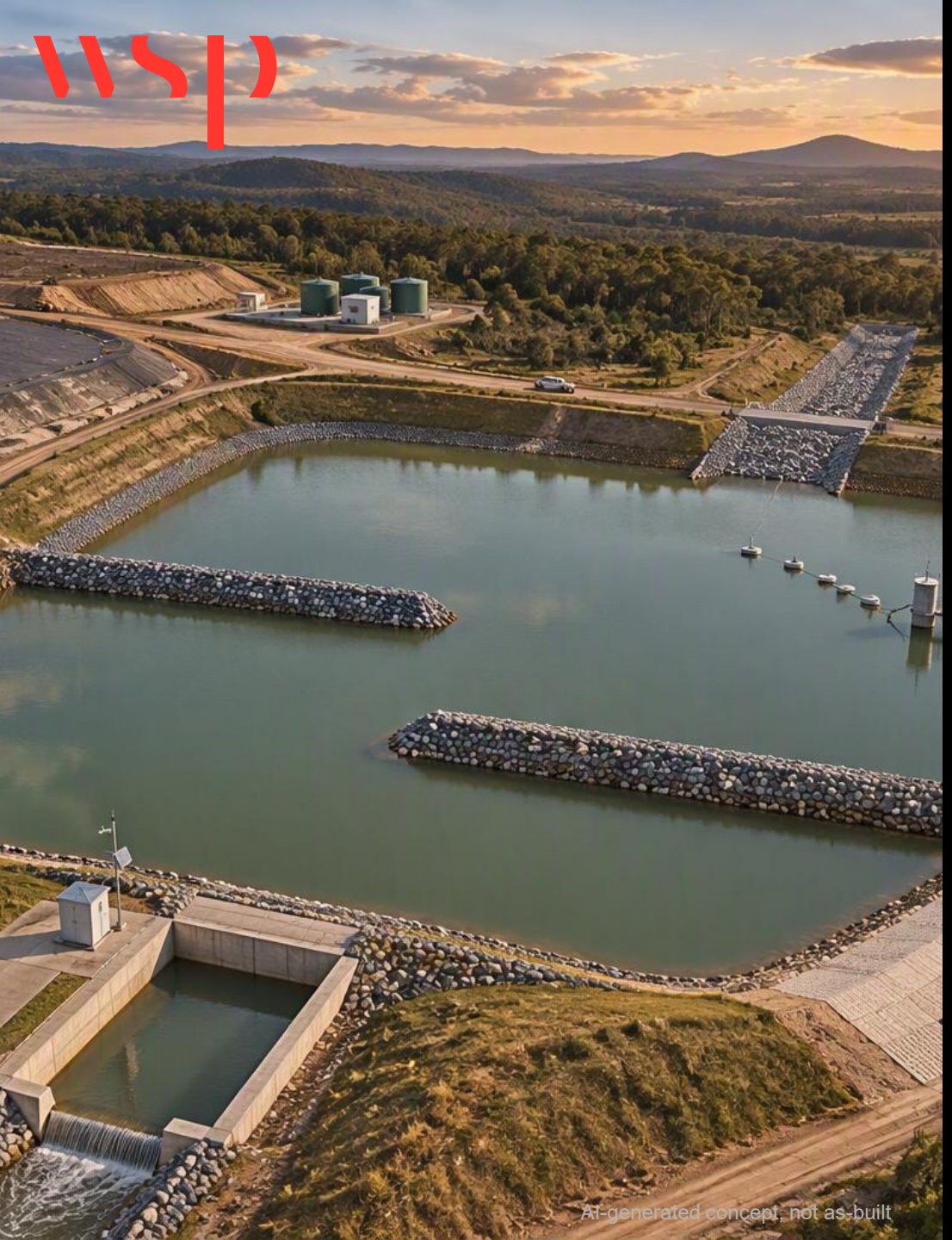


WMRR 2026 Australian Landfill & Transfer Stations Conference

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INNOVATIVE HIGH-EFFICIENCY SEDIMENT BASIN DESIGN FOR LARGE LANDFILLS

SEDIMENT CONTROL UNDER SPACE CONSTRAINTS

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Case study at a glance

Two HES basins retrofit existing sediment & attenuation basins to support stormwater treatment and reuse within a constrained landfill site.

2
Large-scale HES basins

≈70 ha
Contributing catchment

>50%
Reported footprint reduction

50 mg/L
Suspended solids EA limitation

Design features tailored to space constraints

Forebay and inlet tailored to site conditions

Baffles extend the flow path

Custom floating decant systems

Valves control retention and discharge

Ramps enable sediment removal

Guidelines, design events & climate change

Site approvals set the treatment criteria. Basin sizing, hydraulic performance and climate allowances required separate checks.

Conventional storage

Typical sediment basin design: 10% AEP, 24-hour rainfall.

$V_r = 10 \times C_v \times A \times P_{24}$

e.g., DETSI: Full retention & 50 mg/L discharge.

Note: Alternative designs including HES Basins are allowed.

IECA HES design

IECA method: 20% AEP.

$V_s = K \,.\, A\,(I_{EY\ yr,\ 24\ hr})^{1.8}$

Confirm inflow parameters, settling and outlet duty.

Size each storage zone separately.

ARR climate guidance

ARR v4.2 updates climate-change guidance.

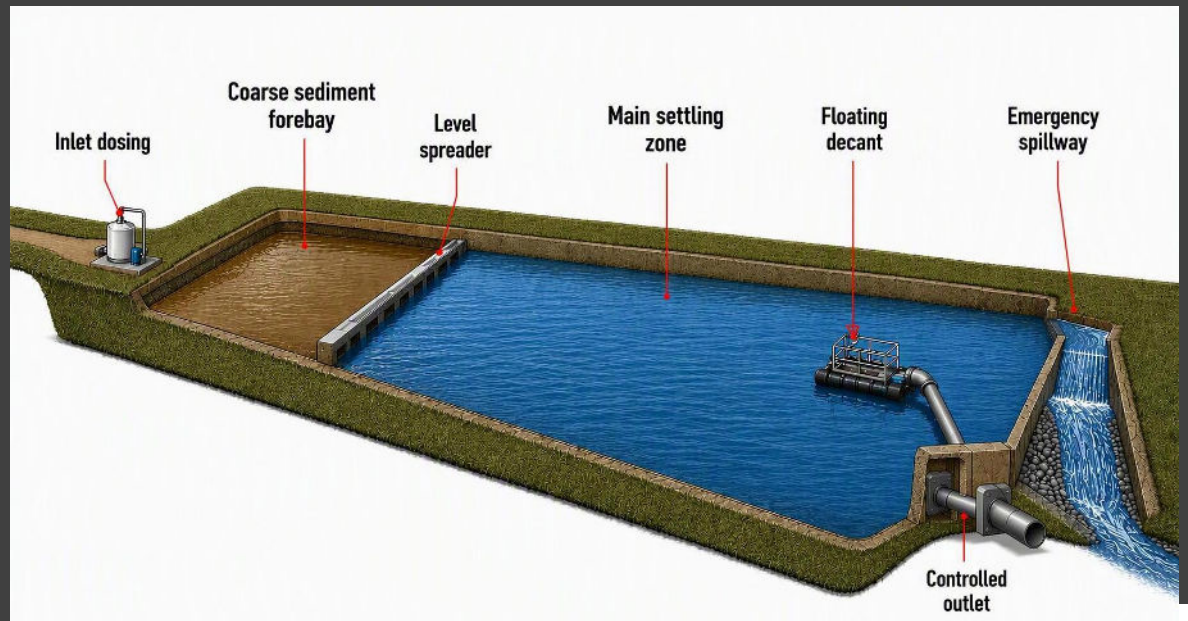
Select an SSP scenario and planning horizon. Rainfall adjustments depend on warming and storm duration.

Assess outlet and spillway hydraulics separately.

V_r: runoff volume (m³) C_v: volumetric runoff coefficient A: catchment area (ha) P_{24} / $I_{EY\ yr,\ 24\ hr}$: 24-hour rainfall depth (mm)/ intensity (mm/hr)

AEP: annual exceedance probability SSP: Shared Socioeconomic Pathway K: coefficient V_s: settling zone volume (m³)

HES (IECA Type A) basin

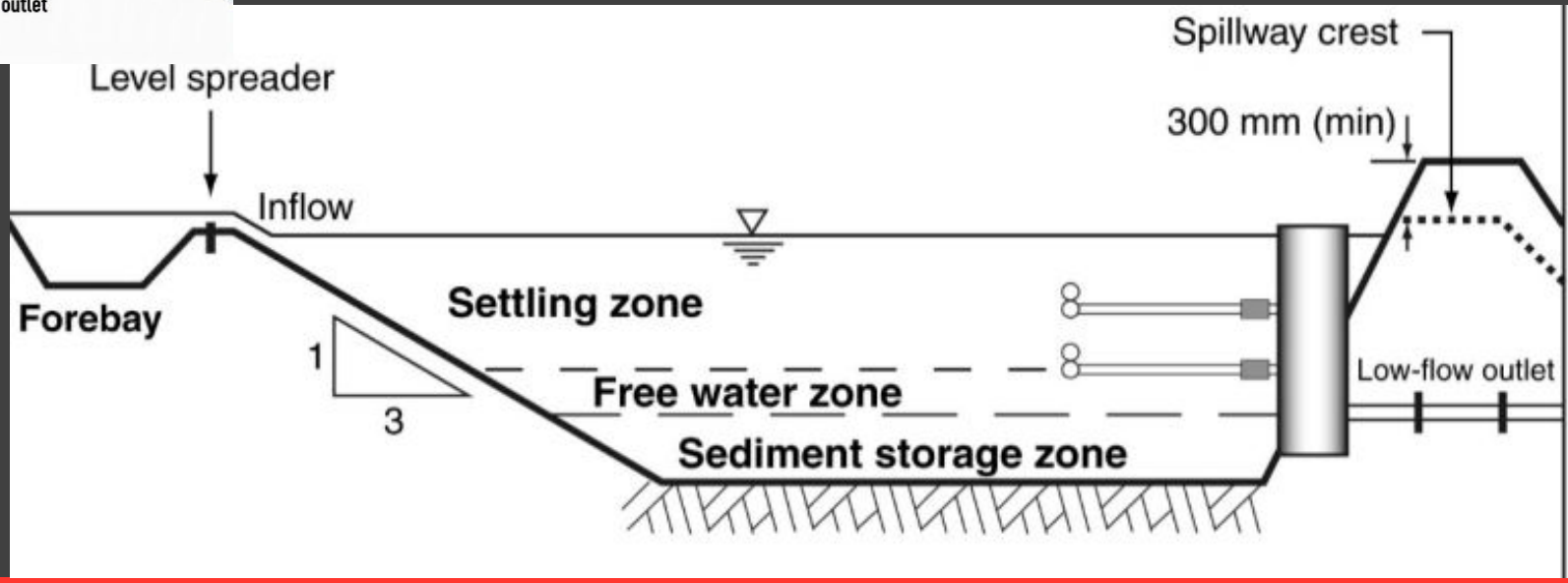


AI-generated concept, not to scale

- Inlet and dosing system
- Forebay
- Level spreader
- Settling pond
- Decant structures
- Emergency spillway
- Access ramps

HES basin arrangement

Typical HES basin cross-section (IECA, 2025)



Supporting technical assessments

Catchment hydrology and hydraulic modelling

Inlet, storage and spillway sizing utilising XPSWMM

Consequence Category Assessment (CCA)

High-level CCA defined the spillway design event

Geotechnical assessments

Groundwater and seepage conditions, settlement and batter stability

Structural design

Forebay, spillway, valve chamber and access ramps

Water balance assessment

Operational conditions

HES basin layout

Effective flow path

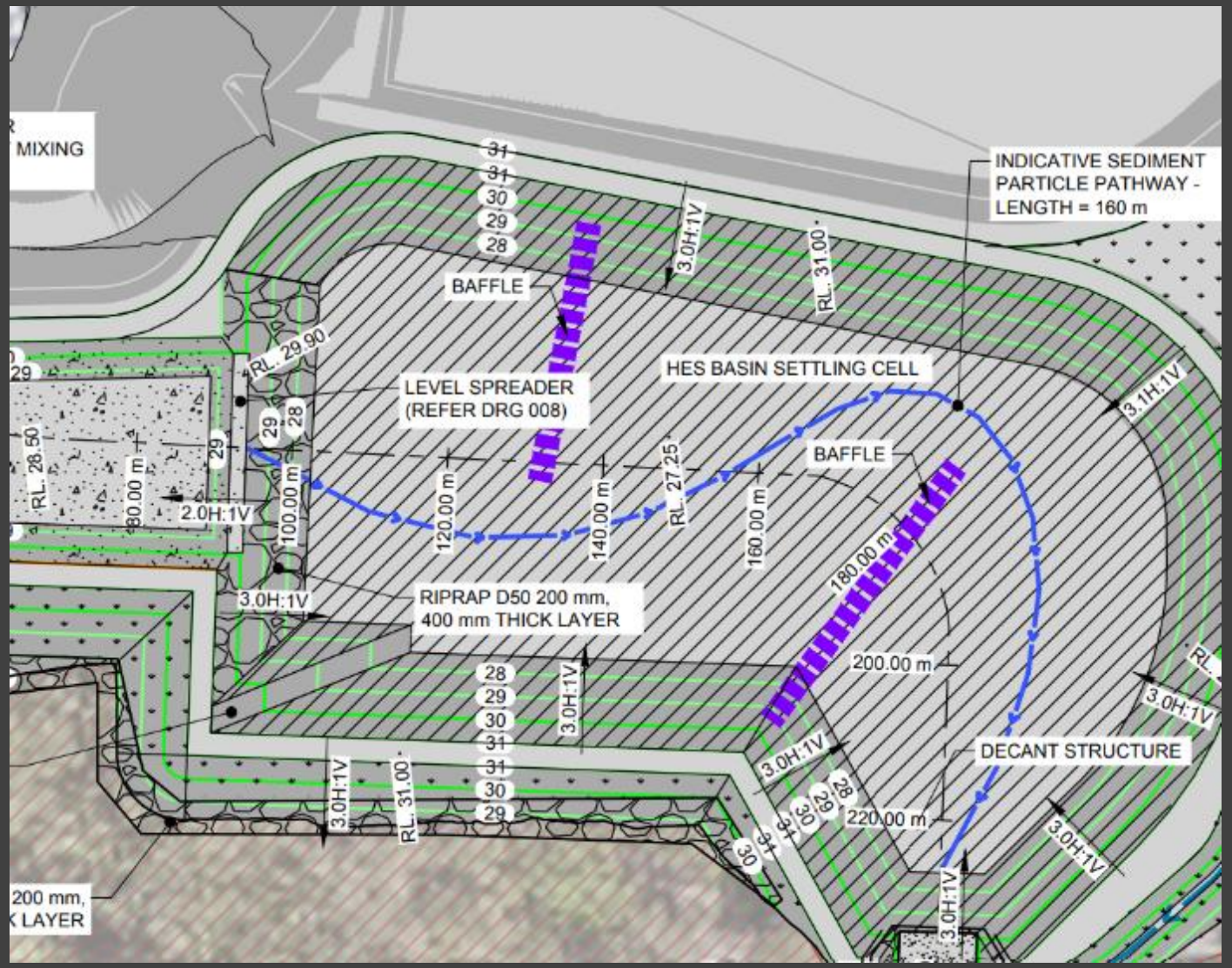
Baffles constructed using rock and concrete rubble extend the path.

Sediment cleaning access

Concrete mats supported machinery access on the steeper ramp saving space.

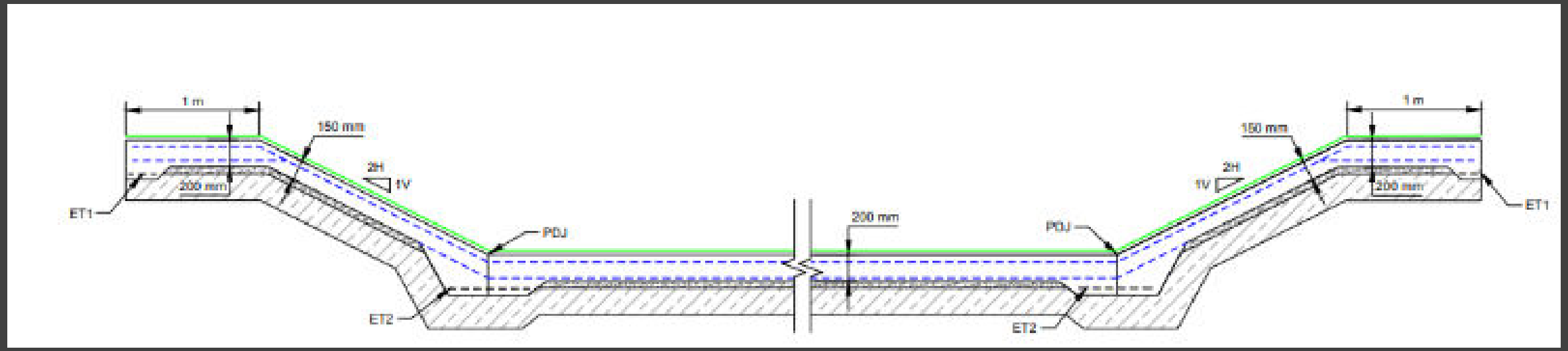
Liner and protection

Clay Liner and protection armouring



Forebay design

Reinforced concrete forebay structure is needed to account for potential landfill settlement



Maintenance access

Ramp access enables machinery to remove sediment.

Inlet arrangement

Set inlet level against basin operational level to manage backflow.

Additional baffles may require

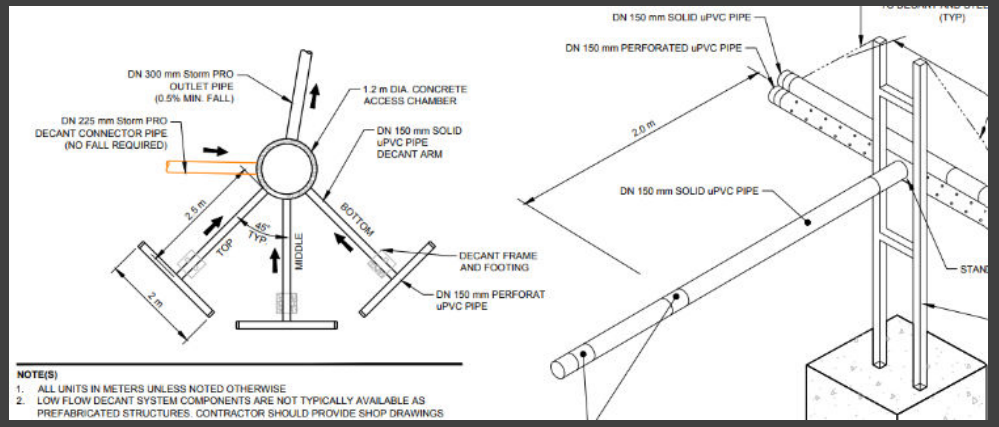
Level spreader

Level spreader for laminar outflow.

Erosion protection safeguards the batter.

Decant hydraulics

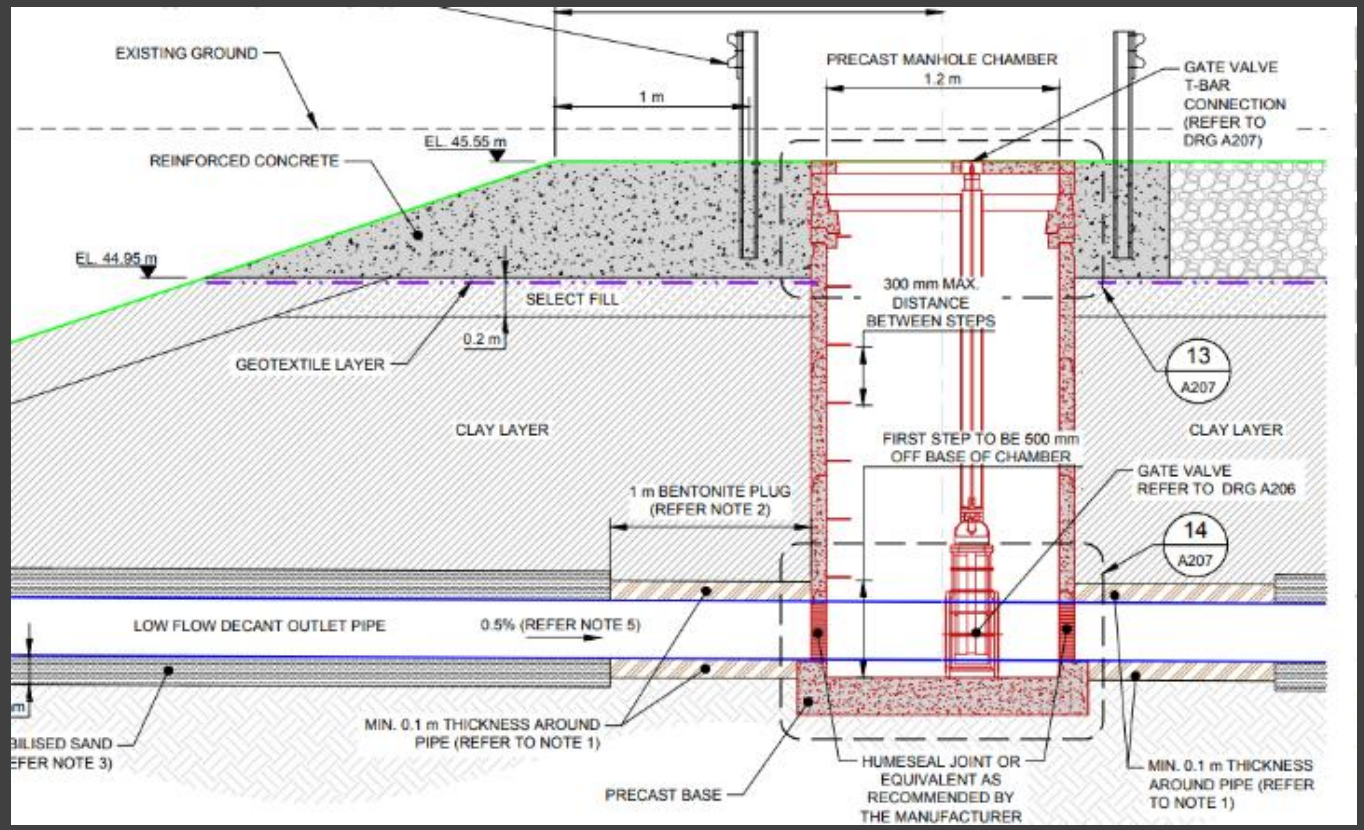
Monitor & control discharge for water quality and site's operational water usage.



Controlled discharge

Decant arms and perforations designed to match adopted flow duty.

Outlet valves control discharge.



Safe access requires for inspection and maintenance.

Water balance assessment

Water balance assessment utilising GoldSim was undertaken to forecast operational water demand, water availability, pond levels and drawdown timing.

Inputs

Long-term climate statistics

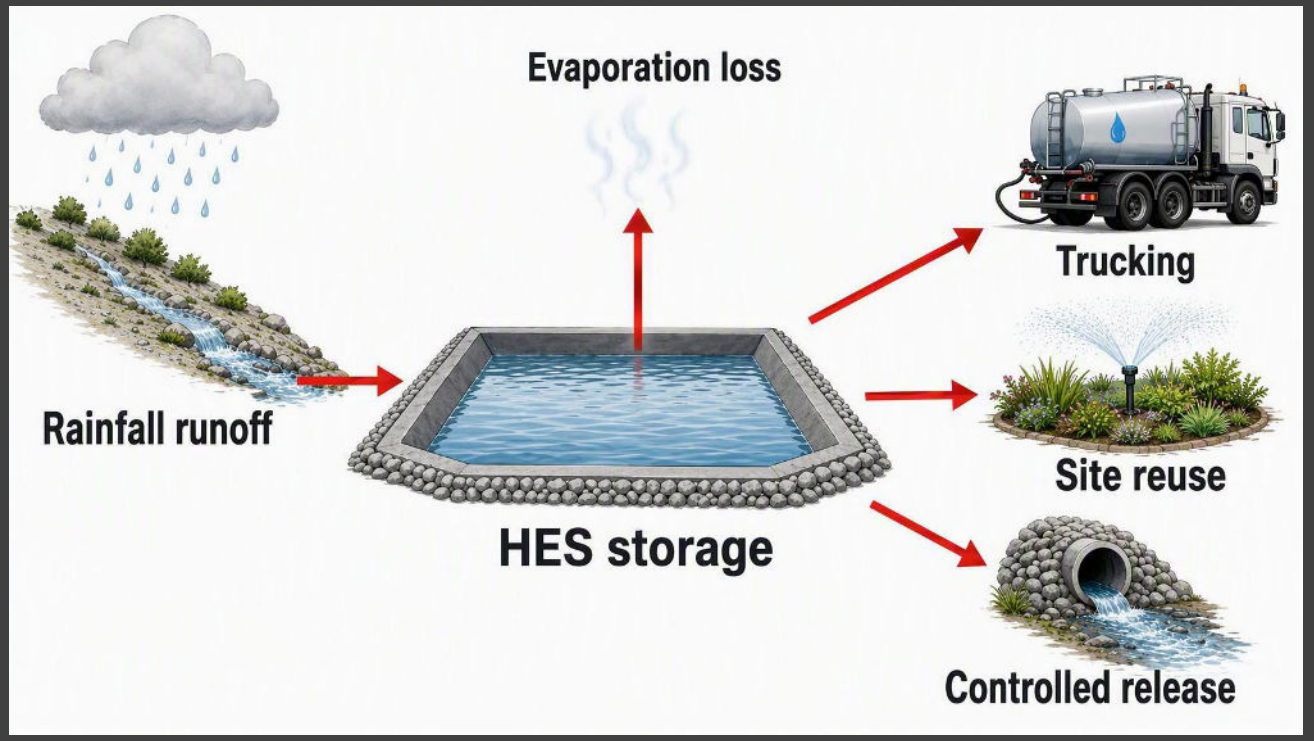
Intended uses, daily consumption rates and operating days.

Storage response

Track runoff, evaporation, reuse and releases.

Operating decisions

Balance reuse with capacity for the next event.



AI-generated schematic of principal flows, not a model output

Basin drawdown and operating rules

Controlled release

Floating decants and outlet valves regulate discharge.

Confirm outlet duty and drawdown time.

Check water-quality release conditions before discharge.

Retention for reuse

Retain water within approved operating levels.

Set triggers to restore treatment capacity.

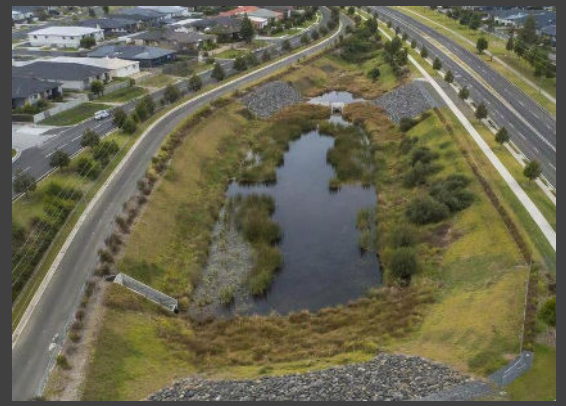
Assign responsibility for level monitoring and release authorisation.

Operating rule Link release decisions to water quality, storage level and available basin capacity.

HES applications on constrained sites

HES designs depend on space constraints in addition to verified hydraulics and maintainable operations.






AI-generated illustrations of typical settings, not project photographs

Waste facilities

Sediment treatment within active landfill and compost operations.

Mining & quarries

Restricted footprints and steep terrain limit basin layouts.

Urban councils

Existing infrastructure limits basin space in urban catchments.

Road upgrades

Steep terrain can leave insufficient land for conventional retention.

THANK YOU

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Panel Q&A at the end of the session

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AI-generated imagery