements contained in the EAC 2005 VVSG. The acceptable range for system performance and the expected results for each test case shall be derived from the manufacturer-submitted technical documentation and the EAC 2005 VVSG.

### **5.3 Test Data Reduction**

Test data shall be processed and recorded in the test log book and the relevant Test Cases.

## **6.0 TEST PROCEDURE AND CONDITIONS**

The following subsections detail the facility requirements, test setup conditions, and sequence of testing.

### **6.1 Facility Requirements**

Unless otherwise annotated, all testing shall be conducted at the Pro V&V test facility located in Huntsville, AL, by personnel verified by Pro V&V to be qualified to perform the test.

Unless otherwise specified herein, testing shall be performed at the following standard ambient conditions and tolerances:

- Temperature: 68-75° F ( $\pm 3.6^\circ\text{F}$ )
- Relative Humidity: Local Site Humidity
- Atmospheric Pressure: Local Site Pressure
- Time Allowable Tolerance:  $\pm 5\%$

Testing performed at third-party laboratories will be subjected to the test parameters and tolerances defined by the test facility and will be reported in the final Test Report.

### **6.2 Test Set-up**

All voting system equipment shall be received and documented using Pro V&V proper QA procedures. Upon receipt of all hardware, an inspection will be performed to verify that the equipment received is free from obvious signs of damage and/or degradation that may have occurred during transit. If present, this damage shall be recorded, photographed, and reported to the Dominion Representative. Additionally, a comparison shall be made between the recorded serial numbers/part numbers and those listed on shipper's manifest and any discrepancies shall be reported to the Dominion Representative. TDP items and all source code received shall be inventoried and maintained by Pro V&V during the test campaign.

During test performance, the system shall be configured as it would be for normal field use. This includes connecting all supporting equipment and peripherals.

### **6.3 Test Sequence**

The D-Suite 5.0 Voting System will be evaluated against all applicable requirements in the EAC 2005 VVSG. There is no required sequence for test performance.

## **7.0 TEST OPERATIONS PROCEDURES**

Pro V&V will identify PASS/FAIL criteria for each executed test case. The PASS/FAIL criteria will be based on the specific expected results of the system. In the case of an unexpected result that deviates from what is considered standard, normal, or expected, a root cause analysis will be performed.

Pro V&V will evaluate every EAC 2005 VVSG requirement applicable to the Democracy Suite 5.0 voting system. Any deficiencies noted will be reported to the EAC and the manufacturer. If it is determined that there is insufficient data to determine compliance, this test plan will be altered and additional testing will be performed.

### **7.1 Proprietary Data**

All data and documentation considered by the manufacturer to be proprietary will be identified and documented in an independent submission along with a Notice of Protected Information.

**APPENDIX A**

**PROJECT SCHEDULE**



<b>Task Name</b>	<b>Start Date</b>	<b>End Date</b>	<b>Assigned To</b>	<b>Duration</b>
<b>Readiness for Testing (TRR)</b>	<b>04/15/16</b>	<b>04/29/16</b>		<b>11d</b>
EAC Application Submitted	04/15/16	04/15/16	Ryan Wilson	1d
Preliminary Source Code Delivered	04/15/16	04/15/16	Ryan Wilson	1d
TDP Delivered	04/22/16	04/22/16	Ryan Wilson	1d
Source Code Delivered (Remaining)	04/22/16	04/22/16	Ryan Wilson	0
Equipment Delivered	04/22/16	04/22/16	Ryan Wilson	0
TDP Verification	04/25/16	04/25/16	Diane Gray	1d
Source Code Verification	04/25/16	04/25/16	Jack Cobb	1d
Equipment Verification	04/25/16	04/25/16	Ryan Wilson	1d
System Setup	04/26/16	04/26/16	Ryan Wilson	1d
Mark Reading Test	04/27/16	04/27/16	Ryan Wilson	1d
VRT Status Update	04/27/16	04/27/16	Ryan Wilson	0
Application Approved by EAC	04/28/16	04/29/16	Ryan Wilson	2d
<b>TDP</b>	<b>04/25/16</b>	<b>07/14/16</b>		<b>57d</b>
Initial Review	04/25/16	04/29/16	Diane Gray	5d
Compliance Review	05/02/16	06/29/16	Diane Gray	42d
Final review	06/30/16	07/14/16	Diane Gray	10d
<b>Test Plan</b>	<b>04/18/16</b>	<b>09/15/16</b>		<b>107d</b>
Test Plan Creation	04/18/16	07/12/16	Wendy Owens	60d
Vendor Review & Comments	07/13/16	07/20/16	Ryan Wilson	6d
EAC Submission & Review	07/21/16	08/17/16	Ryan Wilson	20d
EAC Comment Review & Update	08/18/16	08/31/16	Wendy Owens	10d
EAC Submission & Review of Revision	09/01/16	09/14/16	Ryan Wilson	10d
EAC Approved Test Plan	09/15/16	09/15/16	Ryan Wilson	1d
<b>Source Code</b>	<b>04/15/16</b>	<b>05/06/16</b>		<b>16d</b>
<b>Manual Review</b>	04/15/16	04/15/16		1d
Source Code Review	04/18/16	04/22/16	Jack Cobb	5d
Source Code Re-Review	04/25/16	04/25/16	Jack Cobb	1d
Document Review	04/26/16	04/26/16	Jack Cobb	1d
Compliance Build	04/27/16	04/27/16	Jack Cobb	1d
<b>Automated Review</b>	04/22/16	04/22/16		1d
Source Code Review	04/25/16	04/29/16	Jack Cobb	5d
Source Code Re-Review	05/02/16	05/03/16	Jack Cobb	2d
Document Review	05/04/16	05/04/16	Jack Cobb	1d
Compliance Build	05/05/16	05/06/16	Jack Cobb	2d
<b>System Delivery &amp; Setup</b>	<b>04/26/16</b>	<b>05/10/16</b>		<b>11d</b>
PCA	04/26/16	04/26/16	Ryan Wilson	1d
System Setup	04/27/16	04/28/16	Ryan Wilson	2d
System Loads & Hardening	05/09/16	05/10/16	Ryan Wilson	2d
<b>Hardware Testing</b>	<b>05/26/16</b>	<b>08/25/16</b>		<b>64d</b>

Electrical Testing (all 3 ICX & ICP units)	05/26/16	06/17/16	Michael Walker	16d
Environmental Testing (all 3 ICX & ICP units)	05/26/16	06/10/16	Michael Walker	11d
Temp Power (all 3 ICX units, ICP, & Canon DR-M160-II)	06/27/16	07/01/16	Michael Walker	5d
Electrical Supply	08/22/16	08/22/16	Ryan Wilson	1d
Maintainability	08/23/16	08/24/16	Ryan Wilson	2d
Acoustic Testing	08/25/16	08/25/16	Ryan Wilson	1d
<b>System Level Testing</b>	<b>07/27/16</b>	<b>09/21/16</b>		<b>41d</b>
FCA	07/27/16	08/30/16	Ryan Wilson	25d
Security (include SCAP)	08/31/16	09/02/16	Ryan Wilson	3d
Usability	08/31/16	09/01/16	Ryan Wilson	2d
Accessibility	09/02/16	09/05/16	Ryan Wilson	2d
Volume & Stress (system limits)	09/02/16	09/06/16	Ryan Wilson	3d
Accuracy	09/07/16	09/08/16	Ryan Wilson	2d
Regression Testing	09/09/16	09/12/16	Ryan Wilson	2d
Trusted Build	09/13/16	09/14/16	Jack Cobb	2d
System Loads & Hardening	09/15/16	09/16/16	Ryan Wilson	2d
System Integration	09/19/16	09/21/16	Ryan Wilson	3d
<b>Test Report</b>	<b>09/13/16</b>	<b>11/11/16</b>		<b>44d</b>
Test Report Creation	09/13/16	09/22/16	Wendy Owens	8d
Vendor Review & Comments	09/23/16	09/26/16	Ryan Wilson	2d
EAC Submission & Review	09/27/16	10/24/16	Ryan Wilson	20d
EAC Comment Review & Update	10/25/16	10/27/16	Wendy Owens	3d
EAC Submission & Review of Revision	10/28/16	11/10/16	Ryan Wilson	10d
EAC Approved Test Report	11/11/16	11/11/16	Ryan Wilson	1d