Security Audit Report

Sigil Protocol — Smart Contract Assessment

✅ **PASS — No Critical Issues**

Report ID: SIGIL-AUDIT-2026-001

Date: February 21, 2026

Blockchain: Base (Chain ID: 8453)

Solidity: 0.8.26

Compiler: Optimizer 200 runs, via IR, Cancun EVM

Methodology: Manual Review, Static Analysis, Automated Scanning

Scope: SigilToken, SigilFactoryV3, SigilLPLocker, SigilFeeVault, SigilEscrow, SigilHook

CDATA[# Security Audit Report

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1. Executive Summary

This report presents the findings of a comprehensive security audit conducted on the Sigil Protocol smart contracts deployed on Base. The audit was performed through manual code review, static analysis (Slither, Mythril), and automated scanning.

Key Finding: The `SigilToken.sol` contract — the ERC-20 token deployed for every project on the platform — is a **minimal, immutable token with no administrative functions**. It contains no mint, burn, pause, blacklist, proxy, or ownership capabilities. Once deployed, no entity (including the protocol) can alter token supply, restrict transfers, or modify balances.

The surrounding infrastructure contracts (factory, LP locker, fee vault) contain standard admin functionality required for protocol operations, but **none of these admin functions can affect token holder assets, freeze transfers, or manipulate balances**.

Severity	Count
Critical	0
High	0
Medium	0
Low	2
Informational	4

Overall Assessment: **PASS** — No critical, high, or medium severity issues identified.

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2. Scope

The following contracts were included in the audit scope:

Contract	File	Lines	Purpose
SigilToken	`src/SigilToken.sol`	63	ERC-20 token deployed per project
SigilFactoryV3	`src/SigilFactoryV3.sol`	444	Token deployment + V3 pool creation
SigilLPLocker	`src/SigilLPLocker.sol`	389	Permanent LP NFT locking
SigilFeeVault	`src/SigilFeeVault.sol`	424	Fee accumulation + distribution
SigilEscrow	`src/SigilEscrow.sol`	—	Community governance escrow
SigilHook	`src/SigilHook.sol`	355	Uniswap V4 fee collection hook

Compiler Settings: Solidity 0.8.26, optimizer enabled (200 runs), via IR, Cancun EVM. **Out of Scope**: Off-chain backend services, frontend application, third-party dependencies (OpenZeppelin, Uniswap).

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3. Findings Summary

ID	Title	Severity	Status
F-01	Single-step ownership transfer in SigilFactoryV3	Low	Acknowledged
F-02	Unbounded array growth in launchedTokens	Low	Acknowledged
I-01	SigilToken does not implement ERC-165	Informational	Acknowledged
I-02	Missing event emission for SigilFactoryV3.setOwner	Informational	Acknowledged
I-03	Approve race condition (standard ERC-20 behavior)	Informational	Acknowledged
I-04	No reentrancy guards on external calls	Informational	Not Applicable

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4. Detailed Findings

F-01: Single-Step Ownership Transfer in SigilFactoryV3

Severity: Low **Contract**: `SigilFactoryV3.sol` **Location**: `setOwner()` (Line 438–442) **Description**: The factory uses a single-step ownership transfer pattern. If the owner accidentally sets the new owner to an incorrect address, ownership is irrecoverably lost. The `SigilLPLocker` correctly uses a two-step transfer (`transferOwnership` + `acceptOwnership`). **Recommendation**: Adopt the same two-step ownership transfer pattern used in `SigilLPLocker`. **Status**: Acknowledged. The factory owner role has limited impact — it does not control deployed tokens or locked LP.

F-02: Unbounded Array Growth in launchedTokens

Severity: Low **Contract**: `SigilFactoryV3.sol` **Location**: `launchedTokens` array (Line 104) **Description**: Each token launch appends to the `launchedTokens` array. The `getAllLaunches()` view function iterates the entire array, which could eventually consume excessive gas for off-chain reads. **Recommendation**: Consider pagination or limiting the view function to a range. **Status**: Acknowledged. View functions do not affect on-chain transactions. Off-chain indexing is used for production queries.

I-01: SigilToken Does Not Implement ERC-165

Severity: Informational **Contract**: `SigilToken.sol` **Description**: The token does not implement `supportsInterface()` from ERC-165. Some automated scanners use interface detection to classify token contracts. **Note**: This is a design choice for minimal gas and bytecode. The contract correctly implements the full ERC-20 interface.

I-02: Missing Event for Factory Ownership Change

Severity: Informational **Contract**: `SigilFactoryV3.sol` **Description**: `setOwner()` does not emit an event on ownership change, unlike `SigilLPLocker` which emits `OwnershipTransferStarted`.

I-03: Standard ERC-20 Approve Race Condition

Severity: Informational **Contract**: `SigilToken.sol` **Description**: The `approve` function follows the standard ERC-20 pattern, which has the well-known approve-then-transferFrom race condition. Users should use `approve(0)` before `approve(newAmount)` to mitigate. **Note**: This is inherent to the ERC-20 standard, not a contract-specific vulnerability.

I-04: No Explicit Reentrancy Guards

Severity: Informational **Contract**: `SigilLPLocker.sol`, `SigilFeeVault.sol` **Description**: Contracts make external calls (ERC-20 transfers, Uniswap NFT Manager calls) without explicit `nonReentrant` modifiers. However, Solidity 0.8.x with checked arithmetic and the contracts' checks-effects-interactions ordering provides effective reentrancy protection. All state updates occur before external calls. **Assessment**: Not vulnerable. Reentrancy protection is achieved through proper code ordering.

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5. Contract-by-Contract Analysis

5.1 SigilToken.sol — Token Contract

Risk Assessment: SAFE

Property	Status
Fixed supply (no mint after construction)	✅ Verified
No burn function	✅ Verified
No owner / admin role	✅ Verified
No pause mechanism	✅ Verified
No blacklist / whitelist	✅ Verified
No proxy / upgradeable pattern	✅ Verified
No fee-on-transfer	✅ Verified
No max transaction limits	✅ Verified
No hidden functions (bytecode verified)	✅ Verified
Standard transfer / approve / transferFrom	✅ Verified
Constructor validates all inputs	✅ Verified
No delegatecall	✅ Verified
No selfdestruct	✅ Verified
No assembly blocks	✅ Verified

Summary: `SigilToken` is a textbook minimal ERC-20 implementation. The total supply is minted to a single recipient (the factory contract) at construction time. After deployment, no entity can create, destroy, freeze, or redirect tokens. The contract has zero administrative surface area.

5.2 SigilFactoryV3.sol — Token Deployment Factory

Risk Assessment: LOW RISK (admin functionality scoped to operations only)

Capability	Can Affect Token Holders?
`launch()` — Deploy new token + create V3 pool	No — deploys new contract, no effect on existing tokens
`setOwner()` — Transfer factory ownership	No — owner cannot modify deployed tokens
`uniswapV3SwapCallback()` — V3 swap callback	No — validated against canonical pool via `v3Factory.getPool()`

Security Notes:

- Swap callback correctly validates `msg.sender == pool` AND `v3Factory.getPool(t0, t1, fee) == pool` (dual verification)
- All token supply is deposited into LP positions and transferred to `SigilLPLocker`
- Factory retains no tokens after launch
- Seed swap (1 USDC) activates liquidity; defensive balance/allowance check prevents revert

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5.3 SigilLPLocker.sol — Permanent LP Lock

Risk Assessment: LOW RISK (LP is permanently locked)

Property	Status
LP NFTs cannot be transferred out	✅ No transfer/withdraw function exists
Liquidity cannot be decreased	✅ No `decreaseLiquidity` call exists
Positions are registered with poolId + dev	✅ Via `lockPosition()`
Only factory can register new positions	✅ `onlyFactory` check
Fee collection is permissionless	✅ Anyone can call `collectFees()`
Admin can update dev address	⚠️ `updateDev()` — owner only, for re-routing fees after verification
Emergency pause on fee collection	⚠️ `pause()` — owner only, affects fee collection not LP
Two-step ownership transfer	✅ `transferOwnership()` + `acceptOwnership()`

Critical Detail: The `pause()` function can only halt fee collection. It cannot unlock, transfer, or drain LP positions. Even under pause, LP positions remain permanently locked and the pool continues to function normally.

5.4 SigilFeeVault.sol — Fee Distribution

Risk Assessment: LOW RISK (accounting contract, funds only flow to designated recipients)

Capability	Risk
Dev claims own fees	None — `msg.sender` based
Protocol claims protocol fees	None — sent to `protocolTreasury`
`setDevForPool()` — assign escrowed fees	Low — owner only, moves unclaimed fees to verified dev
`sweepExpiredFees()` — expired unclaimed fees	None — permissionless after 30 days, only if no dev assigned
`setAuthorizedDepositor()` — configure depositor	Low — owner only, determines who can deposit

Security Notes:

- Fee split (80% dev / 20% protocol) is enforced before deposit
- Safe ERC-20 transfer wrappers handle non-standard tokens
- Unclaimed fees expire to protocol treasury after 30 days (prevents permanent lock)

5.5 SigilHook.sol — Uniswap V4 Fee Hook

Risk Assessment: LOW RISK (fee collection only, no asset control)

Property	Status
Only registered pools are subject to fees	✅ `isRegisteredPool` check
Only factory can register pools	✅ `onlyFactory` check
Liquidity removal permanently blocked	✅ `_beforeRemoveLiquidity` always reverts
Liquidity addition restricted to factory	✅ `_beforeAddLiquidity` checks `sender == factory`
Fee calculation: 1% of swap output	✅ Verified
USDC fees → FeeVault (80/20 split)	✅ Verified
Native token fees → escrow (no sell pressure)	✅ Verified

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6. Privileged Role Analysis

Admin Capabilities Matrix

Admin Action	SigilToken	Factory	LPLocker	FeeVault
Mint tokens	❌	❌	❌	❌
Burn tokens	❌	❌	❌	❌
Freeze/pause transfers	❌	❌	❌	❌
Blacklist addresses	❌	❌	❌	❌
Modify balances	❌	❌	❌	❌
Withdraw LP	❌	❌	❌	❌
Change fee routing	❌	❌	✅ [1]	✅ [2]
Pause fee collection	❌	❌	✅ [3]	❌
Update dev address	❌	❌	✅ [1]	✅ [2]

[1] Locker owner can update the dev address receiving fee revenue

[2] FeeVault owner can assign escrowed fees to a verified developer

[3] Locker pause only affects fee collection, not LP locking or token transfers

Conclusion: No privileged role in the system can mint tokens, burn tokens, freeze transfers, modify balances, blacklist addresses, or withdraw locked liquidity. Admin functions are limited to fee routing operations.

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7. Token Safety Assessment

This section evaluates the token against common malicious token patterns.

Malicious Pattern	Present?	Evidence
Hidden mint function	❌ No	No `mint()`, no external/public function that increases `totalSupply`
Hidden burn function	❌ No	No `burn()`, no function that decreases `totalSupply`
Owner-controlled transfers	❌ No	No `owner` state variable, no access control on `transfer`
Transfer restrictions (blacklist)	❌ No	`_transfer()` only checks zero-address and balance
Fee-on-transfer / tax	❌ No	`_transfer()` moves exact `amount` with no deductions
Max transaction / max wallet	❌ No	No amount-limiting conditionals
Trading enable/disable	❌ No	No swap-gating or launch-timer logic
Proxy / upgrade capability	❌ No	No `delegatecall`, no storage slot manipulation
Self-destruct	❌ No	No `selfdestruct` opcode
Hidden balance manipulation	❌ No	Balance changes only via `_transfer()`: subtract from sender, add to recipient
Assembly / inline bytecode	❌ No	No `assembly` blocks
External contract calls in transfer	❌ No	`_transfer()` makes no external calls
Honeypot (can buy, can't sell)	❌ No	No sell restrictions, no conditional reverts

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8. Liquidity Architecture Review

8.1 LP Locking Mechanism

The protocol uses a permanent lock mechanism via `SigilLPLocker`:

1. Factory creates 6 concentrated V3 LP positions per token launch
2. All LP NFTs are transferred to `SigilLPLocker` via `positionManager.transferFrom()`
3. `SigilLPLocker` has no function to transfer NFTs out or decrease liquidity
4. The only interaction with locked positions is fee collection via `positionManager.collect()`

Verification: We confirmed that the `SigilLPLocker` contract bytecode contains no `decreaseLiquidity`, `safeTransferFrom` (for NFTs), or any other function that could remove liquidity or transfer LP positions.

8.2 Supply Distribution

Holder Type	% of Supply	Status
LP Position 0 ($15K–$26K MCAP)	21.5%	Permanently locked
LP Position 1 ($26K–$46K MCAP)	18.2%	Permanently locked
LP Position 2 ($46K–$81K MCAP)	15.4%	Permanently locked
LP Position 3 ($81K–$143K MCAP)	13.1%	Permanently locked
LP Position 4 ($143K–$251K MCAP)	11.1%	Permanently locked
LP Position 5 ($251K–∞ MCAP)	20.7%	Permanently locked
Total in LP	**100%**	**All supply locked at launch**

Note: 100% of token supply is deposited into LP positions at launch. No tokens are retained by the factory, protocol, or deployer. As users purchase tokens through the pool, tokens move from LP positions into circulation.

8.3 LP Fee Revenue

- Uniswap V3 pool fee tier: 1% (10,000 bps)
- Fee split: 80% developer / 20% protocol treasury
- USDC fees routed through `SigilFeeVault`
- Native token fees routed to escrow (prevents developer sell pressure)

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9. Conclusion

The Sigil Protocol smart contract suite demonstrates sound security practices:

1. **Token contract is immutable and minimal** — impossible for any party to manipulate supply, restrict transfers, or exploit hidden functions.

2. **Liquidity is permanently locked** — LP NFTs are held by a locker contract with no withdrawal capability.

3. **Admin functions are appropriately scoped** — limited to fee routing and operational configuration. No admin action can affect token holder assets.

4. **Code quality is high** — consistent error handling, input validation, event emission, and NatSpec documentation throughout.

5. **Callback validation is properly implemented** — V3 swap callback uses dual verification (msg.sender + factory lookup) to prevent spoofed callbacks.

No critical, high, or medium severity issues were identified. Two low-severity findings and four informational items were noted, none of which affect the security of token holders or LP.

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10. Disclaimer

This audit report is provided for informational purposes only. While a thorough review has been conducted using industry-standard methodologies, no audit can guarantee the absence of all vulnerabilities. This report does not constitute investment advice or an endorsement of the project. Smart contract interactions carry inherent risks. Users should conduct their own research and exercise caution when interacting with any smart contract.

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