



Part of Tibereum Group

# AUDITING REPORT

# Version Notes

| Version | No. Pages | Date       | Revised By       | Notes       |
|---------|-----------|------------|------------------|-------------|
| 1.0     | Total: 38 | 2022-09-10 | Plemonade, Donut | Audit Final |

# Audit Notes

|                                      |   |
|--------------------------------------|---|
| Audit Date                           | 2022-08-24 - 2022-09-09   |
| Auditor/Auditors                     | Plemonade, ByFixter   |
| Auditor/Auditors Contact Information | contact@obeliskaудитинг.com   |
| Notes                                | Specified code and contracts are audited for security flaws.<br>UI/UX (website), logic, team, and tokenomics are not audited. |
| Audit Report Number                  | OB565658741   |

# Disclaimer

This audit is not financial, investment, or any other kind of advice and is for informational purposes only. This report is not a substitute for doing your own research and due diligence. Obelisk is not responsible or liable for any loss, damage, or otherwise caused by reliance on this report for any purpose. Obelisk has based this audit report solely on the information provided by the audited party and on facts that existed before or during the audit being conducted. Obelisk is not responsible for any outcome, including changes done to the contract/contracts after the audit was published. This audit is fully objective and only discerns what the contract is saying without adding any opinion to it. The audit is paid by the project but neither the auditors nor Obelisk has any other connection to the project and has no obligations other than to publish an objective report. Obelisk will always publish its findings regardless of the outcome of the findings. The audit only covers the subject areas detailed in this report and unless specifically stated, nothing else has been audited. Obelisk assumes that the provided information and material were not altered, suppressed, or misleading. This report is published by Obelisk, and Obelisk has sole ownership of this report. Use of this report for any reason other than for informational purposes on the subjects reviewed in this report including the use of any part of this report is prohibited without the express written consent of Obelisk. In instances where an auditor or team member has a personal connection with the audited project, that auditor or team member will be excluded from viewing or impacting any internal communication regarding the specific audit.

# Obelisk Auditing

Defi is a relatively new concept but has seen exponential growth to a point where there is a multitude of new projects created every day. In a fast-paced world like this, there will also be an enormous amount of scams. The scams have become so elaborate that it's hard for the common investor to trust a project, even though it could be legit. We saw a need for creating high-quality audits at a fast phase to keep up with the constantly expanding market. With the Obelisk stamp of approval, a legitimate project can easily grow its user base exponentially in a world where trust means everything. Obelisk Auditing consists of a group of security experts that specialize in security and structural operations, with previous work experience from among other things, PricewaterhouseCoopers. All our audits will always be conducted by at least two independent auditors for maximum security and professionalism.

As a comprehensive security firm, Obelisk provides all kinds of audits and project assistance.

## Audit Information

The auditors always conducted a manual visual inspection of the code to find security flaws that automatic tests would not find. Comprehensive tests are also conducted in a specific test environment that utilizes exact copies of the published contract.

While conducting the audit, the Obelisk security team uses best practices to ensure that the reviewed contracts are thoroughly examined against all angles of attack. This is done by evaluating the codebase and whether it gives rise to significant risks. During the audit, Obelisk assesses the risks and assigns a risk level to each section together with an explanatory comment. Take note that the comments from the project team are their opinion and not the opinion of Obelisk.

# Table of Contents

|  |           |
|--|-----------|
| <b>Version Notes</b>                       | <b>2</b>  |
| <b>Audit Notes</b>                         | <b>2</b>  |
| <b>Disclaimer</b>                          | <b>2</b>  |
| <b>Obelisk Auditing</b>                    | <b>3</b>  |
| <b>Audit Information</b>                   | <b>3</b>  |
| <b>Project Information</b>                 | <b>6</b>  |
| <b>Audit of Based 3</b>                    | <b>7</b>  |
| Summary Table                              | 8         |
| Code Analysis                              | 8         |
| On-Chain Analysis                          | 9         |
| <b>Findings</b>                            | <b>10</b> |
| Code Analysis                              | 10        |
| Operator Can Transfer All USDC             | 10        |
| No Protection Against Insufficient Funds   | 11        |
| External Dependencies                      | 12        |
| No Protection From Sandwich Attacks        | 14        |
| Contract Might Underflow And Revert        | 15        |
| Fetched WETH Address Can Be Freeze Rewards | 17        |
| Token Decimals Are Assumed                 | 18        |
| Tokens With Transfer Fee Not Supported     | 19        |
| Estimate Swap Estimates Price After Swap   | 20        |
| Unnecessary Code                           | 21        |
| Underflow Causing Locked Assets            | 22        |
| Transfer Fee Can Freeze Assets             | 23        |
| Division Before Multiplication             | 25        |
| Rounding Error Reduces Rewards             | 26        |
| Oracle Can Be Changed                      | 27        |
| Rounding Error Reduces Rewards             | 28        |
| On-Chain Analysis                          | 29        |
| No Timelock                                | 29        |
| Swapper Contract Is Unverified             | 30        |
| <b>External Addresses</b>                  | <b>31</b> |
| Externally Owned Accounts                  | 31        |
| Owner/Operator                             | 31        |
| External Contracts                         | 32        |
| SMELT - WFTM Uniswap Oracle                | 32        |
| FTM / USD Chainlink price feed             | 32        |
| Swapper                                    | 32        |
| External Tokens                            | 33        |
| SMELT                                      | 33        |

|  |           |
|--|-----------|
| USDC                                   | 33        |
| Wrapped Ether                          | 33        |
| <b>Appendix A - Reviewed Documents</b> | <b>34</b> |
| Deployed Contracts                     | 34        |
| Libraries And Interfaces               | 34        |
| Revisions                              | 34        |
| Imported Contracts                     | 34        |
| <b>Appendix B - Risk Ratings</b>       | <b>35</b> |
| <b>Appendix C - Finding Statuses</b>   | <b>35</b> |
| <b>Appendix D - Glossary</b>           | <b>36</b> |
| Contract Structure                     | 36        |
| Security Concepts                      | 36        |
| <b>Appendix E - Audit Procedure</b>    | <b>37</b> |

# Project Information

|                     |  |
|---------------------|--|
| Name                | Based  |
| Description         | BASED Next Generation protocol is the first pegless seigniorage protocol exploring DeFi on the FTM Network. We are introducing innovative yield strategies whilst providing inclusivity for Based Finance (V1), that successfully finished emissions. Based Next Gen is a multi-token protocol which consists of the following tokens: \$OBOL - PEGLESS token with elastic supply. \$SMELT - protocol's underlying Perpetual Print (PP) mechanism emitting OBOL. |
| Website             | <a href="https://basedfinance.io/">https://basedfinance.io/</a>  |
| Contact             | <a href="https://twitter.com/BasedFinance_io">https://twitter.com/BasedFinance_io</a>  |
| Contact information | @@athena_goddazz on TG   |
| Token Name(s)       | N/A  |
| Token Short         | N/A  |
| Contract(s)         | See Appendix A   |
| Code Language       | Solidity   |
| Chain               | Fantom   |

# Audit of Based 3

Obelisk was commissioned by Based on the 22nd of August 2022 to conduct a comprehensive audit of Based's additional contracts. The following audit was conducted between the 24th of August 2022 and the 9th of September 2022. Two of Obelisk's security experts went through the related contracts manually using industry standards to find if any vulnerabilities could be exploited either by the project team or users.

The contracts for this audit are closed source so the audit report includes no code snippets. The contracts will not be verified on-chain, but we have confirmed that the deployed bytecode matches the audited contracts for the on-chain portion of the audit.

During the audit, we found multiple instances of Low, Medium, and High-Risk issues. These issues were conveyed to the project team which worked to solve most of them. Issue #3 which is a High-Risk issue is partially closed as it needs a timelock in order for the user to react to changes. Similar to issue #15 which is still open because of a missing timelock. Issue #9 is a Low-Risk issue that is still open and which needs the user to read the comment on the issue in order to understand its concern. All other findings of relevance are solved in the contracts.

When it comes to the on-chain analysis, issue #17 is open until a timelock is implemented and which then also closes issues #3 and #15. Issue #18 relates to the deployed contracts that are not verified on-chain which means that no one outside of those that have the original code can check on the code of the deployed contracts, which makes sense since the code is closed-source but still warrants an open issue.

The informational findings are good to know while interacting with the project but don't directly damage the project in its current state, hence it's up to the project team if they deem that it's worth solving these issues, however, please take note of them.

**The team has not reviewed the UI/UX, logic, team, or tokenomics of the Based project.**

This document is a summary of the findings that the auditors found. Please read the full document for a complete understanding of the audit.

# Summary Table

## Code Analysis

| Finding                                    | ID    | Severity      | Status           |
|--|-------|---------------|------------------|
| Operator Can Transfer All USDC             | #0001 | High Risk     | Closed           |
| No Protection Against Insufficient Funds   | #0002 | High Risk     | Closed           |
| External Dependencies                      | #0003 | High Risk     | Partially Closed |
| No Protection From Sandwich Attacks        | #0004 | Medium Risk   | Closed           |
| Contract Might Underflow And Revert        | #0005 | Medium Risk   | Closed           |
| Fetched WETH Address Can Be Freeze Rewards | #0006 | Medium Risk   | Closed           |
| Token Decimals Are Assumed                 | #0007 | Low Risk      | Closed           |
| Tokens With Transfer Fee Not Supported     | #0008 | Low Risk      | Closed           |
| Estimate Swap Estimates Price After Swap   | #0009 | Low Risk      | Open             |
| Unnecessary Code                           | #0010 | Informational | Closed           |
| Underflow Causing Locked Assets            | #0011 | High Risk     | Closed           |
| Transfer Fee Can Freeze Assets             | #0012 | High Risk     | Closed           |
| Division Before Multiplication             | #0013 | High Risk     | Closed           |
| Rounding Error Reduces Rewards             | #0014 | Informational | Open             |
| Oracle Can Be Changed                      | #0015 | Low Risk      | Open             |
| Retiring Nodes Requires User Interaction   | #0016 | Informational | Open             |

## On-Chain Analysis

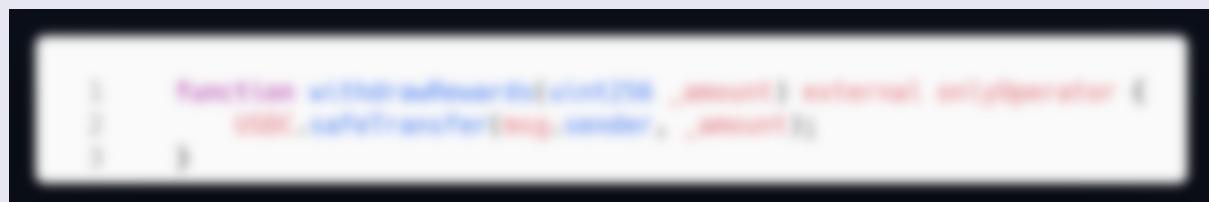
| Finding                        | ID    | Severity    | Status |
|--------------------------------|-------|-------------|--------|
| No Timelock                    | #0017 | High Risk   | Open   |
| Swapper Contract Is Unverified | #0018 | Medium Risk | Open   |

# Findings

## Code Analysis

### Operator Can Transfer All USDC

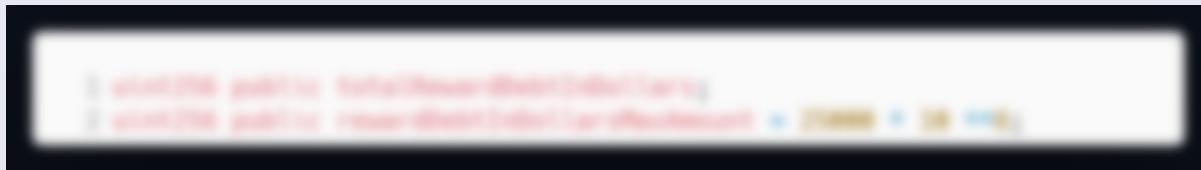
|            |                             |
|------------|-----------------------------|
| FINDING ID | #0001                       |
| SEVERITY   | High Risk                   |
| STATUS     | Closed                      |
| LOCATION   | TwistedNodes.sol -> 106-108 |



|                |   |
|----------------|---|
| DESCRIPTION    | <p>The operator is able to transfer all the USDC out of the contract.</p> <p>Currently, the contract is not aware of how many funds are needed to fully pay all the users risk free so transferring USDC out of the contract could mean that the remaining amount is insufficient to pay all users.</p> |
| RECOMMENDATION | <p>Remove this function.</p> <p>Another way would be to have a minimum amount of USDC in the contract and allow excess funds to be removed.</p>   |
| RESOLUTION     | The project team has removed the function.  |

## No Protection Against Insufficient Funds

|            |                           |
|------------|---------------------------|
| FINDING ID | #0002                     |
| SEVERITY   | High Risk                 |
| STATUS     | Closed                    |
| LOCATION   | TwistedNodes.sol -> 32-34 |

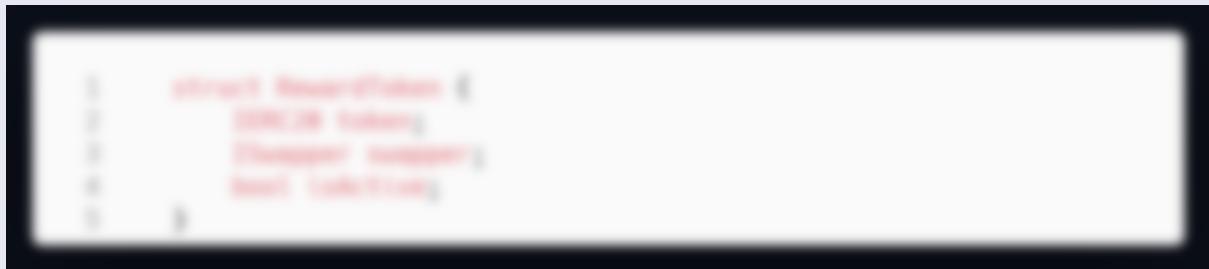


|          |  |
|----------|--|
| LOCATION | TwistedNodes.sol -> 259-259  |
|          | A screenshot of a code editor showing a line of Solidity code. The word 'debt' is highlighted with a red underline, indicating a potential issue or error. |

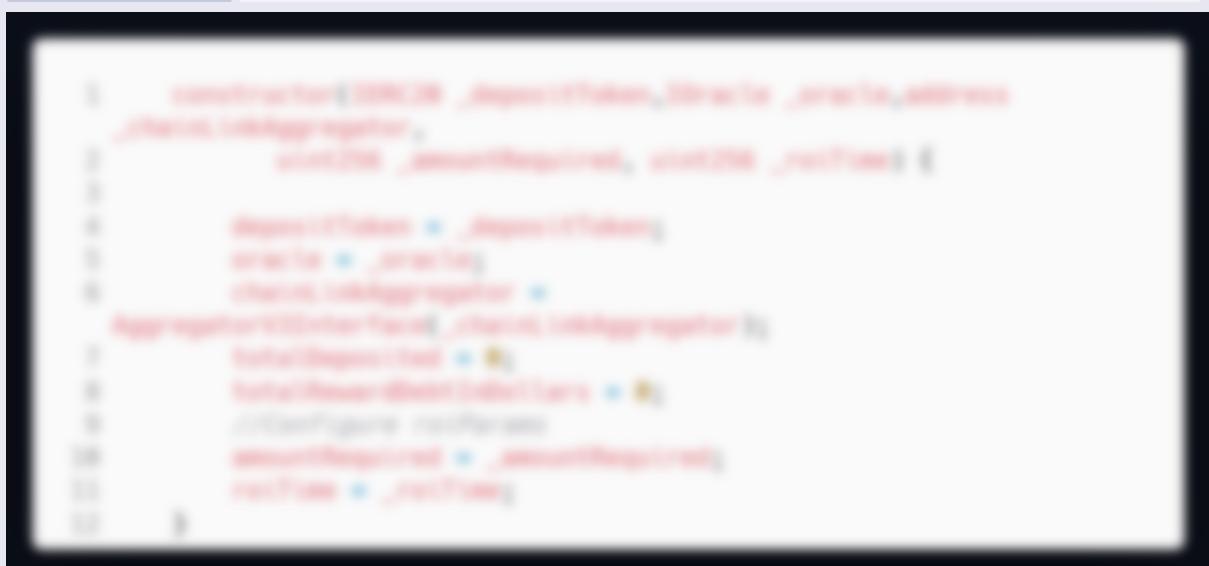
|                |   |
|----------------|---|
| DESCRIPTION    | <p>There are no guarantees that the contract will have USDC funds to pay out any rewards.</p> <p>Even if there are initial funds to pay the current debt, as USDC is paid out, the total debt is decreased (line 259) and new investors can invest and therefore require a steady external supply of USDC.</p> <p>This contract needs an external supplier of USDC. There is no guarantee that any was USDC supplied.</p> |
| RECOMMENDATION | Add a mechanism to ensure that sufficient USDC is available.  |
| RESOLUTION     | Project team implemented the recommended fix.   |

## External Dependencies

|            |                           |
|------------|---------------------------|
| FINDING ID | #0003                     |
| SEVERITY   | High Risk                 |
| STATUS     | Partially Closed          |
| LOCATION   | TwistedNodes.sol -> 40-44 |



LOCATION TwistedNodes.sol -> 64-74



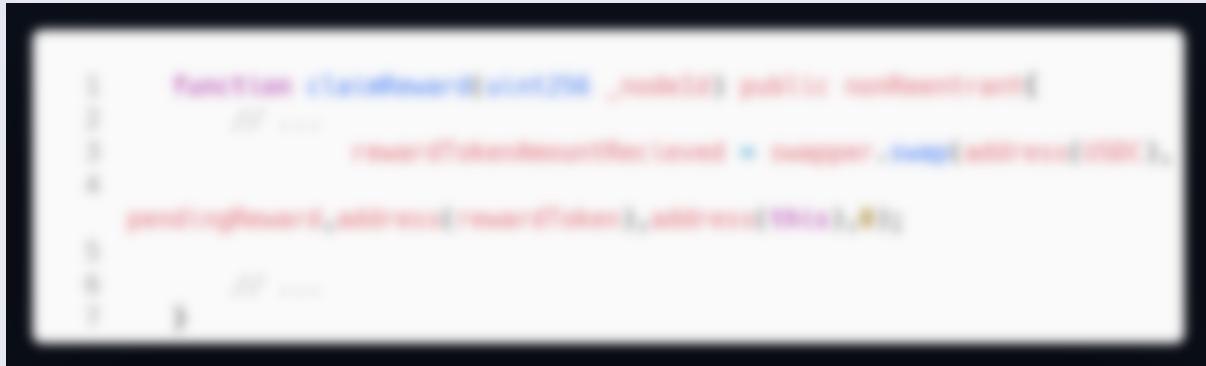
|                |   |
|----------------|---|
| DESCRIPTION    | The swapper contract and oracle contract is currently unknown and obelisk has not received these contracts.<br><br>Conventional behavior is assumed but not guaranteed. Unexpected behavior could be used to steal rewards and deposits.                |
| RECOMMENDATION | Ensure that 3rd party contracts behave correctly.   |
| RESOLUTION     | The external dependencies have been looked at and currently, they need to be locked down as users' deposits are locked for a long time. An alternative is making the user able to change the swapper and oracle themselves in case migration is needed. |

External contracts can be changed without delay, see finding #17.

Project team comment: "*we will be adding timelocks in the future to the contract.*"

## No Protection From Sandwich Attacks

|            |                             |
|------------|-----------------------------|
| FINDING ID | #0004                       |
| SEVERITY   | Medium Risk                 |
| STATUS     | Closed                      |
| LOCATION   | TwistedNodes.sol -> 225-278 |



|                |   |
|----------------|---|
| DESCRIPTION    | The estimate and swap of the rewards happen at transaction time. Thus the price of tokens is directly related to the current price. A malicious actor could front-run big reward claims and manipulate the pool in a sandwich attack. |
| RECOMMENDATION | Allow the user to input the current value of an estimated swap when sending the transaction and or use an oracle to acquire a fairly accurate price.  |
| RESOLUTION     | A min amount parameter was added to add protection against sandwich attacks.  |

## Contract Might Underflow And Revert

|            |                             |
|------------|-----------------------------|
| FINDING ID | #0005                       |
| SEVERITY   | Medium Risk                 |
| STATUS     | Closed                      |
| LOCATION   | TwistedNodes.sol -> 336-356 |



### DESCRIPTION

If *rewardPaidInDollars* or *rewardPaidInToken* is more than *riskFreeValueUSDC* then the contract will revert.

If it is 0, then it would also have been 0 in the calculation. Thus these two if statements are unnecessary when solidity 0.8 is used.

For example: Suppose a user claimed 9/10 of their *riskFreeValueUSDC* in tokens and then the token value increases so that the claimed amount is worth more than the *riskFreeValueUSDC*. The contract will revert until the

|                |  |
|----------------|--|
|                | value drops enough for another withdrawal.   |
| RECOMMENDATION | Instead calculate $rewardPaidInDollars > riskFreeValueUSDC$ and the equivalent $rewardPaidInToken > riskFreeValueUSDC$ . |
| RESOLUTION     | The project team implemented the recommended fix.  |

## Fetched WETH Address Can Be Freeze Rewards

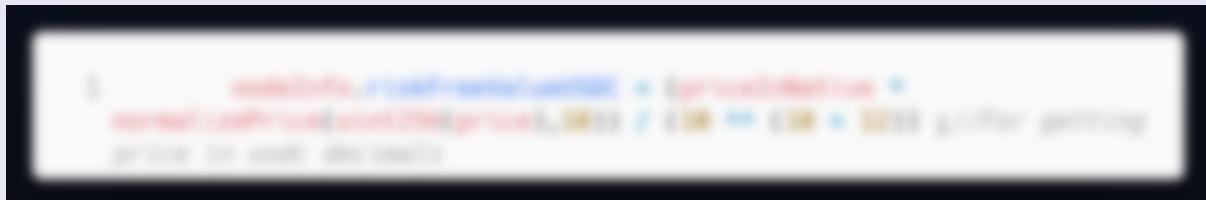
|            |                             |
|------------|-----------------------------|
| FINDING ID | #0006                       |
| SEVERITY   | Medium Risk                 |
| STATUS     | Closed                      |
| LOCATION   | TwistedNodes.sol -> 267-271 |



|                |   |
|----------------|---|
| DESCRIPTION    | <p>The swapper contract can change the address of WETH and force a revert or other behavior when calling <i>withdraw</i>.</p> <p>Even if the swapper is static the operator can disable the reward token and force the use of a new reward token with a different swapper contract.</p> |
| RECOMMENDATION | Set a constant or immutable WETH address at compile time.   |
| RESOLUTION     | The project team added a native wrapped token as a constant variable.   |

## Token Decimals Are Assumed

|            |                         |
|------------|-------------------------|
| FINDING ID | #0007                   |
| SEVERITY   | Low Risk                |
| STATUS     | Closed                  |
| LOCATION   | TwistedNodes.sol -> 173 |



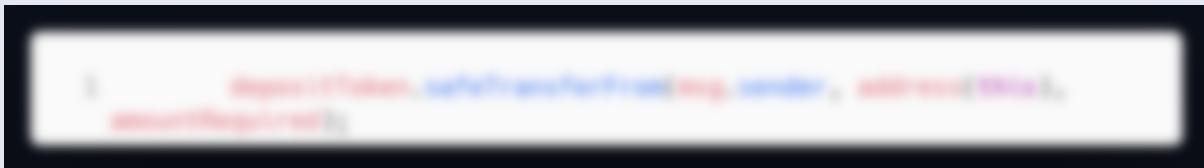
|          |                             |
|----------|-----------------------------|
| LOCATION | TwistedNodes.sol -> 359-375 |
|----------|-----------------------------|



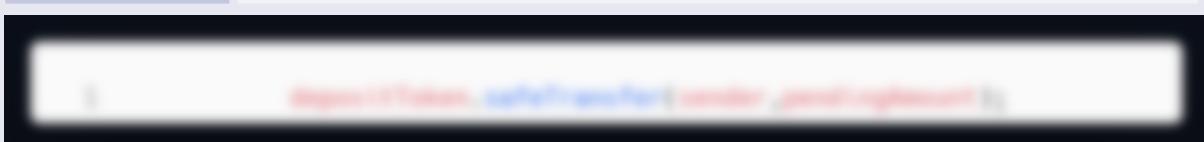
|                |  |
|----------------|--|
| DESCRIPTION    | Token prices are normalized to use hard-coded decimal places. This can lead to unexpected calculation results in tokens that use a different number of decimals. |
| RECOMMENDATION | Remove the hard-coded assumptions and query tokens for their decimals.   |
| RESOLUTION     | The project team now fetches the decimals.<br><br>The fetching of decimals can be done once in the constructor and stored as an immutable variable.              |

## Tokens With Transfer Fee Not Supported

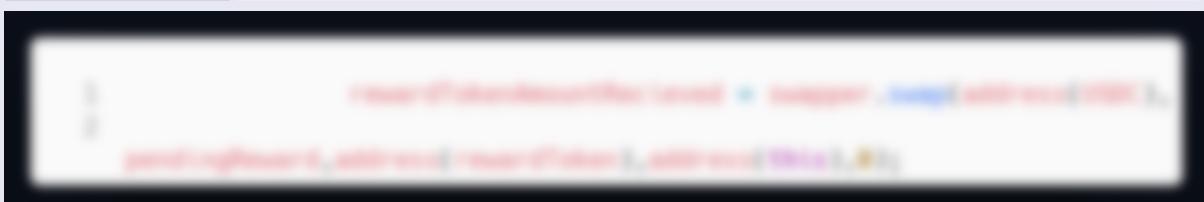
|            |                         |
|------------|-------------------------|
| FINDING ID | #0008                   |
| SEVERITY   | Low Risk                |
| STATUS     | Closed                  |
| LOCATION   | TwistedNodes.sol -> 157 |



|          |   |
|----------|---|
| LOCATION | TwistedNodes.sol -> 210   |
|          | A screenshot of a code editor displaying a line of Solidity code. The code includes several tokens and a transfer operation. The tokens are highlighted in red, blue, and green, while the transfer operation is highlighted in yellow. |



|          |   |
|----------|---|
| LOCATION | TwistedNodes.sol -> 253-254   |
|          | A screenshot of a code editor displaying a line of Solidity code. The code includes several tokens and a transfer operation. The tokens are highlighted in red, blue, and green, while the transfer operation is highlighted in yellow. |



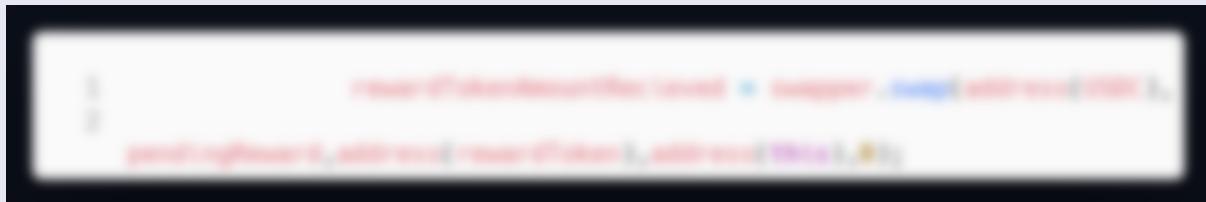
|          |   |
|----------|---|
| LOCATION | TwistedNodes.sol -> 274   |
|          | A screenshot of a code editor displaying a line of Solidity code. The code includes several tokens and a transfer operation. The tokens are highlighted in red, blue, and green, while the transfer operation is highlighted in yellow. |



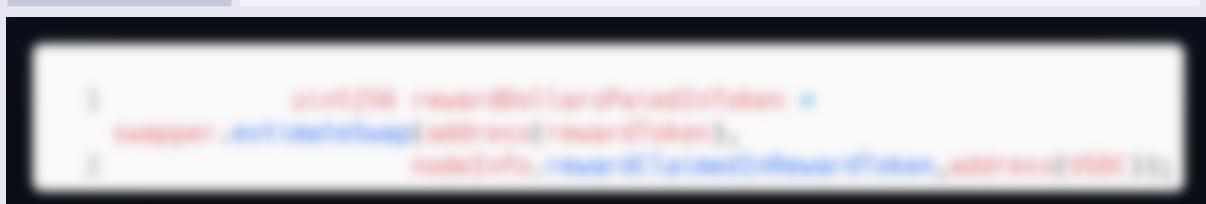
|                |  |
|----------------|--|
| DESCRIPTION    | The contract does not support tokens with a transfer fee as it assumes all transfers to transfer 100% of tokens. |
| RECOMMENDATION | Make sure tokens with transfer fees aren't added.  |
| RESOLUTION     | The contract was modified to allow for the withdrawal of a transfer fee token.                                   |

## Estimate Swap Estimates Price After Swap

|            |                             |
|------------|-----------------------------|
| FINDING ID | #0009                       |
| SEVERITY   | Low Risk                    |
| STATUS     | Open                        |
| LOCATION   | TwistedNodes.sol -> 253-254 |



LOCATION TwistedNodes.sol -> 261-262



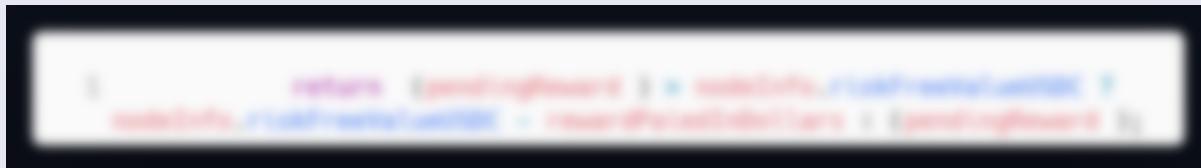
DESCRIPTION After a swap is made the price will have changed. Thus the node owner will receive just a bit less because of the previous swap(in USD).  
For a low-volume token, this difference will be greater.

RECOMMENDATION Instead of estimating after the swap, use the amount swapped.

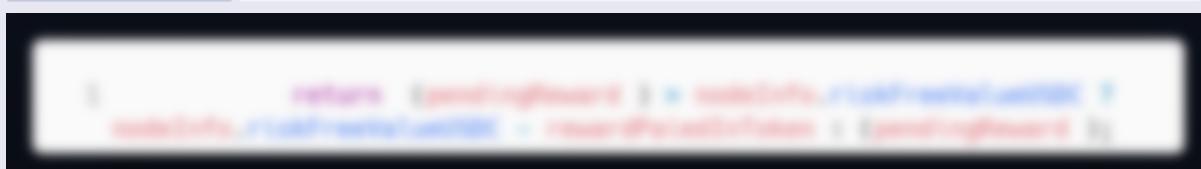
RESOLUTION N/A

## Unnecessary Code

|            |                         |
|------------|-------------------------|
| FINDING ID | #0010                   |
| SEVERITY   | Informational           |
| STATUS     | Closed                  |
| LOCATION   | TwistedNodes.sol -> 326 |



|          |  |
|----------|--|
| LOCATION | TwistedNodes.sol -> 332  |
|          | A screenshot of a code editor showing a line of code with several return statements highlighted in red. The code appears to be in Solidity, and the highlighted lines indicate unnecessary or redundant logic. |



|                |   |
|----------------|---|
| DESCRIPTION    | <p>The noted return statements are in effect a min of <i>pendingReward</i> and <i>riskFreeValueUSDC</i>.</p> <p>Note that in the current implementation, <i>pendingReward</i> will always be the lesser of the values. <i>claimPerSec</i> is the total reward time so at most, <i>pendingReward</i> should be the same as <i>riskFreeValueUSDC</i>.</p> |
| RECOMMENDATION | Simplify the code to reduce complexity and the possibility of calculation errors.   |
| RESOLUTION     | Project team has removed the code.  |

## Underflow Causing Locked Assets

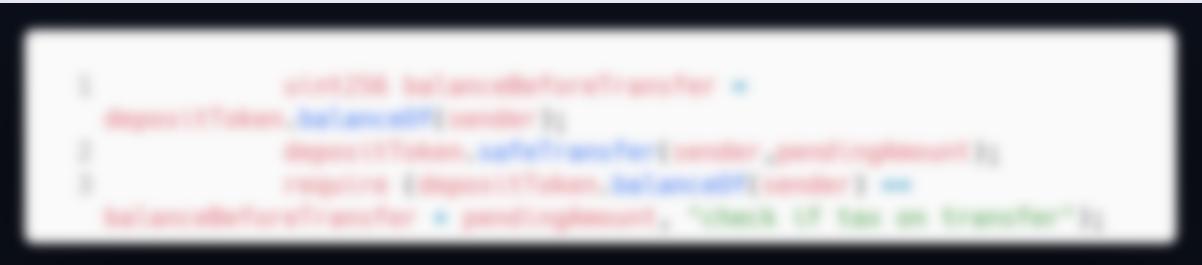
|            |                                    |
|------------|------------------------------------|
| FINDING ID | #0011                              |
| SEVERITY   | High Risk                          |
| STATUS     | Closed                             |
| LOCATION   | rev2 - TwistedNodes.sol -> 256-265 |



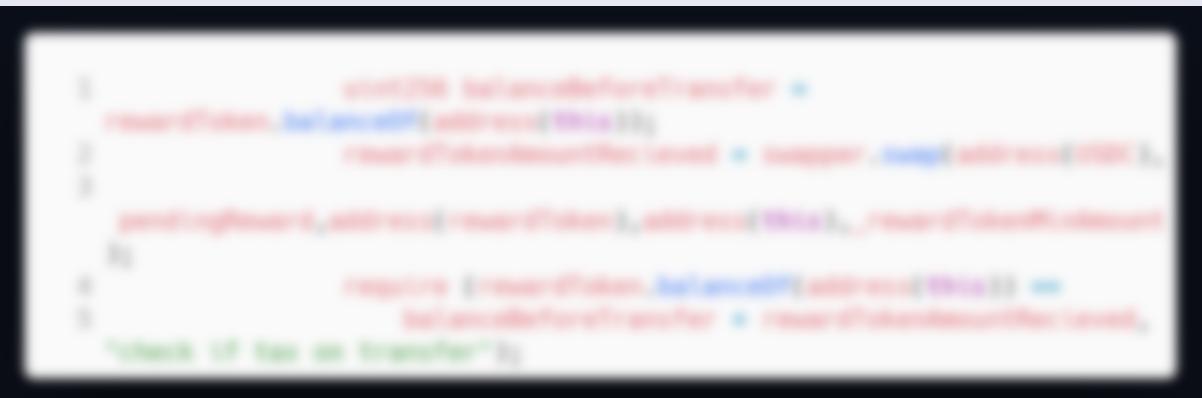
|                |   |
|----------------|---|
| DESCRIPTION    | <p><i>totalRewardDebtInDollars</i> is decremented twice: First with the <i>pendingReward</i> and then again for the whole amount when the node is retired. <i>pendingReward</i> should be the only thing to decrement.</p> <p>When enough users have retired their nodes the claiming will revert as <i>totalRewardDebtInDollars</i> will underflow. Because the claiming as a node is retired has 2x the impact on <i>totalRewardDebtInDollars</i> the forever locked funds amount will increase as more people deposit and claim rewards.</p> |
| RECOMMENDATION | Use <i>nodeInfo.rewardClaimedInDollars</i> and <i>nodeInfo.riskFreeValueUSDC</i> to remove the remaining on <i>totalRewardDebtInDollars</i> as the node is retired.   |
| RESOLUTION     | The project team has implemented the recommendation.  |

## Transfer Fee Can Freeze Assets

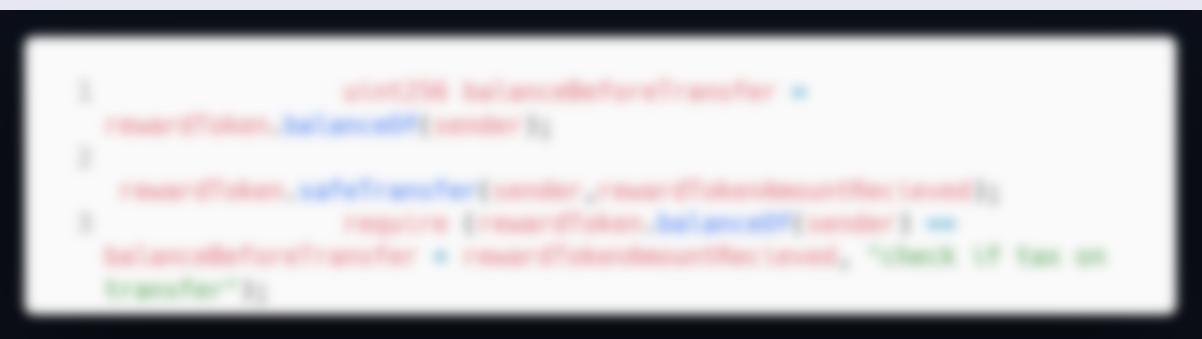
|            |                                    |
|------------|------------------------------------|
| FINDING ID | #0012                              |
| SEVERITY   | High Risk                          |
| STATUS     | Closed                             |
| LOCATION   | rev2 - TwistedNodes.sol -> 201-203 |



|          |                                    |
|----------|------------------------------------|
| LOCATION | rev2 - TwistedNodes.sol -> 246-250 |
|----------|------------------------------------|



|          |                                    |
|----------|------------------------------------|
| LOCATION | rev2 - TwistedNodes.sol -> 273-275 |
|----------|------------------------------------|



|             |   |
|-------------|---|
| DESCRIPTION | If a transfer fee token is deposited or used as a rewards token, then all attempts to claim rewards will fail as the require statement will not be satisfied.<br><br>This could occur as well if a transfer fee is enabled after a user deposits. |
|-------------|---|

|                |  |
|----------------|--|
| RECOMMENDATION | Remove the checks on the claim functions or add a parameter that bypasses the <i>require</i> statement on the claim functions. |
| RESOLUTION     | N/A  |

## Division Before Multiplication

|            |                                    |
|------------|------------------------------------|
| FINDING ID | #0013                              |
| SEVERITY   | High Risk                          |
| STATUS     | Closed                             |
| LOCATION   | rev3 - TwistedNodes.sol -> 316-327 |



```
function claim() public {
    uint256 claimPerSec = CLAIM_PER_SECOND / nodeLifespan;
    uint256 claim = claimPerSec * user.claimable;
    return claim;
}
```

|                |  |
|----------------|--|
| DESCRIPTION    | The calculations noted use mixed orders of multiplication and division.<br><br><i>claimPerSec</i> in some cases will round down to 0. However, the users would be able to claim after the whole node lifespan. |
| RECOMMENDATION | Change the calculations to first multiply, then divide.  |
| RESOLUTION     | The team fixed the order of operations.<br><br>Users might earn a bit less within the lifespan of the node. See #14.   |

## Rounding Error Reduces Rewards

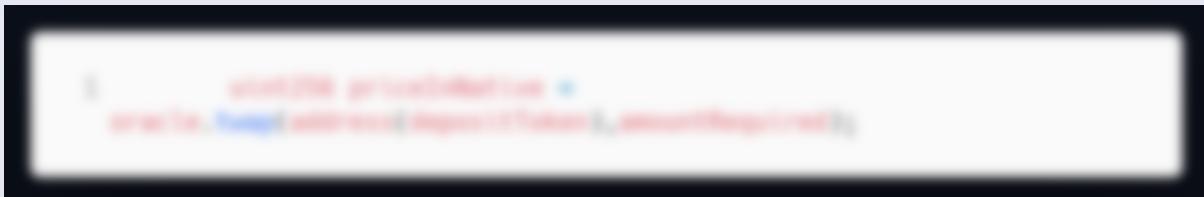
|            |                                    |
|------------|------------------------------------|
| FINDING ID | #0014                              |
| SEVERITY   | Informational                      |
| STATUS     | Open                               |
| LOCATION   | rev4 - TwistedNodes.sol -> 316-327 |



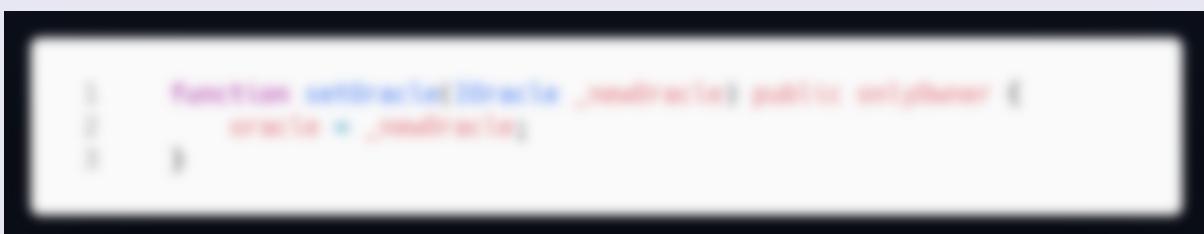
|                |   |
|----------------|---|
| DESCRIPTION    | The reward calculation causes a rounding error which leaves some tokens undistributed. However, the users would be able to claim after the whole node lifespan. |
| RECOMMENDATION | Fix the rounding error to ensure tokens are correctly distributed.  |
| RESOLUTION     | N/A   |

## Oracle Can Be Changed

|            |                                 |
|------------|---------------------------------|
| FINDING ID | #0015                           |
| SEVERITY   | Low Risk                        |
| STATUS     | Open                            |
| LOCATION   | rev-5 - TwistedNodes.sol -> 169 |



|          |                                     |
|----------|-------------------------------------|
| LOCATION | rev-5 - TwistedNodes.sol -> 402-405 |
|----------|-------------------------------------|



|                |   |
|----------------|---|
| DESCRIPTION    | On a deposit the <i>oracle.twap</i> is called to check the price of the deposit token. If a malicious actor has the Owner role, they could frontrun a deposit and switch out the oracle to a malicious one. This could cause the depositor to lose their funds. |
| RECOMMENDATION | Add a <i>require</i> statement with a minimum amount of input from the user. Alternatively, add a timelock to safeguard against manipulation of the oracle.   |
| RESOLUTION     | No timelock was added to the deployed contract. See finding #17.  |

## Rounding Error Reduces Rewards

|            |                                     |
|------------|-------------------------------------|
| FINDING ID | #0016                               |
| SEVERITY   | Informational                       |
| STATUS     | Open                                |
| LOCATION   | rev-5 - TwistedNodes.sol -> 227-282 |



|                |  |
|----------------|--|
| DESCRIPTION    | A Node is only retired after a claim is called. This can become an issue when previously paid tokens have gone up in price.<br><br>In such a case, a user has no incentive to claim and retire their node. Because the total debt of the contract won't decrease if the token ever goes down in price they could claim the rest of the unclaimed USDC amount. This could give certain users an unintended advantage. |
| RECOMMENDATION | Provide contract information to all users to remove unintended advantages.   |
| RESOLUTION     | N/A  |

# On-Chain Analysis

## No Timelock

|                |  |
|----------------|--|
| FINDING ID     | #0017  |
| SEVERITY       | High Risk  |
| STATUS         | Open   |
| LOCATION       | MEDIUM NODES:<br><a href="#">0x525ca3877a78c6AE12292D0a55765775e3943379</a><br><br>SMELT - WFTM Uniswap Oracle<br><a href="#">0x5E92ccb0Bd8071B9793f23eB4D7F3b818aE59536</a>   |
| DESCRIPTION    | <p>The noted contracts have not had their ownership transferred to the timelock contract.</p> <p>A malicious actor as the contract owner can change the chainlink price feed and oracle addresses. This can be used to cause deposits to be recorded as zero, or to prevent the withdrawal of any rewards.</p> <p>Additionally, the connected uniswap oracle does not have a timelock, which can allow its period to be manipulated to use out-of-date prices. This can have a similar but reduced effect.</p> |
| RECOMMENDATION | Add a timelock to the contracts.   |
| RESOLUTION     | Project team comment: " <i>we will be adding timelocks in the future to the contract.</i> "  |

## Swapper Contract Is Unverified

|            |   |
|------------|---|
| FINDING ID | #0018   |
| SEVERITY   | Medium Risk   |
| STATUS     | Open  |
| LOCATION   | Swapper<br><a href="#">0x63A8e53DbD8fbf08DfA9A92d550468DaF62f65b1</a> |

|                |  |
|----------------|--|
| DESCRIPTION    | <p>The swapper contract was not verified on chain. As a result, its functionality could not be confirmed.</p> <p>This contract is used to convert all rewards to the user's specified reward token. If the swapper contract is attacked, or malfunctions, it can lead to the loss of expected rewards.</p> |
| RECOMMENDATION | Verify the contract on the chain.  |
| RESOLUTION     | N/A  |

# External Addresses

## Externally Owned Accounts

Owner/Operator

|         |   |
|---------|---|
| ACCOUNT | <a href="#">0xB9B22504b9071291E938E0E582934A82C4a4670c</a>  |
| USAGE   | <a href="#">0x525ca3877a78c6AE12292D0a55765775e3943379</a><br><i>TwistedNodes.owner</i> - Variable<br><i>TwistedNodes.operator</i> - Variable |
| IMPACT  | <ul style="list-style-type: none"><li>• receives elevated permissions as owner, operator, or other</li></ul>                                  |

## External Contracts

*These contracts are not part of the audit scope.*

### SMELT - WFTM Uniswap Oracle

|         |  |
|---------|--|
| ADDRESS | <a href="#">0x5E92ccb0Bd8071B9793f23eB4D7F3b818aE59536</a>   |
| USAGE   | <a href="#">0x525ca3877a78c6AE12292D0a55765775e3943379</a><br><i>TwistedNodes.oracle</i> - Variable                      |
| IMPACT  | <ul style="list-style-type: none"><li>• Uniswap Oracle</li><li>• impacts ability to deposit or withdraw tokens</li></ul> |

### FTM / USD Chainlink price feed

|         |   |
|---------|---|
| ADDRESS | <a href="#">0xf4766552d15ae4d256ad41b6cf2933482b0680dc</a>  |
| USAGE   | <a href="#">0x525ca3877a78c6AE12292D0a55765775e3943379</a><br><i>TwistedNodes.chainLinkAggregator</i> - Variable      |
| IMPACT  | <ul style="list-style-type: none"><li>• ERC20 Token</li><li>• impacts ability to deposit or withdraw tokens</li></ul> |

### Swapper

|         |  |
|---------|--|
| ADDRESS | <a href="#">0x63A8e53DbD8fbf08DfA9A92d550468DaF62f65b1</a>   |
| USAGE   | <a href="#">0x525ca3877a78c6AE12292D0a55765775e3943379</a><br><i>TwistedNodes.rewardTokens[x].swapper</i> - Variable (no setter) |
| IMPACT  | <ul style="list-style-type: none"><li>• receives transfer of tokens deposited or minted by project</li></ul>                     |

## External Tokens

*These contracts are not part of the audit scope.*

### SMLET

|         |  |
|---------|--|
| ADDRESS | 0x141FaA507855E56396EAdBD25EC82656755CD61e   |
| USAGE   | <a href="#"><u>0x525ca3877a78c6AE12292D0a55765775e3943379</u></a><br><i>TwistedNodes.depositToken</i> - Variable (no setter)<br><i>TwistedNodes.rewardTokens[2].token</i> - Variable (no setter) |
| IMPACT  | <ul style="list-style-type: none"><li>• ERC20 Token</li></ul>  |

### USDC

|         |  |
|---------|--|
| ADDRESS | 0x04068DA6C83AFCFA0e13ba15A6696662335D5B75   |
| USAGE   | <a href="#"><u>0x525ca3877a78c6AE12292D0a55765775e3943379</u></a><br><i>TwistedNodes.USDC</i> - Variable (no setter)<br><i>TwistedNodes.rewardTokens[1].token</i> - Variable (no setter) |
| IMPACT  | <ul style="list-style-type: none"><li>• ERC20 Token</li></ul>  |

### Wrapped Ether

|         |  |
|---------|--|
| ADDRESS | 0x21be370D5312f44cB42ce377BC9b8a0cEF1A4C83   |
| USAGE   | <a href="#"><u>0x525ca3877a78c6AE12292D0a55765775e3943379</u></a><br><i>TwistedNodes.WETH</i> - Constant<br><i>TwistedNodes.rewardTokens[0].token</i> - Variable (no setter) |
| IMPACT  | <ul style="list-style-type: none"><li>• ERC20 Token</li></ul>  |

# Appendix A - Reviewed Documents

## Deployed Contracts

| Document     | Address  |
|--------------|--|
| TwistedNodes | <a href="#">0x525ca3877a78c6AE12292D0a55765775e3943379</a> |

## Libraries And Interfaces

```
interfaces/IOracle.sol  
interfaces/ISwapper.sol  
interfaces/IUniswapV2Router.sol  
interfaces/IWeth.sol  
lib/TransferHelper.sol  
owner/TwistedNodes.sol
```

## Revisions

|            |  |
|------------|--|
| Revision 1 | d94aa38596305a189b62cedf54077ca7ff930625 |
| Revision 2 | 9e39284ad51073f6d16e5981ee4696f3bd6cb7c2 |
| Revision 3 | 7388ff3c6b678db4371af6165b43ee6248415814 |
| Revision 4 | 9fa4534f9263537c768667a1cf0e3512bf3c84b5 |
| Revision 5 | d940b6caf30072a61a7da0352aa8e27c712255ec |

## Imported Contracts

|              |       |
|--------------|-------|
| OpenZeppelin | 4.5.0 |
| Chainlink    | 0.4.0 |

## Appendix B - Risk Ratings

| Risk          | Description   |
|---------------|---|
| High Risk     | Security risks that are <b>almost certain</b> to lead to <b>impairment or loss of funds</b> . Projects are advised to fix as soon as possible.  |
| Medium Risk   | Security risks that are <b>very likely</b> to lead to <b>impairment or loss of funds</b> with <b>limited impact</b> . Projects are advised to fix as soon as possible.                          |
| Low Risk      | Security risks that can lead to <b>damage to the protocol</b> . Projects are advised to fix. Issues with this rating might be used in an exploit with other issues to cause significant damage. |
| Informational | Noteworthy information. Issues may include code conventions, missing or conflicting information, gas optimizations, and other advisories.   |

## Appendix C - Finding Statuses

|                     |   |
|---------------------|---|
| Closed              | Contracts were modified to permanently resolve the finding.   |
| Mitigated           | The finding was resolved on-chain. The issue may require monitoring, for example in the case of a time lock.  |
| Partially Closed    | Contracts were modified to partially fix the issue  |
| Partially Mitigated | The finding was resolved by project specific methods which cannot be verified on chain. Examples include compounding at a given frequency, or the use of a multisig wallet. |
| Open                | The finding was not addressed.  |

# Appendix D - Glossary

## Contract Structure

**Contract:** An address with which provides functionality to users and other contracts. They are implemented in code and deployed to the blockchain.

**Protocol:** A system of contracts which work together.

**Stakeholders:** The users, operators, owners, and other participants of a contract.

## Security Concepts

**Bug:** A defect in the contract code.

**Exploit:** A chain of events involving bugs, vulnerabilities, or other security risks which damages a protocol.

**Funds:** Tokens deposited by users or other stakeholders into a protocol.

**Impairment:** The loss of functionality in a contract or protocol.

**Security risk:** A circumstance that may result in harm to the stakeholders of a protocol. Examples include vulnerabilities in the code, bugs, excessive permissions, missing timelock, etc.

**Vulnerability:** A vulnerability is a flaw that allows an attacker to potentially cause harm to the stakeholders of a contract. They may occur in a contract's code, design, or deployed state on the blockchain.

# Appendix E - Audit Procedure

A typical Obelisk audit uses a combination of the three following methods:

**Manual analysis** consists of a direct inspection of the contracts to identify any security issues. Obelisk auditors use their experience in software development to spot vulnerabilities. Their familiarity with common contracts allows them to identify a wide range of issues in both forked contracts as well as original code.

**Static analysis** is software analysis of the contracts. Such analysis is called “static” as it examines the code outside of a runtime environment. Static analysis is a powerful tool used by auditors to identify subtle issues and to verify the results of manual analysis.

**On-chain analysis** is the audit of the contracts as they are deployed on the block-chain. This procedure verifies that:

- deployed contracts match those which were audited in manual/static analysis;
- contract values are set to reasonable values;
- contracts are connected so that interdependent contract function correctly;
- and the ability to modify contract values is restricted via a timelock or DAO mechanism. (We recommend a timelock value of at least 72 hours)

Each obelisk audit is performed by at least two independent auditors who perform their analysis separately.

After the analysis is complete, the auditors will make recommendations for each issue based on best practice and industry standards. The project team can then resolve the issues, and the auditors will verify that the issues have been resolved with no new issues introduced.

Our auditing method lays a particular focus on the following important concepts:

- Quality code and the use of best practices, industry standards, and thoroughly tested libraries.
- Testing the contract from different angles to ensure that it works under a multitude of circumstances.
- Referencing the contracts through databases of common security flaws.

## Follow Obelisk Auditing for the Latest Information



ObeliskOrg



ObeliskOrg



Part of Tibereum Group