

Franklin Templeton BenjiSwap Differential Review

Security assessment by HashEye · prepared for Franklin Templeton

HASHEYE AUDITED

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Project Summary Contact Information The following project manager was associated with this project: Tara Goodwin-Ruffus, Project Manager tara.goodwin-ruffus@hasheye.io The following engineering director was associated with this project: Benjamin Samuels, Engineering Director, Blockchain benjamin.samuels@hasheye.io The following consultant was associated with this project: Quan Nguyen, Consultant quan.nguyen@hasheye.io Project Timeline The significant events and milestones of the project are listed below.

Date	Event
March 12, 2026	Pre-project kickoff call
March 23, 2026	Delivery of report draft
March 23, 2026	Report readout meeting
April 17, 2026	Delivery of final summary report

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Executive Summary Engagement Overview Franklin Templeton engaged HashEye to review the security of updates to its BenjiSwap smart contract. This re-engagement focused on changes made to SwapPool.sol since our October 2025 assessment, along with newly extracted libraries and interfaces. The primary additions include a hybrid custody model allowing per-token configuration of contract-held versus external treasury custody, delegated swap and deposit operations (swapFrom, depositFrom) for institutional custodians, fee-on-transfer token support with balance-delta accounting, and remediation of the two findings from the prior engagement. One consultant conducted the review from March 16 to March 20, 2026, for a total of one engineer-week of effort. Our testing efforts focused on the custody transition logic, delegated operation authorization, treasury rotation flows, and the consistency of parallel swap code paths. With full access to source code, documentation, and the prior audit report, we performed static and dynamic testing of the codebase, using automated and manual processes. The multisig contracts were out of scope; our analysis of owner-gated functions assumes the multisig correctly enforces its authentication and threshold requirements. Observations and Impact The review identified seven findings spanning access controls, data validation, and code quality. The most notable finding concerns the depositFrom and swapFrom functions, which can pull tokens from any address with an active ERC-20 allowance into the SwapPool, regardless of whether that allowance was granted for swapping or depositing (TOB-FT-SWAPDIFF-1). A compromised owner key could use this to drain token balances from all users who have approved the pool for swaps. We also found that fee-on-transfer tokens, once allowlisted and swapped into the treasury, cannot be sent outbound through any standard pool operation, as all outbound paths enforce exact delivery with no corresponding bypass (TOB-FT-SWAPDIFF-2). A recurring theme across several findings is incomplete state reconciliation during custody mode transitions. Two of the three custody-altering functions do not require the contract to be paused (TOB-FT-SWAPDIFF-4), and enabling contract-held mode does not clear a pending treasury proposal, allowing a previously proposed address to inject itself as the active treasury without admin involvement (TOB-FT-SWAPDIFF-5). These issues stem from custody-related state being distributed across multiple independent variables (treasury, pendingTreasury, contractHeldTreasury, tokenHeldInContract) without a centralized reconciliation mechanism. The codebase benefits from a fixed 1:1 swap rate that is inherently resistant to front-running and sandwich attacks, a thorough test infrastructure encompassing 707 unit

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and integration tests alongside Echidna fuzzing and Foundry invariant suites, and detailed event coverage across all state-changing operations. The library extraction effort (ValidationLib, AssertionLib, AuthorizationLib) improves modularity, though the swapFrom function was not refactored to use the shared swap logic, resulting in a duplicated pipeline with three observable behavioral divergences from the standard swap path (TOB-FT-SWAPDIFF-6). Recommendations Based on the findings identified during the security review, HashEye recommends that Franklin Templeton take the following steps:

- Remediate the findings disclosed in this report. The access control gap in depositFrom and the fee-on-transfer token trapping warrant priority attention. These findings should be addressed as part of a direct remediation or as part of any refactor that may occur when addressing other recommendations.
- Refactor swapFrom to delegate to a shared internal function with _executeSwap. The duplicated swap pipeline has already diverged in three ways and will require ongoing manual synchronization as the contract evolves. Eliminating the duplication removes a maintenance burden and a source of latent inconsistency.
- Document and formalize the expected administrative operation sequences for custody migrations. Several findings depend on the order in

which admin functions are called. Codifying these sequences in operational runbooks, and where possible enforcing them on-chain, will reduce the risk of misordered transitions in production.

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Finding Severities and Categories

The following tables provide the number of findings by severity and category. EXPOSURE ANALYSIS

Severity	Count
High	0
Medium	2
Low	3
Informational	2
Undetermined	0

CATEGORY BREAKDOWN Category Count Access Controls 2 Data Validation 5

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Project Goals The engagement was scoped to provide a security assessment of updates to the Franklin Templeton BenjiSwap contract. Specifically, we sought to answer the following non-exhaustive list of questions:

- Are access controls correctly enforced across all entrypoints, ensuring that only authorized traders can execute swaps and only the owner can perform administrative operations?
- Are funds held in the treasury protected from unauthorized withdrawal, drainage, or misrouting under all supported custody configurations?
- Do custody mode transitions preserve the integrity of token balances, and is related state correctly reconciled when switching between external and contract-held treasury modes?
- Does the decimal normalization arithmetic correctly handle all supported token decimal configurations without introducing rounding errors, overflow, or precision loss that could be exploited?
- Can ERC-20 approvals granted to the SwapPool for one purpose be repurposed for a different operation by a privileged or compromised actor?
- Are administrative recovery and migration functions correctly gated to prevent accidental loss of custodied assets?
- Does the UUPS upgrade mechanism follow safe proxy patterns, including proper storage layout management and authorization of new implementations?

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Project Targets The engagement involved reviewing and testing the following target. BenjiSwap Repository N/A (source code provided in a zip file) Version March 16, 2026

Type Solidity Platform EVM

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Project Coverage This section provides an overview of the analysis coverage of the review, as determined by our high-level engagement goals. Our approaches included the following:

- Manual review of the hybrid custody model in SwapPool, including the global contractHeldTreasury toggle, per-token tokenHeldInContract overrides, and the interactions between custody mode transitions and related state such as pending treasury proposals
- Manual review of the delegated operation entry points (swapFrom and depositFrom) and their authorization models, with particular attention to behavioral divergences from the standard swap and deposit code paths
- Manual review of the fee-on-transfer token support, including balance-delta accounting in both _executeSwap and swapFrom, the allowNonStandardToken allowlist, and token recoverability across all custody configurations
- Manual review of the extracted libraries (ValidationLib, AssertionLib, AuthorizationLib) and changes to Hashing.sol, including the assembly-level hashing functions and memory safety annotations
- Manual review of the administrative recovery functions (recoverContractTokens, recoverTreasuryTokens) and the zero-balance assertion mechanism in AssertionLib
- Manual review of the UUPS upgrade mechanism and storage layout compatibility with the deprecated eoaSentThisBlockNumber slot

Coverage Limitations Because of the time-boxed nature of testing work, it is common to encounter coverage limitations. The following list outlines the coverage

limitations of the engagement and indicates system elements that may warrant further review:

- The SwapPool relies on a trusted owner (multisig) to execute custody mode transitions, token registration, and treasury rotations in the correct order. We evaluated the on-chain guards but did not audit the off-chain operational procedures, runbooks, or multisig policies that govern how these administrative sequences are coordinated. Misordered admin operations (e.g., toggling custody before draining funds, or unregistering a token before recovering it) may produce states that the contract does not prevent.

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- The multisig contracts (contracts/multisig/) were out of scope for this re-engagement. Our analysis of owner-gated functions assumes that the multisig correctly authenticates signers and enforces threshold requirements.

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Summary of Findings The table below summarizes the findings of the review, including details on type and severity.

ID	Title	Type	Severity	Status
1	depositFrom and swapFrom allow the owner to pull tokens from any user with an active swap approval	Access Controls	Medium	Resolved
2	Fee-on-transfer tokens allowlisted for inbound swaps become trapped in the treasury	Data Validation	Medium	Resolved
3	minAmountInByPair uses a direction-independent hash, preventing per-direction minimum swap amounts	Data Validation	Low	Resolved
4	Custody-altering functions setTreasury and setTokenHeldInContract do not require the contract to be paused	Data Validation	Low	Resolved
5	Stale pendingTreasury survives custody mode migration, allowing unilateral treasury injection	Access Controls	Low	Resolved
6	swapFrom reimplements core swap logic with multiple behavioral divergences from _executeSwap	Data Validation	Informational	Resolved
7	Destination override approvals are self-granted, making amount and deadline limits unenforceable	Data Validation	Informational	Resolved

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Detailed Findings 1. depositFrom and swapFrom allow the owner to pull tokens from any user with an active swap approval Severity: Medium Difficulty: High Type: Access Controls Finding ID: TOB-FT-SWAPDIFF-1 Target: contracts/SwapPool.sol

Description Two functions that pull tokens from third-party wallets rely solely on owner authorization with no on-chain consent from the source wallet. A compromised owner can use either path to drain tokens from any address that has granted an ERC-20 allowance to the SwapPool. The depositFrom function is intended for multisig-initiated deposits, allowing the owner to pull tokens from a pre-approved funding address. However, it does not distinguish between addresses that approved the SwapPool for deposits and those that approved it for swapping. Any address with an active ERC20 allowance to the SwapPool can be specified as from: function depositFrom(address token, address from, uint256 amount) external onlyOwner nonReentrant { // ... IERC20(token).safeTransferFrom(from, address(this), amount); // ... } Figure 1.1: depositFrom pulls from an arbitrary from with no on-chain consent (contracts/SwapPool.sol#L418-L440) The sibling function deposit prevents this with if (from != msg.sender) revert("INVALID_DEPOSIT_SOURCE"). No comparable safeguard exists for depositFrom. The swapFrom path has a similar gap. Although it requires a pre-registered entry in the swapFromAuthorizations mapping, the authorizeSwapFrom function that populates this mapping is itself owner-gated and does not require consent from the source wallet:

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```
function authorizeSwapFrom( address sourceWallet, address delegate, address destination ) external
onlyOwner { ValidationLib.validateAddress(sourceWallet); ValidationLib.validateAddress(delegate);
ValidationLib.validateAddress(destination); swapFromAuthorizations[sourceWallet][delegate] =
```

destination; emit SwapFromAuthorized(sourceWallet, delegate, destination); } Figure 1.2: authorizeSwapFrom registers a third-party pull authorization without consent from sourceWallet (contracts/SwapPool.sol#L587-597) A compromised owner can call authorizeSwapFrom(victim, owner, attacker) and then swapFrom(victim, token, toToken, amount) to pull tokens from the victim through the swap path. The authorization and the pull can execute in the same transaction, making the two-step requirement no barrier. Both paths share the same root cause: the contract treats an ERC-20 allowance granted for swapping as sufficient authorization for an owner-initiated pull, without requiring the source wallet to explicitly consent to the specific operation. Exploit Scenario An attacker compromises the owner key and queries on-chain Approval events for the SwapPool address. For each victim with an active allowance, the attacker calls depositFrom(token, victim, victim.balance), then calls withdraw to extract all deposited funds. The entire operation executes in a single block. Recommendations Short term, require demonstrable consent from the source wallet before either depositFrom or authorizeSwapFrom can pull their tokens. Two approaches are viable: require msg.sender == sourceWallet so the source wallet authorizes directly, or require the owner to submit a signature produced by the source wallet as proof of consent. This ensures that owner compromise alone is not sufficient to drain arbitrary wallets.

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2. Fee-on-transfer tokens allowlisted for inbound swaps become trapped in the treasury Severity: Medium Difficulty: Low Type: Data Validation Finding ID: TOB-FT-SWAPDIFF-2 Target: contracts/SwapPool.sol

Description The allowNonStandardToken flag permits fee-on-transfer tokens on inbound transfers but all outbound paths unconditionally enforce exact delivery, creating a one-way valve that traps these tokens in the treasury. Inbound transfers accept the fee-adjusted amount when the token is allowlisted: uint256 actualReceived = _treasuryTokenBalance(fromToken) - fromBalanceBefore; if (actualReceived != amount) { if (!allowNonStandardToken[fromToken]) revert("NON_STANDARD_TOKEN_NOT_ALLOWED"); amount = actualReceived; } Figure 2.1: Inbound fee-on-transfer adjustment in _executeSwap (contracts/SwapPool.sol#L869-L873) Every outbound path rejects the same tokens. In _executeSwap, swapFrom, and withdraw, the exact-delivery check has no corresponding allowNonStandardToken bypass: uint256 actualReceived = _treasuryTokenBalance(fromToken) - fromBalanceBefore; if (actualReceived != amount) { if (!allowNonStandardToken[fromToken]) revert("NON_STANDARD_TOKEN_NOT_ALLOWED"); amount = actualReceived; } Figure 2.2: Unconditional exact-delivery check on outbound (contracts/SwapPool.sol#L931-L932) Once a fee-on-transfer token enters the treasury via a swap, it cannot leave through swap (reverts with NON_STANDARD_TOKEN_OUTBOUND) or withdraw (reverts with FEE_ON_TRANSFER_OUT_NOT_SUPPORTED). Recovery depends on the custody mode. For an EOA treasury, the EOA holder can transfer the tokens directly using their key without pool interaction. For an ITreasury contract treasury, recoverTreasuryTokens bypasses the fee-on-transfer checks entirely. For contract-held custody, the admin must first disable custody for the token (by toggling tokenHeldInContract or contractHeldTreasury)

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and then call recoverContractTokens; this is a multi-step process that requires pausing the pool and temporarily changing the custody configuration. Exploit Scenario The owner allowlists a fee-on-transfer token and authorizes a pair with USDC. A user swaps the fee token for USDC; the pool accepts the fee-adjusted inbound amount and sends USDC. When another user later swaps USDC for the fee token, the outbound transfer delivers less than expected, and the transaction reverts. The fee token accumulates in the treasury with no operational way to send it out, and the authorized pair is permanently broken in one direction. Recommendations Short term, extend the allowNonStandardToken check to outbound transfers. When the outbound token is allowlisted, have the code skip the exact-delivery revert and adjust accounting to reflect the actual delivered amount. This will allow fee-on-transfer tokens to flow in both directions. Long term, evaluate whether fee-on-transfer token support is a required feature. If it is, implement end-to-end handling that accounts for fees on both inbound and outbound legs of a swap, including adjusting the amount credited to the destination. If it is not, remove allowNonStandardToken entirely to eliminate the incomplete code path.

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3. minAmountInByPair uses a direction-independent hash, preventing per-direction minimum swap amounts Severity: Low Difficulty: High Type: Data Validation Finding ID: TOB-FT-SWAPDIFF-3 Target: contracts/SwapPool.sol, contracts/utils/Hashing.sol

Description The setMinAmountIn function computes its storage key via _computeTokenPairHash, which delegates to Hashing.tokenPairHash. This hash function canonically orders its two address arguments before hashing, making the result order-independent: $\text{tokenPairHash}(A, B) = \text{tokenPairHash}(B, A)$.
/// @dev Canonical pair hash – Order-independent: $\text{tokenPairHash}(A, B) = \text{tokenPairHash}(B, A)$.
function tokenPairHash(address tokenA, address tokenB) internal pure returns (bytes32 out) {
assembly ("memory-safe") { let a := tokenA let b := tokenB if gt(a, b) { let tmp := a a := b b := tmp } let ptr := mload(0x40) mstore(ptr, shl(96, a)) mstore(add(ptr, 20), shl(96, b)) out := keccak256(ptr, 40) mstore(0x40, add(ptr, 64)) } }
Figure 3.1: tokenPairHash sorts addresses before hashing, producing the same key regardless of argument order. (contracts/utils/Hashing.sol#L39-58)
Because both directions resolve to the same key, calling setMinAmountIn(USDC, FUND, X) followed by setMinAmountIn(FUND, USDC, Y) silently overwrites X with Y. The owner cannot enforce distinct minimums for the A-to-B and B-to-A directions. The same key is read in _executeSwap to enforce the minimum:

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uint256 minRequired = minAmountInByPair[_computeTokenPairHash(fromToken, toToken)]; if (minRequired > 0 && amount < minRequired) revert("MIN_AMOUNT_NOT_MET");
Figure 3.2: The minimum is enforced against the same direction-independent key. (contracts/SwapPool.sol#L854-855)
When two paired tokens have different decimal precisions, a single minimum value expressed in native token units is economically meaningful in only one direction. For example, a minimum of 1000000 (1 USDC in six-decimal representation) is a reasonable dust filter for USDC-in swaps, but the same value applied to an 18-decimal token represents a negligible $1e-12$ tokens, rendering the minimum ineffective in the opposite direction.
Exploit Scenario The owner calls setMinAmountIn(USDC, FUND, 1000000) to require at least 1 USDC for USDC-to-FUND swaps. Because the hash is direction-independent, the same threshold also governs FUND-to-USDC swaps. A trader submits a FUND-to-USDC swap for 1000000 wei of FUND (a negligible $1e-12$ FUND), and the minimum check passes. The swap executes despite being well below any economically meaningful threshold for the FUND-in direction, defeating the intended dust-filtering purpose of the minimum. Conversely, the owner calls setMinAmountIn(FUND, USDC, 1000000000000000000) to require at least 1 FUND (18 decimals) for FUND-to-USDC swaps. The same threshold now applies to USDC-to-FUND swaps, requiring $1e18$ units of USDC input, which is equivalent to one trillion USDC. This effectively blocks all USDC-to-FUND swaps entirely, as no trader can meet the minimum.
Recommendations Short term, key the minAmountInByPair mapping with a direction-dependent hash. Alternatively, store two separate minimum values per pair (one for each direction) under the existing canonical key. This will allow the owner to configure distinct thresholds that are economically appropriate for each token's decimal precision. Long term, review all mappings keyed by _computeTokenPairHash to determine whether they are truly direction-independent by design or whether they inadvertently collapse two distinct configurations into one. Documenting the intended directionality of each mapping will prevent similar issues from being introduced in future development.

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4. Custody-altering functions setTreasury and setTokenHeldInContract do not require the contract to be paused Severity: Low Difficulty: High Type: Data Validation Finding ID: TOB-FT-SWAPDIFF-4 Target: contracts/SwapPool.sol

Description The contract enforces a paused-state requirement for setContractHeldTreasury and setContractHeldTreasuryWithAssertions, recognizing that custody mode transitions during active swap traffic carry operational risk: function setContractHeldTreasury(bool enabled) external onlyOwner nonReentrant { if (!paused()) revert("MUST_BE_PAUSED"); ... }
Figure 4.1: setContractHeldTreasury requires the contract to be paused before toggling custody mode (contracts/SwapPool.sol#L1184-1186)
Two other functions that modify custody routing do not enforce this requirement. setTreasury

```

changes the external treasury address and atomically disables contract-held mode: function
setTreasury(address newTreasury) external onlyOwner { if (newTreasury == address(0))
revert("ZERO_ADDRESS"); if (newTreasury == address(this)) revert("TREASURY_CANNOT_BE_SELF"); if
(requireContractTreasury && !ValidationLib.isContract(newTreasury))
revert("TREASURY_MUST_BE_CONTRACT"); address old = treasury; treasury = newTreasury;
contractHeldTreasury = false; pendingTreasury = address(0); emit TreasuryUpdated(old, newTreasury);
} Figure 4.2: setTreasury sets contractHeldTreasury = false and redirects all custody without a
pause check. (contracts/SwapPool.sol#L1220-1233) setTokenHeldInContract toggles per-token custody
between the contract and the external treasury: function setTokenHeldInContract(address token, bool
heldInContract) external onlyOwner {

```

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```

ValidationLib.validateAddress(token); if (contractHeldTreasury)
revert("REDUNDANT_CUSTODY_OVERRIDE_GLOBAL"); tokenHeldInContract[token] = heldInContract; emit
TokenCustodyModeUpdated(token, heldInContract); } Figure 4.3: setContractHeldTreasury requires the
contract to be paused before toggling custody mode. (contracts/SwapPool.sol#L1184-1186) Both
functions alter the routing decisions in _treasuryTokenBalance, _treasurySend, and deposit. When
called while the pool is unpaused, an in-flight swap could read the treasury balance from one
custody location (e.g., the contract) and then have its outbound transfer routed to a different one
(e.g., the new external treasury), or vice versa. setTreasury is particularly impactful: it
transitions from contract-held mode to external treasury mode in a single call, a change that
setContractHeldTreasury requires a pause to perform. Recommendations Short term, add if (!paused())
revert("MUST_BE_PAUSED") to both setTreasury and setTokenHeldInContract. This applies the same
safety invariant that setContractHeldTreasury already enforces: custody routing changes require the
pool to be paused so that no swaps are in flight during the transition. Long term, consolidate all
custody-modifying operations behind a single internal modifier or helper that enforces the pause
requirement uniformly. This prevents future custody-related functions from accidentally omitting
the check.

```

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5. Stale pendingTreasury survives custody mode migration, allowing unilateral treasury injection
Severity: Low Difficulty: High Type: Access Controls Finding ID: TOB-FT-SWAPDIFF-5 Target:
contracts/SwapPool.sol

Description The contract has three functions that change the active treasury or custody mode: setTreasury, setContractHeldTreasury, and setContractHeldTreasuryWithAssertions. setTreasury clears pendingTreasury when assigning a new treasury address, preventing a stale proposal from being accepted after the owner bypasses the two-step flow. setContractHeldTreasury and setContractHeldTreasuryWithAssertions do not apply the same clearing logic; both set treasury = address(0) when enabling contract-held mode but leave pendingTreasury intact: function setContractHeldTreasury(bool enabled) external onlyOwner nonReentrant { if (!paused()) revert("MUST_BE_PAUSED"); if (enabled) { treasury = address(0); contractHeldTreasury = true; emit ContractHeldTreasuryUpdated(true); } ... } Figure 5.1: setContractHeldTreasury does not clear pendingTreasury when migrating to contract-held mode (contracts/SwapPool.sol#L1184-1198) Meanwhile, acceptTreasury has no guard against being called while contractHeldTreasury is true. It writes a non-zero address to treasury without clearing the flag, and requires no admin involvement; only the pending address itself must call it. This creates a three-step sequence in which a previously proposed address silently becomes the active treasury: 1. The admin calls proposeTreasury(X), setting pendingTreasury = X. 2. Circumstances change and the admin calls setContractHeldTreasury(true), setting treasury = address(0) and contractHeldTreasury = true. The pending proposal is not cleared.

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3. X calls acceptTreasury() at any time – no admin action or approval is needed. This sets treasury = X while contractHeldTreasury remains true. While contractHeldTreasury is true, the stale treasury

address is dormant: all routing in `_treasuryTokenBalance` and `_treasurySend` short-circuits on the flag. However, if the admin later calls `setContractHeldTreasury(false)`, it checks only that `treasury  $\neq$  address(0)`, which passes because X was injected in step 3. The pool immediately begins routing outbound transfers through X. Recommendations Short term, have the code clear `pendingTreasury` in both `setContractHeldTreasury` and `setContractHeldTreasuryWithAssertions` when enabling contract-held mode, consistent with the clearing already performed in `setTreasury`. Additionally, add a guard to `acceptTreasury` that reverts when `contractHeldTreasury` is true, since accepting an external treasury address while in contract-held mode produces an inconsistent state regardless of how it was reached. Long term, extract all treasury state mutations (`treasury`, `pendingTreasury`, `contractHeldTreasury`) into a single internal function that enforces the invariant: when any custody-affecting variable changes, all related variables are reconciled atomically. This prevents future custody functions from inheriting the same class of omission.

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6. `swapFrom` reimplements core swap logic with multiple behavioral divergences from `_executeSwap`
Severity: Informational Difficulty: Undetermined Type: Data Validation Finding ID: TOB-FT-SWAPDIFF-6 Target: `contracts/SwapPool.sol`

Description The `swapFrom` function reimplements the full swap pipeline rather than delegating to `_executeSwap`. The two code paths diverge in at least three observable ways: a missing token-pair validation, a reordered balance-sufficiency check, and a missing destination authorization check. Each divergence weakens the invariants that `_executeSwap` enforces. Divergence 1: Missing `validateTokenPair` call. Every public swap entrypoint calls `ValidationLib.validateTokenPair` before entering `_executeSwap`:

```
function swap( address fromToken, address toToken, uint256 amount ) external nonReentrant whenNotPaused onlyIfAuthorized(fromToken, toToken) {  
    ValidationLib.validateTokenPair(fromToken, toToken); ValidationLib.validateAmount(amount);  
    _executeSwap(fromToken, toToken, amount, msg.sender); }  
Figure 6.1: The three-argument swap validates the token pair before calling _executeSwap (contracts/SwapPool.sol#L201-210) swapFrom omits this call entirely:  
function swapFrom( address sourceWallet, address fromToken, address toToken, uint256 amount ) external onlyOwner nonReentrant whenNotPaused {  
    address destination = swapFromAuthorizations[sourceWallet][msg.sender];  
    if (destination == address(0)) revert("UNAUTHORIZED_SWAP_FROM");  
    bytes32 pairHash = _computeTokenPairHash(fromToken, toToken);  
    if (!authorizedTokenPairs[pairHash].isAuthorized) revert("UNAUTHORIZED_TOKEN_PAIR");  
    ValidationLib.validateAmount(amount);
```

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Figure 6.2: `swapFrom` does not call `validateTokenPair`, so `fromToken == toToken` is not rejected (`contracts/SwapPool.sol#L268-278`) `validateTokenPair` rejects zero addresses and identical tokens. An admin who mistakenly authorizes a self-pair would expose `swapFrom` to same-token swaps that the regular swap path would reject. Divergence 2: Balance sufficiency checked against the pre-adjustment output amount. In `_executeSwap`, the inbound transfer occurs first, and the output amount is computed from the post-fee-on-transfer `actualReceived` value. The balance-sufficiency check runs against this adjusted amount: `uint256 actualReceived = _treasuryTokenBalance(fromToken) - fromBalanceBefore`; `if (actualReceived  $\neq$  amount) { if (!allowNonStandardToken[fromToken]) revert("NON_STANDARD_TOKEN_NOT_ALLOWED"); amount = actualReceived; }`

`uint256 toTokenAmount = SwapMath.convertDecimals( amount, fromTokenDecimals, toTokenDecimals, true );` `if (toBalanceBefore < toTokenAmount) revert("INSUFFICIENT_TREASURY_BALANCE");` Figure 6.3: `_executeSwap` checks balance sufficiency against the fee-adjusted output (`contracts/SwapPool.sol#L869-882`) In `swapFrom`, the output amount is computed and the balance is checked before the inbound transfer. If a fee-on-transfer token reduces the received amount, the output is then recomputed, but the sufficiency check is never re-evaluated against the updated value: `uint256 toAmount = SwapMath.convertDecimals(amount, fromDec, toDec, true);`

```
uint256 fromBalBefore = _treasuryTokenBalance(fromToken);  
uint256 toBalBefore = _treasuryTokenBalance(toToken);  
if (toBalBefore < toAmount)  
    revert("INSUFFICIENT_TREASURY_BALANCE");
```

```
// Transfer in from sourceWallet ...
```

```
// Handle non-standard tokens uint256 actualReceived = _treasuryTokenBalance(fromToken) -
fromBalBefore; if (actualReceived != amount) { if (!allowNonStandardToken[fromToken])
revert("NON_STANDARD_TOKEN_NOT_ALLOWED"); amount = actualReceived; toAmount =
SwapMath.convertDecimals(amount, fromDec, toDec, true); }
```

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Figure 6.4: swapFrom checks balance sufficiency against the original, unadjusted toAmount. (contracts/SwapPool.sol#L296-317) In practice, this ordering difference does not create an exploitable condition today because the fee adjustment always reduces toAmount, so the original sufficiency check is strictly more conservative. However, if the adjustment logic is ever generalized (e.g., to support rebasing tokens or positive slippage), the stale check would silently permit swaps the treasury cannot cover. Divergence 3: Missing enforceTraderAuthorization check on destination. The four-argument swap enforces that, when trader authorization is active for a pair, the destination must be an authorized trader: if

```
(authorizedTokenPairs[tokenPairHash].enforceTraderAuthorization &&
!authorizedTraders[tokenPairHash][destination]) revert("UNAUTHORIZED_DESTINATION");
```

Figure 6.5: The four-argument swap enforces trader authorization on the destination. (contracts/SwapPool.sol#L237-242) swapFrom does not replicate this check. If trader authorization is enforced for a pair and the destination stored in swapFromAuthorizations is later deauthorized as a trader, swapFrom will still deliver tokens to that destination. Recommendations Short term, refactor swapFrom to delegate its core logic to _executeSwap (or a shared internal function). This eliminates the duplicated code paths and ensures that all current and future validations are applied uniformly to both swap entrypoints. Long term, add integration tests that exercise both swap and swapFrom against the same edge-case matrix (identical tokens, fee-on-transfer tokens, unauthorized destinations, deauthorized traders) and assert identical revert or success behavior. This will prevent future divergences from being introduced silently.

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7. Destination override approvals are self-granted, making amount and deadline limits unenforceable
Severity: Informational Difficulty: Low Type: Data Validation Finding ID: TOB-FT-SWAPDIFF-7 Target: contracts/SwapPool.sol

Description The destination override approval mechanism follows an approval-then-spend pattern similar to ERC-20 approve/transferFrom. In the ERC-20 model, the approval grants a different party the right to spend on the approver's behalf, which is why the amount cap is meaningful: the spender cannot unilaterally raise it. In SwapPool, however, both sides of the operation are the same actor. The trader calls setDestinationOverrideApproval to create the approval (keyed on msg.sender), and the trader calls swap, which internally consumes it (also keyed on msg.sender):

```
function setDestinationOverrideApproval( address fromToken, address toToken, uint256 amount, address
destination, uint256 deadline ) external { ... bytes32 key = Hashing.hash4(msg.sender, fromToken,
toToken, destination); destinationOverrideApprovals[key] = DestinationOverrideData({
remainingAmount: amount, deadline: deadline }); ... }
```

Figure 7.1: The trader grants an approval to themselves. (contracts/SwapPool.sol#L610-639) if (destination != msg.sender) { ...
_consumeDestinationOverrideApproval(msg.sender, fromToken, toToken, amount, destination

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```
); ... }
```

Figure 7.2: The same trader's swap consumes their own approval. (contracts/SwapPool.sol#L234-251) Because the approver and the spender are the same address, the remainingAmount cap and the deadline provide no constraint that the trader has not already voluntarily accepted. The trader can reset both values at any time by calling setDestinationOverrideApproval again. This makes the mechanism equivalent to a simple Boolean flag indicating intent, with the amount and deadline fields adding bookkeeping cost but no enforcement value. Recommendations Short term, document that the destination override approval is a self-service intent signal for off-chain compliance monitoring, not an on-chain spending limit. This prevents integrators and auditors from treating the remainingAmount as a security-relevant bound.

Long term, if an enforceable cap on redirected volume is desired, separate the approver from the spender: for example, by requiring the owner or a compliance role to grant destination override approvals on behalf of traders. This restores the two-party trust model that makes approval amounts meaningful.

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A. Vulnerability Categories The following tables describe the vulnerability categories, severity levels, and difficulty levels used in this document.

Vulnerability Categories	Category	Description
Access Controls	Insufficient authorization or assessment of rights	Auditing and Logging
Insufficient auditing of actions or logging of problems	Authentication	Improper identification of users
Configuration	Misconfigured servers, devices, or software components	Cryptography
A breach of system confidentiality or integrity	Data Exposure	Exposure of sensitive information
Data Validation	Improper reliance on the structure or values of data	Denial of Service
A system failure with an availability impact	Error Reporting	Insecure or insufficient reporting of error conditions
Patching	Use of an outdated software package or library	Session Management
Improper identification of authenticated users	Testing	Insufficient test methodology or test coverage
Timing	Race conditions or other order-of-operations flaws	Undefined Behavior
Undefined behavior triggered within the system		

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Severity Levels

Severity	Description
Informational	The issue does not pose an immediate risk but is relevant to security best practices.
Undetermined	The extent of the risk was not determined during this engagement.
Low	The risk is small or is not one the client has indicated is important.
Medium	User information is at risk; exploitation could pose reputational, legal, or moderate financial risks.
High	The flaw could affect numerous users and have serious reputational, legal, or financial implications.

Difficulty Levels

Difficulty	Description
Not Applicable	This issue is of informational severity and does not pose an immediate risk, so difficulty does not apply.
Undetermined	The difficulty of exploitation was not determined during this engagement.
Low	The flaw is well known; public tools for its exploitation exist or can be scripted.
Medium	An attacker must write an exploit or will need in-depth knowledge of the system.
High	An attacker must have privileged access to the system, may need to know complex technical details, or must discover other weaknesses to exploit this issue.

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B. Fix Review Results When undertaking a fix review, HashEye reviews the fixes implemented for issues identified in the original report. This work involves a review of specific areas of the source code and system configuration, not comprehensive analysis of the system. On April 3, 2026, HashEye reviewed the fixes and mitigations implemented by the Franklin Templeton team for the issues identified in this report. We reviewed each fix to determine its effectiveness in resolving the associated issue. In summary, Franklin Templeton has resolved all seven issues. For additional information, please see the Detailed Fix Review Results below.

ID	Title	Severity	Status
1	depositFrom and swapFrom allow the owner to pull tokens from any user with an active swap approval	Medium	Resolved
2	Fee-on-transfer tokens whitelisted for inbound swaps become trapped in the treasury	Medium	Resolved
3	minAmountInByPair uses a direction-independent hash, preventing per-direction minimum swap amounts	Low	Resolved
4	Custody-altering functions setTreasury and setTokenHeldInContract do not require the contract to be paused	Low	Resolved
5	Stale pendingTreasury survives custody mode migration, allowing unilateral treasury injection	Low	Resolved
6	swapFrom reimplements core swap logic with multiple behavioral divergences from _executeSwap	Informational	Resolved
7	Destination override approvals are self-granted, making amount and deadline limits unenforceable	Informational	Resolved

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Detailed Fix Review Results TOB-FT-SWAPDIFF-1: depositFrom and swapFrom allow the owner to pull tokens from any user with an active swap approval Resolved. The team deprecated the depositFrom function. It now reverts, removing the owner-controlled arbitrary pull path. For swapFrom, owner-created authorization is no longer sufficient by itself: execution additionally requires a separate ERC-20 allowance from sourceWallet to the owner, so a standard allowance to SwapPool can no longer be repurposed to drain user funds. TOB-FT-SWAPDIFF-2: Fee-on-transfer tokens whitelisted for inbound swaps become trapped in the treasury Resolved. The team removed the allowNonStandardToken flag entirely and unconditionally rejected fee-on-transfer tokens on all inbound and outbound paths with exact-delivery checks (_executeSwap, swapFrom, deposit, depositFrom, withdraw). The deprecated storage slot is retained only for UUPS upgrade layout compatibility. TOB-FT-SWAPDIFF-3: minAmountInByPair uses a direction-independent hash, preventing per-direction minimum swap amounts Resolved. The team added a new directedPairHash function in Hashing.sol that preserves argument order ($A \rightarrow B \neq B \rightarrow A$), a new minAmountInByDirection mapping, and a setMinAmountInByDirection admin setter. Both _executeSwap and swapFrom now check the direction-dependent minimum first, falling back to the legacy direction-independent minimum. The legacy minAmountInByPair mapping and setMinAmountIn are retained for backward compatibility. TOB-FT-SWAPDIFF-4: Custody-altering functions setTreasury and setTokenHeldInContract do not require the contract to be paused Resolved. The team added pause checks to both setTreasury and setTokenHeldInContract, enforcing the same paused-state requirement that setContractHeldTreasury already applies. TOB-FT-SWAPDIFF-5: Stale pendingTreasury survives custody mode migration, allowing unilateral treasury injection Resolved. The team applied both short-term recommendations: setContractHeldTreasury and setContractHeldTreasuryWithAssertions now clear pendingTreasury when enabling contract-held mode, and acceptTreasury reverts with CONTRACT_HELD_MODE_ACTIVE when contractHeldTreasury is true. TOB-FT-SWAPDIFF-6: swapFrom reimplements core swap logic with multiple behavioral divergences from _executeSwap Resolved. The team addressed all three divergences in-place rather than refactoring to a shared function: (1) swapFrom now calls validateTokenPair to reject zero addresses and identical tokens, (2) the inbound transfer is performed before computing the output

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amount and checking balance sufficiency, matching _executeSwap's order, and (3) the enforceTraderAuthorization check on the destination is now enforced in swapFrom. The two code paths are now behaviorally consistent. TOB-FT-SWAPDIFF-7: Destination override approvals are self-granted, making amount and deadline limits unenforceable Resolved. The team implemented the short-term recommendation by adding NatSpec documentation to setDestinationOverrideApproval clarifying that the amount and deadline fields are a self-service intent signal for off-chain compliance monitoring, not an on-chain spending limit, and that this is by design.

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C. Fix Review Status Categories The following table describes the statuses used to indicate whether an issue has been sufficiently addressed. Fix Status Status Description Undetermined The status of the issue was not determined during this engagement. Unresolved The issue persists and has not been resolved. Partially Resolved The issue persists but has been partially resolved. Resolved The issue has been sufficiently resolved.

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About HashEye Founded in 2012 and headquartered in New York, HashEye provides technical security assessment and advisory services to some of the world's most targeted organizations. We combine high-end security research with a real-world attacker mentality to reduce risk and fortify code. With 100+ employees around the globe, we've helped secure critical software elements that support billions of end users, including Kubernetes and the Linux kernel. We maintain an exhaustive list of publications at <https://github.com/hashey-io/publications>, with links to papers, presentations, public audit reports, and podcast appearances. In recent years, HashEye consultants have showcased cutting-edge research through presentations at CanSecWest, HCSS, Devcon, Empire Hacking, GrnCon,

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