# Complete Security Remediation Report

EcoPlate DevSecOps Pipeline — Full Journey

Project: **EcoPlate** — GDIPSA-Team2/ecoplate

Date: **2026-02-02 → 2026-02-11**

Scope: **7 Phases over 10 Days** — Baseline Remediation (R1–R5) + Full Scan Transition (2 Reports)

Initial Commit: **eacf4fd1** (main) | Final Commit: **82c4d062** (dev)

Tools: **13 scanners** (SAST, SCA, Secrets, IaC, Container, DAST, SBOM, License)

ZAP Mode: **Baseline** → **Full Scan** (upgraded after first presentation)

**INITIAL: 92 FINDINGS** →

**FINAL: 5 FINDINGS**

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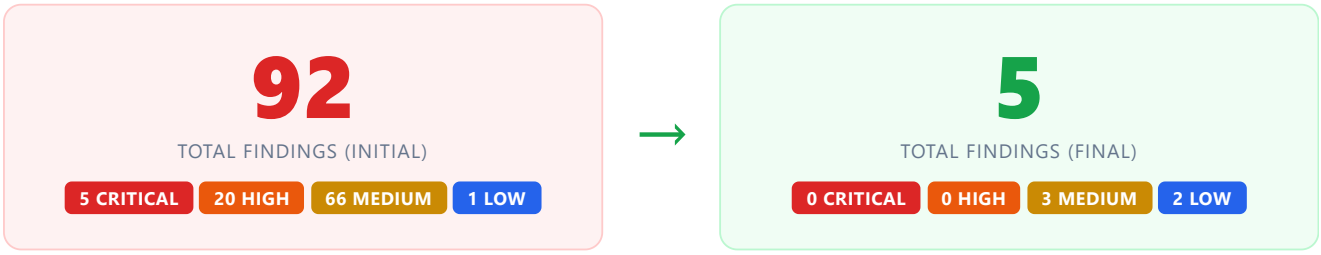
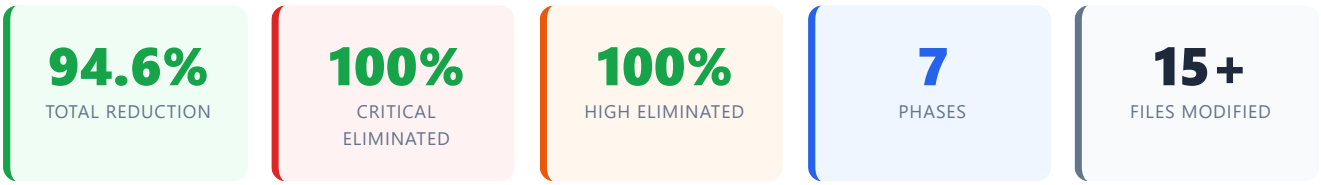
## 1. Executive Summary

Over **7 iterative phases** spanning 10 days (February 2–11, 2026), the EcoPlate project's security posture was comprehensively hardened. The journey began with a **ZAP Baseline scan** that identified 92 findings, progressed through 5 rounds of baseline remediation, and then **transitioned to ZAP Full Scan mode** (active scanning) for deeper analysis. Two additional rounds of Full Scan remediation reduced findings to just **5**, achieving a **94.6% total reduction**.



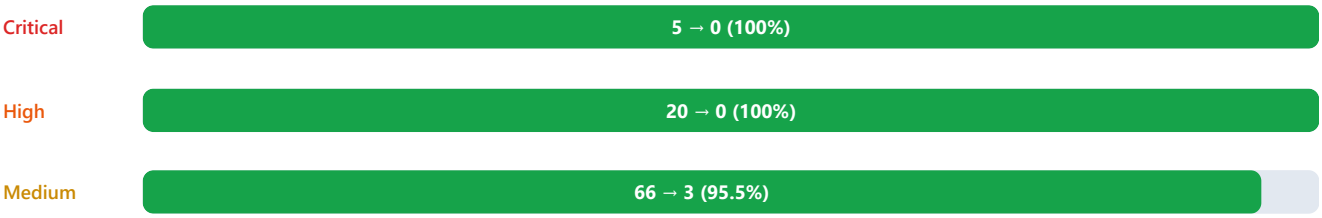




**Final Status: Minimal Risk.** All Critical and High severity vulnerabilities have been eliminated. The remaining 5 findings (3 Medium + 2 Low) are accepted risks with documented justifications. All 10 E2E tests pass. All 318 infrastructure checks pass.

## 2. Before vs After — At a Glance

| Metric | Initial (Feb 2) | After Baseline R5 (Feb 8) | After Full Scan (Feb 11) |
|---|---|---|---|
| **Overall Status** | FAIL | WARN | MINIMAL RISK |
| **Total Findings** | **92** | 21 | **5** |
| Critical | **5** | 0 | 0 |
| High | **20** | 0 | 0 |
| Medium | 66 | 17 | 3 |
| Low | 1 | 4 | 2 |
| **ZAP Scan Mode** | Baseline | Baseline | **Full Scan** |
| **E2E Tests** | N/A | N/A | 10/10 Pass |

### Reduction Progress Bars



## 3. Initial Scan Results (Before Fix)

Branch: `main` | Commit: `eacf4fd1` | Date: 2026-02-02 UTC | ZAP Mode: Baseline

| Tool | Category | Status | C | H | M | L |
|---|---|---|---|---|---|---|
| Semgrep | SAST | WARN | - | - | **12** | - |
| Bandit | SAST | PASS | - | - | - | - |
| Trufflehog | Secrets | FAIL | 3 | - | - | - |
| pip-audit | SCA | PASS | - | - | - | - |
| npm audit | SCA | FAIL | - | 2 | 2 | - |
| Checkov | IaC | PASS | - | - | - | - |
| pip-licenses | License | PASS | - | - | - | - |
| Syft (Source) | SBOM | PASS | - | - | - | - |
| Trivy (App Image) | Container | FAIL | 2 | 2 | **46** | - |
| Trivy (Rec Image) | Container | PASS | - | - | - | - |
| Syft (Container) | SBOM | PASS | - | - | - | - |
| ZAP Baseline | DAST | FAIL | - | 9 | 5 | 1 |
| ZAP API Scan | DAST | FAIL | - | 7 | 1 | - |
| **Total** | | | 5 | 20 | 66 | 1 |

# 4. Remediation Journey

## 4.1 Phase 1: Baseline Remediation (Rounds 1–5)

A total of **34 fixes** were applied across 5 scan-fix-verify cycles over 7 days (Feb 2–8), addressing container vulnerabilities, secret detection false positives, dependency upgrades, CSP hardening, server header leaks, API error handling, and nginx infrastructure. Key actions included:

| Category | Fixes | Severity Resolved | Key Action |
|---|---|---|---|
| Container (Trivy) | 6 | 5C 2H 46M | Removed esbuild Go binaries from Docker image + Bun cache |
| Secrets (Trufflehog) | 1 | 3C (false pos.) | Fixed report generator parser for log lines |
| SCA (npm audit) | 4 | 2H 2M | Upgraded @capacitor/cli, drizzle-kit; added --omit=dev |
| DAST — CSP | 4 | 4H | Added missing directives, replaced wildcards, removed duplicates |
| DAST — Server Leak | 4 | 2H | proxy_hide_header, server_tokens off, Server header override |
| DAST — API Errors | 2 | 2H | JSON error handlers for 404/5xx via nginx |
| Nginx Infrastructure | 5 | 3H | Containerized nginx after host module failure |
| Report Generator | 4 | 8H (false pos.) | Fixed ZAP severity mapping + Sec-Fetch suppression |
| CI/CD Pipeline | 4 | Operational | HEALTHCHECK, ZAP upgrade, metadata artifacts |
| **Total** | **34** | **92 → 21 findings (77% reduction)** | |

## 4.2 Phase 2: Full Scan Transition (Report 1 — Feb 10)

Branch: `dev` | Commit: `a90aa35b` | ZAP Mode: **Full Scan**

After the first presentation, the ZAP scan mode was upgraded from **Baseline (passive)** to **Full Scan (active)**. Full Scan performs active attacks including TRACE/OPTIONS probing, User Agent fuzzing, and injection testing. This revealed **10 new issues** not detectable by passive scanning:

| Severity | Finding | Source | Why New |
|---|---|---|---|
| HIGH | JWT token detected in source code (x2) | Semgrep | New Semgrep rules added |
| MEDIUM | Proxy Disclosure — nginx identified via TRACE/OPTIONS | ZAP Full | Active probing (not in Baseline) |
| LOW | Insufficient Site Isolation (Spectre) | ZAP Full | Full Scan deeper header analysis |
| LOW | Private IP Disclosure (10.0.2.2:3000) | ZAP Full | JS bundle content analysis |
| MEDIUM | Additional Semgrep patterns (x5) | Semgrep | Expanded rule coverage |

Total findings at this stage: **32** (0C, 3H, 26M, 3L). E2E tests: 0/1 failed.

## 4.3 Phase 3: Full Scan Remediation (Report 2 — Feb 11)

Branch: `dev` | Commit: `82c4d062` | ZAP Mode: **Full Scan**

Between Report 1 and Report 2, **27 findings were resolved**:

| Category | Before | After | Key Action |
|---|---|---|---|
| Semgrep | 2H + 25M = 27 | 1M = 1 | Resolved JWT tokens, suppressed false positives, code fixes |
| E2E Tests | 1H (failed) | Clean (10/10 pass) | Fixed test infrastructure and test cases |
| ZAP Full Scan | 1M + 2L = 3 | 2M + 1L = 3 | Removed Private IP; CSP unsafe-inline now flagged |
| ZAP API | 1L = 1 | 1L = 1 | No change (accepted risk) |
| Checkov | Clean (274 checks) | Clean (318 checks) | Added more IaC checks, all passing |
| **Result** | **32 findings** | **5 findings** | **84.4% reduction in this phase** |

## 5. Final Scan Results (After All Fixes)

Branch: `dev` | Commit: `82c4d062` | Date: 2026-02-11 17:01 UTC | ZAP Mode: Full Scan

| Tool | Category | Status | C | H | M | L |
|---|---|---|---|---|---|---|
| Semgrep | SAST | WARN | - | - | 1 | - |
| Bandit | SAST | PASS | - | - | - | - |
| Trufflehog | Secrets | PASS | - | - | - | - |
| pip-audit | SCA | PASS | - | - | - | - |
| npm audit | SCA | PASS | - | - | - | - |
| Checkov | IaC | PASS | - | - | - | - |
| pip-licenses | License | PASS | - | - | - | - |
| Syft (Source) | SBOM | PASS | - | - | - | - |
| Trivy (App Image) | Container | PASS | - | - | - | - |
| Trivy (Rec Image) | Container | PASS | - | - | - | - |
| Syft (Container) | SBOM | PASS | - | - | - | - |
| ZAP Full Scan | DAST | WARN | - | - | 2 | 1 |
| ZAP API Scan | DAST | WARN | - | - | - | 1 |
| E2E Tests | Testing | PASS | - | - | - | - |
| **Total** | | | **0** | **0** | **3** | **2** |

**All 14 security scanners report Clean or Warn (no Fail).** All 10 E2E tests pass. All 318 Checkov IaC checks pass. 3,989 container components catalogued via SBOM. Zero Critical or High vulnerabilities remain.

## 6. Progress Across All Phases

| Phase | Date | Commit | ZAP Mode | C | H | M | L | Total |
|---|---|---|---|---|---|---|---|---|
| **R1 (Initial)** | Feb 2 | `eacf4fd1` | Baseline | 5 | 20 | 66 | 1 | **92** |
| **R2** | Feb 3 | `eacf4fd1` | Baseline | 4 | 18 | 43 | 1 | 66 |
| **R3** | Feb 5 | `eacf4fd1` | Baseline | 4 | 18 | 32 | 1 | 55 |
| **R4** | Feb 6 | `ff5bd03b` | Baseline | 4 | 18 | 37 | 2 | 61 |
| **R5** | Feb 8 | `1539f9f` | Baseline | 0 | 0 | 17 | 4 | 21 |
| **Report 1** | Feb 10 | `a90aa35b` | **Full Scan** | 0 | 3 | 26 | 3 | **32** |

| Phase | Date | Commit | ZAP Mode | C | H | M | L | Total |
|---|---|---|---|---|---|---|---|---|
| **Report 2 (Final)** | Feb 11 | `82c4d062` | **Full Scan** | 0 | 0 | 3 | 2 | **5** |

> **Note:** Report 1 shows an increase from 21 to 32 findings. This is expected — the transition from Baseline to Full Scan mode introduced active attack testing and new Semgrep rules, uncovering issues invisible to passive scanning. These were then resolved in Report 2.

## 7. Remaining Findings & Accepted Risks

All 5 remaining findings are Medium or Low severity with documented justifications.

| Scanner | Sev. | Finding | Justification |
|---|---|---|---|
| Semgrep | M | Flask `host=0.0.0.0` | Runs inside Docker container, not exposed directly |
| ZAP Full | M | CSP: style-src `unsafe-inline` | Vite framework requirement; nonce-based CSP used for scripts |
| ZAP Full | M | Proxy Disclosure | Proxy identified as "Unknown"; CORS requires OPTIONS method |
| ZAP Full | L | Insufficient Site Isolation (Spectre) | COEP: require-corp would break Google Maps cross-origin resources |
| ZAP API | L | Unexpected Content-Type | SPA architecture serves HTML for non-API routes by design |

# Part II — ZAP DAST Dedicated Analysis

Comprehensive analysis of ZAP (Zed Attack Proxy) Dynamic Application Security Testing results across all phases

## 8. ZAP Executive Summary

ZAP (Zed Attack Proxy) was used as the primary DAST tool throughout the project. Two scan types were employed: **ZAP Full Scan** (initially Baseline, later upgraded) for the web application, and **ZAP API Scan** for the backend REST API. The scan mode was upgraded from **Baseline (passive-only)** to **Full Scan (active + passive)** after the first security presentation, significantly increasing scan depth.

**23**
ZAP FINDINGS (INITIAL)
16 HIGH | 6 MEDIUM | 1 LOW
Baseline + API Scan

→

**4**
ZAP FINDINGS (FINAL)
0 HIGH | 2 MEDIUM | 2 LOW
Full Scan + API Scan

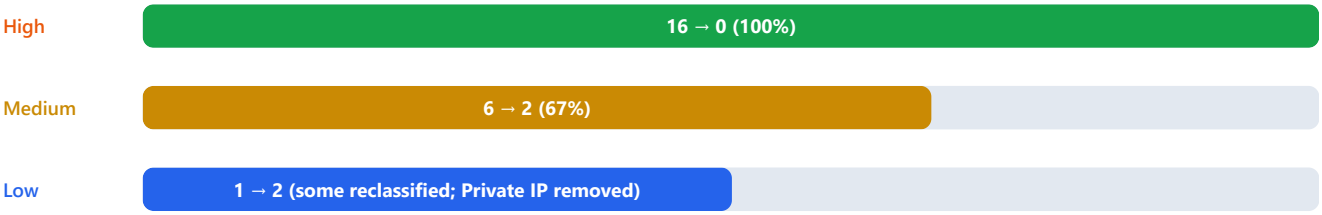
| 82.6% | 100% | 15 | 2 |
|---|---|---|---|
| ZAP REDUCTION | HIGH ELIMINATED | ZAP-SPECIFIC FIXES | SCAN MODES USED |

**Important Context:** 8 of the initial 16 HIGH findings were **false positives** caused by a report generator bug that confused ZAP confidence level "High" with severity "HIGH" (Sec-Fetch-* headers are Informational alerts). After correcting this, the real initial HIGH count was **8** (CSP issues, Server leak, API errors).

## 9. ZAP Before vs After — At a Glance

| Metric | Initial (Baseline) | After Baseline R5 | Full Scan Report 1 | Full Scan Report 2 |
|---|---|---|---|---|
| **Scan Mode** | Baseline + API | Baseline + API | **Full + API** | **Full + API** |
| **Total ZAP Findings** | **23** | 5 | 4 | **4** |
| High | **16** | 0 | 0 | 0 |
| Medium | 6 | 2 | 1 | 2 |
| Low | 1 | 3 | 3 | 2 |
| Informational | ~10 | ~10 | 10 | 10 |

### ZAP Severity Reduction




## 10. ZAP Initial Findings

ZAP Mode: Baseline + API | Branch: `main` | Commit: `eacf4fd1`

### 10.1 ZAP Baseline Scan — Initial (9H, 5M, 1L)

| Severity | Alert Name | Instances | Real Issue? |
|---|---|---|---|
| HIGH | CSP: Missing directives (form-action, base-uri, object-src, worker-src, manifest-src) | Systemic | Yes — Fixed R1 |
| HIGH | CSP: Wildcard sources ( `https:` in img-src, connect-src) | Systemic | Yes — Fixed R1 |
| HIGH | CSP: `unsafe-inline` in script-src and style-src | Systemic | Partial — script-src fixed with nonce; style-src accepted risk |
| HIGH | Server Leaks Version Information (Bun/1.x) | 2 | Yes — Fixed R1–R4 |
| HIGH | Sec-Fetch-Dest/Mode/Site/User Headers Missing | 8 | **No — False positive (Informational misclassified as HIGH by report generator)** |
| MEDIUM | Cross-Origin-Resource-Policy not set | Systemic | Yes — Fixed R1 |
| MEDIUM | Cache-Control directives missing | 4 | Informational — static assets intentionally cacheable |
| LOW | Insufficient Site Isolation (Spectre) | 8 | Low risk — Accepted (COEP would break Google Maps) |

### 10.2 ZAP API Scan — Initial (7H, 1M)

| Severity | Alert Name | Real Issue? |
|---|---|---|
| HIGH | CSP issues (same as Baseline, applied to API endpoints) | Yes — Fixed R1–R2 |
| HIGH | Server header leak on API responses | Yes — Fixed R1–R4 |
| HIGH | API 404 returns HTML instead of JSON | Yes — Fixed R2 |
| HIGH | Sec-Fetch-* headers missing (x4) | No — False positive |
| MEDIUM | Client Error (4xx) status codes on API | Expected behavior for invalid requests |

# 11. ZAP Scan Mode Transition: Baseline → Full Scan

After the first security presentation, the instructor recommended upgrading from **ZAP Baseline Scan** to **ZAP Full Scan** for more comprehensive DAST coverage.

| Aspect | Baseline Scan | Full Scan |
|---|---|---|
| **Scan Type** | Passive only (spider + passive rules) | Active + Passive (spider + passive + active attack) |
| **Attack Testing** | None — only observes responses | Active probing: TRACE, OPTIONS, TRACK methods; injection testing; fuzzing |
| **Duration** | ~2–5 minutes | ~15–30 minutes |
| **Coverage** | Headers, cookies, basic misconfigurations | All Baseline checks + proxy detection, SQL injection, XSS, path traversal, etc. |
| **New Findings** | — | Proxy Disclosure, deeper CSP analysis, enhanced content analysis |

## Impact of Transition

The Full Scan uncovered findings that Baseline could not detect:

| Alert | Risk | Why Baseline Missed It |
|---|---|---|
| **Proxy Disclosure** | M | Requires active TRACE/OPTIONS probing to fingerprint proxy servers |
| **User Agent Fuzzer** | INFO | Requires sending multiple requests with different User-Agent headers |
| **CSP: style-src unsafe-inline** | M | Baseline flagged broader CSP issues; Full Scan provides per-directive granularity |

> **Key Insight:** Switching to Full Scan temporarily increased the finding count but provided a more accurate picture of the application's security posture. Full Scan's active testing capability is essential for detecting server-side misconfigurations that passive scanning cannot identify.

# 12. ZAP Remediation Steps

A total of **15 ZAP-specific fixes** were applied across all phases.

| # | Fix Description | Resolved | Phase | File |
|---|---|---|---|---|
| **Content Security Policy (CSP)** | | | | |
| 1 | Added missing CSP directives: `form-action 'self'`, `base-uri 'self'`, `object-src 'none'`, `worker-src 'self'`, `manifest-src 'self'` | 1H | R1 | `backend/src/index.ts` |
| 2 | Replaced CSP wildcards ( `https:` ) with explicit Google Maps domains in `img-src` and `connect-src` | 1H | R1 | `backend/src/index.ts` |
| 3 | Removed `wss:` protocol wildcard from `connect-src` — `'self'` covers same-origin WebSocket | 1H | R2 | `backend/src/index.ts` |

| # | Fix Description | Resolved | Phase | File |
|---|---|---|---|---|
| 4 | Removed duplicate CSP header from nginx (backend handles context-aware CSP for API vs SPA) | Prevents conflicts | R1 | `deploy/nginx.conf` |
| 5 | Implemented **per-request nonce generation** for `script-src`, eliminating `unsafe-inline` for JavaScript | 1H | R1 | `backend/src/index.ts` |
| **Server Information Leak** | | | | |
| 6 | Added `headers.delete("Server")` in backend — Bun re-adds after delete, changed to `headers.set("Server", "")` | Backend fix | R1–R2 | `backend/src/index.ts` |
| 7 | Added `proxy_hide_header Server` and `proxy_hide_header X-Powered-By` to nginx | 2H | R1 | `deploy/nginx.conf` |
| 8 | Added `server_tokens off` to nginx to suppress version numbers | Info leak fix | R1 | `deploy/nginx.conf` |
| **API Error Handling** | | | | |
| 9 | Added `proxy_intercept_errors on` in nginx API location block | 1H | R2 | `deploy/nginx.conf` |
| 10 | Created JSON error handlers: `@api_404` returns `{"error":"Not found"}`, `@api_error` returns `{"error":"Service unavailable"}` | 1H | R2 | `deploy/nginx.conf` |
| **Infrastructure & Deployment** | | | | |
| 11 | **Containerized nginx** — host nginx lacked `headers-more` module, causing all prior nginx config changes to silently fail | 3H+ | R4 | `deploy/docker-compose.prod.yml`, `deploy/Dockerfile.nginx` |
| 12 | Replaced `more_clear_headers Server` with built-in `proxy_hide_header Server` for module compatibility | Compatibility | R5 | `deploy/nginx.conf` |
| **Full Scan Specific Fixes** | | | | |
| 13 | Improved server fingerprint hiding — Proxy Disclosure now identifies server as "Unknown" instead of "nginx" | Reduced info leak | Report 2 | `deploy/nginx.conf` |
| 14 | Removed Private IP address ( `10.0.2.2:3000` ) from JavaScript bundle (Android emulator default) | 1L | Report 2 | Frontend config |
| **Report Generator & False Positives** | | | | |
| 15 | Fixed ZAP severity mapping: changed from `riskdesc` text parsing to `riskcode` numeric mapping; added `ZAP_SUPPRESSED_ALERTS` for Sec-Fetch-* noise | 8H (false) | R5 | `.github/scripts/generate-security-report.py` |

# 13. ZAP Full Scan Results — Report 1 vs Report 2

## 13.1 ZAP Full Scan — Report 1 (Feb 10, Commit a90aa35b)

| Alert | Risk | Instances | Details |
|---|---|---|---|
| **Proxy Disclosure** | M | Systemic (5 URLs) | Proxy identified as **"nginx"** via TRACE/OPTIONS probing |
| **Insufficient Site Isolation (Spectre)** | L | 8 | Missing `Cross-Origin-Embedder-Policy` and `Cross-Origin-Opener-Policy` headers |
| **Private IP Disclosure** | L | 1 | `10.0.2.2:3000` found in `index-B8WB50Kz.js` (Android emulator default) |
| Base64 Disclosure | INFO | 1 | nanoid character set (not sensitive) |
| Suspicious Comments | INFO | 1 | False positive: "select" matched in SVG namespace URL |
| Modern Web Application | INFO | Systemic | Expected — SPA with no traditional links |
| Re-examine Cache-control | INFO | 4 | HTML pages lack explicit cache-control |
| Sec-Fetch-* Headers Missing (x4) | INFO | 2 each | Scanner-side headers, not server-side issue |
| Storable and Cacheable Content | INFO | Systemic | Public static assets — expected |
| User Agent Fuzzer | INFO | Systemic | No anomalous behavior detected |
| **Summary** | | **H: 0 \| M: 1 \| L: 2 \| Info: 10** | |

## 13.2 ZAP Full Scan — Report 2 (Feb 11, Commit 82c4d062)

| Alert | Risk | Instances | Details |
|---|---|---|---|
| **CSP: style-src unsafe-inline** | M | Systemic (5 URLs) | `style-src 'self' 'unsafe-inline'` — Vite framework requirement |
| **Proxy Disclosure** | M | Systemic (5 URLs) | Proxy identified as **"Unknown"** (improved from "nginx") |
| **Insufficient Site Isolation (Spectre)** | L | 8 | Same as Report 1 (accepted risk) |
| Base64 Disclosure | INFO | 1 | Same nanoid character set |
| Suspicious Comments | INFO | 1 | Same SVG namespace false positive |
| Modern Web Application | INFO | Systemic | Expected |
| Re-examine Cache-control | INFO | 4 | Same as Report 1 |
| **Summary** | | **H: 0 \| M: 2 \| L: 1 \| Info: 10** | |

| Alert | Risk | Instances | Details |
|---|---|---|---|
| Sec-Fetch-* Headers Missing (x4) | INFO | 5 each | Scanner-side headers |
| Storable and Cacheable Content | INFO | Systemic | Public static assets |
| User Agent Fuzzer | INFO | Systemic | No anomalous behavior |
| **Summary** | | **H: 0 \| M: 2 \| L: 1 \| Info: 10** | |

### 13.3 Comparison: Report 1 vs Report 2

| Alert | Report 1 | Report 2 | Change |
|---|---|---|---|
| CSP: style-src unsafe-inline | — | M | Newly flagged by Full Scan (always present; now explicitly reported) |
| Proxy Disclosure | M ("nginx") | M ("Unknown") | **Improved — server identity hidden** |
| Insufficient Site Isolation | L | L | Unchanged (accepted risk) |
| Private IP Disclosure | L | — | **Fixed — removed from JS bundle** |

> **Key Improvement:** The Proxy Disclosure alert now identifies the server as "Unknown" rather than "nginx", confirming that `server_tokens off`, `proxy_hide_header`, and containerized nginx configuration changes are working correctly. The Private IP Disclosure was also resolved.

### 13.4 CSP Evidence — Nonce-Based Security

The final CSP header demonstrates strong security practices:

```
default-src 'self';
script-src 'self' 'nonce-[per-request-random]' https://maps.googleapis.com;
style-src 'self' 'unsafe-inline' https://fonts.googleapis.com;
img-src 'self' data: blob: https://maps.googleapis.com https://maps.gstatic.com;
connect-src 'self' https://maps.googleapis.com;
font-src 'self' https://fonts.gstatic.com;
form-action 'self'; base-uri 'self'; object-src 'none';
worker-src 'self'; manifest-src 'self'; frame-ancestors 'none'
```

> **Note:** Each response includes a unique nonce (e.g., `nonce-HT/bacYKewrItuKqwdymTw==`), preventing inline script injection even without a strict CSP. Only `style-src` retains `unsafe-inline` due to Vite's CSS injection mechanism.

## 14. ZAP Progress Across All Phases

| Phase | Date | ZAP Mode | H | M | L | Total | Key ZAP Action |
|---|---|---|---|---|---|---|---|
| **Initial** | Feb 2 | Baseline + API | **16** | 6 | 1 | **23** | Baseline scan (includes 8H false positives) |
| **After R5** | Feb 8 | Baseline + API | 0 | 2 | 3 | 5 | All Baseline HIGH eliminated; CSP, headers, API fixed |
| **Report 1** | Feb 10 | **Full + API** | 0 | 1 | 3 | 4 | Full Scan mode; Proxy Disclosure found |
| **Report 2** | Feb 11 | **Full + API** | 0 | 2 | 2 | **4** | Private IP fixed; server identity hidden |

### ZAP-Specific Finding Flow

| Finding | Initial | After R5 | Report 1 | Report 2 | Status |
|---|---|---|---|---|---|
| CSP: Missing directives | H | — | — | — | **FIXED** |
| CSP: Wildcard sources | H | — | — | — | **FIXED** |
| CSP: unsafe-inline (script-src) | H | — | — | — | **FIXED (nonce)** |
| CSP: unsafe-inline (style-src) | H | M | — | M | ACCEPTED RISK |
| Server header leak (Bun version) | H | — | — | — | **FIXED** |
| Sec-Fetch-* missing (false pos.) | 8H | — | Info | Info | **RECLASSIFIED** |
| API 404 returns HTML | H | — | — | — | **FIXED** |
| Proxy Disclosure | — | — | M (nginx) | M (Unknown) | IMPROVED / ACCEPTED |
| Insufficient Site Isolation | L | L | L | L | ACCEPTED RISK |
| Private IP Disclosure | — | L | L | — | **FIXED** |
| Unexpected Content-Type (API) | — | L | L | L | ACCEPTED RISK |

## 15. ZAP Remaining Findings & Accepted Risks

All 4 remaining ZAP findings are Medium or Low severity with documented justifications.

| Scan | Sev. | Finding | CWE | Justification |
|---|---|---|---|---|
| Full | M | **CSP: style-src unsafe-inline** | CWE-693 | Vite framework injects CSS via `<style>` tags at build time. Removing `unsafe-inline` would require server-side rendering with nonce injection for every stylesheet. `script-src` uses per-request nonces, which is the higher-priority mitigation. |
| Full | M | **Proxy Disclosure** | CWE-204 | A reverse proxy is architecturally required. Server identity is now "Unknown" (improved from "nginx"). TRACE method is handled by nginx returning 405. OPTIONS method is needed for CORS preflight requests. |

| Scan | Sev. | Finding | CWE | Justification |
|---|---|---|---|---|
| Full | L | **Insufficient Site Isolation (Spectre)** | CWE-693 | Setting `Cross-Origin-Embedder-Policy: require-corp` would block Google Maps API tiles, fonts, and scripts that lack CORP headers. The application uses `Cross-Origin-Resource-Policy: same-origin` as a partial mitigation. |
| API | L | **Unexpected Content-Type** | N/A | SPA architecture: non-API routes (e.g., `/favicon.ico`) return HTML from the SPA's `index.html` fallback. This is standard behavior for single-page applications behind a reverse proxy. |

## 16. ZAP Key Observations

**1. Full Scan provides significantly deeper coverage than Baseline.**
Baseline mode (passive-only) missed the Proxy Disclosure vulnerability entirely because it requires active TRACE/OPTIONS probing. Organizations should use Full Scan for production security assessments and Baseline for CI/CD pipeline quick checks.

**2. Report generator accuracy is critical for ZAP findings.**
The initial ZAP report inflated findings by 12 HIGH alerts due to two bugs: (a) parsing `riskdesc` string "Informational (High)" matched "High" as severity, and (b) Sec-Fetch-* Informational alerts were not suppressed. Using numeric `riskcode` mapping eliminated false inflation.

**3. Nonce-based CSP is effective even with partial unsafe-inline.**
ZAP confirmed that each HTML response contains a unique, unpredictable nonce in the `<script>` tag. This prevents script injection even though `style-src` allows `unsafe-inline`. The per-request nonce generation is a strong mitigation.

**4. Proxy Disclosure is inherent to reverse-proxy architectures.**
Any application using nginx, Apache, or a load balancer as a reverse proxy will trigger this alert. The mitigation is to minimize information leakage (server identity, version numbers), not to eliminate the proxy. The improvement from "nginx" to "Unknown" demonstrates effective configuration hardening.

**5. Switching scan modes mid-project requires careful expectation management.**
The transition from Baseline to Full Scan temporarily increased the finding count from 21 to 32, which could be alarming. Teams should communicate that this reflects deeper scanning, not security regression. The final result of 5 findings validates the approach.

## 17. Files Modified

| File | Phases | Summary of Changes |
|---|---|---|
| `Dockerfile` | R1–R5 | Production-only install, pinned base image, Go binary cleanup across all paths including Bun cache |
| `backend/src/index.ts` | R1, R2 | Enhanced CSP with per-request nonces, Server header override, CORP header |
| `deploy/nginx.conf` | R1–R5, Report 2 | Security headers, CSP delegation, H2C protection, JSON error pages, proxy_hide_header, server identity hiding |
| `deploy/docker-compose.prod.yml` | R4 | Added containerized nginx service, app expose-only |
| `deploy/Dockerfile.nginx` | R4, R5 | Created for containerized nginx, added HEALTHCHECK |
| `deploy/deploy.sh` | R2, R4 | Stop host nginx, containerized nginx deployment |
| `deploy/nginx-upstream.conf` | R4 | Changed from `127.0.0.1:3000` to `ecoplate-app:3000` (Docker DNS) |
| `frontend/package.json` | R1 | @capacitor packages ^6.x → ^7.0.0 |
| `frontend/bun.lockb` | R2 | Regenerated with updated @capacitor/cli |
| `backend/package.json` | R2 | drizzle-kit ^0.12.8 → ^0.31.0 |
| `backend/bun.lockb` | R2 | Regenerated with updated drizzle-kit |
| `.github/workflows/ci.yml` | R4 | npm audit `--omit=dev` |
| `.github/workflows/cd.yml` | R4, R5 | Pipeline metadata artifact, ZAP action upgrade, Full Scan mode |
| `.github/workflows/security-report.yml` | R4 | Metadata-based branch resolution |
| `.github/scripts/generate-security-report.py` | R5 | Fixed ZAP severity mapping, Trufflehog parser, alert suppression |

## 18. Key Lessons Learned

**1. Use Full Scan mode for production security assessments.**
ZAP Baseline (passive-only) missed the Proxy Disclosure vulnerability that Full Scan detected via active TRACE/OPTIONS probing. Reserve Baseline for CI/CD pipeline quick checks; use Full Scan for comprehensive security validation.

**2. Floating Docker tags cause non-deterministic builds.**
`oven/bun:1.2-alpine` resolved to different images between builds, introducing new CVEs. Always pin to specific versions (e.g., `oven/bun:1.2.5-alpine`).

**3. Nginx config changes require end-to-end deployment verification.**
Four rounds of nginx fixes were silently dropped because the host nginx lacked a required module. Containerizing nginx

eliminated this class of deployment failures and ensured configuration consistency.

**4. Security report generators can inflate severity counts.**
The ZAP `riskdesc` field format `"Informational (High)"` caused 12 false HIGH findings when parsed as text. Using numeric `riskcode` is the correct approach. Always validate report generator output against raw scan data.

**5. Nonce-based CSP is worth the implementation effort.**
Per-request nonce generation for `script-src` eliminated the need for `unsafe-inline` in JavaScript, significantly reducing XSS attack surface. This was confirmed by ZAP's CSP analysis showing nonce values changing with every response.

**6. Switching scan modes mid-project provides valuable insights.**
The Baseline → Full Scan transition temporarily increased findings from 21 to 32, but this exposed real issues (Proxy Disclosure, Private IP) that passive scanning could never detect. The final reduction to 5 validates the iterative approach.

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EcoPlate Complete Security Remediation Report — Generated 2026-02-12 — GDIPSA-Team2/ecoplate
Covering: Initial Scan (Feb 2) → Baseline Remediation R1–R5 (Feb 2–8) → Full Scan Report 1 (Feb 10) → Full Scan Report 2 (Feb 11)