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Lyntra

Engineering & Project Management for Bio-Carbon Removal

SILO LOCATION OPTIONS ASSESSMENT

Bulk Handling Transition — Bulk Bags to Direct Truck Loading via Silo

Sector:

Waste Tyre & Rubber Recycling

Client:

[Client name withheld]

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Document status:

Portfolio sample, written up from working notes for a completed client engagement. Client and site details have been withheld.

Project Background

The client's site processes tyre derived feedstock and produces char as an output product. Char was previously handled in bulk bags, which required manual bag filling, forklift movement, and bag loading onto trucks for dispatch.

Lyntra was engaged to design a pneumatic transfer system to move char directly from the process into storage silos, from which trucks could be loaded directly. This removes the bulk bagging step and the associated manual handling. This document covers the location study carried out to select where the new silos should be sited, supported by an assessment of existing site traffic. The detailed mechanical design of the pneumatic transfer system itself is outside the scope of this document.

The client's original plan was to install the silos in their current location (Option A). During the investigation, it became clear that the preferred 2 silo configuration would not fit at that location within the site's height limit, which prompted a wider look at both silo configurations and at alternative locations.

Silo Configuration Options

Two silo configurations were assessed, both providing the same 120 tonne total storage capacity (6.5–7 days of production buffer at full output):

- Two 60 tonne silos; smaller footprint, shorter structure, deeper bund (0.65 m)
- Three 40 tonne silos; larger footprint (37 m² more than the 2 silo option), shallower bund (0.44 m), an additional $230,200 in equipment cost, and additional ongoing maintenance

The site has a maximum permitted structure height of 15 m, measured from the bottom of the existing building. The 2 silo design was found to exceed this by 386 mm at Option A. Because the 3 silo design was $216,767 more expensive at the same location ($765,017 vs $548,250 including civil and equipment costs), it was worth checking whether the cheaper 2 silo design could be made to fit somewhere else on site before accepting the 3 silo cost.

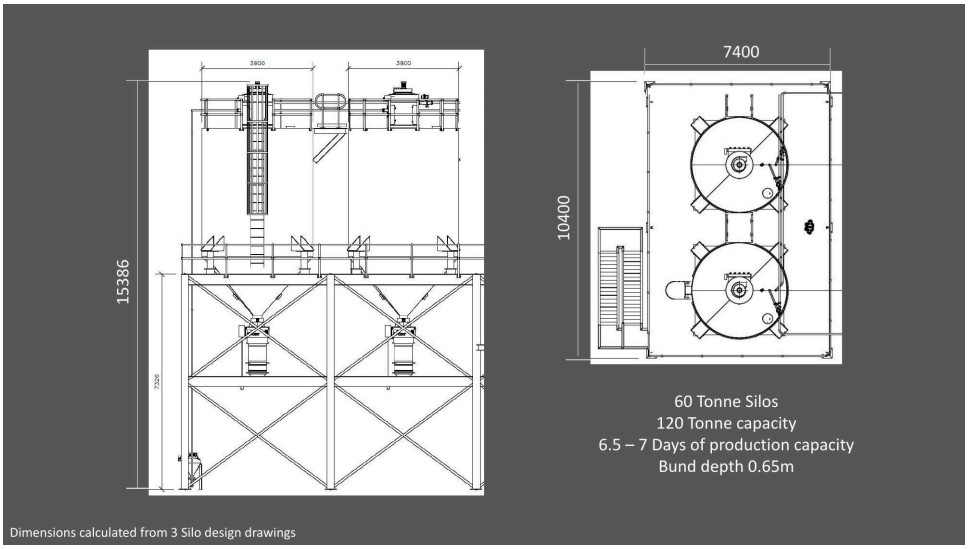

Figure 1. Two 60 tonne silo configuration: elevation and plan, 120 t total capacity, 0.65 m bund depth.

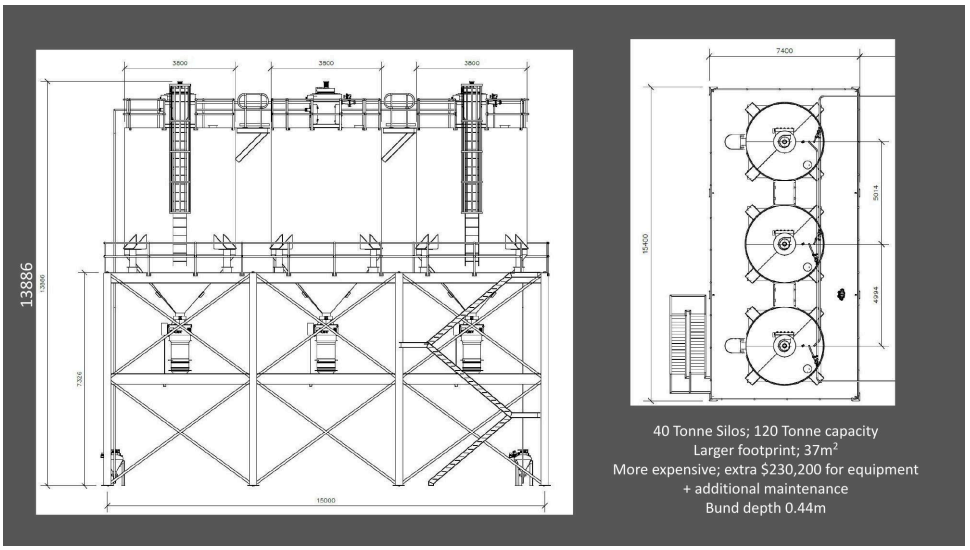

Figure 2. Three 40 tonne silo configuration: elevation and plan, 120 t total capacity, larger footprint, 0.44 m bund depth.

Site Traffic Context

Existing truck movements were quantified to understand how a new silo location would interact with site traffic, particularly around the truck turnaround area, where vehicles reverse to position for loading.

- Monday: 13 trucks/day, 7 of which use the turnaround area to reverse (higher volume due to weekend catch up deliveries)
- Tuesday–Friday: 9 trucks/day, 4 reversing
- A 3 day long weekend adds roughly 7 extra trucks and 2 extra reversing movements to the first day back, if no mitigating measures are taken
- A 4 day long weekend adds roughly 11 extra trucks and 4 extra reversing movements to the first day back, on the same assumption

Truck movements were assessed alongside staff shift changeovers (operations, maintenance, and office staff crossing the same site roads between roughly 6–8 am and 3–6 pm), since a new silo location that increases congestion at these times would increase the risk of a vehicle/pedestrian conflict, independent of any change in truck numbers.

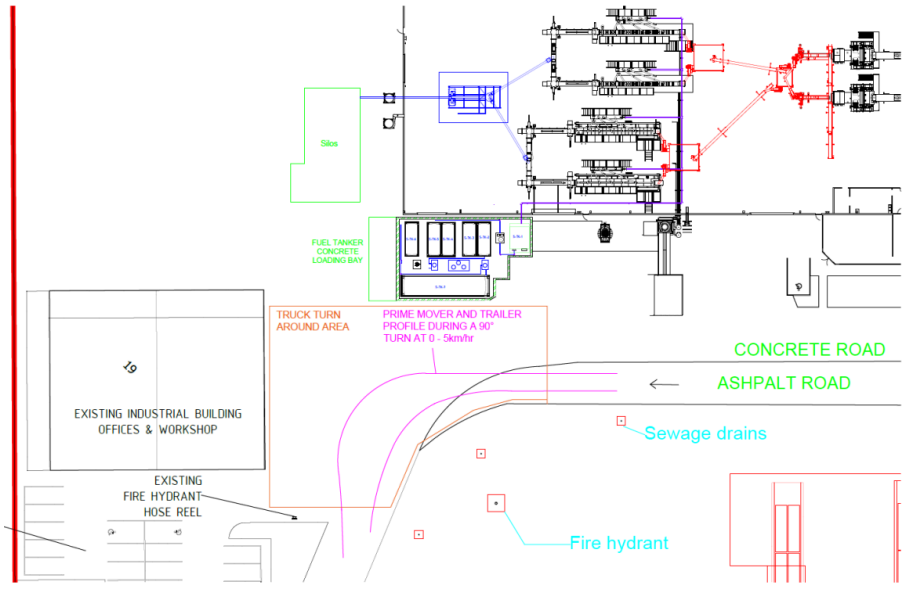

Figure 3 — Existing site layout, showing the truck turnaround area, car parks, existing traffic routes, and potential silo location Option A (client identifying details redacted).

Location Options Considered

Three candidate locations were assessed for the new silo installation, referred to as Option A, B, and C.

Option A — Adjacent to process building

The client's original plan: locating the new silos adjacent to the process building.

Benefits

- Design close to 30% review stage; costing approximately $20,000
- Reduced impact on production during installation
- Quicker installation
- Shortest cable and pipe run

Potential issues

- Does not fit the 2 silo configuration within the site's height limit; only the more expensive 3 silo design fits here
- Risk of truck traffic queuing/jams at this location
- Floods during heavy rain; would need improved run off to the nearest stormwater drain, which sits outside the area shown on the site plan
- This area is in regular operational use as a plant set down area, and is the access/egress point used to bring a Franna in when equipment becomes clogged and needs to be pulled out, building here would block that access

Potential solutions: *overflow/waiting bay; traffic bypass route; excavation; additional stormwater drainage.*

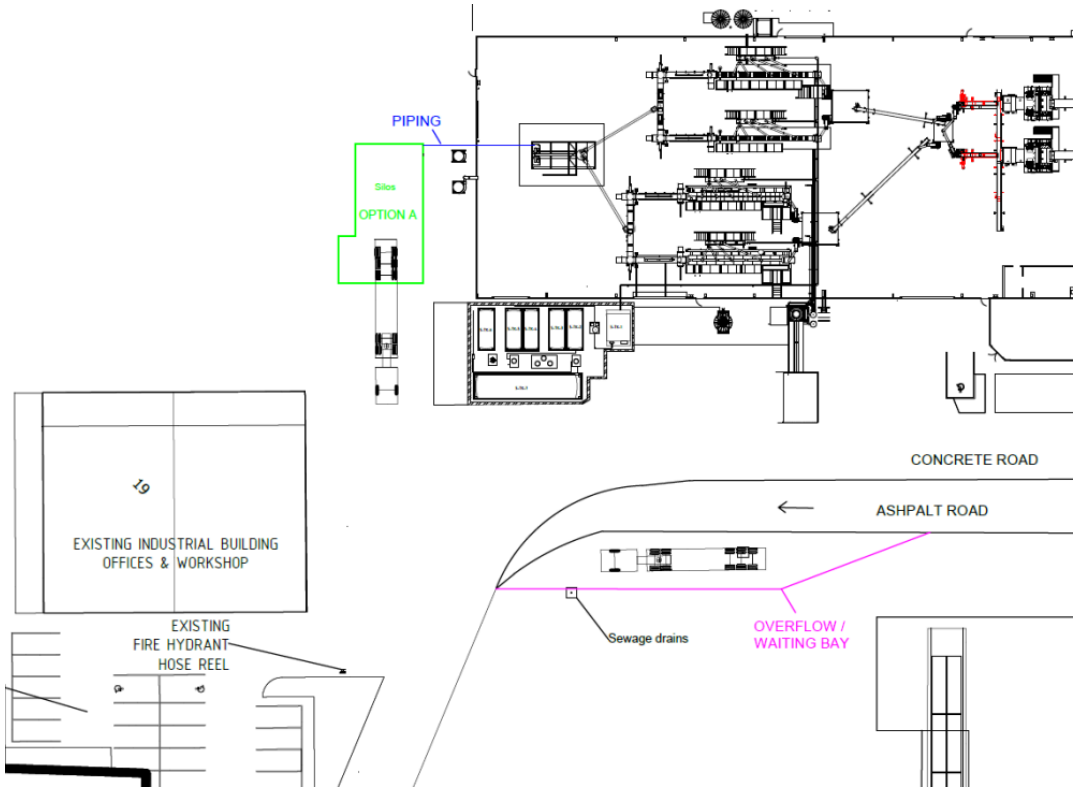

Figure 4. Option A: Initial proposed silo location.

Option B — Roadside, with Garden Bed

Relocating the silos alongside the site's internal asphalt road, with a garden bed included as part of the surrounding works. Ground levels were checked at two points moving away from the process building: a 290 mm drop close to the building, and a further 100 mm drop approaching the road. The combined fall of roughly 390 mm was just enough to clear the 386 mm height exceedance found at Option A, meaning the cheaper 2 silo design, ruled out at the current location, became viable here with only a minor reduction in the concrete pad level, rather than a full structural redesign.

Benefits

- Fits the 2 silo configuration
- Improves overall site traffic flow
- Garden bed improves the look of the site and may support staff morale
- Reduces the risk of incidents between mobile plant, pedestrians, trucks and cars, keeps trucks off the site's most heavily used pedestrian crossing, between the office and the production facility
- Does not block the set down area/Franna access point used at the current silo location, no impact on current operational practices
- Can reuse the existing stormwater drainage rather than installing new drainage
- Part of option 1 design can be re-used for this design

Potential issues

- Requires a compressor and additional utilities at the new location
- Traffic disruption during piping installation
- Greater overall complexity than Option A

Potential solutions: *install culverts, piping and electrical conduit before the new asphalt road is laid; stage the culvert installation in sections to limit disruption to plant operations and vehicle movements, rather than closing the route in one go.*

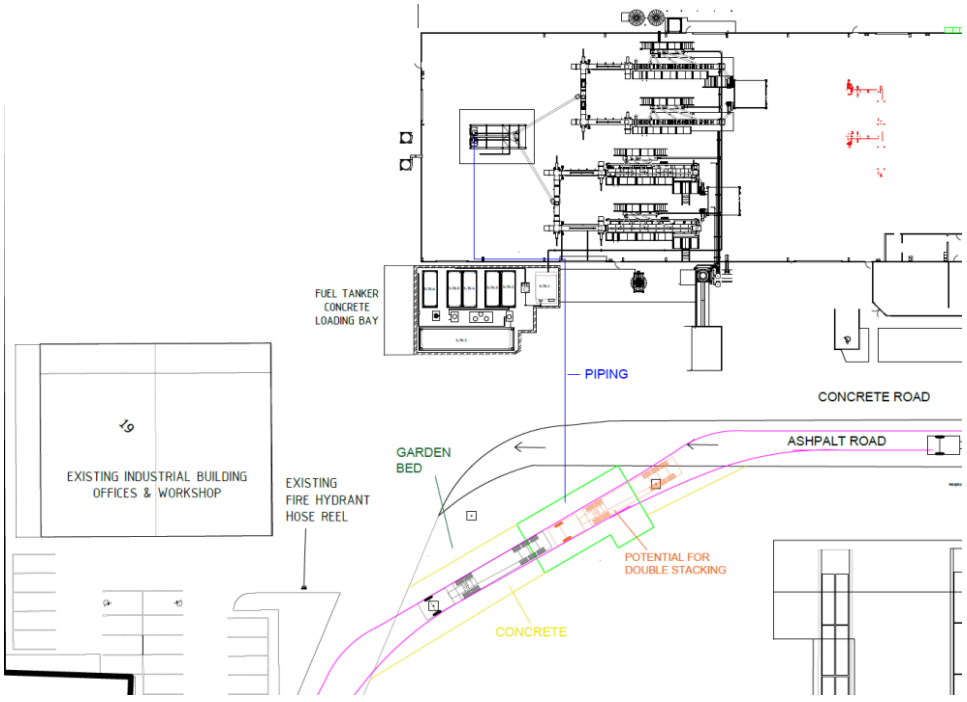

Figure 5. Option B: roadside location with garden bed.

The additional civil and electrical work at Option B brought its total to $585,972, around $37,700 more than the $548,250 originally budgeted for a 2 silo build at Option A. That original figure was based on a design that didn't actually fit the height limit, and never included the cost of demolishing and re-pouring concrete to lower the structure enough to comply, so the true premium of building at Option B is smaller than this headline comparison suggests. Against the $216,767 saved by using a 2 silo design rather than 3 silo, the additional civil cost at Option B was comfortably absorbed within the contingency allowance of the original design.

Option C — Roadside, No Garden Bed

The same roadside location as Option B, without the garden bed.

Benefits	Potential issues
• Fits the 2 silo configuration • Improves overall site traffic flow • Lower risk of truck driver error at this location	• The most expensive of the three options, due to the additional length of road needed for the waiting bay • Requires additional utilities at the new location • No garden bed

Potential solutions: *install culverts, piping and electrical conduit before the new asphalt road is laid; temporary traffic management plan during construction.*

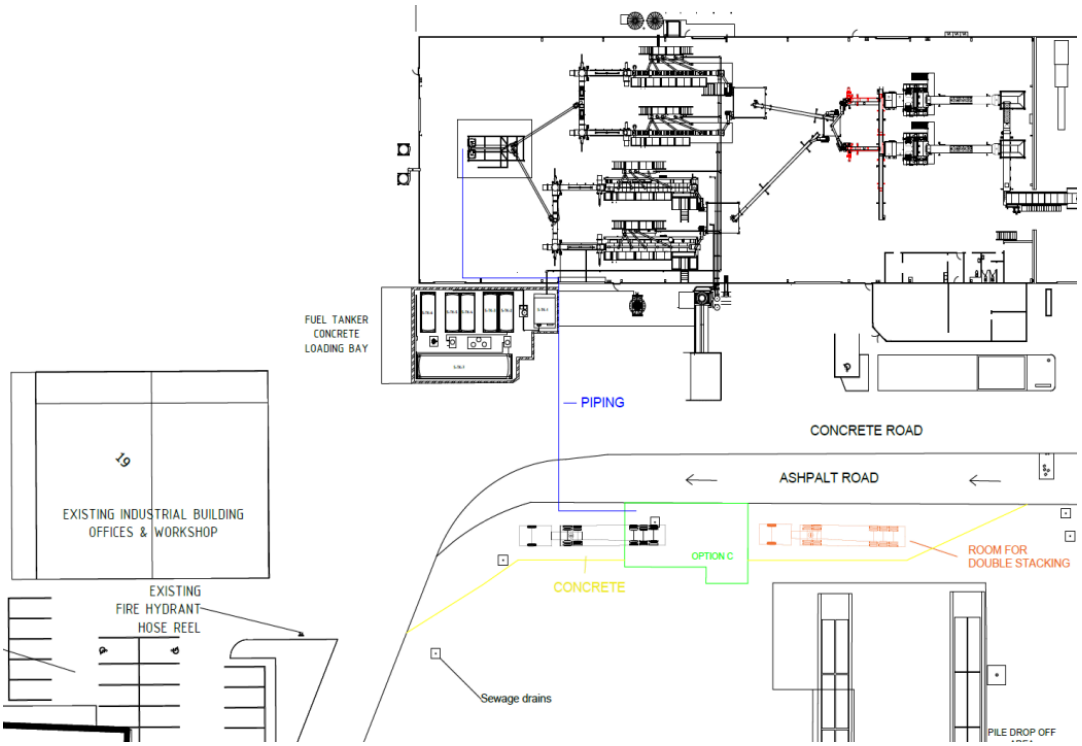

Figure 6. Option C: roadside location without garden bed.

The garden bed in Option B was more than cosmetic: as well as giving visitors and investors a better view than bare gravel, it would have acted as a partial windbreak, helping to reduce dust blowing off site, a contributor to neighbour complaints, with a possible side benefit to staff morale.

Decision Tree & Cost Analysis

Each location was evaluated against both silo configurations, since the space available at each site constrains which configuration is realistic. A decision tree was used to weight the likelihood of the 2 silo vs 3 silo configuration being needed at each location, based on the space, civil, and utility constraints identified above.

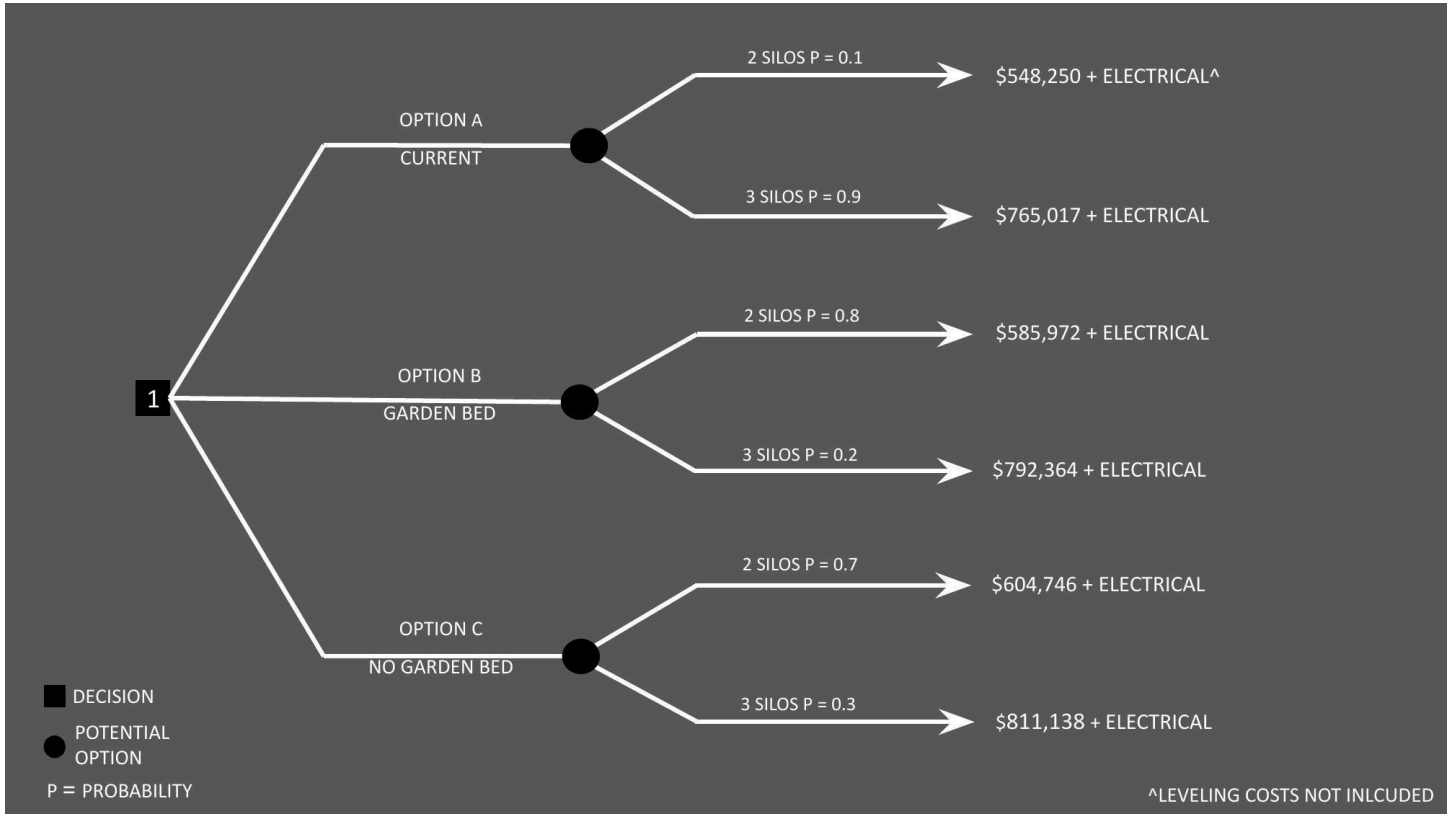

Figure 7. Decision tree: location options, configuration probability, and total installed cost (excluding electrical connection).

Option A carries a 90% likelihood of requiring the 3 silo configuration, given the limited space and height constraint at that location, pushing its probability weighted cost above what the raw 2 silo figure suggests. Options B and C were assessed as more likely to accommodate the 2 silo design, since the natural fall in site levels moving toward the road resolves the height problem found at Option A.

Detailed civil and installation cost breakdown

Civil & Installation Item	Option A — 2 Silo	Option A — 3 Silo	Option B — 2 Silo	Option B — 3 Silo	Option C — 2 Silo	Option C — 3 Silo
Piping ($118/m)	37.5 / $4,425	40.5 / $4,779	85 / $10,030	88 / $10,384	92 / $10,856	95 / $11,210
Concrete cutting, — road ($150/m²)	—	—	11.5 / $1,725	11.5 / $1,725	11.5 / $1,725	11.5 / $1,725
Concrete cutting — bund ($150/m²)	75 / $11,250	112.5 / $16,875	—	—	—	—
Excavation — culverts ($150/m³)	—	—	12.8 / $1,920	12.8 / $1,920	15.6 / $2,340	15.6 / $2,340
Excavation — bund ($150/m³)	110 / $16,500	74 / $8,140	110 / $16,500	74 / $8,140	110 / $16,500	74 / $8,140
Culverts ($469 each)	—	—	13 / $6,097	13 / $6,097	16 / $7,500	16 / $7,500
Electrical cable	50 m	53 m	60 m	63 m	66 m	69 m
Bund ($307/m³)	110 / $33,770	74 / $22,718	110 / $33,770	74 / $22,718	110 / $33,770	74 / $22,718
Concrete road ($125/m²)	—	—	269 / $33,625	231 / $28,875	398 / $49,750	360 / $45,000
Civil & installation subtotal	**$65,945**	**$52,512**	**$103,667**	**$79,859**	**$122,441**	**$98,633**
Equipment + mechanical install*	$482,305	$712,505	$482,305	$712,505	$482,305	$712,505
Total (excl. electrical connection)	**$548,250**	**$765,017**	**$585,972**	**$792,364**	**$604,746**	**$811,138**

Equipment and mechanical installation cost is the same across all three locations for a given silo count; it is the civil works (piping runs, concrete, excavation, and culverts) that vary by location. Bund costs are adjusted for location specific conditions; bund size is based on 1.2 × the volume of the largest single silo.

Outcome

Option B, with the 2 silo configuration, was the option recommended to the client. It was the cheapest way to achieve a height compliant installation, reduced the risk of incidents between mobile plant, pedestrians, trucks and cars, kept trucks off the site's busiest pedestrian crossing, and avoided disrupting the existing set down area and Franna access at the current silo location, all within the contingency allowance of the original design.

The project did not proceed to installation. It was deprioritised in favour of other capital works, and was later put on hold due to funding constraints. This document reflects the options assessment and recommendation stage of the project only.