ASSET CRITICALITY ANALYSIS

Plant 2 Asset Criticality: Re-Ranking What Matters Most

36 production and utility assets scored on consequence of failure, re-tiered against the 2019 register, and translated into maintenance effort, spares policy, and working capital.

SAMPLE — FICTIONAL DAT

CLIENT	Larkspur Valley Foods, Inc. — Plant 2 (cultured dairy)
SCOPE	36 assets and asset groups across process, utilities, Lines 1–3, warehouse, and facilities
REPORT NO.	CA-2026-003 · Revision 0 · Issued December 4, 2026
METHOD	Consequence-weighted scoring (safety, food safety, production, environmental and regulatory, repair) with override rules; likelihood used to sequence work within a tier
RELATED WORK	RCA-2026-014 (GR-305) and FMECA-2026-007 (Line 3 filler), whose figures are reused and whose benefits are excluded here
TEAM	Apex Reliability Engineering (facilitator) · Maintenance & Engineering Manager · Production Manager · Food Safety & QA Manager · EHS Manager · Storeroom Lead · Plant Controller

> **Demonstration document.** Sample report. All company names, people, data, and financial figures are fictional and shown for demonstration only. The structure, methods, and level of detail match Apex Reliability Engineering client deliverables.

Executive Summary

Decision brief for the Plant Manager and Plant Controller. Sections 1–6 contain the supporting detail.

BOTTOM LINE

Plant 2's 2019 criticality register no longer reflects the plant. **19 of 36 assets change tier**, including the constraint line's gearbox, product pump, and seal heads, which were all ranked B. Today, tier A assets carry 67% of failure risk but get 41% of preventive maintenance hours. Re-tiering moves effort and spares to where the risk is, with **8% more PM hours** and inventory funded largely by releasing low-tier stock.

ASSETS CHANGING TIER	TIER A SHARE OF RISK	PM HOURS ON TIER C TODAY	INVENTORY RELEASED	5-YR NPV, EXPECTED
19 of 36	**67%**	**27%**	**$72.2K**	**$249K**
6 raised, 13 lowered	vs. 41% of PM hours today	for 9% of the risk	vs. $52.0K added to tier A and B	Range $43K–$433K

DECISIONS REQUESTED

1. **Adopt the 36-asset register** as the plant's criticality basis for work priority, PM, PdM, and spares.
2. **Approve the spares re-balance:** add $52.0K on tier A and B assets, and release $72.2K of tier C and excess stock through return, consignment, or run-down.
3. **Fund 240 h of implementation** ($18.7K) and a six-month review gate before the remaining rollout.

WHAT THE ANALYSIS SHOWS

- FINDING The constraint's three highest-risk assets were ranked B because the 2019 register predates Line 3 becoming the constraint.
- FINDING 27% of PM hours go to tier C assets, including office HVAC and the shop compressor.
- JUDGMENT 11 assets are tier A by override (safety, food safety, or no-redundancy stoppage); for 5 of them, the override is the only reason they reach A.

FINANCIAL SUMMARY (PRE-TAX)

	CONSERV.	EXPECTED	HIGH
Net annual benefit	$20.5K	$69.2K	$113.8K
Year-0 cash outlay	$34.6K	$12.9K	Self-funding
Payback (months)	20.2	2.2	Immediate
5-yr NPV at 10%	**$43K**	**$249K**	**$433K**

Benefits from GR-305, P-310, and the seal heads ($185.2K/yr of risk) are excluded, because RCA-2026-014 and FMECA-2026-007 already claim them.

CONFIDENCE

MODERATE Consequence scores are team judgments against defined anchors (Appendix). Risk reduction on tier A drives the case, and two stress tests turn the conservative NPV negative. The six-month gate exists to test that assumption before full rollout.

SAMPLE — FICTIONAL D

1 Method: Consequence First

Criticality answers one question: **how bad is it when this asset fails?** How often it fails is a reliability question. Mixing the two produces a "bad actor" list, not a criticality ranking.

TABLE 1.1 — CONSEQUENCE CATEGORIES AND WEIGHTS

CATEGORY	WEIGHT	SCORED ON (1–5)
Production (P)	30%	Throughput lost; constraint and redundancy
Personnel safety (S)	25%	Credible injury from failure or its repair
Food safety and quality (F)	25%	CCP, preventive control, or product hold
Environmental and regulatory (E)	10%	Release, permit, or compliance exposure
Repair cost and time (R)	10%	Parts, labor, and lead time per failure

Score = weighted average rescaled to 0–100. Tier A ≥ 55, B 30–54, C < 30. The anchor definitions for each level are in the Appendix.

OVERRIDE RULES

Any asset scoring **5 in safety (S), food safety (F), or production (P)** is tier A whatever its weighted score. P = 5 means the asset stops the whole plant or the constraint and has no redundancy. Weighted averages dilute exactly these single-point consequences, and the overrides exist to stop that.

WHERE LIKELIHOOD FITS

Likelihood (failures per year from CMMS history) does not set the tier. It sequences work *within* a tier and values risk in dollars for the business case. A rarely failing tier A asset still gets tier A protection.

TABLE 1.2 — MAINTENANCE STRATEGY BY TIER

TIER	MAINTENANCE	SPARES	FAILURE RESPONSE	PM + PDM H/YR
A	Condition monitoring (monthly routes) plus OEM/RCM-based PM; priority-1 work orders	Critical spares on site, min/max set	RCA after any failure	110
B	Time-based PM plus quarterly PdM route	Vendor-stocked or consignment	RCA on a repeat (2 in 12 months)	45
C	Run to failure or a minimal inspection	Buy on demand	Repair; no RCA	8

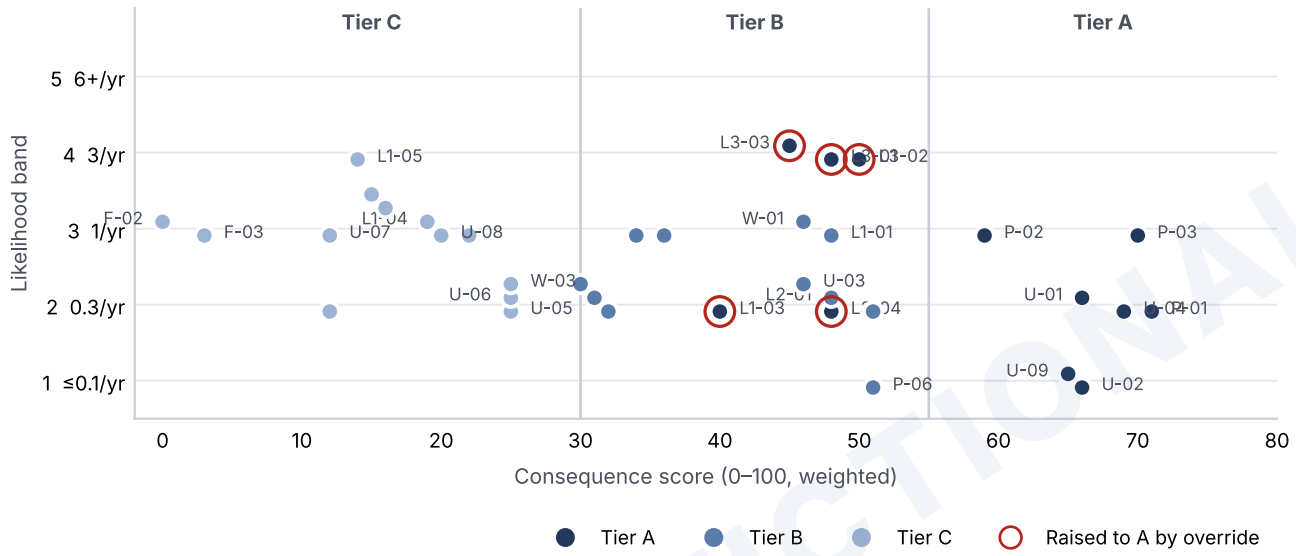
Hours are planning averages per asset. Individual tasks are set by FMECA or RCM, as FMECA-2026-007 did for the Line 3 filler.

SAMPLE — FICTIONAL D

2 Results

12 assets rank tier A, 11 tier B, and 13 tier C. Effort and inventory today do not follow that ranking.

FIGURE 2.1 — ASSETS BY CONSEQUENCE SCORE AND LIKELIHOOD



Labels mark tier A assets and assets that changed tier. Ringed points are raised to tier A by an override despite a weighted score below 55.

TABLE 2.1 — TIER SUMMARY, 2019 REGISTER VS. THIS ANALYSIS

TIER	ASSETS 2019	ASSETS NOW	ANNUAL RISK	PM H TODAY	PM H PROPOSED	SPARES TODAY	SPARES TARGET
A	11	12	$382,436	728	1320	$88,450	$128,400
B	20	11	$137,100	560	495	$96,500	$79,000
C	5	13	$52,700	485	104	$60,000	$17,300
Total	**36**	**36**	**$572,236**	**1773**	**1919**	**$244,950**	**$224,700**

Annual risk = failures per year × (production consequence + repair cost) for each asset. For L3-01, L3-02, and L3-03, values are taken from RCA-2026-014 and FMECA-2026-007 so the three reports reconcile.

SAMPLE — FICTIONAL D

3 Criticality Register

All 36 assets, sorted by tier and score. This register becomes the CMMS criticality field.

ID	ASSET	S	F	P	E	R	SCORE	L	RISK $/YR	2019	NOW
P-01	HTST pasteurizer (timing pump, FDD)	2	5	5	3	3	71	2	$19,800	A	A
P-03	CIP skid CIP-1	3	5	4	3	3	70	3	$31,000	A	A
U-04	Boiler B-1	4	3	4	4	4	69	2	$12,000	A	A
U-01	Ammonia screw compressor C-1	5	2	3	5	5	66	2	$14,700	A	A
U-02	Ammonia screw compressor C-2	5	2	3	5	5	66	1	$4,900	A	A
U-09	Main switchgear / MCC-A	5	1	5	1	5	65	1	$10,000	A	A
P-02	Homogenizer HG-1	2	3	5	1	5	59	3	$100,000	A	A
L3-02	Seal heads (12 lanes)	1	5	4	1	2	50	4	$40,072	B	A · F
L3-01	Filler main drive GR-305	2	2	5	1	3	48	4	$104,028	B	A · P
L3-04	Metal detector	1	5	3	3	2	48	2	$3,300	B	A · F
L3-03	Product pump P-310	1	3	5	1	2	45	4	$41,136	B	A · P
L1-03	Metal detector	1	5	2	3	2	40	2	$1,500	B	A · F
P-07	Glycol chiller	2	3	4	2	4	51	2	$12,000	B	B
P-06	Separator / clarifier	2	3	4	1	5	51	1	$6,500	A	B
L1-01	Cup filler	2	4	3	1	4	48	3	$24,000	A	B
L2-01	Bottle filler	2	4	3	1	4	48	2	$7,200	A	B
W-01	Palletizer (shared, all lines)	4	1	4	1	3	46	3	$31,000	C	B
U-03	Ammonia evaporative condenser	4	1	3	4	3	46	2	$4,500	A	B
L1-02	Lidder	1	4	3	1	2	36	3	$11,000	B	B
L3-06	Case packer	2	1	4	1	3	34	3	$31,000	B	B
P-05	Raw milk receiving pump	1	3	3	2	2	32	2	$3,300	B	B
L3-05	Checkweigher	1	2	3	4	2	31	2	$3,300	B	B
P-04	Fermentation tank agitators (6)	1	3	3	1	2	30	2	$3,300	B	B
U-05	Air compressor AC-1 (N+1)	2	2	2	1	3	25	2	$2,700	B	C
U-06	Air compressor AC-2 (N+1)	2	2	2	1	3	25	2	$2,700	B	C
W-03	Cold-storage evaporators	1	3	2	2	2	25	2	$1,500	B	C
L2-02	Shrink tunnel	3	1	2	1	2	22	3	$5,000	C	C
U-08	Wastewater pH system	1	1	2	5	2	20	3	$5,000	B	C
L1-04	Case packer	2	1	2	1	3	19	3	$9,000	B	C
W-02	Stretch wrapper	2	1	2	1	2	16	3	$5,000	C	C
W-04	Dock levelers	3	1	1	1	2	15	3	$2,500	C	C
L1-05	Transfer conveyors	2	1	2	1	1	14	4	$10,500	B	C
U-07	Cooling tower fan CT-1	1	1	2	2	2	12	3	$5,000	B	C
F-01	Forklift charging station	3	1	1	1	1	12	2	$300	C	C
F-03	Office HVAC	1	1	1	1	2	3	3	$2,500	B	C
F-02	Shop air compressor	1	1	1	1	1	0	3	$1,000	B	C

S safety · F food safety · P production · E environmental/regulatory · R repair; each scored 1–5. L is the likelihood band. A letter after the tier shows the override that raised it. Section 4 lists every tier change with its reason.

SAMPLE — FICTIONAL DATA

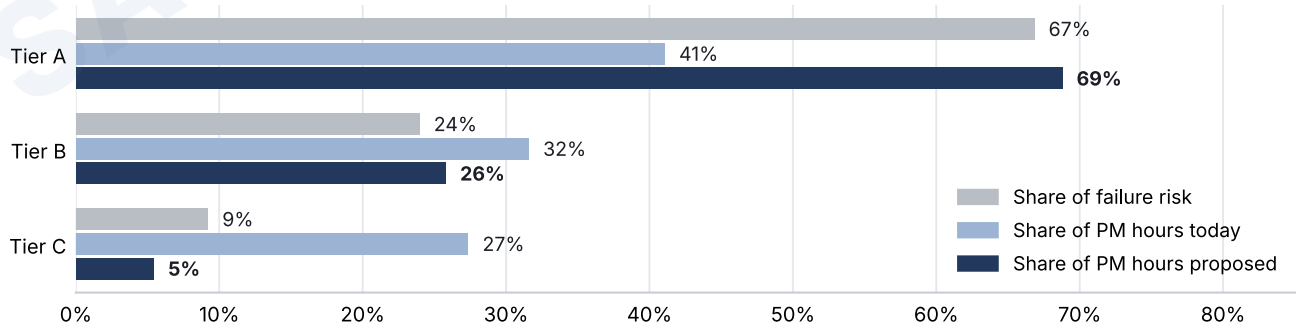
4 What Changes and Why

Every tier change has a stated reason that the owning department can challenge. Most downgrades come from redundancy that the 2019 register did not credit.

TABLE 4.1 — TIER CHANGES

ID	ASSET	CHANGE	REASON
L1-03	Metal detector	B → A	Metal detection is a critical control point (F override).
L3-01	Filler main drive GR-305	B → A	Stops the plant constraint with no redundancy (P override). Subject of RCA-2026-014.
L3-02	Seal heads (12 lanes)	B → A	Seal integrity is a food-safety preventive control (F override).
L3-03	Product pump P-310	B → A	Stops the plant constraint with no redundancy (P override).
L3-04	Metal detector	B → A	Metal detection is a critical control point (F override).
W-01	Palletizer (shared, all lines)	C → B	Single palletizer serves all lines; crush-point safety exposure (score 46).
F-02	Shop air compressor	B → C	No production, safety, or food-safety consequence.
F-03	Office HVAC	B → C	No production, safety, or food-safety consequence.
L1-01	Cup filler	A → B	Line 1 is not the constraint; lost volume is recoverable on overtime.
L1-04	Case packer	B → C	Line 1 is not the constraint; accumulation conveyor buffers stops.
L1-05	Transfer conveyors	B → C	Low-cost, quick-swap components; redundant transfer paths.
L2-01	Bottle filler	A → B	Line 2 is not the constraint; lost volume is recoverable on overtime.
P-06	Separator / clarifier	A → B	Rare failures; production impact recoverable within the shift (score 51).
U-03	Ammonia evaporative condenser	A → B	Multiple condenser cells; one cell out still meets load most of the year.
U-05	Air compressor AC-1 (N+1)	B → C	N+1 redundancy with AC-2.
U-06	Air compressor AC-2 (N+1)	B → C	N+1 redundancy with AC-1.
U-07	Cooling tower fan CT-1	B → C	Multiple tower cells; seasonal load.
U-08	Wastewater pH system	B → C	Holding tank gives response time; compliance is covered by the continuous pH alarm, not tier.
W-03	Cold-storage evaporators	B → C	Multiple evaporators; product stays in temperature during repair.

FIGURE 4.1 — WHERE THE RISK IS VS. WHERE THE HOURS GO



SAMPLE — FICTIONAL D

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Sample report. All company names, people, data, and financial figures are fictional and shown for demonstration only.

5 Financial Justification

This is a reallocation, not a new program. Labor rises 8%, inventory is re-pointed rather than grown, and the return comes from lower failure risk on the assets that matter.

TABLE 5.1 — CASH, WORKING CAPITAL, AND ACCOUNTING TREATMENT

ITEM	CLASS	AMOUNT	TREATMENT
Implementation labor, 240 h at $78/h	OPEX	$18,720	CMMS re-tiering, PM rewrites, spares review. Mostly non-incremental; included so cost is not understated.
Spares added to tier A and B assets	INVENTORY	$51,950	Balance-sheet MRO inventory
Spares released from tier C and excess stock	INVENTORY	($72,200)	Vendor return, consignment, or run-down. Realized share varies by scenario; any write-down is a P&L item for Controller review.
PM and PdM labor change, 1773 → 1919 h/yr	OPEX/YR	$11,388	Net of hours moved off tier C
Carrying cost on the net inventory change	OPEX/YR	20%	Applied to the net change in each scenario

TABLE 5.2 — SCENARIO ANALYSIS (PRE-TAX, 5-YEAR HORIZON, 10% HURDLE RATE)

	CONSERVATIVE	EXPECTED	HIGH IMPACT
Tier A risk avoided (excl. linked assets)	$49,300	$78,880	$108,460
Tier B risk avoided	$6,855	$13,710	$20,565
Tier C risk added (less PM)	($21,080)	($13,175)	($7,905)
Net risk avoided per year	**$35,075**	**$79,415**	**$121,120**
Labor change and carrying cost	−$14,558	−$10,226	−$7,338
Net annual benefit	**$20,517**	**$69,189**	**$113,782**
Net inventory change (release − additions)	−$15,850	$5,810	$20,250
Year-0 cash outlay	$34,570	$12,910	Self-funding
Payback (months)	20.2	2.2	Immediate
5-year NPV at 10%	**$43,206**	**$249,371**	**$432,853**

Conservative: A-tier risk cut 25%, B-tier 5%; C-tier risk up 40%; only half the excess inventory is actually released. **Expected:** A-tier risk cut 40%, B-tier 10%; C-tier risk up 25%; 80% of excess inventory released. **High impact:** A-tier risk cut 55%, B-tier 15%; C-tier risk up 15%; all excess inventory released.

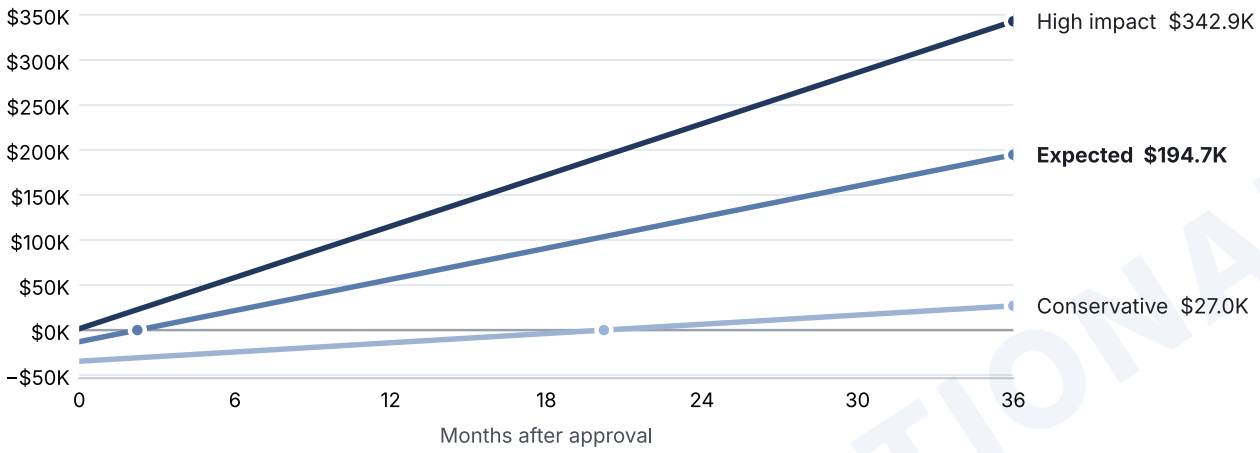
SAMPLE / FICTIONAL D

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5 Financial Justification (continued)

The expected and high cases are strong. The conservative case is positive but thin, and that is what the review gate is for.

FIGURE 5.1 — CUMULATIVE NET CASH POSITION BY SCENARIO (UNDISCOUNTED)



Dots on the zero line mark payback. In the high-impact case, released inventory exceeds year-0 cost, so the line starts above zero.

TABLE 5.3 — STRESS TESTS ON THE CONSERVATIVE CASE

STRESS APPLIED	5-YEAR NPV
Base case (Conservative)	**$43,206**
A-tier risk reduction halved	−$50,237
No inventory released	−$20,264
Implementation cost doubled	$24,486
Discount rate 15%	$34,206

WHERE THE CASE IS FRAGILE

Two stresses turn the conservative NPV negative: halving the tier A risk reduction, and releasing no inventory. Both can be measured within six months. The gate in Section 6 checks them before the remaining rollout is funded.

CONSERVATISM IN THESE FIGURES

Pre-tax and unlevered. Benefits already claimed by RCA-2026-014 and FMECA-2026-007 ($185.2K/yr of risk) are excluded. A higher failure risk on tier C assets is charged against the case, not ignored.

SAMPLE — FICTIONAL D

6 Implementation, Governance, and Limitations

Criticality only pays off if it drives daily decisions. These are the mechanisms that make it do so.

TABLE 6.1 — IMPLEMENTATION AND REVIEW GATE

WINDOW	WORK	OWNER
Months 0–2	Load tiers into the CMMS criticality field; link work-order priority to tier; start the spares returns and consignment talks	Planner · Storeroom Lead
Months 2–4	Rewrite PMs for tier A and B; cut tier C PMs to inspection or run-to-failure; extend PdM routes to all tier A assets	Reliability Engineer
Month 6 gate	**Check: tier A failure rate and downtime trend, inventory actually released, and PM compliance on tier A. Continue, adjust, or stop.**	Plant Manager · Controller
Ongoing	Re-score an asset after any change in duty, redundancy, or regulation. Full review annually.	Reliability Engineer

TABLE 6.2 — VERIFICATION MEASURES

MEASURE	TARGET
Tier A unplanned downtime	≥ 25% reduction against the trailing 12 months by month 12
Share of PM hours on tier A	≥ 60% (from 41%)
Inventory released	≥ 50% of $72.2K by month 6
Tier C failures with a consequence above tier C	Zero; any occurrence triggers a re-score

TABLE 6.3 — LIMITATIONS

GAP	EFFECT
Consequence scores are team judgments INFERENCE	Anchored definitions and cross-department review limit, but do not remove, subjectivity
Likelihood bands from CMMS history without failure coding	Risk dollars are approximate; tiers do not depend on them
Risk-reduction factors by tier are estimates	Covered by the scenario range and tested at the month-6 gate
Analysis covers 36 assets and groups, not every asset	Remaining assets default to tier C until scored

SAMPLE — FICTIONAL D

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A Scoring Anchors, References, and Approval

TABLE A.1 — SCORING ANCHORS (LEVELS 1, 3, 5; LEVELS 2 AND 4 INTERPOLATE)

CATEGORY	1	3	5
Production	No throughput impact, or full redundancy	Line slowed or stopped; volume recoverable on overtime	Stops the plant or the constraint; no redundancy
Safety	No credible injury	Credible recordable injury	Credible serious injury or fatality; PSM-covered (e.g., ammonia)
Food safety	No product contact or quality effect	Quality defect; product held for evaluation	CCP or preventive control; potential recall
Environ. / regulatory	None	Reportable internally; minor permit deviation	Release or permit violation requiring agency report
Repair	Under $1K; same shift	$5K–15K; days of lead time	Over $30K or weeks of lead time

TABLE A.2 — STANDARDS AND REFERENCES

REFERENCE	TITLE AND USE
ISO 55001:2024	Asset management — Asset management system — Requirements. Decision criteria and risk-based prioritization of assets.
IEC 60812:2018	Failure modes and effects analysis (FMEA and FMECA). Basis for task selection within tiers.
29 CFR 1910.119	Process safety management of highly hazardous chemicals. Ammonia system safety override (U-01 to U-03).
21 CFR Part 117	CGMP and risk-based preventive controls for human food. Food-safety override (CCPs, preventive controls).
RCA-2026-014 · FMECA-2026-007	Prior Apex analyses at Plant 2. Source of Line 3 risk values; benefits excluded here.

REVIEW AND APPROVAL

Prepared by
Lead Reliability Engineer, Apex Reliability Engineering — Signature _____ Date _____

Financials validated by
Plant Controller — Signature _____ Date _____

Approved by
Plant Manager — Signature _____ Date _____

SAMPLE — FICTIONAL D

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