



**TechRate**  
AUDIT COMPANY

# Smart Contract Security Audit

TechRate

July, 2021

# Audit Details



Audited project

**MoonWave**



Deployer address

**0x2301706CC6dE1cc4aC2387E4a4DfCEe14dA55b1d**



Client contacts:

**MoonWave team**



Blockchain

**Binance Smart Chain**



Project website:

**[moonwave.finance](https://moonwave.finance)**

# Disclaimer

This is a limited report on our findings based on our analysis, in accordance with good industry practice as at the date of this report, in relation to cybersecurity vulnerabilities and issues in the framework and algorithms based on smart contracts, the details of which are set out in this report. In order to get a full view of our analysis, it is crucial for you to read the full report. While we have done our best in conducting our analysis and producing this report, it is important to note that you should not rely on this report and cannot claim against us on the basis of what it says or doesn't say, or how we produced it, and it is important for you to conduct your own independent investigations before making any decisions. We go into more detail on this in the below disclaimer below – please make sure to read it in full.

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The analysis of the security is purely based on the smart contracts alone. No applications or operations were reviewed for security. No product code has been reviewed.

# Background

TechRate was commissioned by MoonWave to perform an audit of smart contracts:

<https://bscscan.com/address/0xc5cf731137151f7f0806a84f107355807ce1e018#code>

The purpose of the audit was to achieve the following:

- Ensure that the smart contract functions as intended.
- Identify potential security issues with the smart contract.

The information in this report should be used to understand the risk exposure of the smart contract, and as a guide to improve the security posture of the smart contract by remediating the issues that were identified.

# Contracts Details

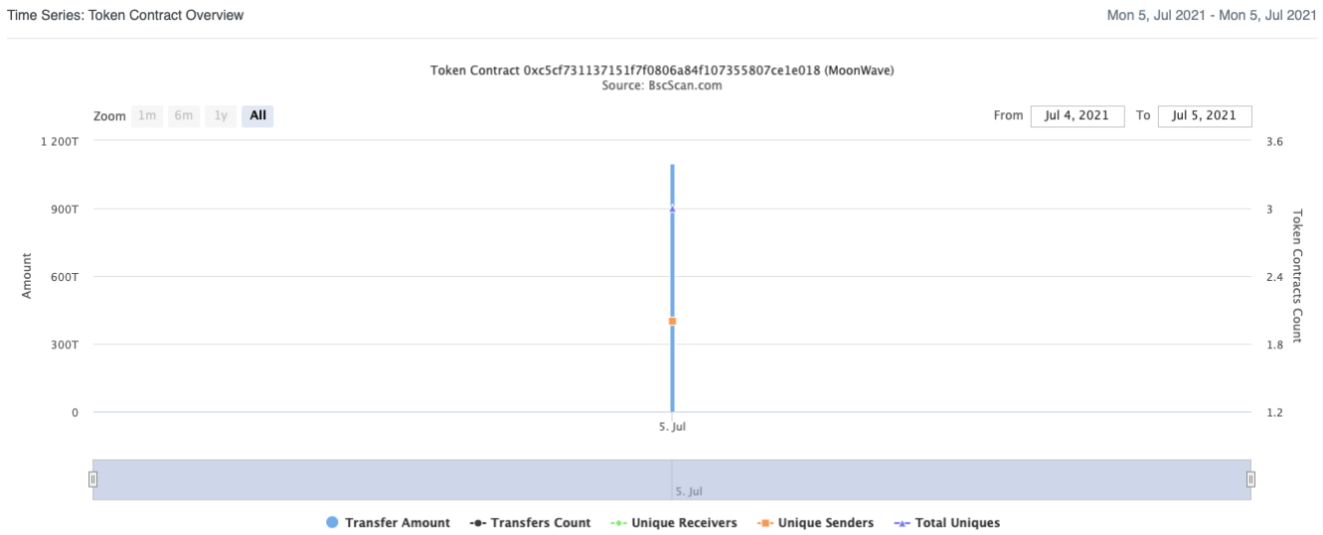
## Token contract details for 10.07.2021

|                                  |  |
|----------------------------------|--|
| Contract name                    | MoonWave                                   |
| Contract address                 | 0xc5cF731137151F7f0806A84f107355807ce1E018 |
| Total supply                     | 1,000,000,000,000,000                      |
| Token ticker                     | \$wAve                                     |
| Decimals                         | 9  |
| Token holders                    | 2  |
| Transactions count               | 2  |
| Top 100 holders dominance        | 100.00%                                    |
| Liquidity fee                    | 9  |
| Tax fee                          | 2  |
| Total fees                       | 0  |
| Uniswap V2 pair                  | 0x44e9174f9f488efc1471c277d6a1e2eeaad70222 |
| Contract deployer address        | 0x2301706CC6dE1cc4aC2387E4a4DfCEe14dA55b1d |
| Contract's current owner address | 0x2301706cc6de1cc4ac2387e4a4dfcee14da55b1d |

# MoonWave Token Distribution



# MoonWave Contract Interaction Details



# MoonWave Top 10 Token Holders

| Rank | Address  | Quantity (Token)    | Percentage |
|------|--|---------------------|------------|
| 1    | <a href="#">0x2301706cc6de1cc4ac2387e4a4dfcee14da55b1d</a> | 900,000,000,000,000 | 90.0000%   |
| 2    | <a href="#">Burn Address</a>                               | 100,000,000,000,000 | 10.0000%   |





# Contract functions details

## + Context

- [Int] \_msgSender
- [Int] \_msgData

## + [Int] IERC20

- [Ext] totalSupply
- [Ext] balanceOf
- [Ext] transfer #
- [Ext] allowance
- [Ext] approve #
- [Ext] transferFrom #

## + [Lib] SafeMath

- [Int] add
- [Int] sub
- [Int] sub
- [Int] mul
- [Int] div
- [Int] div
- [Int] mod
- [Int] mod

## + [Lib] Address

- [Int] isContract
- [Int] sendValue #
- [Int] functionCall #
- [Int] functionCall #
- [Int] functionCallWithValue #
- [Int] functionCallWithValue #
- [Prv] \_functionCallWithValue #

## + Ownable (Context)

- [Pub] <Constructor> #
- [Pub] owner
- [Pub] renounceOwnership #
  - modifiers: onlyOwner
- [Pub] transferOwnership #
  - modifiers: onlyOwner
- [Pub] getUnlockTime
- [Pub] getTime
- [Pub] lock #
  - modifiers: onlyOwner
- [Pub] unlock #

## + [Int] IUniswapV2Factory

- [Ext] feeTo
- [Ext] feeToSetter
- [Ext] getPair
- [Ext] allPairs
- [Ext] allPairsLength
- [Ext] createPair #



- [Ext] setFeeTo #
- [Ext] setFeeToSetter #

+ [Int] IUniswapV2Pair

- [Ext] name
- [Ext] symbol
- [Ext] decimals
- [Ext] totalSupply
- [Ext] balanceOf
- [Ext] allowance
- [Ext] approve #
- [Ext] transfer #
- [Ext] transferFrom #
- [Ext] DOMAIN\_SEPARATOR
- [Ext] PERMIT\_TYPEHASH
- [Ext] nonces
- [Ext] permit #
- [Ext] MINIMUM\_LIQUIDITY
- [Ext] factory
- [Ext] token0
- [Ext] token1
- [Ext] getReserves
- [Ext] price0CumulativeLast
- [Ext] price1CumulativeLast
- [Ext] kLast
- [Ext] burn #
- [Ext] swap #
- [Ext] skim #
- [Ext] sync #
- [Ext] initialize #

+ [Int] IUniswapV2Router01

- [Ext] factory
- [Ext] WETH
- [Ext] addLiquidity #
- [Ext] addLiquidityETH (\$)
- [Ext] removeLiquidity #
- [Ext] removeLiquidityETH #
- [Ext] removeLiquidityWithPermit #
- [Ext] removeLiquidityETHWithPermit #
- [Ext] swapExactTokensForTokens #
- [Ext] swapTokensForExactTokens #
- [Ext] swapExactETHForTokens (\$)
- [Ext] swapTokensForExactETH #
- [Ext] swapExactTokensForETH #
- [Ext] swapETHForExactTokens (\$)
- [Ext] quote
- [Ext] getAmountOut
- [Ext] getAmountIn
- [Ext] getAmountsOut
- [Ext] getAmountsIn

+ [Int] IUniswapV2Router02 (IUniswapV2Router01)

- [Ext] removeLiquidityETHSupportingFeeOnTransferTokens #
- [Ext] removeLiquidityETHWithPermitSupportingFeeOnTransferTokens #

- [Ext] swapExactTokensForTokensSupportingFeeOnTransferTokens #
- [Ext] swapExactETHForTokensSupportingFeeOnTransferTokens (\$)
- [Ext] swapExactTokensForETHSupportingFeeOnTransferTokens #

+ moonwave (Context, IERC20, Ownable)

- [Pub] <Constructor> #
- [Pub] name
- [Pub] symbol
- [Pub] decimals
- [Pub] totalSupply
- [Pub] balanceOf
- [Pub] transfer #
- [Pub] allowance
- [Pub] approve #
- [Pub] transferFrom #
- [Pub] increaseAllowance #
- [Pub] decreaseAllowance #
- [Pub] isExcludedFromReward
- [Pub] totalFees
- [Pub] minimumTokensBeforeSwapAmount
- [Pub] buyBackUpperLimitAmount
- [Pub] deliver #
- [Pub] reflectionFromToken
- [Pub] tokenFromReflection
- [Pub] excludeFromReward #
  - modifiers: onlyOwner
- [Ext] includeInReward #
  - modifiers: onlyOwner
- [Prv] \_approve #
- [Prv] \_transfer #
- [Prv] swapTokens #
  - modifiers: lockTheSwap
- [Prv] buyBackTokens #
  - modifiers: lockTheSwap
- [Prv] swapTokensForEth #
- [Prv] swapETHForTokens #
- [Prv] addLiquidity #
- [Prv] \_tokenTransfer #
- [Prv] \_transferStandard #
- [Prv] \_transferToExcluded #
- [Prv] \_transferFromExcluded #
- [Prv] \_transferBothExcluded #
- [Prv] \_reflectFee #
- [Prv] \_getValues
- [Prv] \_getTValues
- [Prv] \_getRValues
- [Prv] \_getRate
- [Prv] \_getCurrentSupply
- [Prv] \_takeLiquidity #
- [Prv] calculateTaxFee
- [Prv] calculateLiquidityFee
- [Prv] removeAllFee #
- [Prv] restoreAllFee #
- [Pub] isExcludedFromFee
- [Pub] excludeFromFee #

- modifiers: onlyOwner
- [Pub] includeInFee #
  - modifiers: onlyOwner
- [Ext] setTaxFeePercent #
  - modifiers: onlyOwner
- [Ext] setLiquidityFeePercent #
  - modifiers: onlyOwner
- [Ext] setMaxTxAmount #
  - modifiers: onlyOwner
- [Ext] setMarketingDivisor #
  - modifiers: onlyOwner
- [Ext] setNumTokensSellToAddToLiquidity #
  - modifiers: onlyOwner
- [Ext] setBuybackUpperLimit #
  - modifiers: onlyOwner
- [Ext] setMarketingAddress #
  - modifiers: onlyOwner
- [Pub] setSwapAndLiquifyEnabled #
  - modifiers: onlyOwner
- [Pub] setBuyBackEnabled #
  - modifiers: onlyOwner
- [Ext] prepareForPreSale #
  - modifiers: onlyOwner
- [Ext] afterPreSale #
  - modifiers: onlyOwner
- [Prv] transferToAddressETH #
- [Ext] <Fallback> (\$)

(\$)= payable function

# = non-constant function

# Issues Checking Status

| Issue description  | Checking status |
|--|-----------------|
| 1. Compiler errors.  | Passed          |
| 2. Race conditions and Reentrancy. Cross-function race conditions. | Passed          |
| 3. Possible delays in data delivery.                               | Passed          |
| 4. Oracle calls.   | Passed          |
| 5. Front running.  | Passed          |
| 6. Timestamp dependence.   | Passed          |
| 7. Integer Overflow and Underflow.                                 | Passed          |
| 8. DoS with Revert.  | Passed          |
| 9. DoS with block gas limit.                                       | Low issues      |
| 10. Methods execution permissions.                                 | Passed          |
| 11. Economy model of the contract.                                 | Passed          |
| 12. The impact of the exchange rate on the logic.                  | Passed          |
| 13. Private user data leaks.                                       | Passed          |
| 14. Malicious Event log.   | Passed          |
| 15. Scoping and Declarations.                                      | Passed          |
| 16. Uninitialized storage pointers.                                | Passed          |
| 17. Arithmetic accuracy.   | Passed          |
| 18. Design Logic.  | Passed          |
| 19. Cross-function race conditions.                                | Passed          |
| 20. Safe Open Zeppelin contracts implementation and usage.         | Passed          |
| 21. Fallback function security.                                    | Passed          |

# Security Issues

## ✓ High Severity Issues

No high severity issues found.

## ✓ Medium Severity Issues

No medium severity issues found.

## ✓ Low Severity Issues

### 1. Out of gas

Issue:

- The function `includeInReward()` uses the loop to find and remove addresses from the `_excluded` list. Function will be aborted with `OUT_OF_GAS` exception if there will be a long excluded addresses list.

```
function includeInReward(address account) external onlyOwner() {
    require(!_isExcluded[account], "Account is already excluded");
    for (uint256 i = 0; i < _excluded.length; i++) {
        if (_excluded[i] == account) {
            _excluded[i] = _excluded[_excluded.length - 1];
            _tOwned[account] = 0;
            _isExcluded[account] = false;
            _excluded.pop();
            break;
        }
    }
}
```

- The function `_getCurrentSupply` also uses the loop for evaluating total supply. It also could be aborted with `OUT_OF_GAS` exception if there will be a long excluded addresses list.

```
function _getCurrentSupply() private view returns (uint256, uint256) {
    uint256 rSupply = _rTotal;
    uint256 tSupply = _tTotal;
    for (uint256 i = 0; i < _excluded.length; i++) {
        if (
            _rOwned[_excluded[i]] > rSupply ||
            _tOwned[_excluded[i]] > tSupply
        ) return (_rTotal, _tTotal);
        rSupply = rSupply.sub(_rOwned[_excluded[i]]);
        tSupply = tSupply.sub(_tOwned[_excluded[i]]);
    }
    if (rSupply < _rTotal.div(_tTotal)) return (_rTotal, _tTotal);
    return (rSupply, tSupply);
}
```

Recommendation:

Check that the excluded array length is not too big.

## Notes:

- addLiquidity function is not used.

## Owner privileges (In the period when the owner is not renounced)

- Owner can change tax and liquidity fees.

```
ftrace | funcSig
function setTaxFeePercent(uint256 taxFee↑) external onlyOwner() {
    _taxFee = taxFee↑;
}

ftrace | funcSig
function setLiquidityFeePercent(uint256 liquidityFee↑) external onlyOwner() {
    _liquidityFee = liquidityFee↑;
}
```

- Owner can change maximum transaction amount.

```
ftrace | funcSig
function setMaxTxAmount(uint256 maxTxAmount↑) external onlyOwner() {
    _maxTxAmount = maxTxAmount↑;
}
```

- Owner can exclude from the fee.

```
function excludeFromFee(address account↑) public onlyOwner {
    _isExcludedFromFee[account↑] = true;
}
```

- Owner can change marketingDivisor.

```
ftrace | funcSig
function setMarketingDivisor(uint256 divisor↑) external onlyOwner() {
    marketingDivisor = divisor↑;
}
```

- Owner can change minimum number of tokens to add to liquidity.

```
ftrace | funcSig
function setNumTokensSellToAddToLiquidity(uint256 _minimumTokensBeforeSwap↑) external onlyOwner() {
    minimumTokensBeforeSwap = _minimumTokensBeforeSwap↑;
}
```

- Owner can change buyBackUpperLimit.

```
ftrace | funcSig
function setBuybackUpperLimit(uint256 buyBackLimit↑) external onlyOwner() {
    buyBackUpperLimit = buyBackLimit↑ * 10**18;
}
```

- Owner can change marketing address.

```
ftrace | funcSig
function setMarketingAddress(address _marketingAddress↑) external onlyOwner() {
    marketingAddress = payable(_marketingAddress↑);
}
```

- Owner can enable and disable buyBack.

```
ftrace | funcSig
function setBuyBackEnabled(bool _enabled↑) public onlyOwner {
    buyBackEnabled = _enabled↑;
    emit BuyBackEnabledUpdated(_enabled↑);
}
```

- Owner can enable before and after presale modes.

```
ftrace | funcSig
function prepareForPreSale() external onlyOwner {
    setSwapAndLiquifyEnabled(false);
    _taxFee = 0;
    _liquidityFee = 0;
    _maxTxAmount = 1000000000 * 10**6 * 10**9;
}
```

```
ftrace | funcSig
function afterPreSale() external onlyOwner {
    setSwapAndLiquifyEnabled(true);
    _taxFee = 2;
    _liquidityFee = 9;
    _maxTxAmount = 3000000 * 10**6 * 10**9;
}
```



- Owner can lock and unlock. By the way, using these functions the owner could retake privileges even after the ownership was renounced.

```
function lock(uint256 time↑) public virtual onlyOwner {
    _previousOwner = _owner;
    _owner = address(0);
    _lockTime = block.timestamp + time↑;
    emit OwnershipTransferred(_owner, address(0));
}

function unlock() public virtual {
    require(_previousOwner == msg.sender, "You don't have permission to unlock");
    require(block.timestamp > _lockTime, "Contract is locked until 7 days");
    emit OwnershipTransferred(_owner, _previousOwner);
    _owner = _previousOwner;
}
```

# Conclusion

Smart contracts contain low severity issues! Liquidity pair contract's security is not checked due to out of scope. One third of the liquidity goes to marketing address. The further transfers and operations with the funds raise are not related to this particular contract.

**Liquidity locking details NOT provided by the team.**

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## *TechRate note:*

*Please check the disclaimer above and note, the audit makes no statements or warranties on business model, investment attractiveness or code sustainability. The report is provided for the only contract mentioned in the report and does not include any other potential contracts deployed by Owner.*



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