

Kouvola

Siting & Architecture

Data center campus / Savonsuontie, Finland

11.14 ha / 45 MW incoming electrical / 34.2 MW studied IT

REFERENCE PROJECT / INDEPENDENT STUDY

HARMONISED EDITION / 10 SEPTEMBER 2026 / EN

Demonstration project on a real parcel. Proposed programme; no reserved grid connection or granted project permit.

Project overview

Recommendation among the compared configurations

45 MW

incoming electrical programme

34.2 MW

studied IT capacity

864

drawn rack positions

THE PROPOSAL

Two identical 120 × 60 m buildings, each with two levels. Technical distribution is repeatable and equipment has identified allowances.

THE TRADE-OFF

The solution keeps parking at ground level and maintains continuous corridors. Competing pavilions need structured parking here for the same programme.

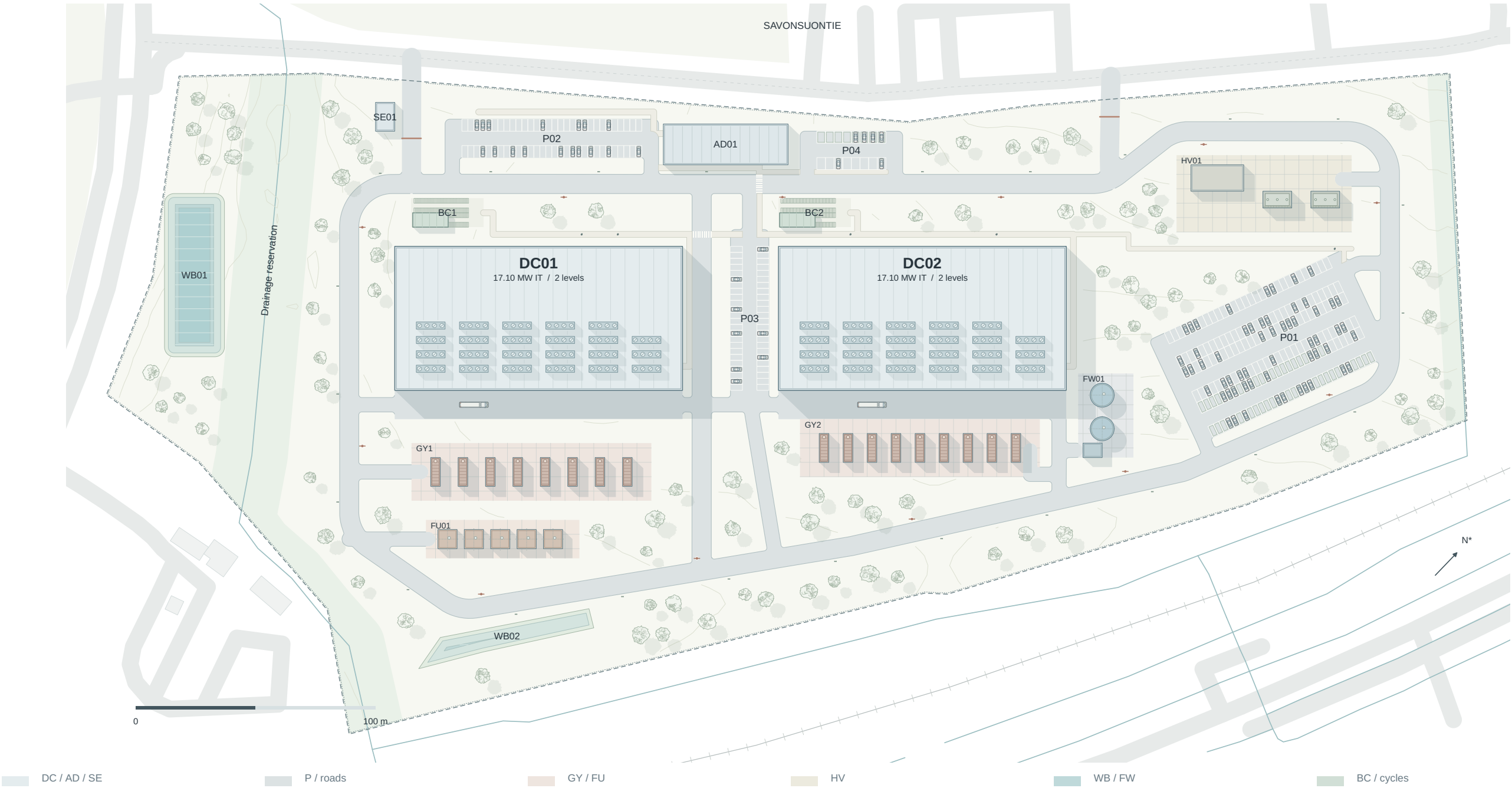
THE STATUS

A developed siting concept linked to the prefeasibility study. Selection is not permission, reserved power or construction engineering.

Geometry, programme and access now form one project basis.

Site constraints and structure

Preserved cadastre, retained ditches, access from Savonsuontie



AN EXACT PARCEL

11.14 ha retained in the native coordinate system. No boundary is straightened to fit the buildings.

WATER BEFORE VOLUMES

15 m reservations on each side of the southwest ditch and 8 m northeast. These are design choices, not statutory setbacks.

THE INTERFACES

The existing 20 kV network requires KSS coordination. Unlocated buried cables and reserved capacity are not represented as established.

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Site constraints and
structure

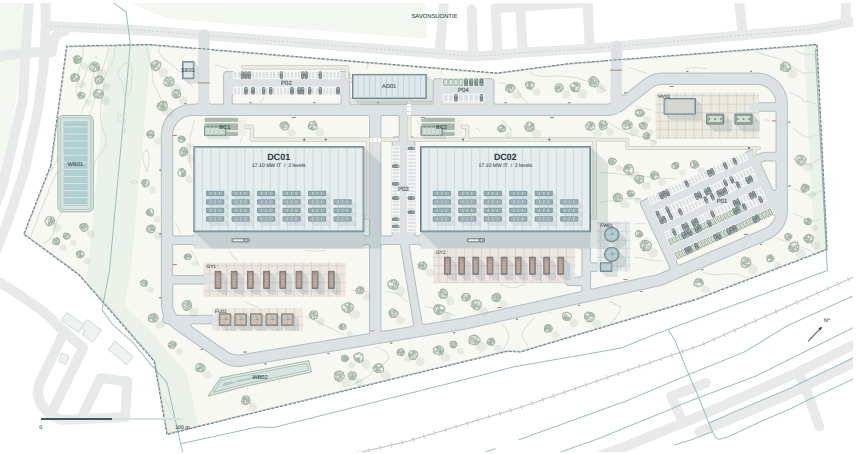
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A3 / Graphic scales

A02

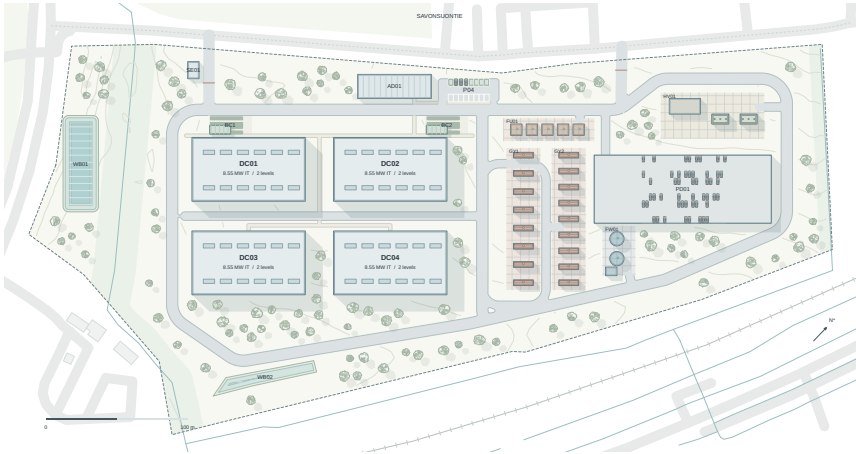
Three families, one objective

Rectangular buildings, two levels and the same IT load for spatial comparison



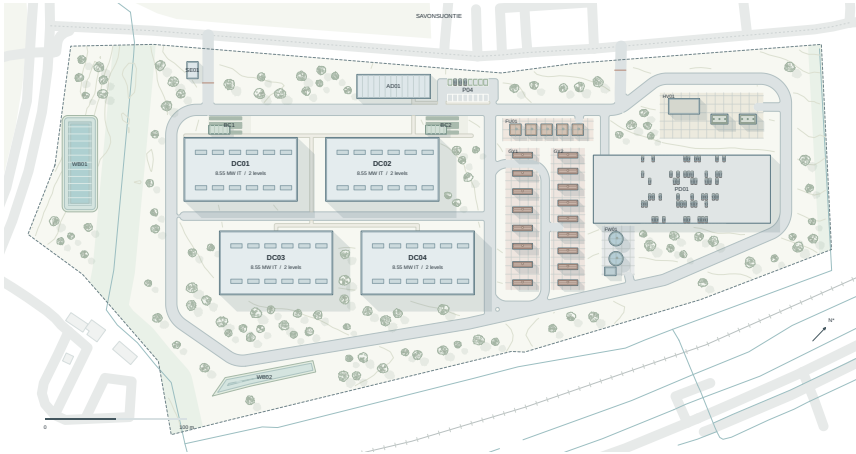
A Two bars

34.2 MW IT / 28,800 m²



B Four pavilions

34.2 MW IT / 28,800 m²



C Staggered pavilions

34.2 MW IT / 28,800 m²

A USEFUL COMPARISON

All three families share rack count, a 14,400 m² DC footprint and two levels. Their deployment logic differs.

GEOMETRIC EXPLORATION

An initial exploration tested 660 more compact placements. The detailed programme was then enlarged and these three configurations refitted to the parcel.

A BOUNDED RECOMMENDATION

A is selected among the configurations studied. This is not proof of a global optimum or a reproduction of an existing permit.

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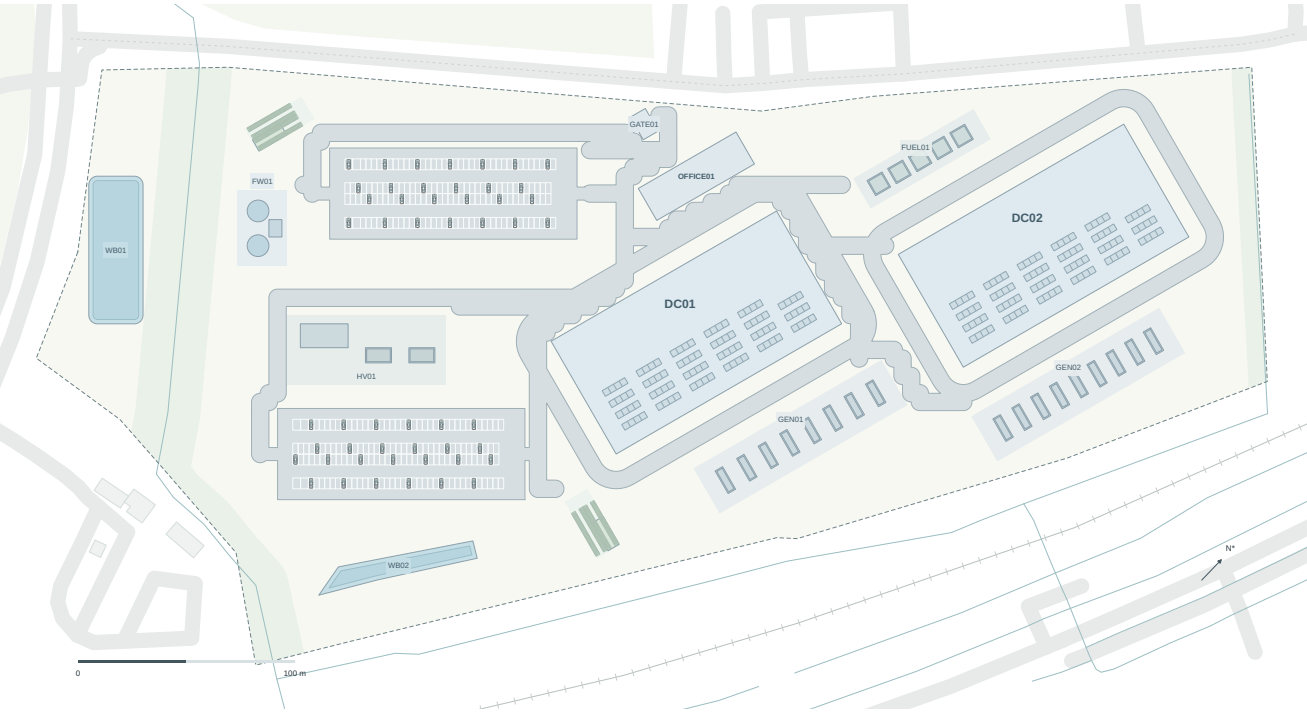
Three families, one
objective

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A3 / Graphic scales

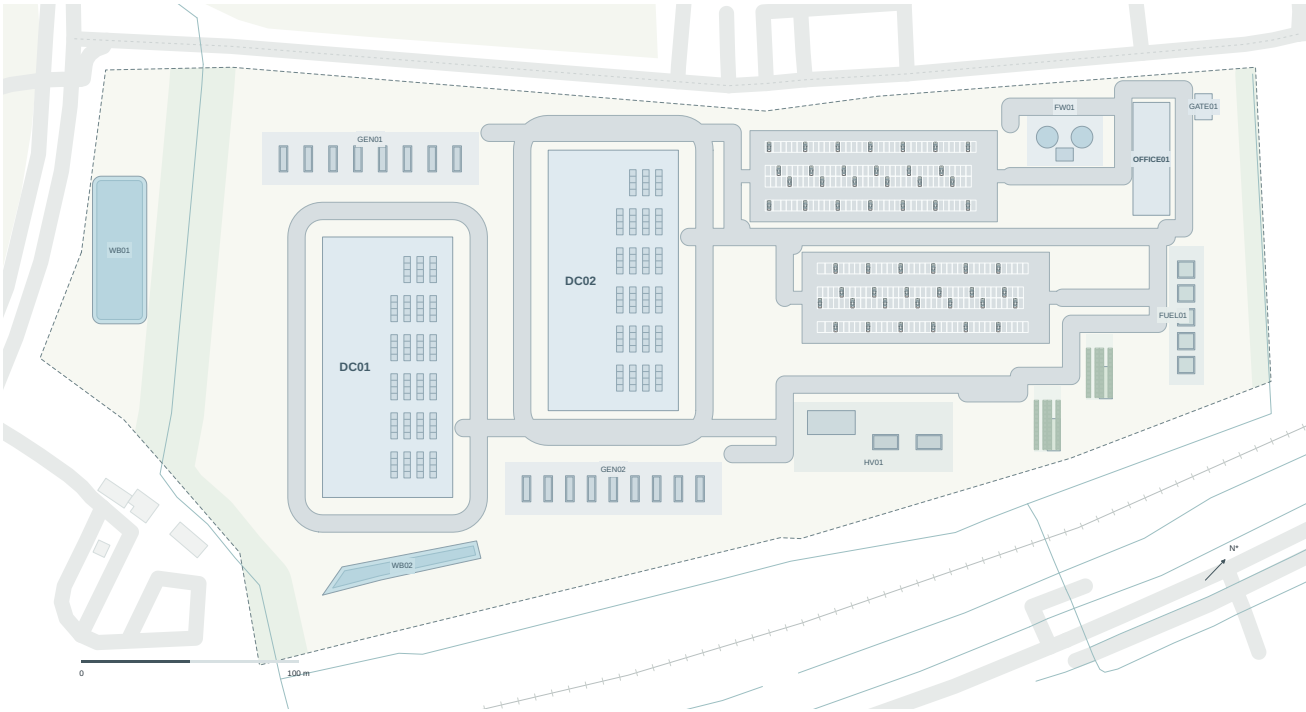
Keep the orientation open

30° and 90° tests release the design from the initial axis



+30°

Common building rotation



+90°

Common building rotation

Both orientations accommodate the programme footprints with 304 cars and 304 cycles. Generator courts are repositioned near their building, reception stays on the Savonsuontie side and water allowances are retained.

A WIDER SEARCH

Common axes tested at 0°, 15°, 30°, 45°, 60° and 90°, plus native cardinal axes. The two drawn witnesses show the original axis is not mandatory.

A DISTINCT DESIGN STAGE

Programme and connected-corridor witnesses. Terminal connections to doors and aprons, detailed street ties and vehicle turns remain to be developed.

ANGLE CONVENTION

0° follows the dossier's local axis, 43.825° from EPSG:3067 grid east. Indicated angles are relative to that frame, not geographic north.

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Keep the orientation
open

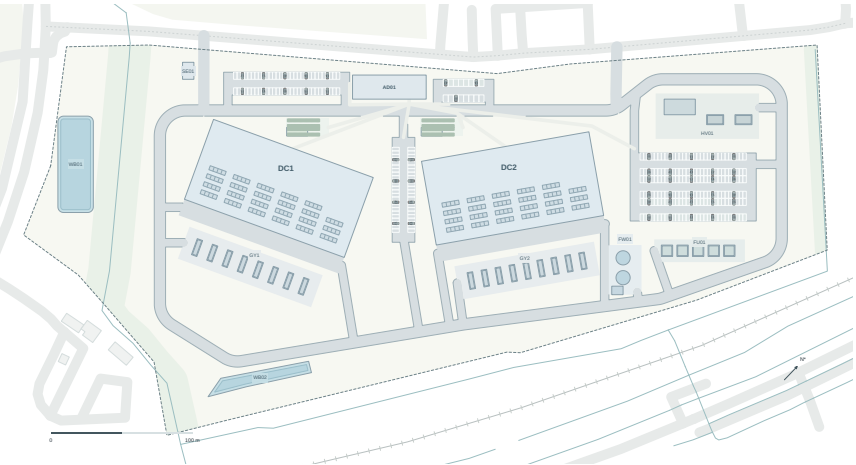
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A3 / Graphic scales

A04

Two buildings, independent angles

Three non-parallel compositions with their own technical courts and access



M01 / -20° · +10°

DC separation: 35.5 m

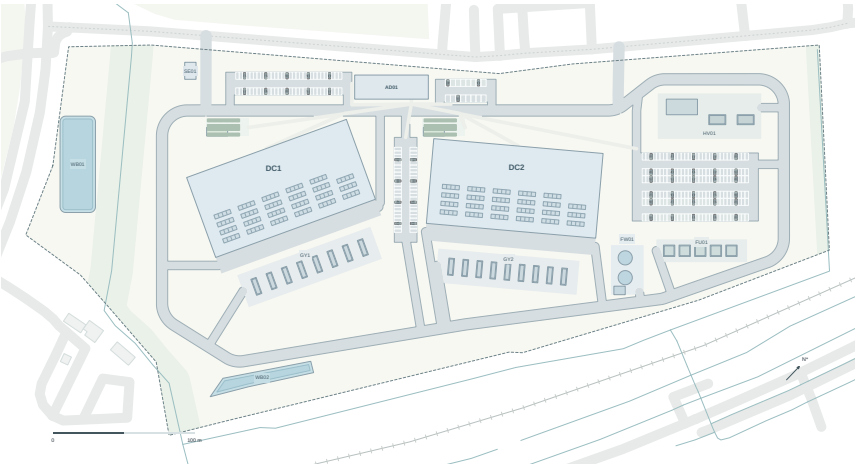
Internal pavement: 17,700 m²

DC cut / fill: 1,272 / 5,524 m³

34.2 MW IT / 864 racks / 304 cars / 304 cycles. Buildings and their courts move together; access is redrawn rather than constrained by the old roads.

CREDIBLE ALTERNATIVES

These layouts are not rejected for lack of space. Geometry unions pass parcel, ditch, equipment and bay checks. Vehicle swept paths remain outstanding.



M02 / +20° · -5°

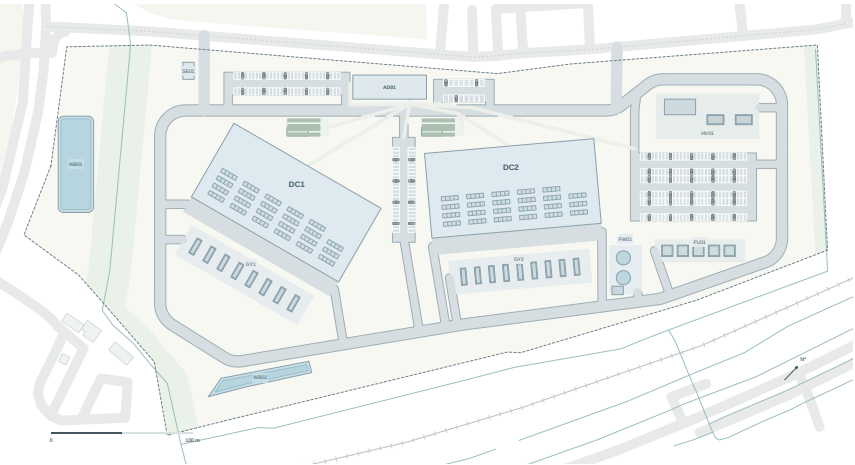
DC separation: 37.3 m

Internal pavement: 18,120 m²

DC cut / fill: 1,024 / 5,689 m³

MEASURED GAINS

A with 25° parking reserves 18,034 m² of internal pavement. Differences remain modest. Cut/fill covers DC footprints only, with formation 0.45 m below FFL.



M03 / -30° · +5°

DC separation: 33.9 m

Internal pavement: 17,655 m²

DC cut / fill: 1,184 / 5,665 m³

THE ARCHITECTURAL CHOICE

M01 is an interesting alternative for a more open arrival. A retains a regular 40 m interval, a shared reception frontage and clearly ordered courts for phasing.

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Two buildings,
independent angles

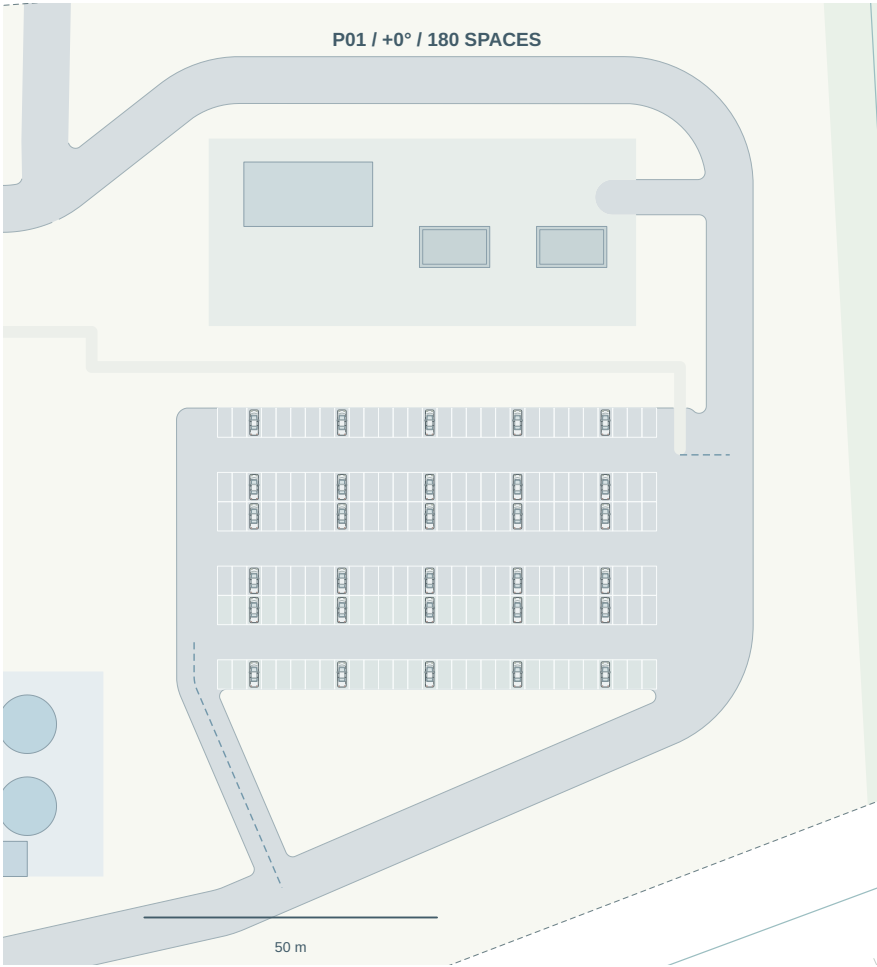
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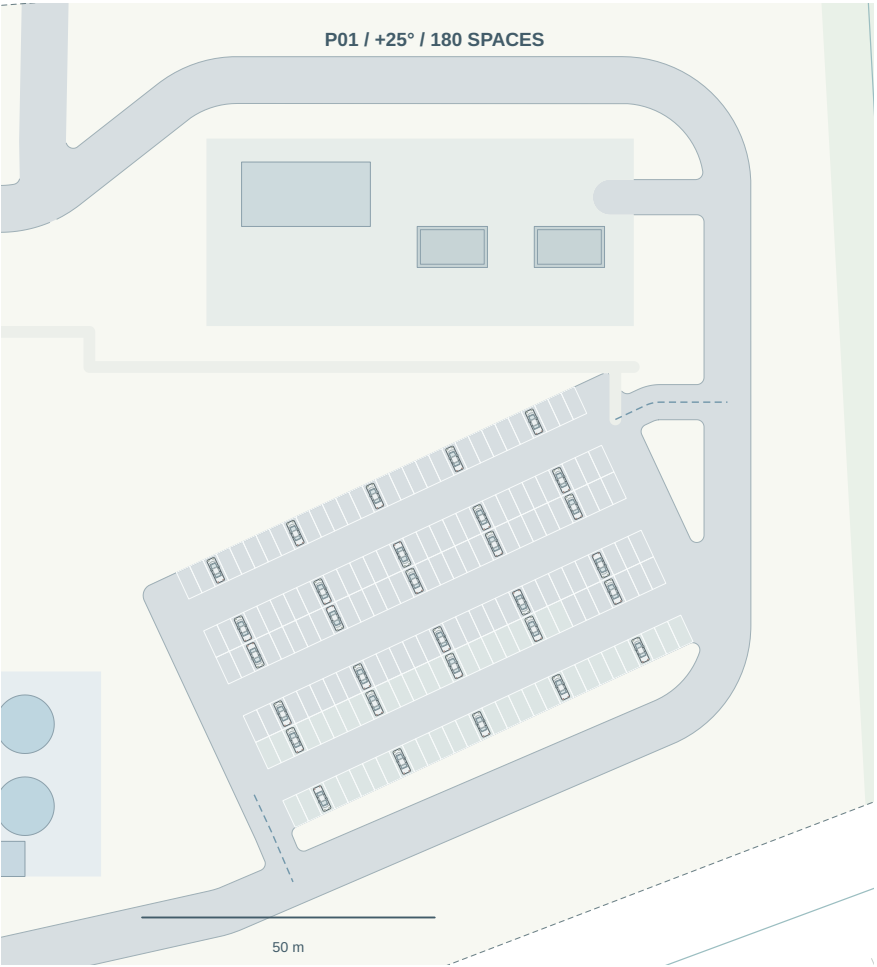
A05

Rotate where it adds value

P01 parking takes its own axis; buildings retain a shared arrangement



REPOSITIONED / 0°



SELECTED / +25°

180 bays retained. P01 links: 53.5 → 36.1 m. Parking + links outside the proposed reference loop: –123 m².

THE SOUTHEAST EDGE AXIS

The 25° parking angle follows the southeast edge and shortens its connections. Two 6 m entries reach the ring; the pedestrian route joins a distribution aisle.

THE PARKING TEST

833 angle/translation placements tested; 108 pass the geometric filter. 25° and 30° perform very similarly: 25° is a composition choice, not a proven optimum.

ONE FRAME, SEVERAL AXES

The proposal combines DCs at 0° with a main car park at 25°. DC parallelism is retained for the shared arrangement after comparing oblique alternatives.

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Rotate where it adds
value

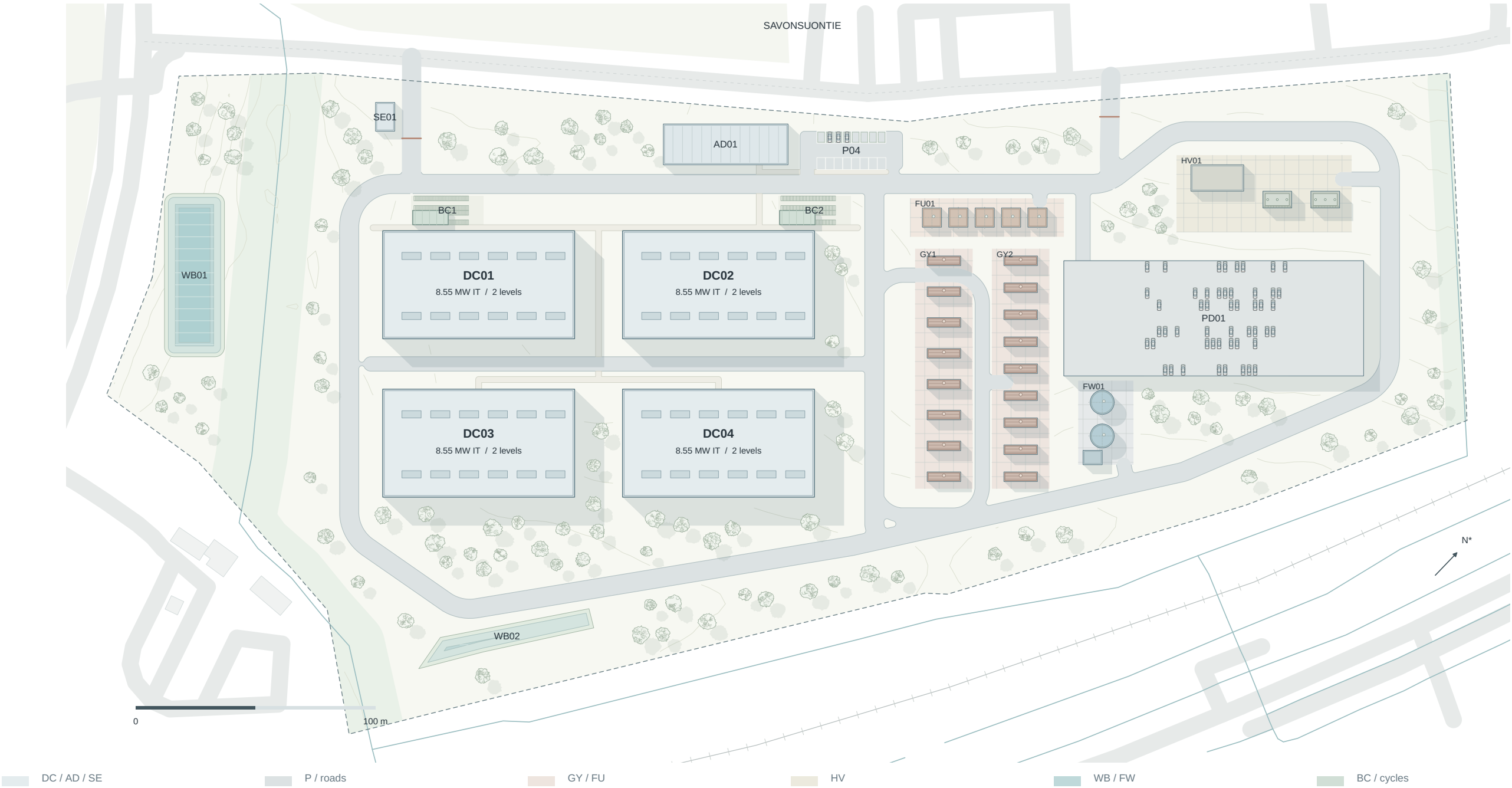
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A3 / Graphic scales

A06

Option B / four aligned pavilions

Four 80 × 45 m buildings — a more fragmented arrangement



DEPLOYMENT AUTONOMY

Four two-level volumes of 8.55 MW IT. The arrangement allows pavilion-by-pavilion delivery.

THE SPATIAL COST

Parking becomes a two-level structure. Chillers must remain shared or their count must increase. More cores and utility interfaces require development.

SCREENING LIMIT

The programme allowance is equivalent; the later 120 × 60 m internal plans do not apply to these pavilions.

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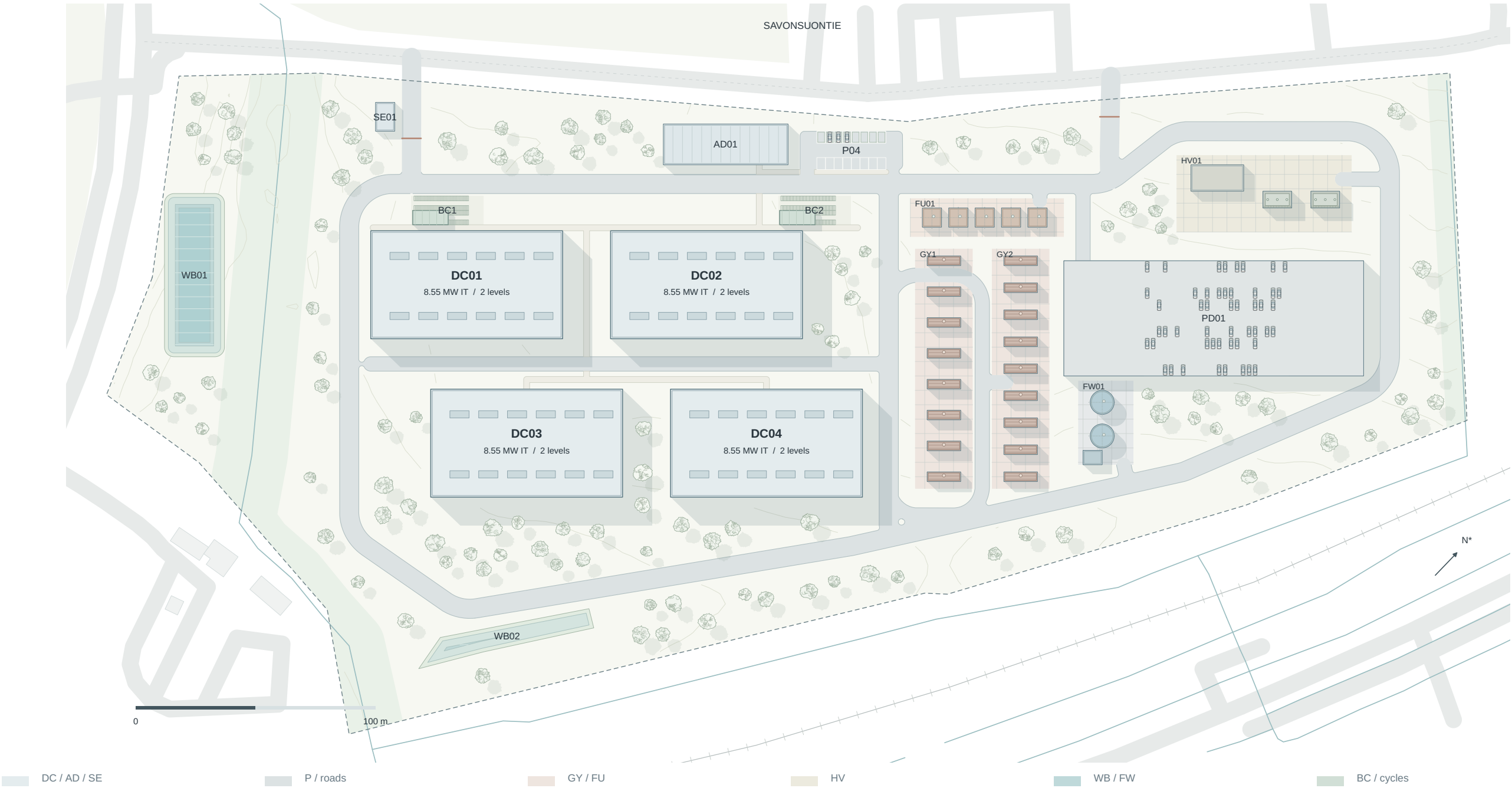
Option B / four aligned
pavilions

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A3 / Graphic scales

Option C / four staggered pavilions

Staggering creates spaces between buildings, with more connections



A DIFFERENT MORPHOLOGY

Buildings remain strictly orthogonal. Staggering comes from translation, without trapezoids or distortion.

LIMITED DEMONSTRATED GAIN

Capacity remains 34.2 MW IT and parking still needs two levels. Staggering produces no additional power here.

MORE INTERFACES

Service routes and yard interfaces are less repetitive. This remains a comparison option and is not selected.

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Option C / four
staggered pavilions

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A3 / Graphic scales

Choose by the consequences

Equal-programme comparison — no invented performance scores

CRITERION	A / SELECTED	B	C
Buildings	2 × 120 × 60 m	4 × 80 × 45 m	4 × 80 × 45 m
DC levels / positions	2 / 864	2 / 864	2 / 864
Total DC floor area	28,800 m²	28,800 m²	28,800 m²
Car parking	304 / surface	304 / 288 in structure	304 / 288 in structure
Min. DC separation	40 m	20 m	20 m
Architectural complexity	Module repeated twice	Four building cores	Four staggered volumes
Building phasing	2 × 17.1 MW IT	4 × 8.55 MW IT	4 × 8.55 MW IT
Developed internal plans	Yes / pages 21–25	No / envelope comparison	No / envelope comparison

A reduces fragmentation and avoids structured parking here. B remains interesting if an operator requires four independent building units; C produces no demonstrated gain for this programme.

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Choose by the
consequences

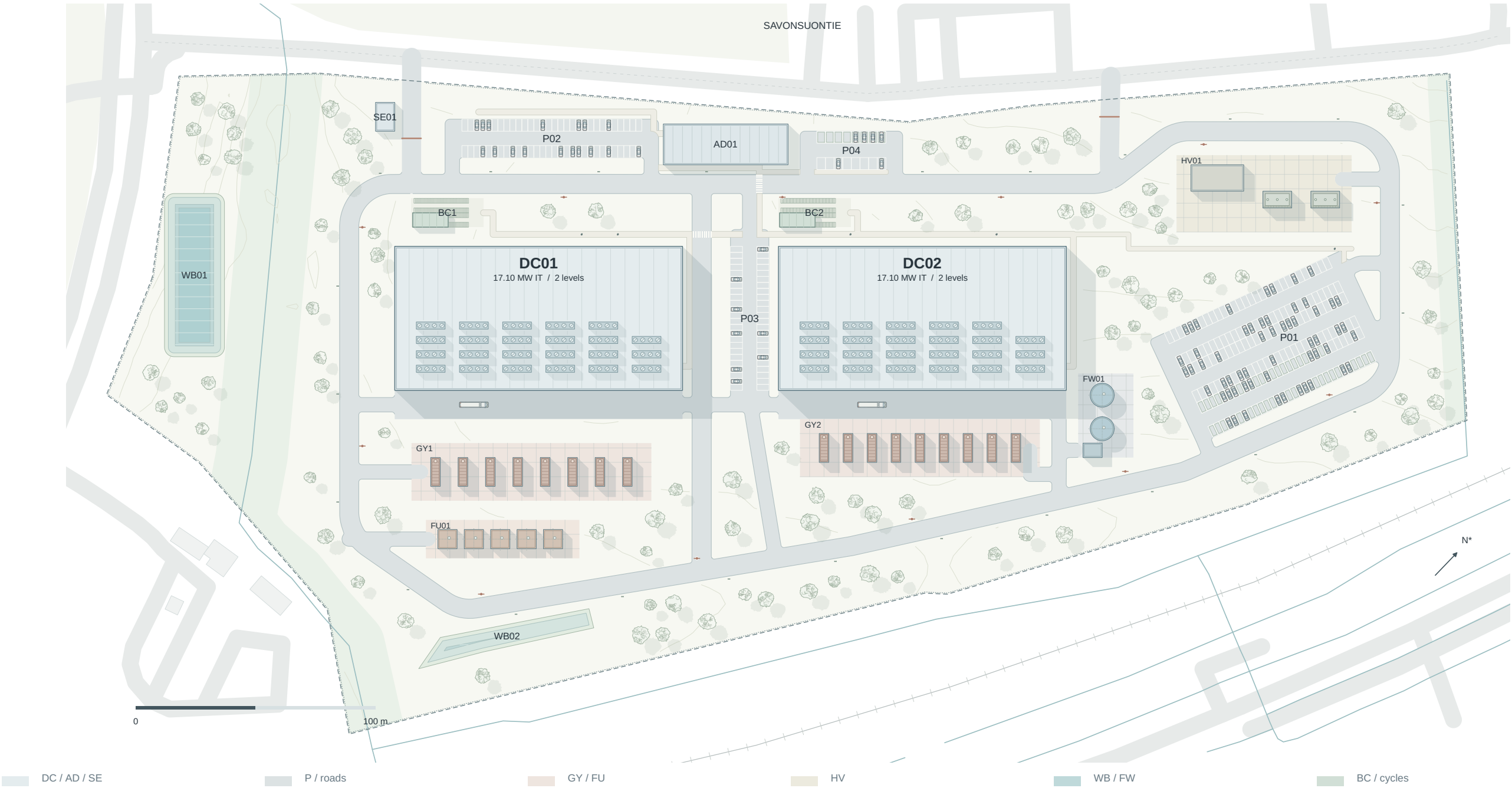
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A3 / Graphic scales

A09

The selected masterplan

Buildings, infrastructure, landscape and circulation in one drawing



A REPEATABLE MODULE

Two identical 120 × 60 m buildings separated by 40 m. P01 rotates by 25°. Two occupied levels and 432 rack positions per building.

A COMPLETE CAMPUS CONCEPT

Reception, guardhouse, HV yard, generators, fuel, firewater, cycles, parking and basins are included in the plan.

A BASIS FOR THE NEXT STAGE

Proposed volumes and levels accompany the geometry. The 3D stage can use this exact basis.

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The selected
masterplan

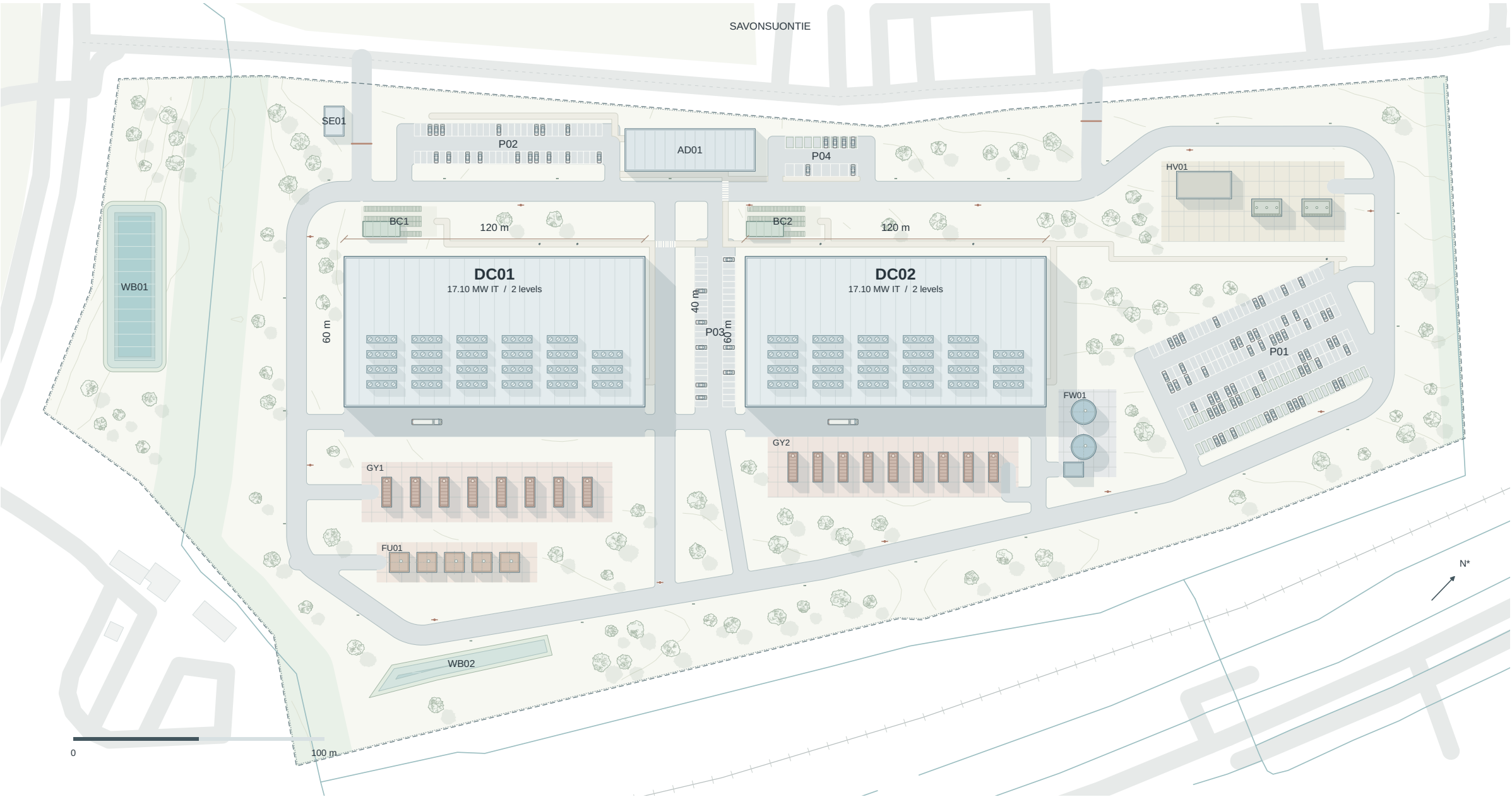
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A3 / Graphic scales

A10

Footprints and dimensions

Areas are calculated from geometry unions without double-counting overlaps



14,400 m²

two DC footprints

44.3%

calculated impervious share

30,070 m²

programme GFA including pump room

Indicative GFA before statutory accounting. The e = 0.60 coefficient alone does not establish buildability.

Sources: G1 · Earendil calculations / assumptions

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Footprints and
dimensions

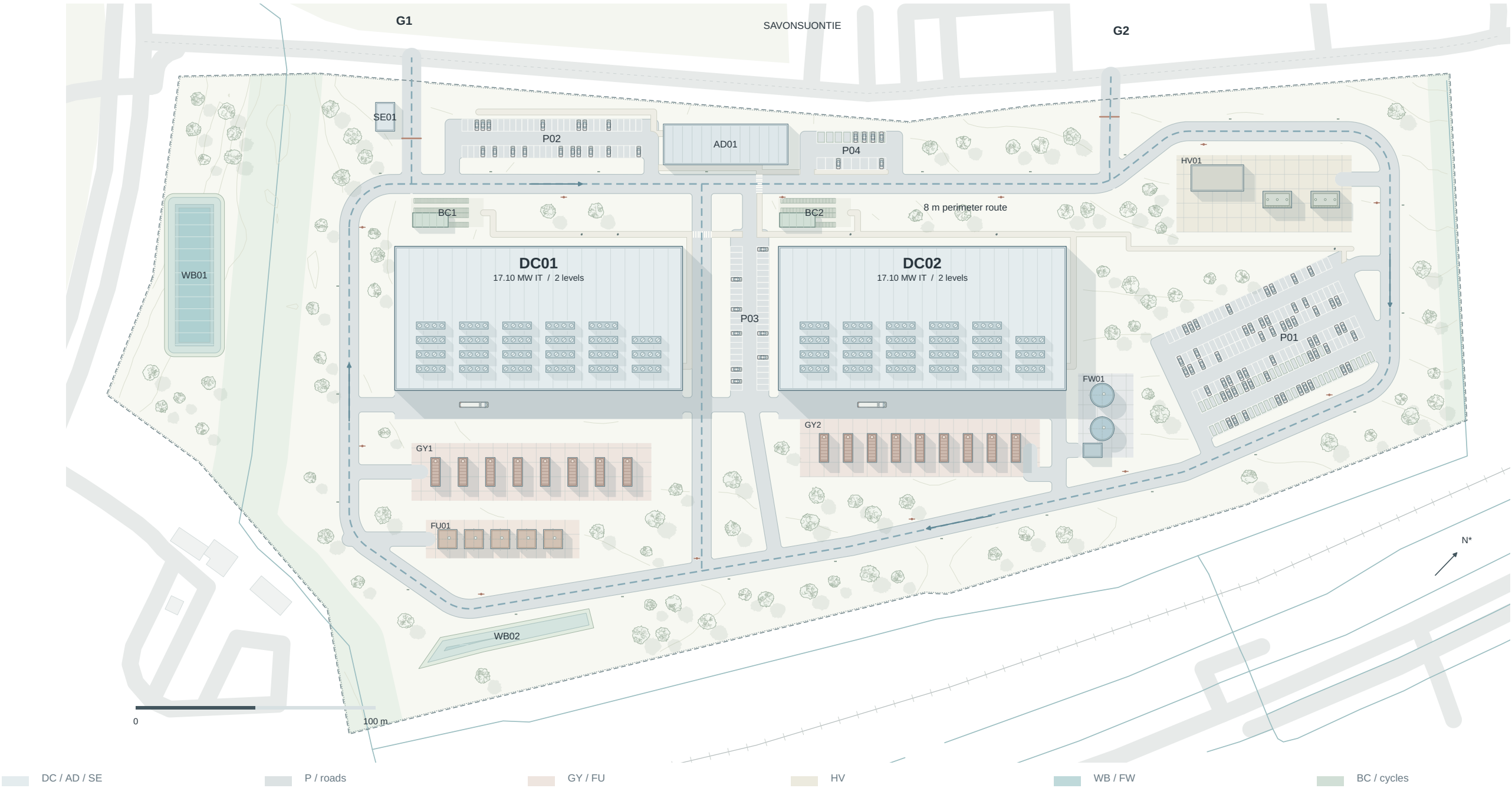
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A3 / Graphic scales

A11

One loop and two entrances

Continuous access, yard connections and facade maintenance aprons



G1 / MAIN ACCESS

Controlled entry for visitors, staff and deliveries; guardhouse ahead of the buildings.

G2 / SECONDARY ACCESS

A second connection to the same public street. It is not a second independent regional access road.

VEHICLE MOVEMENTS

8 m loop with 18 m centreline arcs. Junctions, selected vehicles, loads and gradients still need simulation before approval.

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One loop and two
entrances

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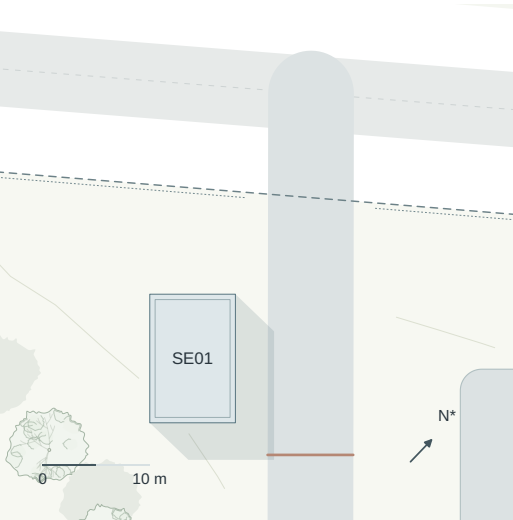
A12

Arrival and public frontage

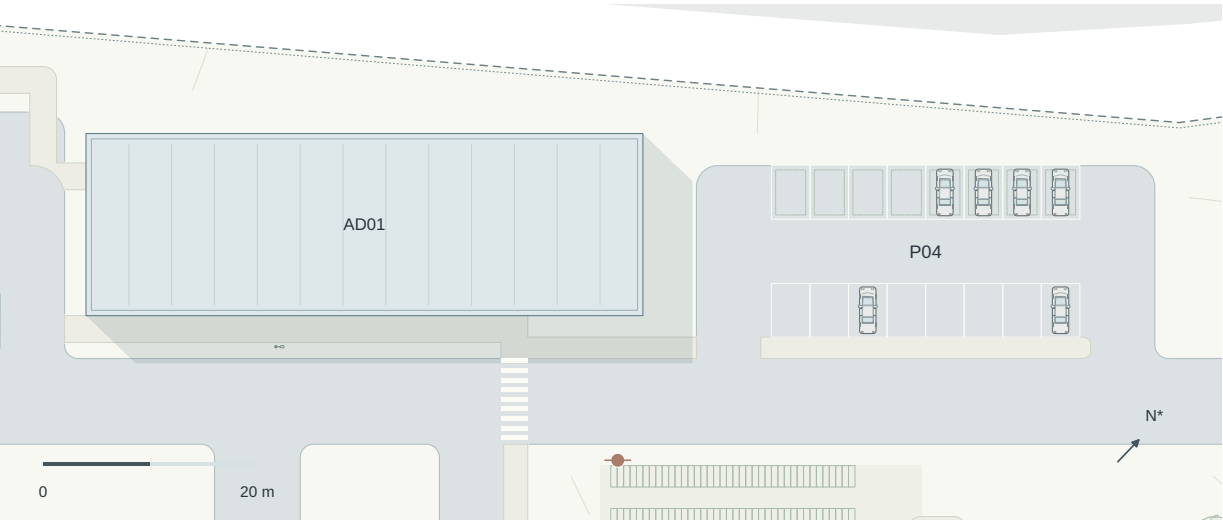
Reception, control and pedestrian routes — public frontage detail



01 / GATE CONTROL



02 / RECEPTION AND CROSSING



THE CAMPUS ADDRESS

AD01 contains reception and administration. Building lobbies are reached by a proposed 2–2.5 m pedestrian network.

VISIBLE CROSSINGS

Internal road crossings are identified; accessible grading, visibility and kerbs will be developed next.

CONTROLLED BOUNDARIES

Perimeter fence, barriers and separated technical zones. The fence must maintain ditch flow.

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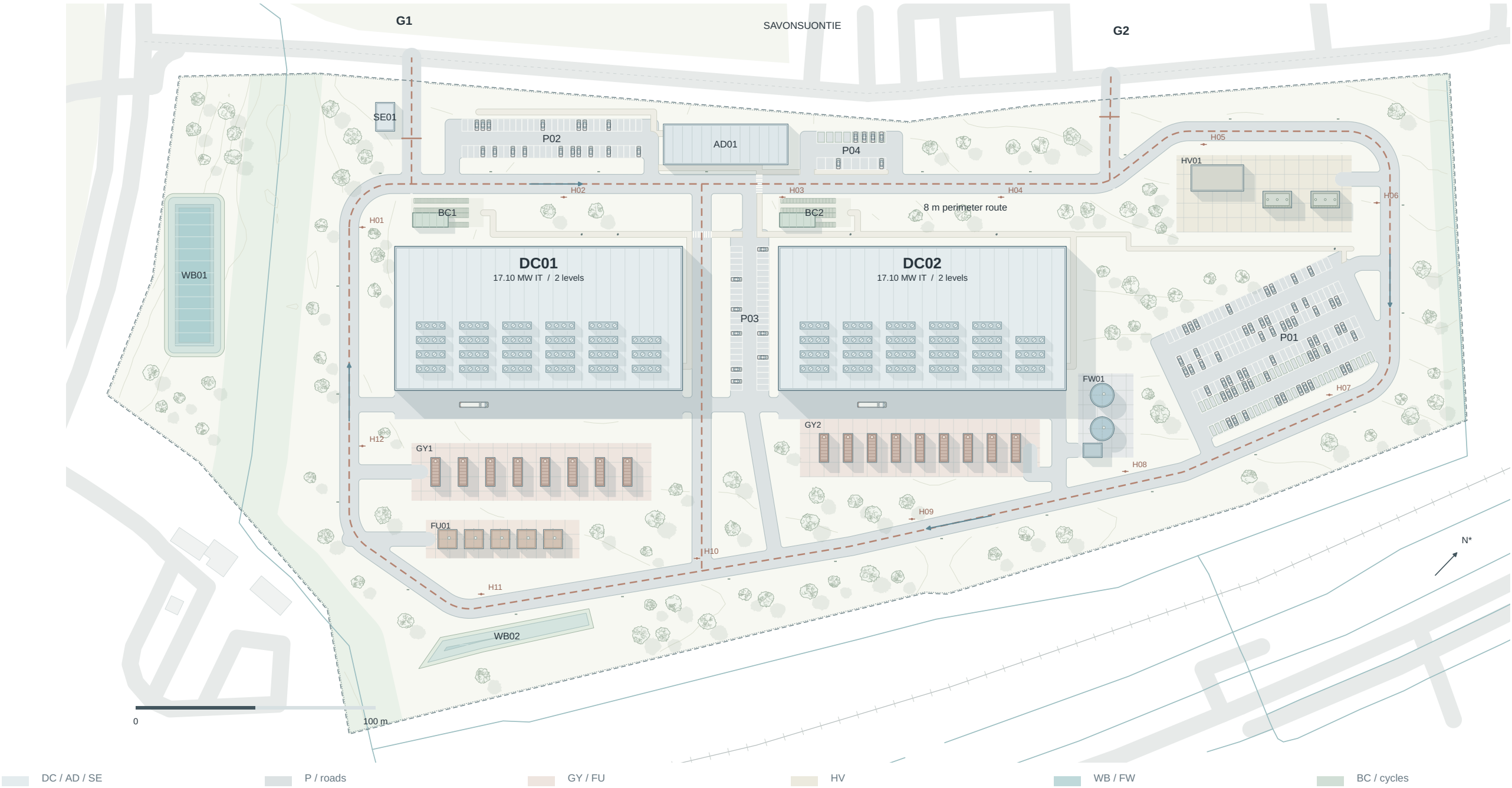
Arrival and public
frontage

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A3 / Graphic scales

Security and emergency response

Equipment allowances and response routes at concept stage



RESPONSE WATER

Two useful 250 m³ reserves and a pump room are located. These programme assumptions require hydraulic validation.

HYDRANTS AND ISOLATION

Twelve concept positions near the loop. No flow, pressure, coverage radius or fire-service approval is claimed.

INCIDENT WATER

A 600 m³ underground allowance below LA1 separates incident containment from routine basins. Load-rated construction and isolation valves require design.

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Security and
emergency response

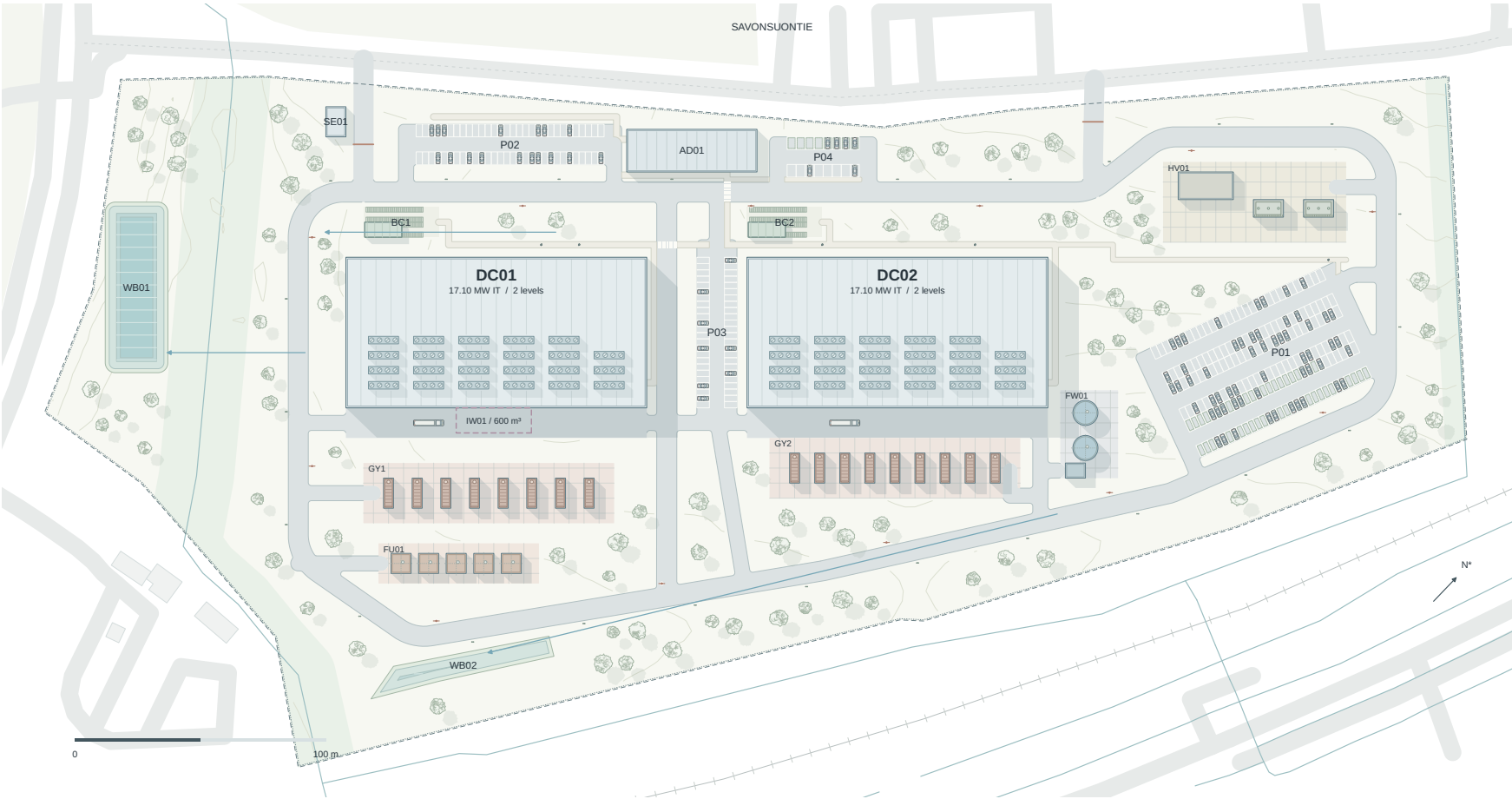
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A3 / Graphic scales

A14

Drainage and water strategy

Existing flow paths, proposed basins and test volumes



1,759 m³

proposed geometric usable storage

1,477 m³

20 mm + 30% test

Two-basin cross-section calculation: 1.2 m water depth, 0.3 m freeboard, 3H:1V sides. Volume follows the shape, not outer rectangle × depth.

SAME METHOD AS PREFEASIBILITY

Coefficients 0.9 impervious / 0.2 remaining, 20 mm test rainfall, 30% uplift. Impervious area now comes from the drawn layout.

A TEST, NOT A STATUTORY STORM

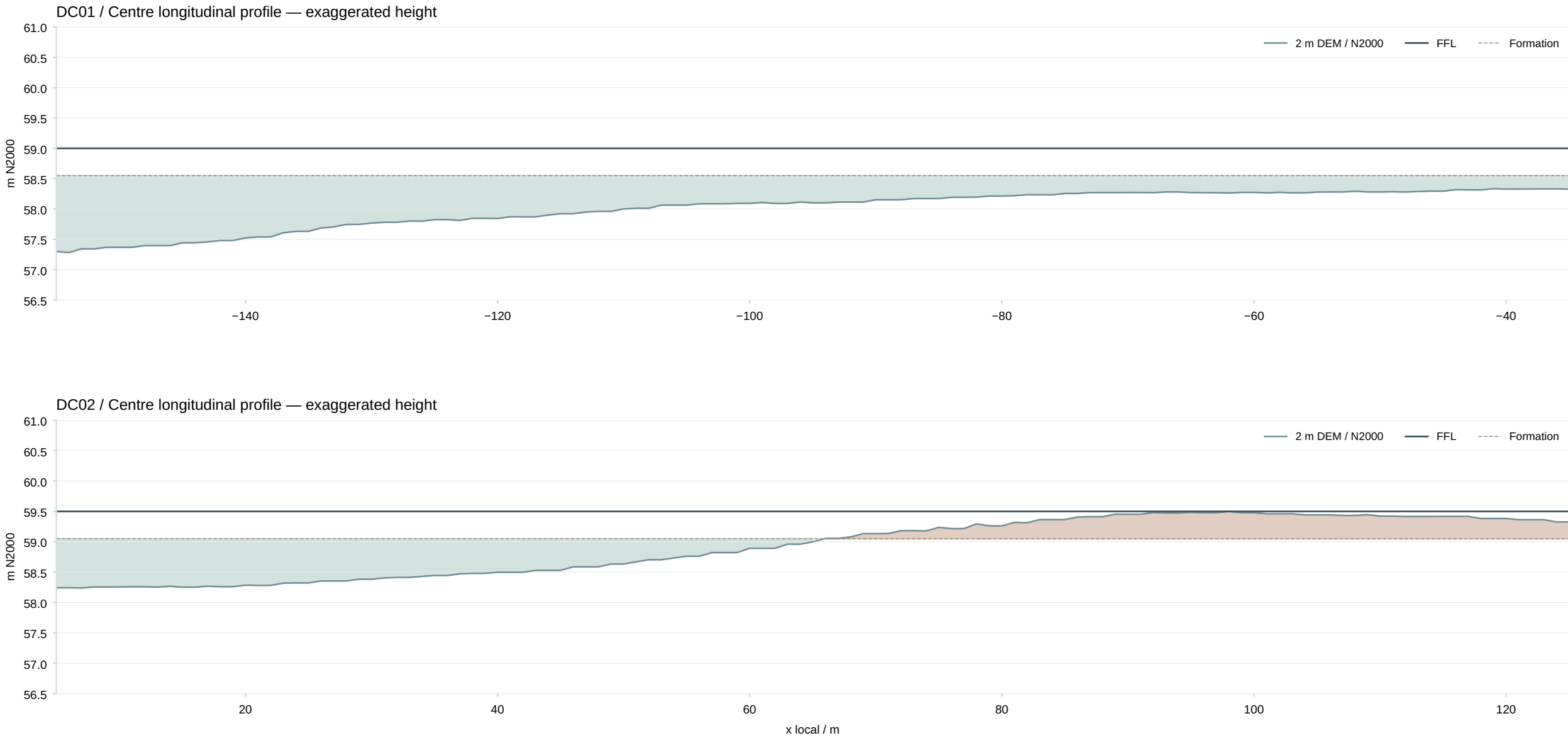
Local rainfall, groundwater, discharge, upstream catchment and exceedance remain to be studied. The 40 mm scenario exceeds the shown reserve.

CLEAN / INCIDENT

Ditches remain continuous. Incident containment IW01 is a separate 600 m³ allowance, not added to stormwater storage.

Two platforms, retained terrain

The 2 m DEM supports the concept balance; detailed design still requires a survey



DC01 / FFL 59.00 m N2000

Cut 0 m³ / fill 3,753 m³ below DC footprint

DC02 / FFL 59.50 m N2000

Cut 991 m³ / fill 2,114 m³ below DC footprint

DEM compared with formation 0.45 m below FFL. Excludes stripping, foundations, bulking, utilities and roads. This partial balance is not a campus earthworks bill.

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Two platforms, retained
terrain

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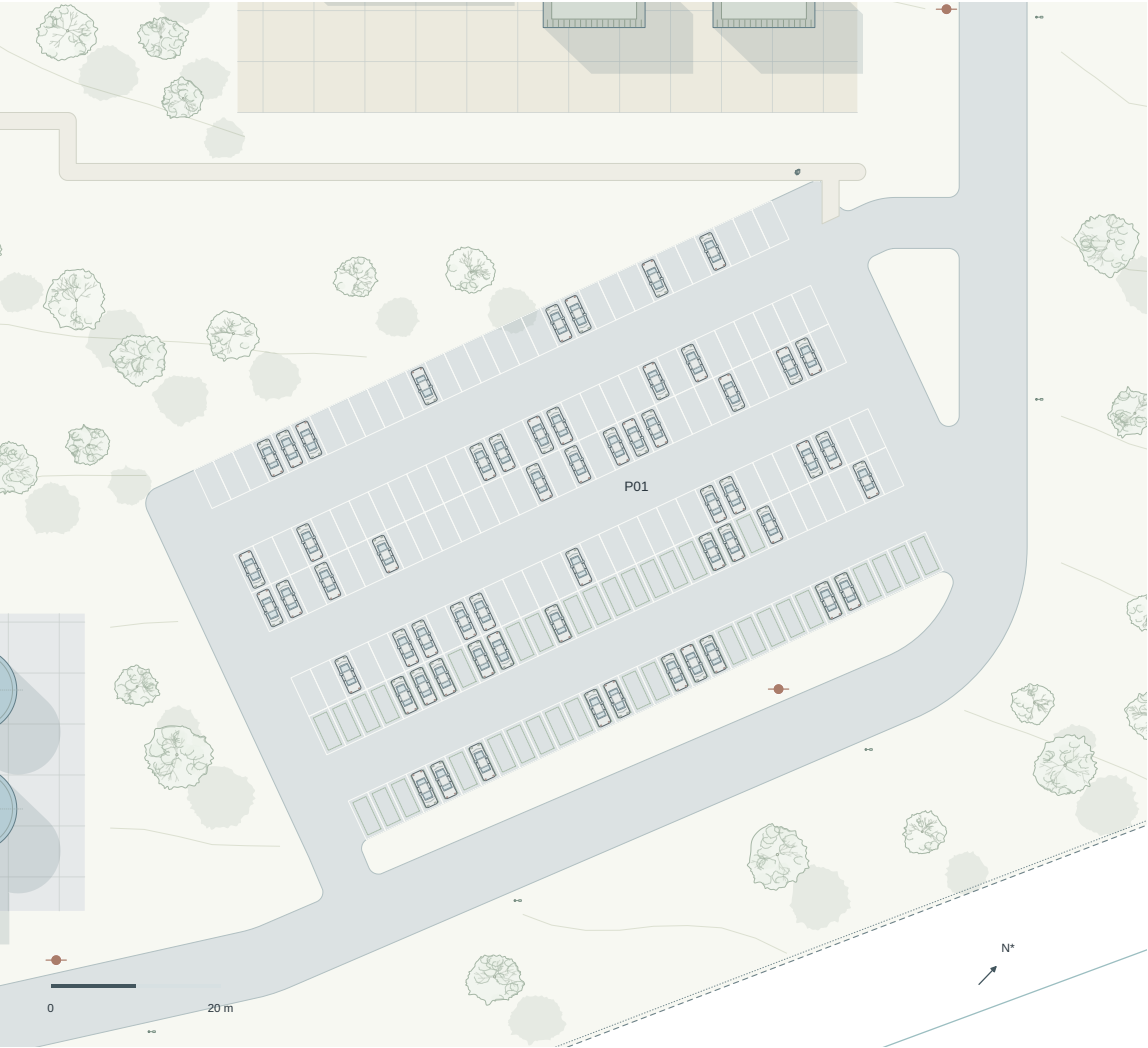
A3 / Graphic scales

A16

Parking and mobility

The local rule materially changes the site arrangement

P01 / 25° / 180 SPACES

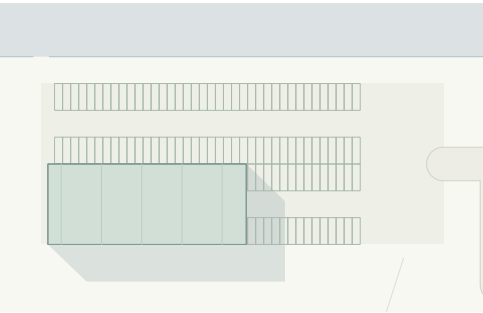


AT GROUND LEVEL

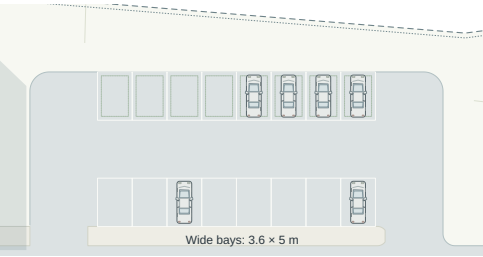
180 + 60 + 48 + 16 spaces. Standard bays 2.5 × 5 m, wide bays 3.6 × 5 m, aisles 6 m. Geometry still needs vehicle movement checks.

Sources: R1 · R2 · R3 · R4 · Earendil calculations / assumptions

BC1 / 152 / 46 COVERED



P04 / 8 ACCESSIBLE + 8 EV



CHARGING

61 ready bays in the standard regulatory case, including 8 equipped. Provide an accessible charger. The pending reform will need rechecking.

304

cars / including 16 wide bays

304 / 92

cycles / covered spaces

Conservative industrial/office basis: 1 car and 1 cycle / 100 m²; ≥30% of cycles covered. 30,070 m² gives 301 spaces of each type. The 8 accessible and 8 wide EV bays are included, not added.

CYCLES

Two groups of 152 spaces, 46 covered in each. Final provision must follow statutory floor area, not programme area alone.

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Parking and mobility

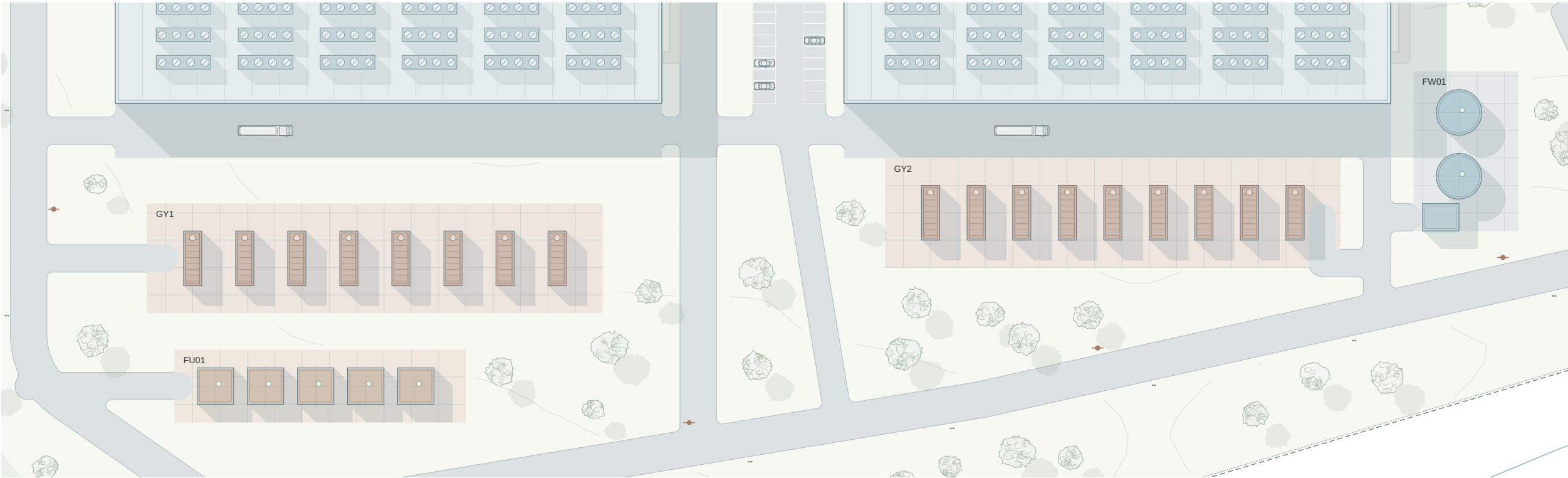
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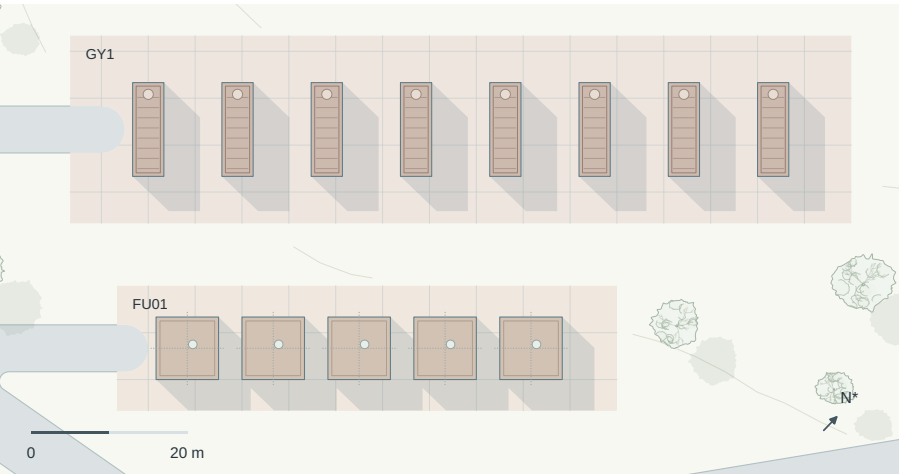
A17

Technical yards and equipment

Technical yards, allowances and replacement access



01 / GENERATORS AND FUEL



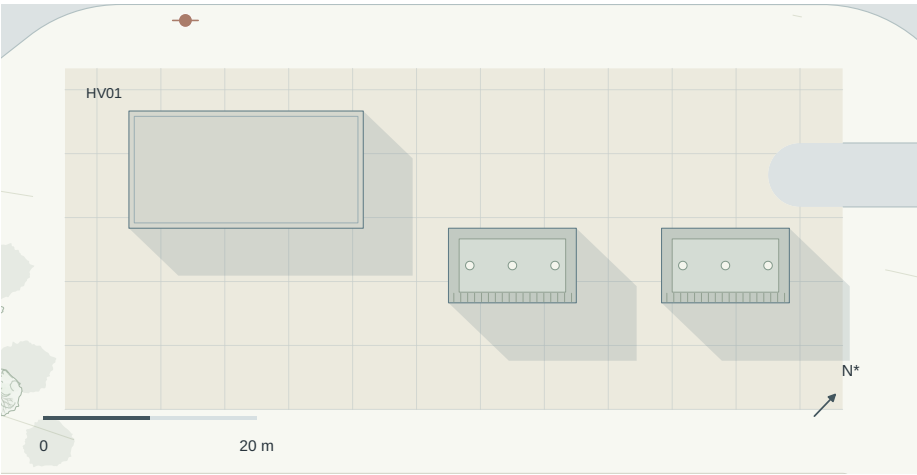
SHARED STANDBY POOL

17 generators of the 3 MW class in yards of 8 and 9. Sharing is functional: the topology must allow transfer between buildings.

FUEL

5 × 66 m³ gross = 330 m³. At 85% usable, 280.5 m³ exceed the calculated 256.5 m³ for 24 h. Chemical safety and containment require design.

02 / HV COMPOUND



HV AND HANDLING

Two 63 MVA transformer reservations. At ground level, 38 dry transformers and removable panels avoid heavy handling upstairs.

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Technical yards and
equipment

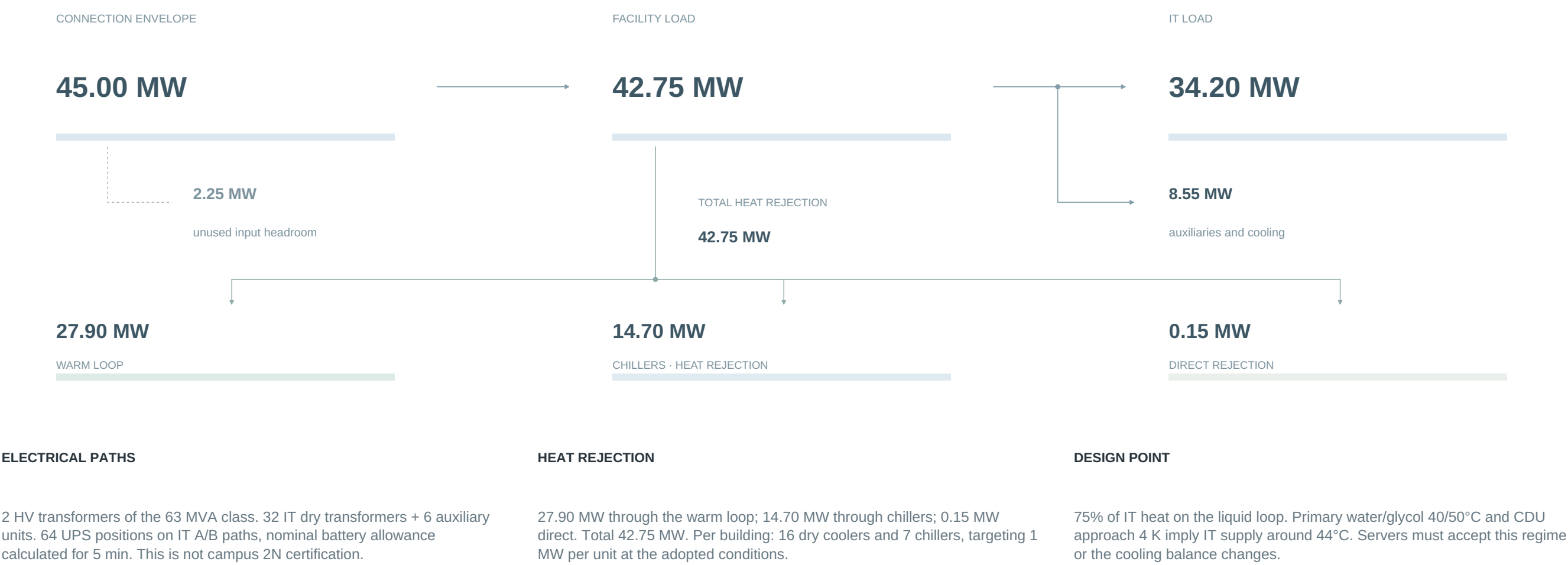
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A3 / Graphic scales

A18

From incoming power to racks

A shared balance of electrical power, heat and IT capacity



0.95 retains 2.25 MW of input headroom. The 1.25 peak factor is neither measured annual PUE nor a performance guarantee.

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From incoming power
to racks

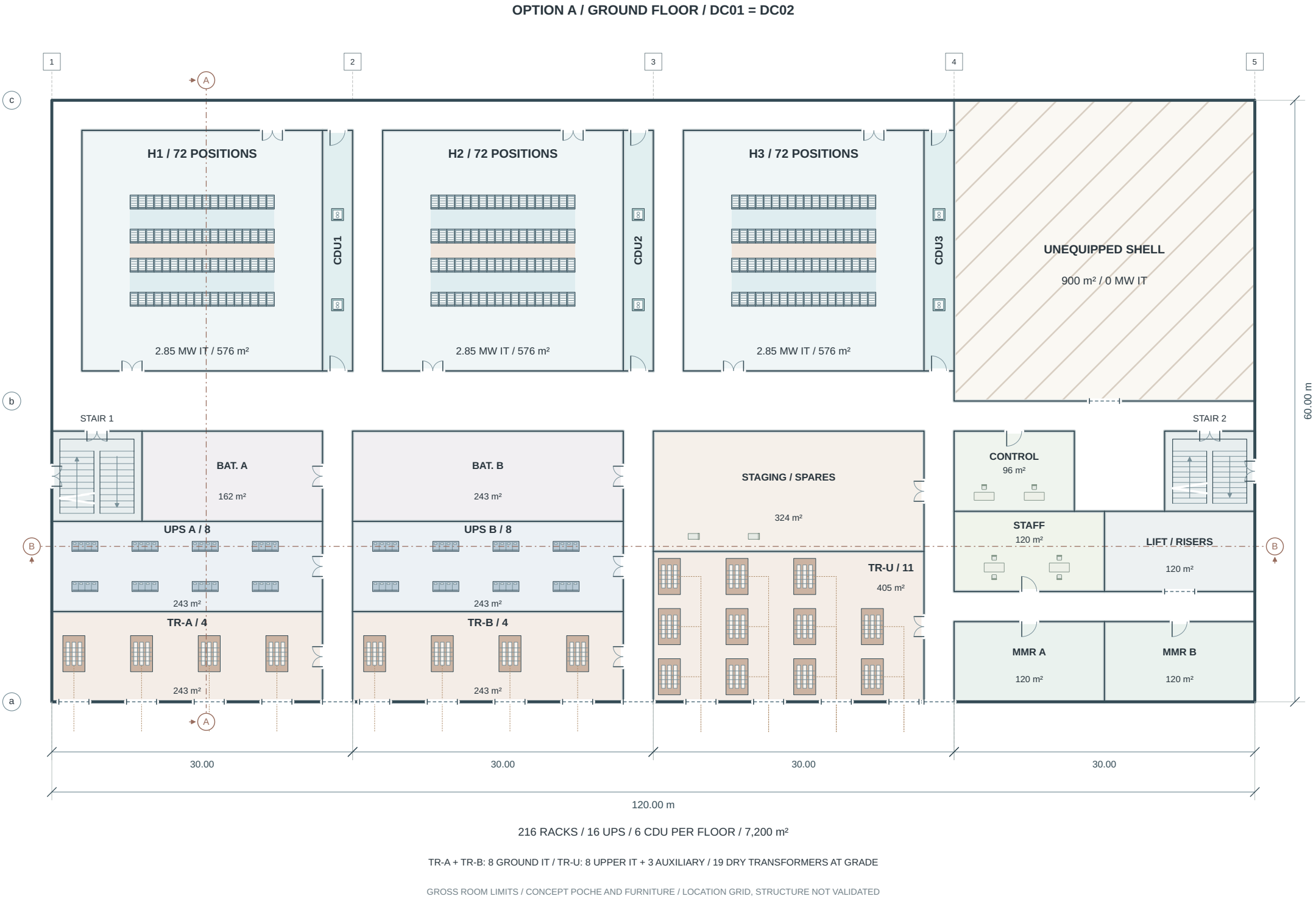
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A3 / Graphic scales

A19

Ground-floor plan

Typical plan for DC01 and DC02 — 7,200 m² per floor



216 positions, 16 UPS, 6 CDUs and 19 transformers per ground floor. Gross room plans; walls, compartments, flows and exits require detailed design.

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Ground-floor plan

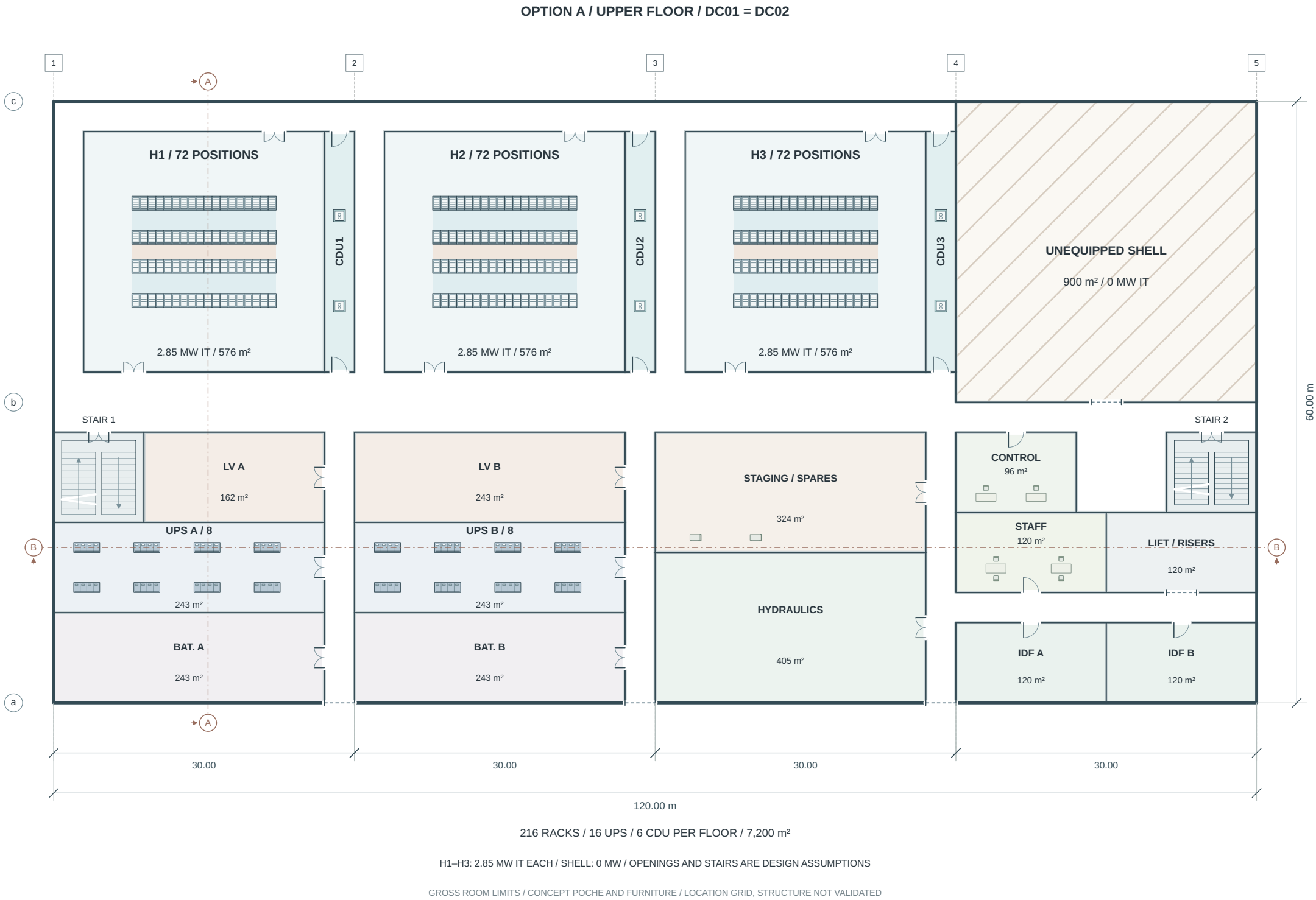
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A3 / Dimensions in metres

A20

Upper-floor plan

Same footprint and IT capacity; adapted technical functions



216 positions, 16 UPS and 6 CDUs per upper floor. Heavy transformers stay at ground level. Galleries and stair allowances organise circulation.

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Upper-floor plan

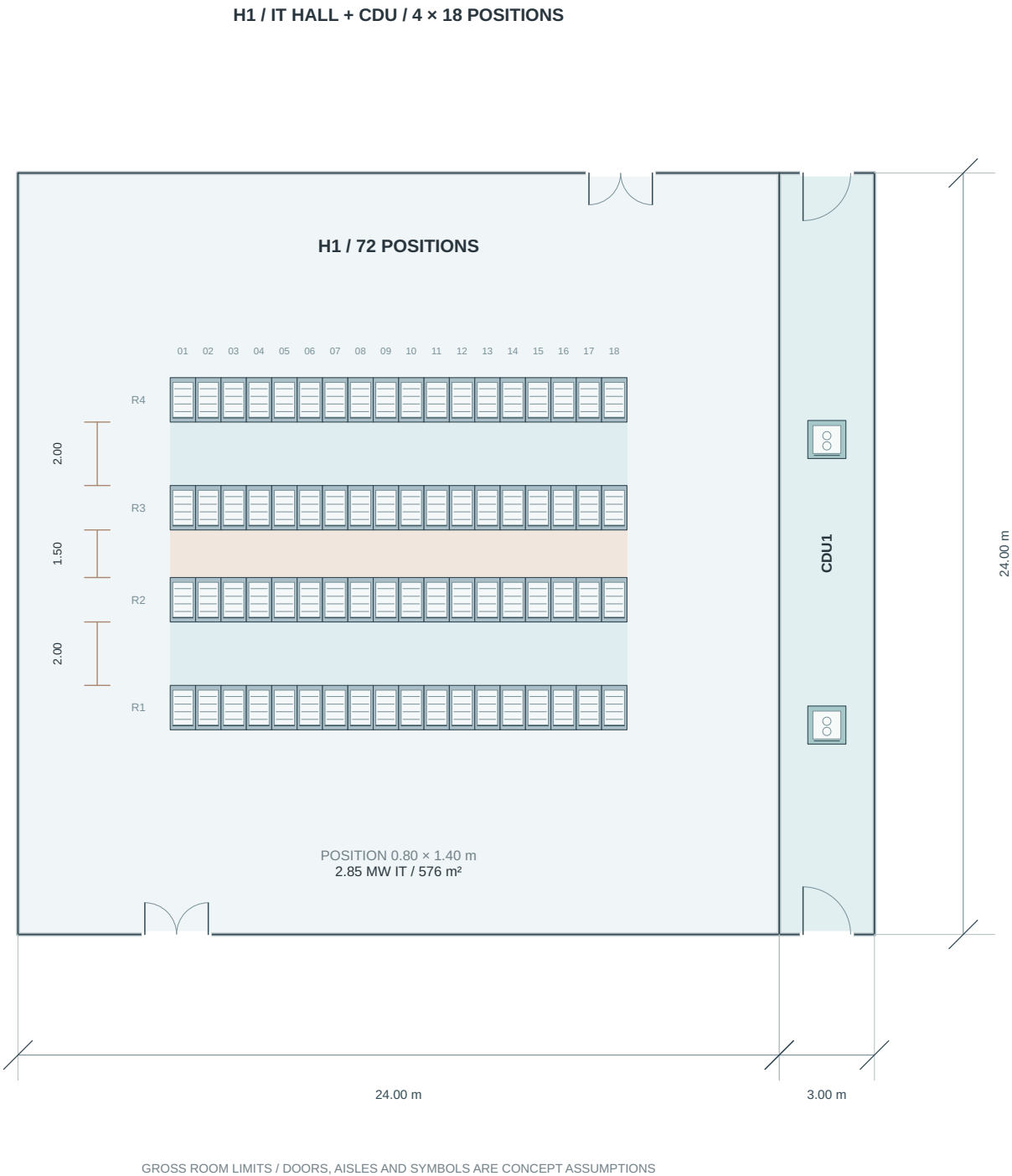
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A3 / Dimensions in metres

A21

The IT hall at rack scale

72 physical positions per hall — a coordination basis for equipment selection



72

positions / 576 m² hall

39.58 kW

average IT per occupied position

4 rows of 18 positions. Reserved cell 0.8 × 1.4 m, 2 m cold aisle, 1.5 m hot aisle and 2 m row-end clearances. These are coordination assumptions.

2.85 MW per hall. The average does not prescribe identical rack-by-rack density. IT selection, floor loading and containment will be coordinated.

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The IT hall at rack scale

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A3 / Dimensions in metres

A22

An organised plant roof

23 units and one free handling cell per building



Two identical roofs: 32 dry coolers and 14 chillers in total. Generic envelopes; airflow, noise, snow, wind and structure not sized.

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An organised plant roof

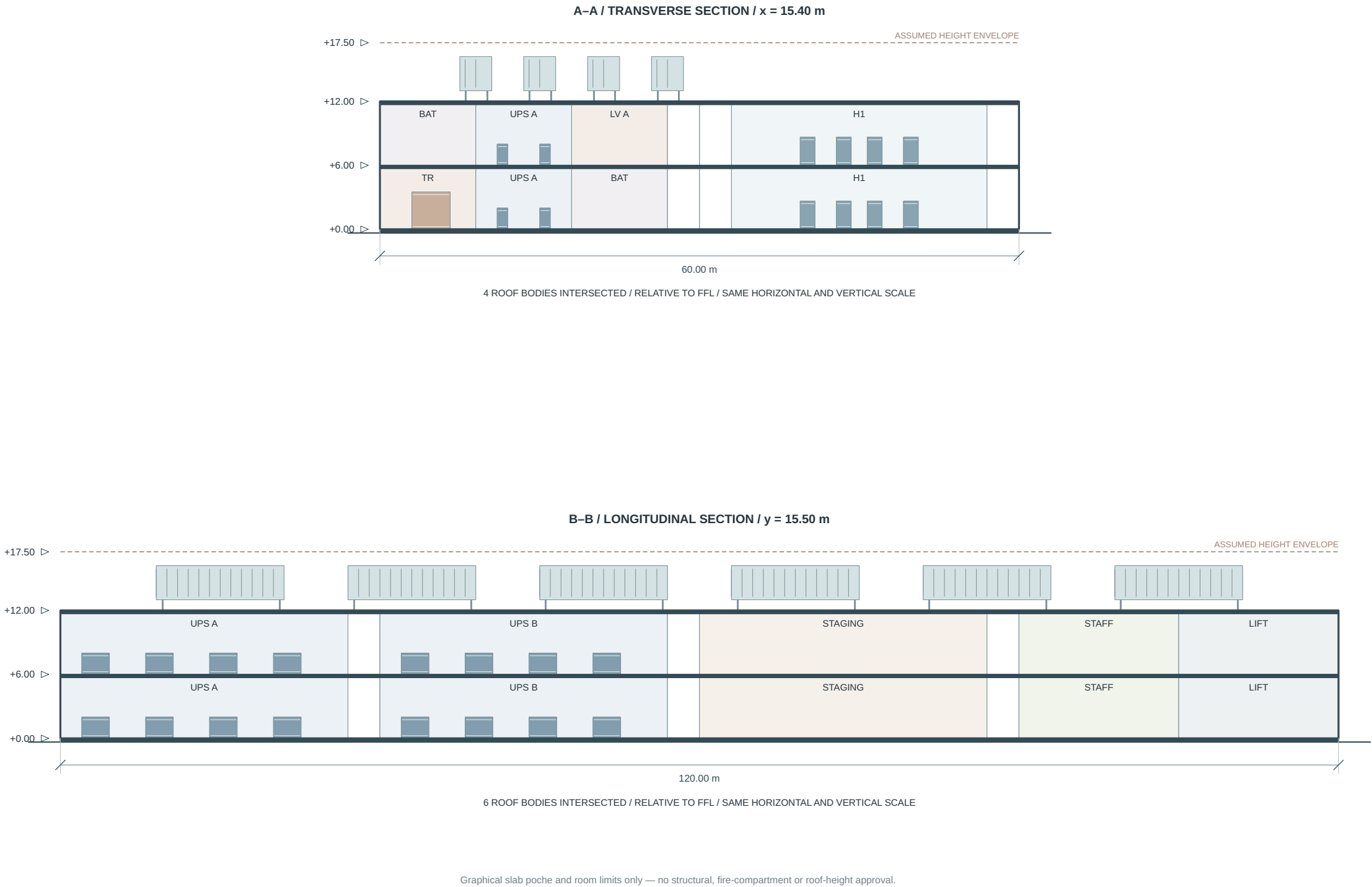
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A3 / Dimensions in metres

A23

Sections and proposed heights

Sections correspond to the plans; they do not establish structural approval



Two 6 m storeys; roof slab +12 m, reserved technical top +17.50 m. III does not authorise this height. Levels relative to each building FFL.

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Sections and proposed
heights

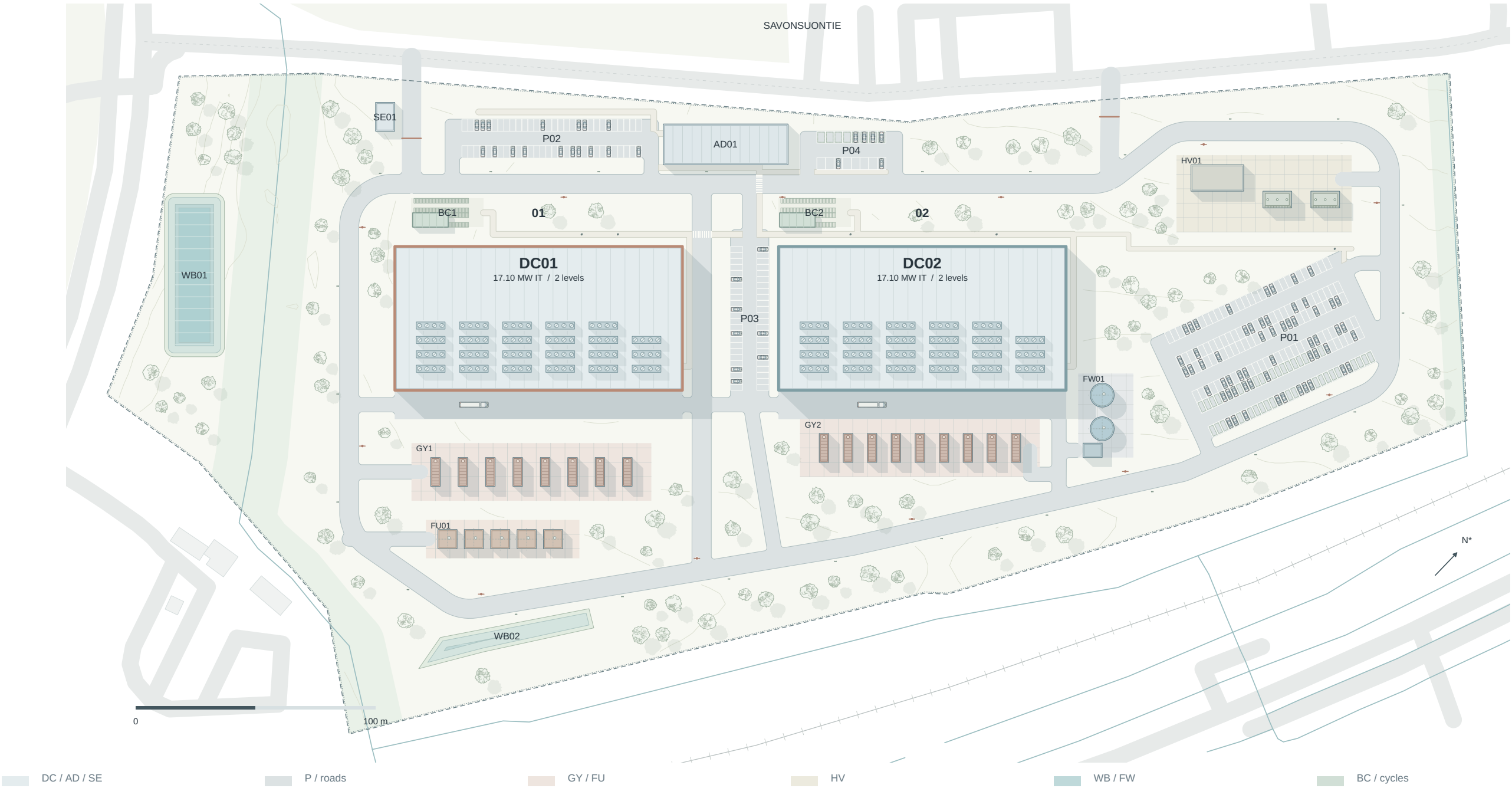
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A3 / Dimensions in metres

A24

Delivery sequence

One operable first building, then repetition of the module



00 / INFRASTRUCTURE

Coordinate land, utilities, drainage, access and common HV infrastructure. Preserve the construction corridor from the outset.

01 / DC01

17.1 MW theoretical IT at completion of this phase, or 21.375 MW facility load in the balance. Common infrastructure is sequenced accordingly.

02 / DC02

The second bar repeats the module. Heavy work and testing must be separated from live operations through a temporary construction plan.

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Delivery sequence

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A3 / Graphic scales

A25

The drawn and counted programme

Quantity schedule and demonstration boundaries

Native parcel	111,435.6 m²	NLS, unchanged geometry
DC / offices / guard / HV / pumps	30,070 m² GFA	Programme area before statutory accounting
Active rack positions	864	2 buildings × 2 levels × 216
Unequipped room reserve	3,600 m²	Included in GFA, excluded from active IT MW
UPS / CDU / dry transformers	64 / 24 / 38	Bodies and service allowances in plans
Generators / fuel tanks	17 / 5 × 66 m³	Generic geometry, equipment not selected
Dry coolers / chillers	32 / 14	23 units + 1 free cell per roof
Cars / cycles	304 / 304	Including 16 wide bays / 92 covered cycles
Firewater / incident water	500 / 600 m³	Separate allowances, volumes to validate

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programme

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A26

The proposed decision

A reference layout with defined conditions for progression

Take Option A forward
for the next design stage.

WHAT IS FIXED HERE

The native parcel, comparison programme, two identical bars, concept placements and drawing layers.

WHAT NEEDS QUALIFICATION

Land and effective zoning; 45 MW network offer; existing utilities; geotechnics; noise; fire; vehicle movements, drainage and statutory areas.

WHAT THE NEXT STAGE ADDS

A 3D model on the same coordinates, facades and materials, overall and detailed views, then system coordination with specialists.

An argued selection and a reproducible package — not a promise of permission or available power.

Sources and reproduction method

Public data, identified assumptions and delivered native files

G1 / National Land Survey / cadastral geometry	E1 / Existing Domgermain library dimensional audit	E9 / Schneider Electric Minera EcoDesign catalogue NRJCAT21025EN
Open source	Local reference / see ZIP register	Local reference / see ZIP register
G2 / NLS / Paituli / 2 m terrain model	E2 / Schneider Electric NetShelter SX2 AR3300B2 product sheet	E10 / DCX 1MW dry cooler product page — excluded rating
Open source	Open source	Open source
G3 / OpenStreetMap / mapped context	E3 / Vertiv PowerUPS 9000 1250 kVA CE manual SL-71926	E11 / Kouvola infrastructure public-source registry
Open source	Open source	Local reference / see ZIP register
G4 / Kouvola / municipal GIS services	E4 / Vertiv CoolChip CDU 2300 kW data sheet SL-80005	E12 / Native model provenance and licence audit
Open source	Open source	Local reference / see ZIP register
R1 / Kouvola / plan report 23/027	E5 / Vertiv Liebert AFC data sheet, NA family dimensional comparison	E13 / Schneider Electric Trihal Standard cast-resin transformer dimensional catalogue
Open source	Open source	Open source
R2 / Finlex / accessibility decree 241/2017	E6 / Güntner V-shape VARIO dry cooler product family	E14 / Schneider Electric EcoDesign Tier 2 Trihal dry-type technical characteristics
Open source	Open source	Open source
R3 / Finlex / EV Act 733/2020	E7 / Cummins C3750D5 50 Hz ratings	
Open source	Open source	
R4 / Government / reform YM004:00/2025	E8 / Caterpillar 3516E 50 Hz generator dimensional class	
Open source	Open source	

The ZIP contains EPSG:3067 geometry, plans, calculations, sources, checks and scripts. R1: indexed official text reviewed; direct PDF download unavailable (404). The plan's effective date remains to be confirmed.

NLS/Paituli and Kouvola: CC BY 4.0; © OpenStreetMap contributors, ODbL. N*: grid north. Contours interpolated from the 2 m DEM. Proposed landscape and furniture. Diagrammatic shadows: west sun, 35° elevation; not a seasonal solar study. Manufacturer dimensional references, without selection or performance validation.

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