


Victorian Electoral Commission

AUDIT OF UPDATED COUNTBACK SOFTWARE

Issued Date	13-November-2020	
Issued To	Victorian Electoral Commission (VEC) ABN 46 583 749 552.	
BMM Reference	VEC.1008.01 2020 Countback Audit	
System:	EMS software changes for Countback	Version: v1.1.0.31
Signed:	 Rodney Li, Systems Consultant, BMM	

Note: The content of this document is strictly confidential. It has been prepared by BMM Australia Pty Ltd (BMM) exclusively for VEC and its nominated auditors and may not be disclosed to any other party without prior written approval of BMM.

bmm australia pty ltd

bmm.com

suite 107, 35 doody street, p.o. box 6223, alexandria nsw, australia 2015
level 3, 810 whitehorse road, box hill, vic, australia 3128
corporate reg: ABN 65 084 016 044

t +612 8337 6900 | f +612 8338 0775
t +613 9895 9888 | f +613 9899 6277

Form Version: 1,3,4
Page 1 of 8

Executive Summary

The Victorian Electoral Commission (VEC) requested BMM to audit software changes to the Computer Count Software module. The module counts ballots to elect candidates for proportional representation and preferential counts for State and local government elections and for countbacks to fill extraordinary vacancies at local government elections where proportional representation was used at the general election.

The Computer Count module is part of the Election Management System (EMS). At the time of the audit the other parts of the EMS software were being changed. Those software changes are outside the computer count module and outside the scope of this audit.

The following changes have been made to the countback algorithm:

- The countback calculation algorithm has been changed to comply with amendments to “*Division 8—Countback process and counting of votes*” of the relevant legislation.
- Countback applies to fill a vacancy left by a vacating elected councillor.
- The previous implementation only counted the ballot papers of the vacating candidate, whereas the amendments requires that all formal ballot papers from the original election are redistributed to elect a replacement candidate.

The scope of the audit included:

1. A review of VECs analysis documents to ensure they correctly define the requirements for changing the countback to take into account all ballot papers from the original election
2. A review of VECs test methodology and test cases to confirm that VEC has sufficient test coverage and that the tests are relevant and executed correctly.
3. A review of VECs test results to confirm that a record of successful completion of tests exists.
4. A review of the source code to
 - 4.1. Inspect changes for any fraudulent code and that all changes relate to the documented requirements.
5. Confirmation that the system complies with the relevant legislation.

BMM found:

- a) The quality assurance methodology and software quality control were rigorous and well documented.
- b) The test cases in software development and integration testing were adequate to ensure the changes comply with relevant legislation.
- c) The system had been tested to ensure that previous election counts could be reproduced with the same candidates being elected at the same stages of the count, and
- d) There was no malicious code in the software changes.

BMM concludes that the change to the Computer Count software performs correctly and complies with relevant legislation.

1 Methodology

VEC provided the documentation listed in the Appendix A for BMM to review during the audit.

BMM reviewed the documents and then conducted the audit using the supplied test plan, test data and test results.

VEC provided access to the source code, the test results, and to personnel in development and quality assurance.

BMM took a copy of the source code for examination and analysis.

2 Software Change Description

Countbacks apply to multi-member wards of 2 or more councillors, when an extraordinary vacancy occurs and must be filled.

The change introduced in this release is that all the formal ballot papers from the original election are used in the countback calculation [see Local Government Act 2020].

2.1 Countback Algorithm

The counting software categorises the candidates into participating and non-participating candidates. Participating candidates are sitting councillors(elected) or eligible candidates. (see Appendix B for details). Preferencing ignores non-participating candidates and instead flows to the next candidate who is participating or exhausts

The countback process then establishes a first preference count of the votes for participating candidates.

All the votes counted in the original election are counted. The quota remains at the same value as the original election. The first preferences totals are checked to verify if any eligible candidate has achieved quota.

Once an eligible candidate achieves quota, the countback immediately ends with the successful election of that candidate and no further distribution of preferences occurs. [see Note 1]

I. If not, then votes of participating candidates i.e. sitting members who have exceeded quota are distributed as a surplus to next preferred participating candidates.

If no surplus remains for redistribution, then the candidate with the least votes is excluded and their votes distributed to next preferred participating candidates.

The countback continues with distributions of surplus or votes of excluded candidates until an eligible candidate achieves quota or only one eligible candidate remains. If a tie occurs, a Tie breaker is used which finds a point of difference in previous rounds of voting. If this is unsuccessful, a Winner is drawn by Lot out of the tied candidates.

3 Quality Assurance

VEC use Microsoft's Team Foundation Server to provide source code management, requirements (stories) management, automated builds and unit testing.

VEC employs an "agile" approach for development and testing. This approach provides iterative cycles and quality gates that ensure that the software:

- correctly implements business stories.
- is subjected to multi-level testing; and
- has formal acceptance before final deployment.

Test cases with results were both stored protected under the HP records management system.

The system provides adequate documentation to allow audit of the process.

4 Test Results

BMM reviewed test cases defined for changes to countback to provide for local council vacancy countback votes. BMM used these test results to verify that

- Eligible candidates were correctly selected and that ineligible candidates did not receive preferences
- A tie during the count is first resolved by Compare and if no point of difference is found, is resolved by Lot
- The algorithm correctly processes all formal ballot papers cast during the general election
- Special rules for City of Melbourne were enforced which allow ballot papers to be exhausted during the countback preference distribution

5 Notes

- 1) The countback stops as soon as an eligible candidate obtains a quota. No further bundles in a distribution are transferred. This complies with the legislative requirements of section 285 7a of the Local Government Act 2020. An alternative method that counts all distribution bundles before electing a winning candidate could result in another candidate's total being higher than the original winning candidate.
- 2) The system prevents any past councillor who vacated from being an eligible candidate at a future countback.
- 3) A winning candidate who declines the office of councillor is declared ineligible and the countback is run again. They will still be eligible in any future countback process.

Appendix A – Document Registry

Countback - High Level Requirements.docx
Countback Calculation Process Diagram v4.vsd
Countback IT QA Test Plan.docx
Countback IT QA Test Report.docx
CountbackAlgo_Test_Cases&Scenarios.xlsx
CountbackAlgo_Test_Cases&Scenarios12Nov20.xlsx
CountbackAlgo_Test_Data_v2.xlsx
CountbackAlgo_Test_Data12Nov20.xlsx
CountbackAlgo_Test_Data_13Nov20.xlsx
Test Results Screenshot.xlsx
Test Results Screenshot12Nov20.xlsx
Test Results Screenshot_13Nov20.xlsx
Results- CountbackDistribution-LG2020-CoM_withATL.xls
Results- CountbackDistribution-LG2020-CoM_ExhaustPoint.xls
Test Results Screenshot12Nov20.xlsx

--- End of Appendix A ---

Appendix B – Candidate Status in a Countback

Candidates	Can receive preferences in countback?	Candidate Status	How many candidates Have this status?	Can win count back?	Comments
Participating	Yes	Elected (Sitting)	1 or more.	No	A candidate was elected at the general election or a previous countback. The candidate receives preferences in a countback. .They cannot lose their seat whether they meet the quota or not in the countback.
		Eligible	2 or more	Yes	These candidates were unsuccessful at general election and previous countbacks and one of these candidates will be declared the elected candidate from the countback
Non-participating	No	Vacating	1 only	No	This candidate was elected at the original election or previous countback but is now no longer serving as councillor for any reason. Preferences do not flow to this candidate in a countback For future countbacks, their status will be vacated
		Vacated	0 or more	No	The candidate was previously elected but vacated their seat. The candidate was the vacating candidate in a previous countback. Preferences do not flow to this candidate in a countback. .
		Ineligible	0 or more	No	The candidate was unsuccessful at the original all election and any previous countback but is currently not eligible to contest the vote. Reasons may include they are no longer resident in the ward or refused a seat after winning a countback. In the latter case, they become ineligible and a further countback is run.
		Deceased	0 or more	No	These candidates were unsuccessful at original election and previous countback and have become deceased and are no longer eligible to receive preferences. A previously successful candidate who becomes deceased will undergo the vacating process instead.

Countbacks apply to multi-member wards of 2 or more councillors, and address one vacancy at a time.

--- End of Appendix B ---