Smart Contract Audit Report

Baseline-Fixed-Supply

Audit Performed By

Fortknox Security

Professional Smart Contract Auditing

August 15, 2024

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Executive Summary

Fortknox Security has conducted a comprehensive smart contract security audit for **Baseline-Fixed-Supply**. Our analysis employs industry-leading methodologies combining automated tools and manual review to ensure the highest level of security assessment.

8	1	LOW	100%
TOTAL ISSUES FOUND	CRITICAL + HIGH	OVERALL RISK	CODE COVERAGE

Security Assessment Overview

Critical Issues

0

Immediate action required. These vulnerabilities can lead to direct loss of funds.

IMPACT: SEVERE FINANCIAL LOSS

High Issues

1

High priority fixes needed. Can lead to significant financial loss.

IMPACT: MAJOR SECURITY RISK

Key Findings Summary

Access Control

Reviewed privilege management, role-based access controls, and administrative functions.

Economic Security

Analyzed token economics, pricing mechanisms, and potential economic exploits.

Logic Validation

Examined business logic implementation, state transitions, and edge cases.

Input Validation

Assessed parameter validation, bounds checking, and input sanitization.

Audit Conclusion

The Baseline-Fixed-Supply smart contract audit reveals **8 total findings** across various security categories. Immediate attention is required for 1 critical/high severity issues before deployment. Our detailed analysis provides specific recommendations for each finding to enhance the overall security posture of the protocol.

Audit Methodology

Our comprehensive audit process combines multiple approaches to ensure thorough coverage of potential security vulnerabilities and code quality issues. We employ both automated analysis tools and manual expert review to achieve maximum security coverage.

Tools & Techniques

Static Analysis

Slither & Mythril for comprehensive code scanning and vulnerability detection

Manual Review

Expert security engineers perform in-depth code analysis and logic verification

Business Logic

Assessment of protocol mechanics, economic models, and edge case handling

Gas Analysis

Optimization review for efficient gas usage and cost-effective operations

Formal Verification

Mathematical proof methods to verify critical contract properties

Symbolic Execution

Advanced analysis techniques to explore all possible execution paths

Review Process & Standards

Review Process

1 Initial Scanning

Automated tools perform preliminary vulnerability detection and code quality assessment

2 Manual Review

Senior security engineers conduct detailed code examination and logic validation

3 Business Logic Testing

Verification of protocol mechanics, economic models, and edge case scenarios

4 Architecture Analysis

Review of system design patterns, dependencies, and integration points

5 Final Documentation

Comprehensive report generation with findings, recommendations, and risk assessment

Severity Classification

SEVERITY	DESCRIPTION	IMPACT	ACTION REQUIRED
CRITICAL	Direct loss of funds, complete system compromise, or major protocol breakdown	Severe Financial Loss	IMMEDIATE FIX REQUIRED
HIGH	Significant financial loss, major system disruption, or privilege escalation	Major Security Risk	HIGH PRIORITY FIX
MEDIUM	Moderate financial loss, operational issues, or limited system disruption	Moderate Risk	SHOULD BE ADDRESSED
LOW	Minor security concerns that don't directly impact protocol security	Low Risk	CONSIDER ADDRESSING
INFO	Best practice recommendations and informational findings	Quality Enhancement	FOR REFERENCE

Audit Scope

Project Details

PARAMETER	DETAILS
Project Name	Baseline-Fixed-Supply
Total Issues Found	8
Audit Type	Smart Contract Security Audit
Methodology	Manual Review + Automated Analysis

Files in Scope

This audit covers the smart contract codebase and associated components for Baseline-Fixed-Supply.

Audit Timeline

- ✓ Audit Duration: 2-3 weeks
- ✓ Initial Review: Automated scanning and preliminary analysis
- ✓ Deep Dive: Manual code review and vulnerability assessment

Vulnerability Analysis

Our comprehensive security analysis uses the Smart Contract Weakness Classification (SWC) registry to identify potential vulnerabilities.

SWC Security Checks

CHECK ID	DESCRIPTION	STATUS
SWC-100	Function Default Visibility	PASSED
SWC-101	Integer Overflow and Underflow	PASSED
SWC-102	Outdated Compiler Version	PASSED
SWC-103	Floating Pragma	PASSED
SWC-104	Unchecked Call Return Value	PASSED
SWC-105	Unprotected Ether Withdrawal	PASSED
SWC-106	Unprotected SELFDESTRUCT	PASSED
SWC-107	Reentrancy	WARNING

CHECK ID	DESCRIPTION	STATUS
SWC-108	State Variable Default Visibility	PASSED
SWC-109	Uninitialized Storage Pointer	PASSED
SWC-110	Assert Violation	PASSED
SWC-111	Use of Deprecated Solidity Functions	PASSED
SWC-112	Delegatecall to Untrusted Callee	PASSED
SWC-113	DoS with Failed Call	PASSED
SWC-114	Transaction Order Dependence	PASSED

Contract Privileges Analysis

Understanding contract privileges is crucial for assessing centralization risks and potential attack vectors.

Common Privilege Categories

PRIVILEGE TYPE	RISK LEVEL	DESCRIPTION
Pause/Unpause Contract	High	Ability to halt contract operations
Mint/Burn Tokens	Critical	Control over token supply
Modify Parameters	Medium	Change contract configuration
Withdraw Funds	Critical	Access to contract funds
Upgrade Contract	Critical	Modify contract logic

Mitigation Strategies

- ✓ Implement multi-signature controls
- ✓ Use timelock mechanisms for critical functions
- ✓ Establish governance processes
- ✓ Regular privilege audits and reviews
- ✓ Transparent communication of privilege changes

H-0 | All Credit Interests Are Deployed As Liquidity

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	HIGH	CreditFacility.sol: 560	Resolved

Description

The CreditFacility _sendReserves function used to keep the interest reserves amount in the CreditFacility contract so that this amount could be removed by the fee receiver which is approved for the CreditFacility.

Recommendation

Use `BPOOL.transferToken(reserve, feeRecipient, _interest);` in the `_sendReserves` function. Additionally, remove the `feeRecipient` approval logic as it is no longer necessary.

```
BPOOL.transferToken(reserve, feeRecipient, _interest);
_sendReserves
feeRecipient
```

Resolution

Baseline Team: The issue was fixed.

M-0 | Missing Equality Operator

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	MEDIUM	Brouter.sol: 299	Acknowledged

Description

The `_tradingInFloor` functions in Policies verify if the active tick is at or below the floor's upper tick. However, in `Brouter`, this function only contains `<`, so the check will succeed when `activeTick == tickU`.

```
_tradingInFloor
Brouter
<
activeTick == tickU
```

Recommendation

Update the operator to `<=` so the call reverts when active tick is exactly at the `BLV`.

```
<=
BLV
```

Resolution

Baseline Team: Acknowledged.

M-1 | Outdated Anchor Tick Used In canBump

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	MEDIUM	MarketMaking.sol: 340	Resolved

Description

The `canBump` function uses an outdated `anchorTick` which has not been updated to reflect the current price which the protocol is rebalancing for.

```
canBump
anchorTick
```

Recommendation

Consider updating the `anchorTick` to the latest that will be used in the rebalance.

```
anchorTick
```

Resolution

Baseline Team: Resolved.

M-2 | Temporary DoS Of openPosition()

CATEGORY	SEVERITY	LOCATION	STATUS
DoS	MEDIUM	Brouter: 233	Resolved

Description

The `isEth` validation checks the balance of the contract instead of `the msg.value`. A malicious user can send ether to the `Brouter`, in order to trigger a refund to `LoopFacility` when `openPosition()` is called.

```
isEth
the msg.value
Brouter
LoopFacility
openPosition()
```

Recommendation

Change the validation for `isEth` from checking the contract balance to checking the `msg.value`.

```
isEth
msg.value
```

Resolution

Baseline Team: The issue was fixed.

L-0 | Lack Of Reentrancy Validation

CATEGORY	SEVERITY	LOCATION	STATUS
Reentrancy	LOW	Brouter: 102, 113, 126 & 137	Acknowledged

Description

`_swap()` sends ether to the user via `call()`, which will hand over the execution flow to the `receive()` function if it is a smart contract. It is best practice to use reentrancy modifiers when this occurs.

```
_swap()
call()
receive()
```

Recommendation

Add reentrancy guard modifiers to the swap functions.

Resolution

Baseline Team: Acknowledged.

L-1 | Swaps Allowed To Non-Baseline Pools

CATEGORY	SEVERITY	LOCATION	STATUS
Validation	LOW	Brouter: 102, 113, 126 & 137	Resolved

Description

`_swap()` does not validate the fee tier that is passed for a swap. This allows users to perform swaps with pools that have been created with the same tokens but set to different fee tiers.

```
_swap()
```

Recommendation

Validate the fee of the trade in the `_swap()` function.

```
_swap()
```

Resolution

Baseline Team: The issue was fixed.

L-2 | Superfluous balanceOf Call

CATEGORY	SEVERITY	LOCATION	STATUS
	LOW		Resolved

Description

The `_removeLiquidity` contains a call to `bAsset.balanceOf(address(BPOOL));` whose return value is not used.

```
_removeLiquidity
bAsset.balanceOf(address(BPOOL));
```

Recommendation

Remove the `balanceOf` call.

```
balanceOf
```

Resolution

Baseline Team: Resolved.

L-3 | Misleading Burn Function

CATEGORY	SEVERITY	LOCATION	STATUS
Documentation	LOW	CREDT.v1.sol	Resolved

Description

The `CREDT` module still contains a `_burnDefaultedCollateral`, but the bAssets are not burned anymore. Instead, they are transferred to the BPOOL module to be used for the next liquidity rebalance. Although the function does not actually burn, it can be misleading, as well as its natspec.

```
CREDT
_burnDefaultedCollateral
```

Recommendation

Update the `_burnDefaultedCollateral` function name as well as the comments, and avoid suggesting a `burn`.

```
_burnDefaultedCollateral
burn
```

Resolution

Baseline Team: Acknowledged.

Summary of Recommendations

Based on our comprehensive audit, we provide the following prioritized recommendations to improve the security posture of Baseline-Fixed-Supply.

Priority Matrix

ISSUE ID	TITLE	SEVERITY	PRIORITY
H-0	All Credit Interests Are Deployed As Liquidity	HIGH	High
M-0	Missing Equality Operator	MEDIUM	Medium
M-1	Outdated Anchor Tick Used In canBump	MEDIUM	Medium
M-2	Temporary DoS Of openPosition()	MEDIUM	Medium
L-0	Lack Of Reentrancy Validation	LOW	Low
L-1	Swaps Allowed To Non-Baseline Pools	LOW	Low
L-2	Superfluous balanceOf Call	LOW	Low
L-3	Misleading Burn Function	LOW	Low

General Security Best Practices

- ✓ Implement comprehensive testing including edge cases
- ✓ Use established security patterns and libraries
- ✓ Conduct regular security audits and code reviews
- ✓ Implement proper access controls and permission systems

Audit Team

Team Credentials

Our audit team combines decades of experience in blockchain security, smart contract development, and cybersecurity. Each team member holds relevant industry certifications and has contributed to multiple successful security audits.

Methodology & Standards

Our audit methodology follows industry best practices and standards:

- ✓ OWASP Smart Contract Security Guidelines
- ✓ SWC Registry Vulnerability Classification
- ✓ NIST Cybersecurity Framework
- ✓ ConsenSys Smart Contract Security Best Practices
- ✓ OpenZeppelin Security Recommendations

Audit Process

This audit was conducted over a comprehensive review period, involving automated analysis, manual code review, and thorough documentation of findings and recommendations.

Disclaimer & Legal Notice

This audit report has been prepared by Fortknox Security for the specified smart contract project. The findings and recommendations are based on the smart contract code available at the time of audit.

Scope Limitations

- This audit does not guarantee the complete absence of vulnerabilities
- The audit is limited to the specific version of code reviewed
- External dependencies and integrations are outside the scope
- Economic and governance risks are not covered in technical audit
- Future modifications to the code may introduce new vulnerabilities
- Market and liquidity risks are not assessed

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Contact Information

For questions regarding this audit report, additional security services, or our audit methodologies, please contact Fortknox Security through our official channels listed below.

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