VotingWorks VxSuite 4.0 EAC Certification Test Plan

V3.0

VWS-24003-TP-03

Prepared for:

Vendor Name	VotingWorks
Vendor System	VxSuite 4.0
EAC Application No.	VXS4

Prepared by:

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TESTING
NVLAP Lab Code 200733-0

Accredited by the
Election Assistance Commission (EAC)
for selected Voting System
Test Methods or Services

Revision History

Date	Version	Author	Revision Summary
2/14/2025	1.0	*E. Bickley*	Initial Release
3/3/2025	2.0	*E. Bickley*	Updates for EAC comments
3/5/2025	3.0	*E. Bickley*	Additional EAC comments

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1. INTRODUCTION

This Voting System Test Plan outlines the test approach SLI Compliance will follow when performing testing on the **VotingWorks VxSuite 4.0** voting system, against the Election Assistance Commission's Voluntary Voting System Guidelines version 2.0 (EAC VVSG 2.0). The purpose of this document is to provide a clear understanding of the work SLI Compliance will conduct and a detailed plan outlining the test effort.

When the testing is complete, SLI Compliance will submit a test report that details all test results and findings from the test effort, as well as a recommendation to the EAC.

1.1 References

The following key documents were used in preparing this test plan:

1. Election Assistance Commission Voluntary Voting System Guidelines (EAC VVSG), Version 2.0, February 10, 2021
2. VVSG Version 2.0 Test Assertions Version 1.3
3. NIST Handbook 150: 2020
4. NIST Handbook 150-22: 2021
5. EAC Voting System Testing and Certification Program Manual, United States Election Assistance Commission, v 3.0
6. SLI Compliance VSTL Quality System Manual, Rev. 4.2 July 11, 2024.

1.2 Attachments

The following attachments apply to this Voting System Test Plan:

➢ Attachment A – Supported VVSG 2.0 Functionality

➢ Attachment B – Manufacturer Extensions

➢ Attachment C – VxSuite 4.0 Test Case Matrix– **PROPRIETARY**

➢ Attachment D – VotingWorks EAC Project Plan

➢ Attachment E – Technical Data Package Listing

➢ Attachment F – Accredited Hardware Test Lab Certification (Electrical and Mechanical)

1.3 Terms and Abbreviations

Table 1 defines terms and abbreviations used throughout this document.

Table 1 – Terms and Abbreviations

Term	Abbreviation	Description
American Association for Laboratory Accreditation	A2LA	A nonprofit, non-governmental, public service, membership society whose mission is to provide comprehensive services in laboratory accreditation and laboratory-related training.
Ballot Marking Device	BMD	An accessible computer-based voting system that produces a marked ballot (usually paper) that is the result of voter interaction with visual or audio prompts.
Central Count Scanner	CCS	A mark sense-based ballot and vote counting device typically located at a central count facility and is operated by an automated multi-sheet feeding capability.
Commercial Off the Shelf	**COTS**	Term used to designate computer software, hardware or accessories that are ready-made and available for sale, lease, or license to the general public
Election Assistance Commission	**EAC**	An independent, bipartisan commission created by the Help America Vote Act (HAVA) of 2002 that operates the federal government's voting system certification program.
Election Management System	**EMS**	Typically a database management system used to enter jurisdiction information (district, precincts, languages, etc.) as well as election specific information (races, candidates, voter groups (parties), etc.). In addition, the EMS is also used to lay out the ballots, download the election data to the voting devices, upload the results and produce the final results reports.
Electromagnetic Compatibility	**EMC**	The goal of EMC is to validate the correct functioning of different equipment in the same environment and the avoidance of any interference effects between them.
Institute of Electrical and Electronics Engineers	**IEEE**	A non-profit professional association for the advancement of technology.

Term	Abbreviation	Description
National Institute of Standards and Technology	NIST	A non-regulatory federal agency within the U.S. Dept. of Commerce. Its mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve quality of life.
National Voluntary Laboratory Accreditation Program	NVLAP	A division of NIST that provides third-party accreditation to testing and calibration laboratories.
Precinct Count Scanner	PCS	A precinct-count optical scanner is a mark sense-based ballot and vote counting device located at a precinct and is typically operated by scanning one ballot at a time.
Request For Interpretation	RFI	A means used by testing laboratories and manufacturers to request that the EAC provide an interpretation of a technical issue related to testing of voting systems.
Technical Data Package	TDP	The data package supplied by the vendor, which includes Functional Requirements, Specifications, End-user documentation, Procedures, System Overview, Configuration Management Plan, Quality Assurance Program, and manuals for each of the required hardware, software, firmware components of a voting system.
Voluntary Voting System Guidelines	VVSG	A set of specifications and requirements against which voting systems can be tested to determine if the systems provide all of the basic functionality, accessibility and security capabilities required for EAC certification.
Voting System Test Lab	VSTL	An independent testing organization accredited by NVLAP and the EAC to conduct voting system testing for EAC certification.
Voting System Under Test	VSUT	The designation for a voting system that is currently being tested.
Voting Test Engineer	VTE	An SLI Compliance employee who has been qualified to perform EAC voting system testing.

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1.4 Testing Responsibilities

The following project schedule contains owner assignments and identifies test procedure (module) development, test case (suite) development, third party tests, and EAC and Manufacturer dependency.

1.4.1 Project Schedule

The subsections below describe the project schedule.

1.4.1.1 Owner Assignments

The Test Manager, M. Santos, is responsible for oversight and approvals for this test campaign. Work is conducted by SLI Compliance's trained and authorized Voting Test Engineers.

➢ System analysis and review will be conducted by Source Code Review, Security and Voting Test Engineers, with oversight by the Test Manager.

➢ Source code review will be conducted by Voting Test Engineers (Source Code Review Specialists), with oversight by the Test Manager.

➢ The trusted build will be conducted by Voting Test Engineers trained in the trusted build process.

➢ Documentation review will be conducted by Security and Voting Test Engineers, with oversight by the Test Manager.

➢ Test module development will be conducted by Security and Voting Test Engineers, with oversight by the Test Manager.

➢ Test suite development will be conducted by Security and Voting Test Engineers utilizing SLI Compliance's formal test methods, with oversight by the Test Manager.

➢ Formal test execution will be conducted by Security and Voting Test Engineers, with oversight by the Test Manager.

➢ Third Party testing will be conducted by the subcontracting third party hardware laboratories, with oversight by the Hardware Test Engineer.

1.4.1.2 Test Case (Module) Development

Test modules will be developed to provide detailed, repeatable test steps. The modules are defined at a basic level in SLI Compliance's formal test methods and are designed for use in any suite that employs their functionality. This reusability reduces the development time associated with creating test procedures. The test modules will provide traceability to SLI Compliance's formal test methods as well as the VVSG requirements. This is done by identifying the test method name and listing each requirement addressed in the module.

1.4.1.3 Test Procedure Development and Validation

Test Procedures (Suites) will be developed to help group and focus testing around key areas of the voting system. The test suites will contain multiple test modules providing clear and traceable test scripts and key information. As needed for the system under test, various configurations will be identified within the suites. Variations of the same suite may be run multiple times to verify different configurations.

1.4.1.4 Third Party Hardware Testing

Hardware testing will be conducted by Third Party certified hardware test laboratories to verify the voting system devices are in compliance with the VVSG 2.0 hardware requirements.

SLI Compliance is responsible for all core voting system tests as defined in the EAC Program Manuals. The labs listed below will perform non-core testing for this test campaign.

Table 2 – Hardware Test Labs

Laboratory	Address	Test(s)
Element Materials Technology Denver-Longmont (A2LA certified for Electromagnetic Compatibility/ Interference (EMC/EMI), Lightning, Transient, and Surge tests)	1736 Vista View Drive Longmont, CO 80504	**EMC / EMI Tests:** • Radiated Emissions • Conducted Emissions • ESD • Electromagnetic Susceptibility • Electrical Fast Transient • Lightning Surge • Conducted RF Immunity • Electrical Power Disturbance (Voltage Dips)
Element Materials Technology Denver-Longmont (A2LA certified for mechanical including MIL STD 810)	1601 Dry Creek Drive Longmont, CO 80503	**MIL-STD-810H Tests:** • Bench Handling, Vibration • Low Temperature • High Temperature • Continuous Operation – Varied Envir. Conditions Low / High Temp / Humidity • Reliability

1.4.1.5 EAC & Manufacturer Dependencies

The Test Plan will require EAC approval prior to finalization.

VotingWorks will be required to provide all source code, documentation, equipment and supporting materials identified as part of the voting system.

The source code must have all discrepancies resolved, be successfully built and the outputs installed, and the components must pass operational status checks prior to formal test execution.

In addition, **VotingWorks** is required to provide training on the voting system and support throughout the life of the project.

Please see the "Attachment D - VotingWorks EAC Project Plan" for a listing of activities within the scope of this test campaign.

1.4.1.6 Formal Test Execution

Formal execution of the approved test suites and modules will be conducted to verify the system's compliance with the VVSG 2.0 requirements.

1.5 Target of Evaluation Description

1.5.1 System Overview

The **VotingWorks VxSuite 4.0** voting system is a paper-based voting system comprised of both precinct and central count tabulators along with a Ballot Marking Device (BMD).

The **VxSuite 4.0** voting system is a paper-based, digital scan voting system that consists of the following major components: **VxAdmin**, **VxCentralScan**, **VxScan**, and **VxMark**.

VxAdmin is an offline central election manager laptop used for equipment configuration, result consolidation, adjudication, and report creation.

VxScan is a voter-facing scanner. Specifically, it simultaneously scans the front and back of a paper ballot for conversion of voter selection marks to electronic Cast Vote Records (CVR). Once the CVRs are stored, they can be transferred into VxAdmin software for vote adjudication, tabulation and reporting of election results.

VxCentralScan is a batch-fed scanner that simultaneously scans the front and back of a paper ballot for conversion of voter selection marks to electronic Cast Vote Records (CVR). Once the CVRs are stored, they can be transferred, via USB flash drive, into VxAdmin software for vote tabulation, adjudication, and reporting of election results. VxCentralScan has the ability to adjudicate overvotes and undervotes.

VxMark is an accessible ballot marking device and attached printer that produces a voter-verifiable paper ballot. Voters can mark their ballots using the touchscreen interface or via accessible controls. Printed summary ballots are then shown for review and stored into the ballot box at the back of the device or can be scanned by VotingWorks VxScan or VxCentralScan for tabulation.

1.5.2 Block Diagram

Figure 1 – VxSuite 4.0 System Diagram
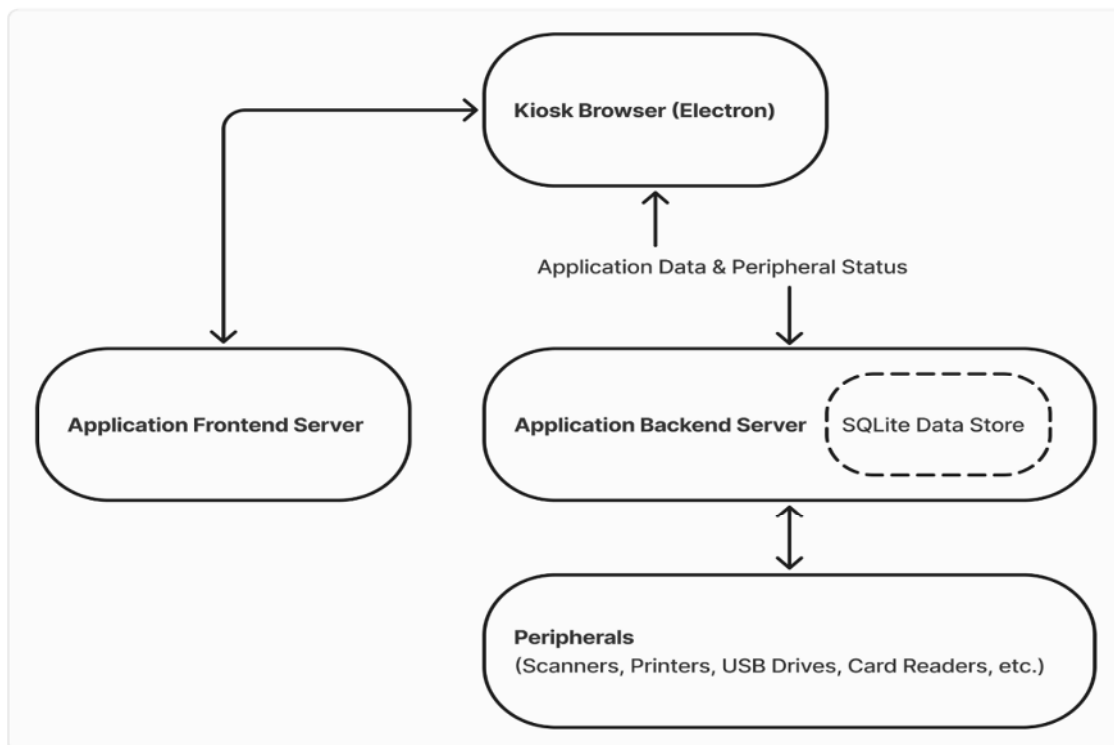
1.5.3 Supported Languages

VxSuite 4.0 supports the following 4 languages: English, Spanish, Chinese (Simplified), and Chinese (Traditional).

1.5.4 VxSuite 4.0 System Limits

Item	Upper Limit
Precincts in an Election	1,000
Candidates in an Election	1,000
Contests in an Election	1,000
Ballot Styles in an Election	1,000
Candidates in a Contest	100
Vote for in a Contest	50
Characters	100
Available disk space for CVRs that can be imported (VxAdmin)	~200GB
Available disk space for number of ballots scanned (VxCentralScan)	~200GB
Maximum Tabulation Rate (VxCentralScan) per minute	Ricoh fi-8170: 80 sheets per minute Ricoh fi-7600: 100 sheets per minute
Maximum Tabulation Rate (VxCentralScan) per batch	Ricoh fi-8170: 30 sheets per batch Ricoh fi-7600: 100 sheets per batch
Maximum Tabulation Rate (VxCentralScan) per day	Ricoh fi-8170: 10,000 sheets/day Ricoh fi-7600: 44,000 sheets/day
Ballot Sizes – Hand Marked Ballots	8.5"x11" 8.5"x14" 8.5"X17" 8.5"x22"
Ballot Size - Marking Device Ballots (VxMark)	8"x13.25" – Thermoscript TF1467
Ballot printing Limit (VxMark)	50 contest selections without reducing text-size 100 contest selections with text-size reduction.
Ballot Box Limit (VxMark)	ballot box supports up to 200 ballots before needing to be cleared
Ballot Box Limit (VxScan)	ballot box supports up to 3000 ballots

1.5.5 Supported Functionality

The following standard VVSG functionality and manufacturer extensions are included in the voting system.

1.5.5.1 Standard VVSG Functionality

Please see "Attachment A – Supported VVSG 2.0 Functionality" for a listing of VxSuite 4.0 supported VVSG 2.0 functionality.

1.5.5.2 Manufacturer Extensions

Please see "Attachment B – Manufacturer Extensions" for a listing of VxSuite 4.0 manufacturer extensions.

2. PRE-CERTIFICATION TESTING AND ISSUES

For this initial certification testing of VxSuite 4.0 to VVSG 2.0, no previous testing is being leveraged. All pertinent VVSG 2.0 requirements will be applied to relevant portions of VxSuite 4.0 during this test campaign.

2.1 Evaluation of prior VSTL Testing

For this initial certification testing of VxSuite 4.0 to VVSG 2.0, no previous VSTL testing is being evaluated.

2.2 Evaluation of Prior Non-VSTL Testing

For this initial certification testing of VxSuite 4.0, the system has not been fielded anywhere, nor been evaluated, no previous Non-VSTL testing is being evaluated.

3. MATERIALS REQUIRED FOR TESTING

Any materials used in an election cycle must be provided to SLI Compliance to facilitate testing of the voting system. This section outlines such materials.

3.1 Software/Firmware

All software and firmware used by the voting system, whether directly or indirectly, in a production environment must be validated during the testing process.

The following software/firmware is required for the execution of hardware, software, telecommunications, and security tests. This includes all supporting software such as operating systems, compilers, assemblers, application software, firmware, and any applications used for burning of media, transmission of data or creation/management of databases.

3.1.1 VxSuite 4.0 Software/Firmware

The table below lists the VxSuite 4.0 system Software/Firmware.

Table 3 –VxSuite 4.0 Software/Firmware

Component	Component Type	Software
VxAdmin (Pre-Election definition loaded and equipment configuration and media creation) (Post-election result consolidation, adjudication, and report creation)	Workstation Software	4.0.1
VxMark (BMD)	Polling Place Device	4.0.1
VxScan (Scan and tabulate)	Polling Place Device	4.0.1
VxCentralScan (Scan and tabulate)	Workstation Software	4.0.1

3.1.2 COTS Software/Firmware

Due to the software being Opensource, a specific manufacturer may not be available. In this instance the group or entity responsible for maintaining version control is listed.

Table 4 – VotingWorks VxSuite COTS Software/Firmware

Manufacturer/ Managing entity	Workstations (All) Application/Package	Version
Rust	rust-1.81.0-x86_64-unknown-linux-gnu.tar.gz	1.81.0
Nodejs	node-v20.16.0-linux-x64.tar.gz	20.16.0
Debian	alsa-utils_1.2.8-1_amd64.deb	1.2.8-1
Debian	brightnessctl_0.5.1-3_amd64.deb	0.5.1-3
Debian	build-essential_12.9_amd64.deb	12.9
Debian	chromium_130.0.6723.69-1~deb12u1_amd64.deb	130.0.6723.69-1~deb12u1
Debian	cloud-guest-utils_0.33-1_all.deb	0.33-1
Debian	cryptsetup_2%3a2.6.1-4~deb12u2_amd64.deb	2:2.6.1-4~deb12u2
Debian	cups_2.4.2-3+deb12u8_amd64.deb	2.4.2-3+deb12u8
Debian	cups-bsd_2.4.2-3+deb12u8_amd64.deb	2.4.2-3+deb12u8
Debian	cups-client_2.4.2-3+deb12u8_amd64.deb	2.4.2-3+deb12u8

Workstations (All)		
Manufacturer/ Managing entity	**Application/Package**	**Version**
Debian	curl_7.88.1-10+deb12u7_amd64.deb	7.88.1-10+deb12u7
Debian	default-jdk_2%3a1.17-74_amd64.deb	2:1.17-74
Debian	dosfstools_4.2-1_amd64.deb	4.2-1
Debian	efitools_1.9.2-3_amd64.deb	1.9.2-3
Debian	exfatprogs_1.2.0-1+deb12u1_amd64.deb	1.2.0-1+deb12u1
Debian	fdisk_2.38.1-5+deb12u1_amd64.deb	2.38.1-5+deb12u1
Debian	firewalld_1.3.3-1~deb12u1_all.deb	1.3.3-1~deb12u1
Debian	firmware-linux-free_20200122-1_all.deb	20200122-1
Debian	firmware-misc-nonfree_20230210-5_all.deb	20230210-5
Debian	firmware-sof-signed_2.2.4-1_all.deb	2.2.4-1
Debian	fonts-wqy-zenhei_0.9.45-8_all.deb	0.9.45-8
Debian	git_1%3a2.39.5-0+deb12u1_amd64.deb	1:2.39.5-0+deb12u1
Debian	gvfs_1.50.3-1_amd64.deb	1.50.3-1
Debian	gzip_1.12-1_amd64.deb	1.12-1
Debian	hplip_3.22.10+dfsg0-2_amd64.deb	3.22.10+dfsg0-2
Debian	ipp-usb_0.9.23-1+b4_amd64.deb	0.9.23-1+b4
Debian	iptables_1.8.9-2_amd64.deb	1.8.9-2
Debian	jq_1.6-2.1_amd64.deb	1.6-2.1
Debian	kde-cli-tools_4%3a5.27.5.1-2_amd64.deb	4:5.27.5.1-2
Debian	libatspi2.0-0_2.46.0-5_amd64.deb	2.46.0-5
Debian	libcairo2-dev_1.16.0-7_amd64.deb	1.16.0-7
Debian	libgif-dev_5.2.1-2.5_amd64.deb	5.2.1-2.5
Debian	libglib2.0-bin_2.74.6-2+deb12u3_amd64.deb	2.74.6-2+deb12u3

Workstations (All)		
Manufacturer/ Managing entity	Application/Package	Version
Debian	libgtk-3-0_3.24.38-2~deb12u2_amd64.deb	3.24.38-2~deb12u2
Debian	libjpeg-dev_1%3a2.1.5-2_amd64.deb	1:2.1.5-2
Debian	libnotify4_0.8.1-1_amd64.deb	0.8.1-1
Debian	libpango1.0-dev_1.50.12+ds-1_amd64.deb	1.50.12+ds-1
Debian	libpcsclite1_1.9.9-2_amd64.deb	1.9.9-2
Debian	libpcsclite-dev_1.9.9-2_amd64.deb	1.9.9-2
Debian	libpixman-1-dev_0.42.2-1_amd64.deb	0.42.2-1
Debian	libpng-dev_1.6.39-2_amd64.deb	1.6.39-2
Debian	libsane_1.2.1-2_amd64.deb	1.2.1-2
Debian	libsane1_1.2.1-2_amd64.deb	1.2.1-2
Debian	libsane-common_1.2.1-2_all.deb	1.2.1-2
Debian	libsane-hpaio_3.22.10+dfsg0-2_amd64.deb	3.22.10+dfsg0-2
Debian	libudev-dev_252.30-1~deb12u2_amd64.deb	252.30-1~deb12u2
Debian	libusb-1.0-0-dev_2%3a1.0.26-1_amd64.deb	2:1.0.26-1
Debian	libx11-dev_2%3a1.8.4-2+deb12u2_amd64.deb	2:1.8.4-2+deb12u2
Debian	libxss1_1%3a1.2.3-1_amd64.deb	1:1.2.3-1
Debian	libxtst6_2%3a1.2.3-1.1_amd64.deb	2:1.2.3-1.1
Debian	libzbar-dev_0.23.92-7+deb12u1_amd64.deb	0.23.92-7+deb12u1
Debian	make_4.3-4.1_amd64.deb	4.3-4.1
Debian	mingetty_1.08-4_amd64.deb	1.08-4
Debian	openbox_3.6.1-10_amd64.deb	3.6.1-10
Debian	parted_3.5-3_amd64.deb	3.5-3
Debian	pcscd_1.9.9-2_amd64.deb	1.9.9-2

Workstations (All)		
Manufacturer/ Managing entity	Application/Package	Version
Debian	pcsc-tools_1.6.2-1_amd64.deb	1.6.2-1
Debian	pulseaudio_16.1+dfsg1-2+b1_amd64.deb	16.1+dfsg1-2+b1
Debian	pulseaudio-utils_16.1+dfsg1-2+b1_amd64.deb	16.1+dfsg1-2+b1
Debian	rsync_3.2.7-1_amd64.deb	3.2.7-1
Debian	rsyslog_8.2302.0-1_amd64.deb	8.2302.0-1
Debian	ruby_1%3a3.1_amd64.deb	1:3.1
Debian	ruby-dev_1%3a3.1_amd64.deb	1:3.1
Debian	sane-airscan_0.99.27-1+b1_amd64.deb	0.99.27-1+b1
Debian	sane-utils_1.2.1-2_amd64.deb	1.2.1-2
Debian	sbsigntool_0.9.4-3.1_amd64.deb	0.9.4-3.1
Debian	swig_4.1.0-0.2_all.deb	4.1.0-0.2
Debian	systemd-boot-efi_252.30-1~deb12u2_amd64.deb	252.30-1~deb12u2
Debian	tar_1.34+dfsg-1.2+deb12u1_amd64.deb	1.34+dfsg-1.2+deb12u1
Debian	trash-cli_0.17.1.14-5_all.deb	0.17.1.14-5
Debian	unclutter_8-25_amd64.deb	8-25
Debian	unzip_6.0-28_amd64.deb	6.0-28
Debian	wget_1.21.3-1+b2_amd64.deb	1.21.3-1+b2
Debian	x11-common_1%3a7.7+23_all.deb	1:7.7+23
Debian	xdg-utils_1.1.3-4.1_all.deb	1.1.3-4.1
Debian	xinit_1.4.0-1_amd64.deb	1.4.0-1
Debian	xinput_1.6.3-1_amd64.deb	1.6.3-1

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Workstations (All)		
Manufacturer/ Managing entity	Application/Package	Version
Debian	xorg_1%3a7.7+23_amd64.deb	1:7.7+23
Debian	xserver-xorg-core_2%3a21.1.7-3+deb12u8_amd64.deb	2:21.1.7-3+deb12u8
Debian	xserver-xorg-input-all_1%3a7.7+23_amd64.deb	1:7.7+23
Debian	xserver-xorg-input-libinput_1.2.1-1+b1_amd64.deb	1.2.1-1+b1
Debian	xserver-xorg-input-wacom_1.1.0-1_amd64.deb	1.1.0-1
Debian	xserver-xorg-video-all_1%3a7.7+23_amd64.deb	1:7.7+23
Debian	zip_3.0-13_amd64.deb	3.0-13
Debian	autoconf_2.71-3_all.deb	2.71-3
Debian	autoconf-archive_20220903-3_all.deb	20220903-3
Debian	automake_1%3a1.16.5-1.3_all.deb	1:1.16.5-1.3
Debian	autotools-dev_20220109.1_all.deb	20220109.1
Debian	libcurl4-openssl-dev_7.88.1-10+deb12u7_amd64.deb	7.88.1-10+deb12u7
Debian	libjson-c-dev_0.16-2_amd64.deb	0.16-2
Debian	libltdl-dev_2.4.7-7~deb12u1_amd64.deb	2.4.7-7~deb12u1
Debian	libqrencode4_4.1.1-1_amd64.deb	4.1.1-1
Debian	libqrencode-dev_4.1.1-1_amd64.deb	4.1.1-1
Debian	libssl-dev_3.0.14-1~deb12u2_amd64.deb	3.0.14-1~deb12u2
Debian	libtool_2.4.7-7~deb12u1_all.deb	2.4.7-7~deb12u1
Debian	libtss2-esys-3.0.2-0_3.2.1-3_amd64.deb	3.2.1-3
Debian	libtss2-fapi1_3.2.1-3_amd64.deb	3.2.1-3
Debian	libtss2-mu0_3.2.1-3_amd64.deb	3.2.1-3
Debian	libtss2-rc0_3.2.1-3_amd64.deb	3.2.1-3
Debian	libtss2-sys1_3.2.1-3_amd64.deb	3.2.1-3

Workstations (All)		
Manufacturer/ Managing entity	Application/Package	Version
Debian	libtss2-tcti-cmd0_3.2.1-3_amd64.deb	3.2.1-3
Debian	libtss2-tcti-device0_3.2.1-3_amd64.deb	3.2.1-3
Debian	libtss2-tctildr0_3.2.1-3_amd64.deb	3.2.1-3
Debian	libtss2-tcti-mssim0_3.2.1-3_amd64.deb	3.2.1-3
Debian	libtss2-tcti-swtpm0_3.2.1-3_amd64.deb	3.2.1-3
Debian	m4_1.4.19-3_amd64.deb	1.4.19-3
Debian	qrencode_4.1.1-1_amd64.deb	4.1.1-1
Debian	tpm2-openssl_1.1.1-1_amd64.deb	1.1.1-1
Debian	tpm2-tools_5.4-1_amd64.deb	5.4-1

3.1.3 Additional Supporting Test Software

This section outlines all test specific software that will be used in the test campaign.

Table 5 – Additional Supporting Test Software

Manufacturer	Application	Version
Tenable	Nessus Professional	10.7.1
Wireshark Foundation	Wireshark	4.2.5
Mh-nexus	HxD	2.5.0.0
Kali	Kali Linux	2024.1
GCHQ	CyberChef	10.18.6
WebAIM.org	Contrast Checker	N/A

3.2 VotingWorks VxSuite Equipment

The following equipment is required for the execution of the hardware, software, telecommunications, and security tests. This includes system hardware, general purpose data processing and communications equipment, and any test instrumentation required.

3.2.1 VotingWorks VxSuite Custom Equipment

The following **VxSuite 4.0** custom equipment will be used in testing:

Table 6 – VotingWorks VxSuite Custom Equipment

Manufacturer	Hardware	Model	Version
VotingWorks	Precinct Scanner	VxScan	4.0.0
VotingWorks	Precinct Scanner Ballot Box	VxScan	4.0.0
VotingWorks	BMD (Limited Dexterity Mark, Verify, and Cast) device	VxMark	4.0.0
VotingWorks	BMD Case	VxMark	4.0.0

3.2.2 COTS Equipment

The following Commercial Off-the-Shelf equipment will be used in testing:

Table 7 – VotingWorks VxSuite COTS Equipment

Component	Component Type	Associated COTS Hardware

VxAdmin	Workstation Software	• Runs on the following COTS workstations:
		   ○ HP Elitebook 840 G11
		• 4-port Ultra Slim USB 3.0 Data Hub
		• Logitech B100 Mouse
		• HP Laser Pro 4001dn
		• NXP JCOP 4 Java Card 3.0.5 Classic
		• Uninterruptible Power Supply for backup power:
		   ○ Anker Solix UPS model: C300

VxScan	Ballot box UPS	• Precinct Scanner Ballot Box - Purpose made, plastic, collapsible ballot box for use with VxScan • Uninterruptible Power Supply for backup power: Anker Solix C300X Portable Power Station
VxCentralScan	Scanners UPS	• Runs on the following COTS workstations: ○ HP Elitebook 840 G11 • 4-port Ultra Slim USB 3.0 Data Hub • Logitech B100 Mouse

Component	Component Type	Associated COTS Hardware
		• RICOH fi-7600 w/AC Adapter • RICOH fi-760PRB w/Power Connector • RICOH fi-8170 w/AC Adapter • RICOH fi-819PRB w/Power Connector • Tripp Lite 4-Port Ultra-Slim USB Hub U360-004- S • Uninterruptible Power Supply for backup power: Anker Solix C300X Portable Power Station
VxMark	UPS	• Smartmatic Ballot marking Device VSAP-150 • LORELEI Headphones • Origin Instruments Air Voter (Sip and Puff) • HID Smart Card Reader • Williams audio Visual T-Coil Neckloop NKL-001 • Uninterruptible Power Supply for backup power: o APC Backup-UPS 1500 - BN1500M2

3.2.3 Supporting Hardware Test Equipment

The following hardware support equipment will be used in testing:

Table 8 – Additional Supporting Hardware Test Equipment

Hardware
Lock-pick tool set
Assorted screwdrivers
Stopwatch
Temperature/Humidity gauge
Decibel Sound reader

3.3 Test Materials

The following test materials are required for the performance of testing including, as applicable, test ballot layout and generation materials, test ballot sheets, test ballot cards and control cards, standard and optional output data report formats, and any other materials used in testing.

➢ Ballot stock (all supported sizes)

➢ Thermal paper

➢ Access cards (Election Manager, PollWorker, System Administrator)

➢ Security Seals Red

➢ HP Paper Ballot Stock

➢ SanDisk 64G USB

➢ Fujitsu ScanAid Cleaning Kit

4. TEST SPECIFICATIONS

The following are the specifications for testing to be conducted on the **VotingWorks VxSuite 4.0**. The specifications contain details on the focus of testing, configuration(s), and the functions to be tested. Additional information is provided in the associated appendices.

4.1 Requirements

The **VotingWorks VxSuite 4.0** will be tested to the approved EAC VVSG 2.0 requirements and test assertions, as well as all published RFIs. All EAC VVSG 2.0 requirements and associated test assignments can be found in "Attachment C – VxSuite 4.0 Test Case Matrix".

All requirements within VVSG 2.0 are verified against the **VotingWorks VxSuite 4.0** voting system unless noted otherwise below.

4.1.1 Mapping of requirements to equipment type and features

All EAC VVSG 2.0 requirements and associated test assignments can be found in "Attachment C –VxSuite 4.0 Test Case Matrix".

4.1.2 Requirements that are not applicable for this campaign

VxSuite 4.0 does not implement the following VVSG 2.0 functionality:

- Straight-party Voting, Casting and Tabulation (1.1.4-K, 1.1.8-E, 7.2-C.4)

- Cumulative Voting, Casting (1.1.4-L, 1.1.8-I)

- Ranked Choice Voting Contest, Casting, Tabulation, and Report Results (1.1.4-M, 1.1.8-J, 1.1.9-I, 7.2-C.5)

- Party Preference Contest (1.1.4-N, 1.1.8-B.3)

- Top-2 primary contest (blanket primary contest) (1.1.4-O)

- Presidential delegate contest, Casting and Tabulation (1.1.4-P, 1.1.8-L)

- Proportional voting contest (equal-and-even cumulative voting contest), Casting and Tabulation (1.1.4-Q, 1.1.8-N)

- Group voting contest, Casting and Tabulation (1.1.4-R, 1.1.8-K, 7.2-C.4)

- Top-2 IRV contest (supplementary or contingent vote contest) (1.1.4-S)

- Cross-party endorsement with straight-party voting (1.1.8-F)

- Recall contest pair (1.1.8-M)
- Voter speech (7.2-F)
- Cryptographic E2E verifiable (9.1.6-A-K, 6.2-A.1, 10.2.1-B-F, 10.2.4-A)
- E2E cryptographic protocols (13.3-B)

4.2 VotingWorks VxSuite Hardware Configuration and Design

The **VotingWorks VxSuite 4.0**, as declared in the application for certification submitted to the EAC, consists of the following:

- **VxAdmin** acts as the election setup hub at the beginning of an election and the results aggregation and reporting hub at the end of an election (and also at the end of testing).
- At the polling place level, **VxScan** precinct scanner and **VxMark** ballot marking device are employed.
- **VxCentralScan** is the system's batch scanner which enables election managers to efficiently scan large batches of ballots.

4.3 Software System Functions

The **VotingWorks VxSuite 4.0** system operations documentation has been reviewed in conjunction with the Implementation Statement provided by the manufacturer. Based on VVSG 2.0 requirements, the applicable system functions have been identified for testing. The following key areas of voting system functionality will be evaluated during test case design.

4.3.1 Election Definition Loading – VxSuite (VxAdmin)

The Election Definition focus will target loading of an election definition. All aspects of processing ballots with regional districts, jurisdictional parameters, grouping and displaying of associated election data will be analyzed and tested. In addition, the ability to support baseline election types, pertinent voting variations and supported languages will be verified.

4.3.2 Election Media Creation – VxSuite (VxAdmin)

This area focuses on the creation and handling of media for the purposes of installing election data onto voting devices, as well as the creation of physical ballot layouts and creation of all media used to hold/transfer election data.

4.3.3 Pre-voting Aspects – VxSuite (VxScan, VxCentralScan, and VxMark)

Pre-voting aspects include pre-election preparatory, diagnostic, and election verification functions of a voting system. The focus will include device preparation, all required pre-voting tasks, and verification of manufacturer recommended pre-voting tasks.

4.3.4   Voting Aspects – Polling Place – VxSuite (VxScan and VxMark)

Polling place aspects include all required and additional supported voting functions, including HAVA compliant requirements. This area will focus on all aspects of election functions and capabilities at the polling place, from opening of the polls through closing the polls and generating applicable reports.

4.3.5   Voting Aspects – Central Count – VxSuite (VxCentralScan)

The focus of the central count functions is primarily the usage of a COTS high speed scanner to scan large quantities of absentee ballots and passing each image to **VxCentralScan** for interpretation of the voter's markings on the ballot.

4.3.6   Post Voting – VxSuite (VxAdmin)

This area will focus on all required election post-voting functions. This includes any additional supported election functions performed after closing the polls, device auditing and reporting aspects of the voting system.

4.3.7   Error Messaging and Recovery – VxSuite (All Components)

This area will focus on the system's ability to generate appropriate error messaging within each system component and the system's ability to recover from error conditions in order to proceed with all election functions.

4.3.8   Auditing – VxSuite (All Components)

This area will focus on device and system level auditing capabilities and will verify at a minimum the required audit functionally. This includes audit trail capability throughout the lifecycle of the voting system and audit log content requirements.

4.3.9   Security – VxSuite (All Components)

Overall system and device level logical and physical security aspects will be tested. Physical security will focus on the areas of integrity (ballot box doors, locks and seals) and detection (compromised ballot box doors, locks or seals). Logical security will focus on the areas of access controls, accountability, confidentiality, and integrity. These logical security areas will be applied to the OS, database, network (including verification that the voting system is not capable of establishing wireless connections) and application entities used by the EMS, BMDs and scanners employed within the voting system under test.

4.4   Test Case (Suite) Design

This section will detail the test suites to be utilized to verify **VxSuite 4.0** to VVSG 2.0. Mapping of requirements to test cases/suites can be found in "Attachment C - VxSuite 4.0 Test Case Matrix".

Test cases define inputs, steps taken and expected results. Accept/reject criteria are based on requirements of the VVSG 2.0 and the system specification documents provided in the TDP.

4.4.1 Software and Hardware Qualitative Examination Design

SLI Compliance will review any reports submitted by the manufacturer of previous testing conducted on the equipment contained in the **VotingWorks VxSuite 4.0** voting system. The results will be compared against the hardware related guidelines of the EAC VVSG 2.0 to identify any additional testing required. In addition, SLI Compliance will create the following test suites to focus on accessibility and usability of the voting system:

➢ **Accessibility** test suite **–** Accessibility requirements for a voting system generally include both objectively measurable and other observable requirements. In combination, the two types of requirements verify that the voting system components are accessible to as many voters as possible, including those who have a category of challenge that creates a need for assistance of some type. The voting systems should be self-contained such that the individual voter is able to cast their vote without assistance from another party. Accessibility calls for the voting system to take into account vision, varying degrees of vision, dexterity, mobility, aural issues, and speech and language proficiency.

➢ **Usability** test suite **–** Usability is defined as a measure of the effectiveness, efficiency, and satisfaction achieved by a specified set of users with a given product in the performance of specified tasks. In the context of voting, the primary user is the voter, the product is the voting system, and the task is the correct recording of the voter's ballot selections. Testing is conducted to ensure voters are able to negotiate the process effectively, efficiently, and comfortably.

4.4.2 Hardware Test Case Design

Hardware environmental testing is performed to verify conformance to the EAC VVSG v2.0. Testing will be accomplished through a combination of testing performed by SLI Compliance and testing performed by qualified subcontractor labs. Please see "Section 1.4.1.4 – Third Party Hardware Testing".

Hardware test suite - Third party testing, with SLI Compliance oversight, will be conducted on the following:

Hardware Test (Requirement)	Applicable Component		
	VxScan	**VxCentralScan**	**VxMark**
Radiated Emissions, 30 MHz - 1 GHz & 1 GHz – 15 GHz. FCC Part 15. Class B.	Yes	No	Yes
Conducted Emissions, 150 kHz - 30 MHz FCC Part 15. Class B. 120 VAC / 60 Hz	Yes	No	Yes
Electrostatic Discharge (2.7-K)	Yes	No	Yes
Radiated RF Immunity (Electromagnetic Susceptibility) (2.7-G)	Yes	No	Yes

Electrical Fast Transient /Burst (2.7-I)	Yes	No	Yes
Surge Immunity (Lightning Surge) (2.7-I)	Yes	No	Yes
Conducted RF Immunity (2.7-J)	Yes	No	Yes
Voltage Dips and Interruptions (2.7-I)	Yes	No	Yes
Vibration (2.7-E)	Yes	No	Yes
Bench Handling (2.7-D)	Yes	No	Yes
Continuous Operation – Varied Environmental Conditions (2.7-C)	Yes	Yes	Yes
High Temperature (2.7-F)	Yes	No	Yes
Low Temperature (2.7-F)	Yes	No	Yes

Additional testing, performed by SLI, includes maintainability testing, hearing devices and assessment of reliability.

4.4.3 Software Module Test Case Design and Data

Source Code Review test suite – Incorporating the manufacturer's software specifications as well as all pertinent VVSG 2.0 source code review requirements, SLI Compliance will validate that all software/firmware components of the system adhere to expected flow control parameters and specifications for data input and output.

4.4.4 Software Functional Test Case Design and Data

SLI Compliance will prepare functional test modules using the operator/user procedures contained within the **VxSuite 4.0** TDP. Functionality of the voting system is exercised to verify that each functional component performs as expected.

4.4.4.1 Component-level Test Suite Design

Component-level test suites exercise the specific functions of each component of a voting system. Testing will focus on the functionality of each component within the **VxSuite 4.0** voting system.

Each of the following components will be subject to focused testing in the identified test suites to verify that the functionality presented in the component meets all applicable VVSG 2.0 requirements, as presented in "Attachment C –VxSuite 4.0 Test Case Matrix."

> **VxSuite VxAdmin** (Manage, Users, Settings) test suite – The **VxSuite VxAdmin** component will be given focused testing in order to verify that the Functionality presented in the component, meets all applicable VVSG 2.0 requirements, as presented in "Attachment C –VxSuite 4.0 Test Case Matrix".

VxSuite VxAdmin (Pre-Election) test suite – The **VxSuite VxAdmin** component will be given focused testing in order to verify that the Functionality presented in the component, meets all applicable VVSG 2.0 requirements, as presented in "Attachment C – VxSuite 4.0 Test Case Matrix".

VxSuite VxMark (BMD) test suite – The **VxSuite VxMark** component will be given focused testing in order to verify that the Functionality presented in the component, meets all applicable VVSG 2.0 requirements, as presented in "Attachment C – VxSuite 4.0 Test Case Matrix".

VxSuite VxScan (Precinct Scanner) test suite – The **VxSuite VxScan** component will be given focused testing in order to verify that the Functionality presented in the component, meets all applicable VVSG 2.0 requirements, as presented in "Attachment C – VxSuite 4.0 Test Case Matrix".

VxSuite VxCentralScan (Central Scanning) test suite – The **VxSuite VxCentralScan** component will be given focused testing in order to verify that the Functionality presented in the component, meets all applicable VVSG 2.0 requirements, as presented in "Attachment C – VxSuite 4.0 Test Case Matrix".

VxSuite VxAdmin (Post Election) test suite – The **VxSuite VxAdmin** component will be given focused testing in order to verify that the Functionality presented in the component, meets all applicable VVSG 2.0 requirements, as presented in "Attachment C – VxSuite 4.0 Test Case Matrix".

4.4.4.2 VVSG 2.0 Verification Test Suite Design

The test suites in this section address specific areas of VVSG requirements.

Ballots test suite – Examines both paper ballots and electronically displayed ballots. Paper ballot test cases review ballots for their use of contrast, color, text size, font, use of plain language, use of supported languages, ability to prevent split contests, and ability to support multipage ballots.

Electronic ballot testing establishes the ease of use by the common voter, including examination against screen requirements such as digital contrast, use of color, text size and scaling ability, font readability, use of plain language, and use of supported languages. In addition, some aspects of device functionality applicable to electronic ballots include the ability to prevent split contests, scroll, and establish a touch area for navigation and selection. See "Attachment C – VxSuite 4.0 Test Case Matrix."

Interoperability test suite – Deals with the concept of interoperability, as defined by VVSG 2.0. Interoperability has two main areas of focus: common data formats, and common hardware interfaces/COTS products.

Common data formats deals with the ability of VVSG 2.0 certified voting systems to transfer data to different voting systems. To do this, VVSG 2.0 looks to ensure that devices are capable of importing and exporting data in common data formats, requires manufacturers to provide complete specification of how the format is implemented, and requires that encoded data uses publicly available, no-cost methods.

Common hardware interfaces/COTS products looks to extend that interchangeability aspect by enforcing the use of common methods (for example, a USB) for all hardware interfaces. Additionally, it looks at verifying that COTS devices continue to meet all relevant VVSG 2.0 requirements. See "Attachment C – VxSuite 4.0 Test Case Matrix."

Software Setup and Validation test suite – Verifies that the voting system has the capability and written instructions for proper setup and verification of the components of the system, in preparation for an election.

All aspects of each system component should be verified to be in proper working order, from having the correct/expected software installed, to proper boot up and verification of all included components.

Any potential issues that may arise during installation, including files that do not meet the installation criteria, should also be addressed, such that the jurisdiction will understand what is occurring and how it should be handled. See "Attachment C – VxSuite 4.0 Test Case Matrix."

System Identification and Installation test suite – Focuses on verification of the installation process for each component of the voting system, as well as obtaining and verifying the post-install signatures. See "Attachment C – VxSuite 4.0 Test Case Matrix."

Supply Chain Risk Management test suite – Covers the requirement that a voting system's documentation contains a supply chain risk management strategy, a list of critical components defined by criticality analysis, and hardware and software information for the critical components. See "Attachment C – VxSuite 4.0 Test Case Matrix."

Pre-election Voting Devices test suite – Examines the basic aspects of loading the election definition and verifying that everything is properly loaded, running test ballots, and verifying that test ballots are cleared prior to opening of polls. Any calibrations that may be required for a device are examined as well. Equipment readiness and ability to report is also included. See "Attachment C – VxSuite 4.0 Test Case Matrix."

4.4.5 System-level Test Suite Design

Testing of the system involves exercising the specific functions of each component of a voting system as well as the entire voting system. Testing will focus on the functionality of the election management system, polling place devices, and devices required for communications and data loading and will then focus on functionality of the integrated voting system.

System level test suites will include the following:

Election Validations: Election test suites are created to replicate each type of election that can be implemented by the jurisdiction. Within the election types, pertinent voting variations that are applicable to that type of election will be validated and verified. Each suite will have a particular focus in order to test the voting system's implementation of a given requirement or set of requirements. Each test suite below is explained in terms of how it differs from a general high-level test, such as the one used in the Test Readiness Review.

GenVariation1 test suite**:** Election has a focus on validating N of M voting, partisan offices, non-partisan offices, voting, ballot rotations, ballot formatting, precincts and districts, languages, and tally and reporting functionality.

GenVariation2 test suite**:** Election has a focus on validating, write-ins, languages, HAVA concerns as well as considerations such as pre-vote capabilities.

OpenPrimary test suite**:** This suite creates an election definition to conform to an Open Primary election with a focus on validating Primary election voting variations .

ClosedPrimary test suite**:** This suite creates an election definition to conform to a Closed Primary election with a focus on validating Primary election voting variations.

Error Message/Recovery test suite**:** The test suite will focus on error messaging and recovery in key areas of the system identified from researching previous testing and voting system documentation to help identify potential failure points. Voting systems can be subject to various conditions, and when the system exceeds limitations, errors are typically found. Testing of error messaging will focus on the appropriate error messages being generated in response to a specific error and content of the message as well as error recovery. See "Attachment C – VxSuite 4.0 Test Case Matrix."

System Audit test suite**:** Election audit trails provide the supporting documentation for verifying the accuracy of reported election results. They present a concrete, indestructible archival record of all system activity related to the vote tally, and are essential for public confidence in the accuracy of the tally, for recounts, and for evidence in the event of criminal or civil litigation. This testing focuses on validating the audit capability throughout the entire voting system, including availability, generation, integrity, and accuracy of the system's audit content capability to ensure it meets the applicable requirements of VVSG 2.0. See "Attachment C – VxSuite 4.0 Test Case Matrix."

Accuracy test suite**:** This testing focuses on the ability of the system to capture, record, store, consolidate and report the specific selections and absence of selections made by the voter for each ballot position without error. Required accuracy is defined in terms of an error rate that for testing purposes represents the maximum number of errors allowed while processing a specified volume of data.

Accuracy testing is conducted at both the device level and the system level.

At the system level, all test suites will be exercised and reviewed to validate that the accumulation, tallying and reporting mechanisms at the system level are able to accurately perform their functions. Accuracy for the system must have zero errors for 10 million ballot marking positions exercised during the course of the test campaign.

At the device level, each device is subjected to scrutiny to verify that the requirements for accuracy are met.

For the device level accuracy test, each tabulator will be used to scan a minimum of 1.55 million ballot position marks.

See "Attachment C – VxSuite 4.0 Test Case Matrix."

Volume test suite**:** Tests a system's response when subjected to large volumes of data, "more than the expected", as called out in the standards. Volume testing is typically considered a type of non-functional testing. However, as a voting system's primary function is to accumulate, tally, and pass a volume of data (votes), the VSTL approaches volume testing as a functional test. Experience has shown that large amounts of data can slow a system, or even cause failures and loss of data due to architectural limitations. Utilizing the VSTL's experience with voting systems, the testing will focus on not only passing large amounts of data but how the system operates and handles the data in key areas of functionality within the voting system. See "Attachment C – VxSuite 4.0 Test Case Matrix."

Stress test suite**:** Tests a system's "response to transient overload conditions." Experience has shown that when passing a dataset through a system that eclipses the system architectural limitations, failures can occur and result in the loss of critical data. Utilizing the VSTL's experience with voting systems, the testing will focus on the system's ability to operate after the limitations have been exceeded and if failures occur, how the data is maintained or recovered in key areas of functionality within the voting system. See "Attachment C – VxSuite 4.0 Test Case Matrix."

4.5 Security Functions

4.5.1 Security Test

The Security Test Suites are SLI Compliance's tests for verifying that a voting system will correspond to security requirements in the EAC VVSG v 2.0. They incorporate systems security provisions, unauthorized access, deletion or modification of data, audit trail data, and modification or elimination of security mechanisms. The vendor documentation will be reviewed to ensure sufficient detail is present to operate the voting system in a secured manner. Where the vendor statements assert the voting system is secured via mechanisms and seals, procedures will test the presence and effectiveness of such controls.

In its security testing, SLI Compliance identifies the specific threats that are tested for and the associated risk if a flaw or exception is identified in a voting system. The

tests used by SLI Compliance are designed to ensure that the voting system meets or exceeds the requirements in the VVSG, including verification that the voting system is not capable of establishing wireless connections. For any instance where an anomaly or possible security flaw is identified, the potential risk is reported and evaluated.

Security testing includes testing each individual component of the system and the system as a whole. As such, each type of precinct optical scanner, BMD, modem, central count scanner, EMS, tally and reporting application, etc. will be subjected to review, as will the system as a whole and its interactions between components.

Access Control test suite: The voting system must be capable of maintaining authorization information and authentication capabilities for all systems, services, and users that interact with the voting system. All devices included in the test campaign receive access control security testing. Device usernames and passwords will be tested for proper authentication capabilities and to verify that password requirements are sufficient. In addition, multi-factor authentication will be tested to verify the bolstering of user account security such that leaked credentials alone will not expose the voting system to account misuse. Each user account will be tested for permissions and role assignments based on documented roles and proper role-based access control (RBAC) implementations. Minimum permission and access rules will be tested to ensure the voting system provides each user with only the permissions relevant to the role's documented purpose. Voting system components are tested through interaction with devices and visual inspection of authentication during user login and user activity. See "Attachment C – VxSuite 4.0 Test Case Matrix."

Data Protection test suite: Ensuring the end-to-end integrity of election system data guarantees the authenticity of the data. System and software cryptographic implementations are tested for computational security and efficacy of encrypting data. Cryptographic modules are verified against the Cryptographic Module Validation Program (CMVP) and evaluated concerning algorithm strength in bits and key lengths. In addition, configuration files are tested for accessibility restrictions. Testing is conducted through documentation review and simulation of documented events to identify key components. Necessary cryptographic artifacts are exfiltrated and analyzed externally to verify algorithm strengths and key lengths, while configuration files are reviewed locally on voting system components to verify alignment with documented configuration procedures. See "Attachment C – VxSuite 4.0 Test Case Matrix."

Physical Security test suite: The voting system is required to have physical security controls implemented to prevent and deter unauthorized access and properly produce alerts if the system encounters errors. Connectivity or lack thereof must be logged for all scanners, BMDs, and other voting system components during activated voting stages. Connections to device ports must also be logged and configured to minimally allow connectivity only to other voting system components for necessary documented procedures. Any physical housing for voting system storage or transportation must

secure the system and produce evidence if tampering is experienced. Any physical locks on the voting system are required to at minimum support different keying schemes including a key owner-unique scheme. Any security controls dependent on power must maintain their state upon loss of power and require a backup power supply. Such requirements are tested through physical inspection and interaction with all relevant voting system components. See "Attachment C – VxSuite 4.0 Test Case Matrix."

System Integrity test suite: System integrity tests the overall security of the voting system with respect to environmental factors. This includes consideration of supply chain attacks, attack surface analyses and limitations, and software verification. Documented risk assessments are evaluated for identified risks and associated acceptances or mitigations as well as procedural and operational security measures in place. Physical components of the voting system are tested to ensure that connections to logical components are properly disabled or limited to documented connections with other voting system components. In addition, software checks are completed to ensure all resident programs are verified with allow lists and that any errors or disallowed software trigger a display of obvious and accurate indications of the error. *The system is examined to verify that no wireless capability is available.* See "Attachment C – VxSuite 4.0 Test Case Matrix."

4.6 TDP Evaluation

TDP Evaluation test suite: Examines the provided Technical Data Package, which includes a system overview and documents the system's functionality, hardware, software, security, test and verification specifications, operations procedures, maintenance procedures, and personnel deployment and training requirements, as well as public documentation, for completeness and accuracy in describing the system. Jurisdiction/voter facing documentation in particular needs to be complete, such that a jurisdiction/voter is able to successfully implement/use the voting system. As such, all system features must be included and implementation/usage be accurately depicted for each of the required hardware, software and firmware components of the **VotingWorks VxSuite 4.0** voting system. See "Attachment C – VxSuite 4.0 Test Case Matrix."

For a complete list of all items included in the TDP, please refer to "Attachment E – Technical Data Package Listing."

4.7 Source Code Review

The test campaign for the **VotingWorks VxSuite 4.0** voting system includes software and firmware that have been created as open source, as well as review of any commercial off the shelf products. SLI Compliance will conduct a source code review of all source code and modified COTS products delivered in the voting system TDP for compliance to the EAC VVSG v 2.0 software code requirements.

The coding languages involved in VxSuite 4.0's applications include:

- ➢ TypeScript
- ➢ JavaScript
- ➢ Rust

Source code review tools used by SLI Compliance include:

- ➢ **Cloc Line Counter:** A commercial application used to determine the counts of executable and comment lines;

- ➢ **Module Finder:** An SLI Compliance proprietary application used to parse module names from Source code and populate the identified module names into the review documents;

- ➢ **ExamDiff Pro:** A commercial application used to compare revised code to previously reviewed code; and

- ➢ **Checkmarx:** A commercial SCA application used to review the source code for vulnerabilities and data flow issues.

Any subsequent re-reviews of source code will be the result of fixes to discrepancies identified in the certification testing activities.

COTS operating systems and software used in the voting system will be verified as authentic and unmodified.

4.8 Trusted Build

The Trusted Build will be conducted prior to the official testing and will be completed on site at SLI Compliance's facility or a secure lab at the vendor's facility approved by SLI Compliance. SLI Compliance will use its approved standard lab procedure that details the processes for controlling, managing, and conducting the Trusted Build. This process includes the following:

- ➢ **Preparation for the Trusted Build –** Obtaining and reviewing VotingWorks' procedure for constructing the build platform, verifying the target build platform, and acquiring and verifying the necessary materials.

- ➢ **Execution of the Trusted Build –** SLI Compliance will perform the Trusted Build using the step-by-step build procedure provided by VotingWorks to create a pristine build environment. SLI Compliance records and ascertains the following items throughout the build process:

  - Build environment and file hashes at various key points.

  - Build environment hardware characteristics.

  - Build results from code compilation and file hashes.

  - Final software install files and file hashes.

- Build virtual machine files.

➢ **Deliverables to Testing –** Upon completion of the Trusted Build, certain items are sent to the SLI Compliance test group. The final result will be a media containing the following:

- Final software install files.

- Hash values to validate install files.

➢ **Final Record Keeping and Archiving Procedures –** At the conclusion of the Trusted Build process, SLI Compliance completes all final record keeping and archiving procedures at SLI Compliance's facility. This record keeping includes any unique identifiers, results of the build with version numbers and dates and descriptions of all hashes and images in the repository.

4.9   Standard VSTL Test Methods and Uncertainty of Test Data Measurement

This test campaign utilizes Standard VSTL test methods and nominal type test data only.

4.10 EAC Interpretations

The test engagement described in this Test Plan utilizes only standard VSTL test methods that conform to the EAC Testing and Certification Program Manual and the identified voting system standard.

This Test Plan and the execution of tests for the voting system identified in this plan do include all EAC interpretations (RFI) and notices of clarification (NOC) that have been published as of the date of this document (Please see "Revision History" on page "ii").

5. TEST DATA

Test data for the **VotingWorks VxSuite 4.0** voting system has been compiled such that all functionality declared will be tested to determine conformance to the standards.

5.1 Data Recording

SLI Compliance has evaluated the system functionality, as described by manufacturer technical documentation, as well as requirements as listed in the EAC VVSG v2.0, and made determinations as to expected results of all data inputs into the **VotingWorks VxSuite 4.0** voting system. This includes:

➢ Election type

- ➢ Precincts of all types
- ➢ Districts
- ➢ Offices
- ➢ Contests
- ➢ Candidates
- ➢ Parties
- ➢ Issues/Referendums
- ➢ Voting variations employed
- ➢ Votes cast for each candidate/issue/referendum
- ➢ Devices used
- ➢ Vote consolidation data from one device/level to the next

This data is incorporated into the appropriate test suite, populating test modules with expected data for the function being tested.

Testing information is recorded in the test suites and test notebooks according to SLI Compliance's relevant standard lab procedures.

5.2 Test Data Criteria

SLI Compliance has evaluated the system functionality as described by manufacturer technical documentation, as well as requirements as listed in the EAC VVSG v 2.0, and made determinations as to expected output of all data inputs into the **VotingWorks VxSuite 4.0** voting system. A data matrix has been recorded into one master data record that couples data inputs to their expected output, as determined above. The system's execution shall be measured against the expected results.

5.3 Test Data Reduction

SLI Compliance processes the test data by manually recording input data into each pertinent module within the test suites as well as the exact output that is generated, e.g., the vote counts when the data is consolidated.

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6. TEST PROCEDURE AND CONDITIONS

This section describes the test conditions and procedures for execution of test suites. If a particular sequence is mandatory for the execution of suites, a rationale will be given. Additionally, this section is used to describe procedures for setting up equipment to be used in the test suite execution.

6.1 Facility Requirements

Testing will be performed on site at SLI Compliance in Colorado.

Multiple secure labs are available with appropriate power supply and space to accommodate the various configurations defined within this test plan. Temperature/humidity gauges will be employed in order to confirm whether the appropriate conditions exist during testing.

Unless otherwise specified herein, all remaining tests, including system level functional testing, shall be performed at standard ambient conditions:

- Temperature: 25°C ± 10°C (77°F ± 18°F)
- Relative Humidity: 20 to 90%
- Atmospheric Pressure: Local Site Pressure

All TDP and test documentation is stored on site at SLI Compliance's facility in a project directory on SLI Compliance's secure Voting server.

Environmental hardware testing for hardware components of the **VotingWorks VxSuite 4.0** voting system will be performed at NVLAP or A2LA accredited testing laboratories, as listed in section "1.4.1.4 Third Party Hardware Testing". These labs have been audited by SLI Compliance to NVLAP Handbook 150-22 requirements.

6.2 Test Setup

All components of the **VxSuite 4.0** voting system will be set up as documented in the TDP.

Successful completion of operational status checks will indicate that the system is ready for test execution.

6.3 Test Sequence

There is no required sequence for performing voting system testing, other than the execution of the General and Primary Elections. Each test suite is designed to be self-contained, other than usage of one of the General or Primary election definitions. Audit testing is done on an ongoing basis, examining the audit logs produced in each of the other test suites.

7. TEST OPERATIONS PROCEDURES

An inventory has been performed to verify the voting equipment received contains hardware and software elements as defined in the TDP prior to commencement of testing.

Throughout the testing effort, test suites and modules will be marked as follows:

> ➢ **Accept** – Test is accepted as successful.
>
> ➢ **Reject** – Test is rejected as unsuccessful.
>
> ➢ **NT** – Not Testable is used for test modules that cannot be completed. For example, if failure of one test modules failure precludes attempting subsequent test modules, the latter will be marked as NT.

Test results **Reject and NT** will include comments by the test engineer explaining the reason for the result.

Issues encountered during review and testing will be documented on the Discrepancy Report. Test findings showing that an aspect of the voting system does not conform to the requirements of the identified test standard will be marked as **Documentation Discrepancies** or **Functional Discrepancies.**

Issues that are encountered during testing or documentation review but are not addressed by the applicable standard will be added to the Discrepancy Report and noted as **Informational**. The vendor has the option whether to address Informational issues. All responses provided by the vendor are noted in the Discrepancy Report attachment to the Voting System Test Report.

8. APPROVAL SIGNATURES

WHEREOF as of the day and year set forth below SLI Compliance VSTL authorized signatory has reviewed and approved Voting System Test Plan "VWS-24003-TP-01" for VotingWorks VxSuite 4.0.

Signature: *Traci Mapps*

Name: Traci Mapps

Title: Vice President, SLI Compliance

Date: March 3, 2025

End of VotingWorks VxSuite 4.0 Voting System Test Plan

Statement of Independence

Voting Systems Compliance Testing Statement of Independence

The SLI Compliance® Voting Systems Compliance Testing Statement of Independence reads as follows:

The management and staff of SLI Compliance, along with SLI Compliance's testing subcontractors and their employees, shall maintain an independent decisional relationship between themselves and SLI Compliance's clients, affiliates, or other organizations so that the Company's capacity to render test reports objectively and without bias is not adversely affected.

SLI Compliance, along with SLI Compliance's testing subcontractors and their employees, shall maintain independence from Voting System Manufacturing clients whose systems are under VSTL test or are scheduled for a VSTL voting system test campaign. Specifically, employees shall not have a direct beneficial interest in a voting system product.