



# Smart Contract Audit Report

Baseline-MM-Looping

## Audit Performed By

Fortknox Security  
Professional Smart Contract Auditing

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## Executive Summary

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

Q

6

TOTAL ISSUES FOUND

⚠

1

CRITICAL + HIGH

i

LOW

✓

100%

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-MM-Looping smart contract audit reveals **6 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-MM-Looping
Total Issues Found	6
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-MM-Looping.

## 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	PASSED



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 | Sqrt Price Compared With Price

Category	Severity	Location	Status
Logical Error	HIGH	MarketMaking.sol: 428	Resolved

### Description

In the `_getUtilizationRate` function the `priceAdj` is computed as:

```
_getUtilizationRate  
priceAdj
```

### Recommendation

Square the `priceAdj` to compute the correct price.

```
priceAdj
```

### Resolution

Baseline Team: Resolved.



# L-0 | Unnecessary Min

Category	Severity	Location	Status
Optimization	LOW	MarketMaking.sol: 395	Resolved

## Description

The `_getAnchorReserves` function uses the min function between `anchorReserves_` and `totalReserves - _getVirtualReserves()` inside the case where it is already determined that `totalReserves - _getVirtualReserves() < anchorReserves_`.

```
_getAnchorReserves
anchorReserves_
totalReserves - _getVirtualReserves()
totalReserves - _getVirtualReserves() < anchorReserves_
```

## Recommendation

Remove the `min` computation and always assign the `anchorReserves_` to `totalReserves - _getVirtualReserves()`.

```
min
anchorReserves_
totalReserves - _getVirtualReserves()
```

## Resolution

Baseline Team: Resolved.



## L-1 | Unused Variable

CATEGORY	SEVERITY	LOCATION	STATUS
Gas Optimization	LOW	MarketMaking.sol: 364	Resolved

### Description

In the `_getACU` function the `activex96` is declared but never used.

```
_getACU  
activex96
```

### Recommendation

Remove the `activex96` variable from the `_getACU` function.

```
activex96  
_getACU
```

### Resolution

Baseline Team: Resolved.



## L-2 | \_getUtilizationRate Reverts Near Min Tick

CATEGORY	SEVERITY	LOCATION	STATUS
DoS	LOW	MarketMaking.sol: 425	Acknowledged

### Description

In the `_getUtilizationRate` function the active tick is reduced by the `BUMPABLE_PREMIUM` which is currently set at 1500 ticks.

```
_getUtilizationRate  
BUMPABLE_PREMIUM
```

### Recommendation

Ensure that system configurations never allow for any active price to be near the min tick.

### Resolution

Baseline Team: Acknowledged.



## L-3 | Rebalances Inconsistently Responsive

CATEGORY	SEVERITY	LOCATION	STATUS
Unexpected Behavior	LOW	MarketMaking.sol	Acknowledged

### Description

In `_updateTicks` the `rebalanceTicks` assignment does not take into account where the active price is, but rather purely where the `anchorTick` was assigned to.

```
_updateTicks  
rebalanceTicks  
anchorTick
```

### Recommendation

Consider taking the `activeTick` into account when assigning the `rebalanceTicks` so that liquidity rebalances are triggered in a more uniform manner.

```
activeTick  
rebalanceTicks
```

### Resolution

Baseline Team: Acknowledged.



## L-4 | Outdated getBaselineValue Function

CATEGORY	SEVERITY	LOCATION	STATUS
Warning	LOW	BPOOL.sol	Acknowledged

### Description

In the `BPOOL` contract the `getBaselineValue` function still returns the original baseline value of the lower floor tick instead of the upper floor tick.

```
BPOOL
getBaselineValue
```

### Recommendation

Update this function to reflect the real baseline value of the upper floor tick.

### 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-MM-Looping.

## Priority Matrix

Issue ID	Title	Severity	Priority
H-0	Sqrt Price Compared With Price	High	High
L-0	Unnecessary Min	Low	Low
L-1	Unused Variable	Low	Low
L-2	_getUtilizationRate Reverts Near Min Tick	Low	Low
L-3	Rebalances Inconsistently Responsive	Low	Low
L-4	Outdated getBaselineValue 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

## Liability Statement

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- ✓ Third-party integrations or dependencies



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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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