

Palam Vihar D Block, Ward 4 — Assessment and Remedy

Referred by the Commissioner. Assessed on the FloodAstra Decision Support System against the recorded July-2025 storm (107 mm in 3 hours); every remedial figure in this report is taken from a full model run of the city with the proposed works in place.¹

The flooding is real, the residents' diagnosis is broadly right, and it is fixable by gravity.

A scheme of 28 street intakes feeding an 800 mm gravity line to Trunk Leg 1, an interception chamber on the incoming lines, and two detention-and-recharge cells in nearby parks removes **24,451 m³ of water from D Block's streets** in the model re-run of the July-2025 storm — 23,476 m³ leaves by gravity with no pumping, and streets that today stay flooded into the next morning are 79% clear by midnight.

Why Palam Vihar D Block floods — the technical position

1. D Block is a perched low pocket: 10.8 ha of surrounding streets drain into it. **2.** Its outlets are 338 mm pipes laid 0.28 m deep — an order of magnitude too small for the arriving flow. **3.** Water from five *other* sectors also arrives here: the drains of Sectors 1, 2, 21, 22 and 23 (230 km of network) converge on this pocket, and ≈25,000 m³ of their water rises back out of the pipes (surcharge) during the storm — the block's largest single source. **4.** Level is *not* the problem — Trunk Leg 1 runs 197 m away with 10.12 m of usable fall, at 37% of its capacity.

1. The residents' statements, tested

Representation	Model finding
D Block is the lowest area of Palam Vihar; water flows towards it	Substantially correct. D Block lies at 215.04 m — lower than 27% of Palam Vihar. It is a perched pocket: 10.8 ha of streets drain into it from the south-east, delivering roughly 11,523 m ³ in this storm.
The ground level of the main drain behind the block is faulty; it overflows	Correct in effect. The drains serving the block are 338 mm pipes laid only 0.28 m deep. They cannot accept the flow, so water backs out of them.
Flow at the last exit is very slow; the out-fall drain sits too high	Correct in effect, with a decisive nuance. The exit is not short of level — Trunk Leg 1 passes 197 m away with its invert 10.12 m below D Block. What is missing is a conduit and, critically, <i>intakes</i> able to collect the water.

2. Severity, confirmed from MCG's own records

The corporation's registers hold **five** separate complaints for this block — four graded *Hypercritical*, with water reported standing “3 hrs & more”. The model reproduces flooding at each: peak depth 0.46 m, about 8.0 ha under water, and 20,180 m³ still standing when the storm ends.

3. The situation in six numbers

10.12 m

of fall to Trunk Leg 1, only 197 m away — the flood is fixable by gravity

25,000 m³

rises back out of the drains — the largest source is the drains overflowing

230 km

of upstream pipe, serving Sectors 1, 2, 21–23, drains towards this one low pocket

5 runs

of the full city model test the works — including the versions that *do not* work

79%

of the flood cleared by midnight with the works — today it stands into the morning

40,000 m³

a year returned to the aquifer by the recharge cells — water for ~800 people

¹ All depths, volumes and sizes in this report are screening-grade model results intended to support prioritisation and preliminary design; they are not construction values. Key levels must be confirmed by survey before design (page 5).

Why D Block Floods

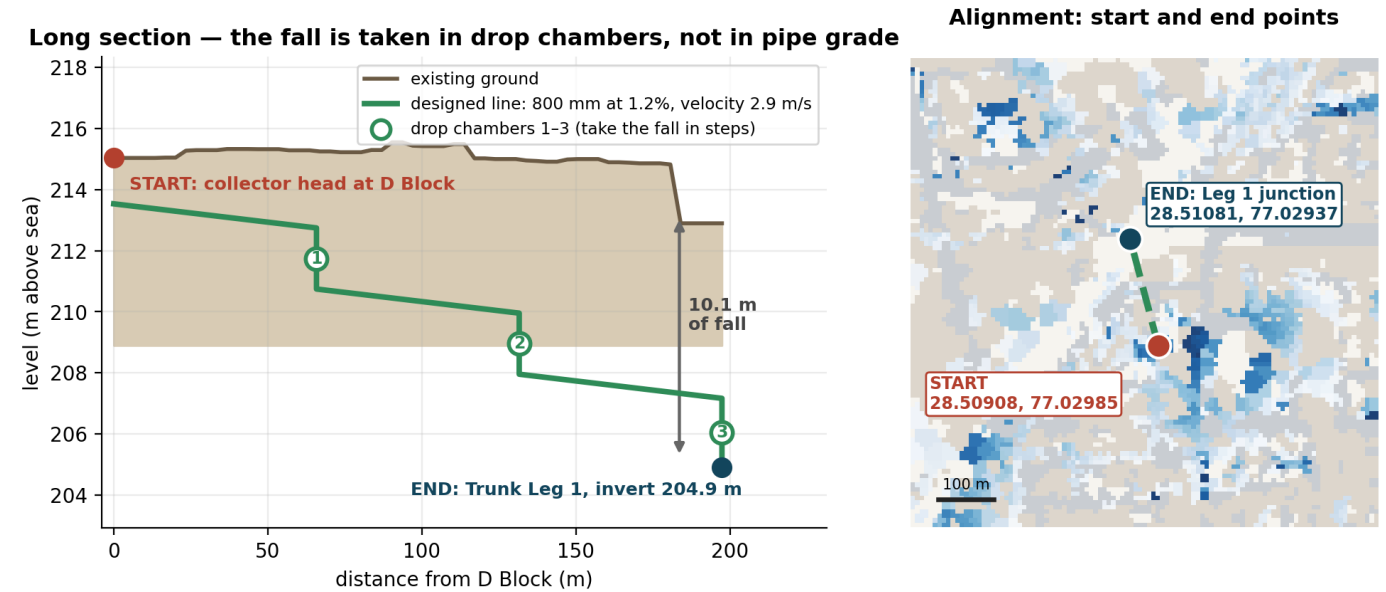
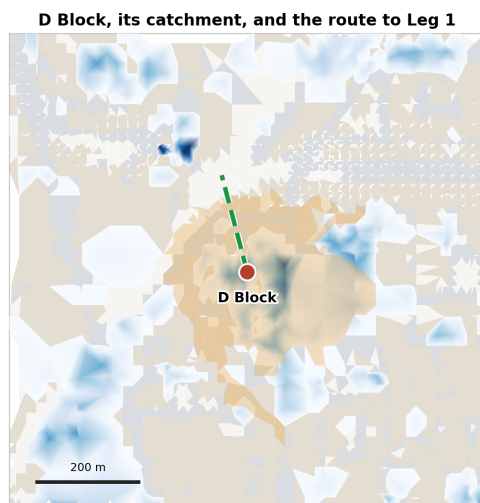


Figure 1: Left: the designed long section. A continuous 5.13% grade would drive the flow to 4.9 m/s and scour the pipe, so the line is laid at 1.2% and the 10.12 m of fall is taken in three drop chambers — velocity stays at 2.9 m/s, within the CPHEEO 3 m/s limit. Right: the alignment with its start and end coordinates.



blue flooded streets (model) orange ground draining into D Block dashed green proposed line to Leg 1

Figure 2: Blue: modelled flooding. Orange: the ground that drains into D Block. Dashed green: the proposed route to Leg 1. Scale bar 200 m.

A perched pocket. 10.8 ha of surrounding streets drain to D Block. Its own outlets — 338 mm pipes at 0.28 m depth — are too small and too shallow for the arriving flow.

The receiving drain has ample room. Trunk Leg 1's capacity is 24.5 m³/s; it runs at 37% in this storm, leaving 15.5 m³/s spare. The proposed connection uses 6% of the leg.

Why desilting alone has never fixed it. A clean 338 mm pipe is still a 338 mm pipe — and, as the next page shows, the pipes are not only too small: they are delivering water *to* the block.

The Finding That Changes the Design

Most of D Block's flood water does not arrive over the streets. It rises out of the drains.

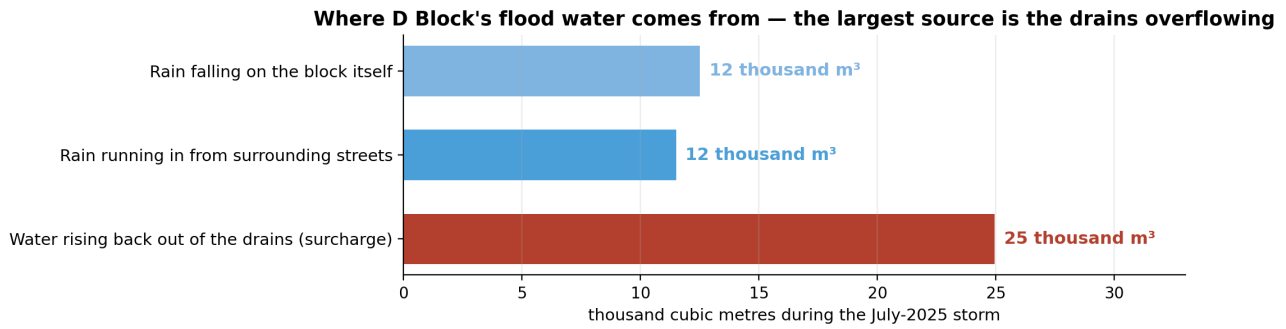
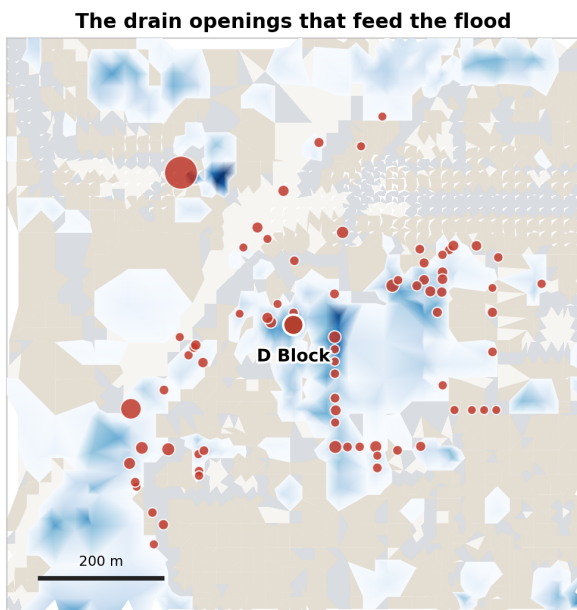


Figure 3: The three sources of D Block's flood, from the model. The largest is the drainage network itself: lines arriving from upstream reach this low pocket already full and push about 25,000 m³ up through gullies and manholes onto the street. The residents' observation that "the main drain overflows" is confirmed, and quantified.



■ flooded streets ● drain openings pushing water up (size = volume)

Figure 4: Where it happens: every red circle is a drain opening that pushed water up during the storm; larger circles pushed more.

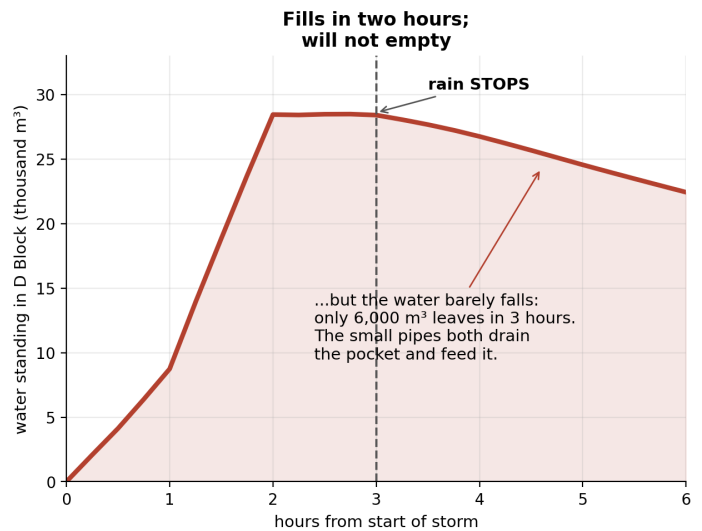


Figure 5: Why the water stands for hours: the pocket fills in two hours, and after the rain stops it barely empties — the small pipes both drain it and feed it.

In plain terms: D Block is a bathtub whose plughole is connected to everyone else's bath upstream. Cleaning the plughole does not help while water is being pushed back up through it. The remedy must therefore do two things at once: **collect** the street water (kerb intakes), and **intercept** the incoming lines before they reach the pocket — turning both flows down the new gravity line to Trunk Leg 1, 10.12 m below.

Five sectors' drainage converges on D Block — arrow width shows each sector's share

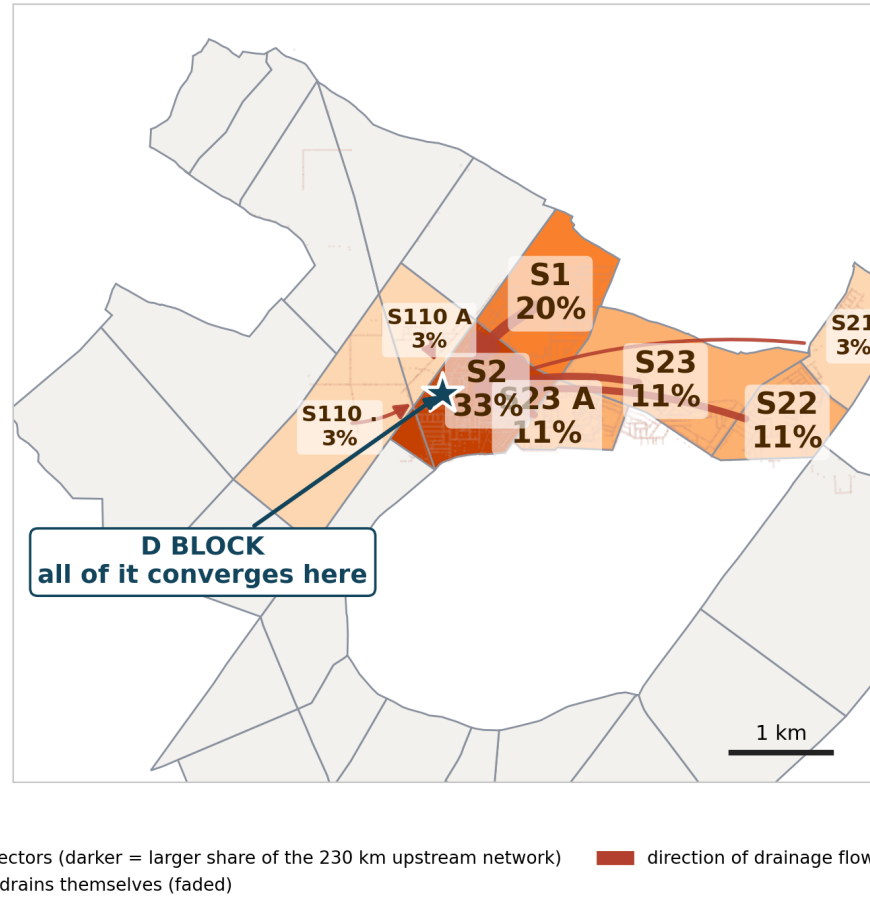


Figure 6: Five sectors’ drainage converges on D Block. Each arrow points along the flow, from the contributing sector to the block; arrow width shows the sector’s share of the 230 km upstream network — one-third from Sector 2, a fifth from Sector 1, a tenth each from Sectors 22, 23 and 23A. This converging flow is what the interception chamber cuts off.

What We Tested in the Model

Five complete runs of the city model, identical except for the works. This is the same procedure as the Scenario Laboratory: change the maps, re-run the storm, compare.

Run	Works in the maps	Peak at D Block	Standing at end
R0	none (today)	0.46 m	22,429 m ³
R1	600 mm line, single connection	0.45 m	unchanged
R2/R3	line + tank, one or four intake points	unchanged	unchanged
R4	line + twelve kerb intakes + tanks	0.39 m	14,390 m ³ (–36%)
R5	28 street intakes at 25 m spacing, 12-hour run	0.40 m	6,000 m ³ by hour 12 (–79% from peak)

What the failed runs prove. R1–R3 are not wasted work: they demonstrate, in full physics, that neither a pipe nor a pump at a single point can drain this pocket — water on nearly flat ground cannot converge to one opening fast enough. Collection must be distributed along the streets. This is also why the pump-and-generator remedy, on its own, would disappoint.

The adaptation plan around D Block — collection, interception, and the parks that hold the water

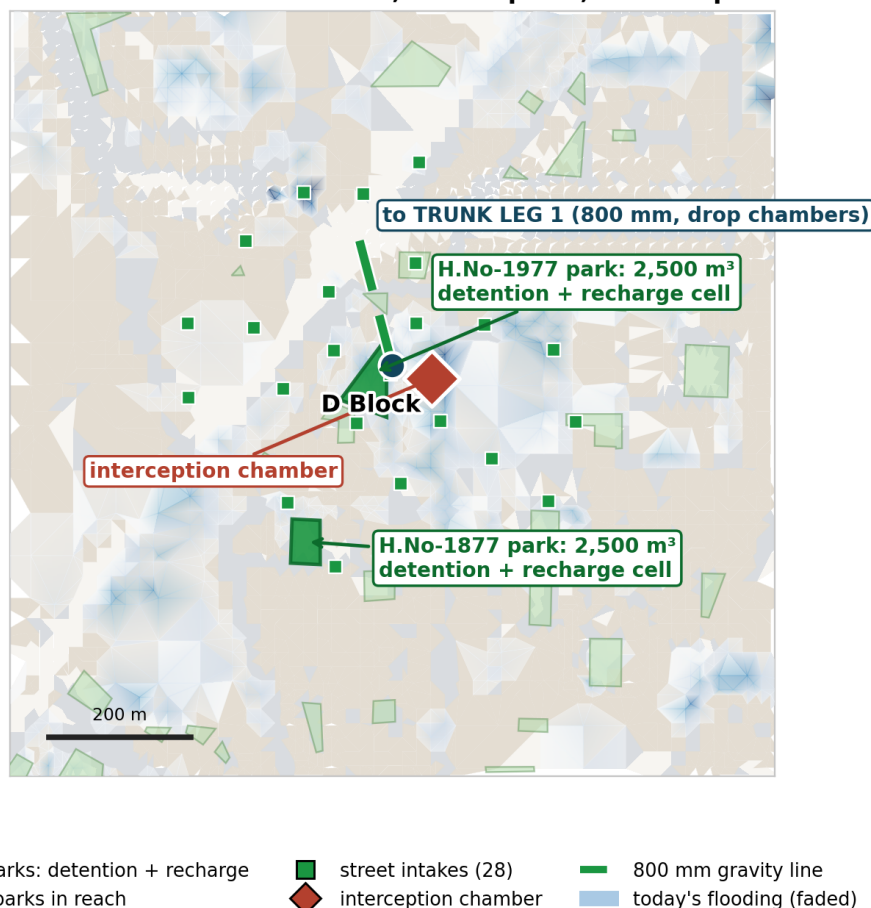


Figure 7: The adaptation plan on the ground. Deep green: the two host parks carrying the $2 \times 2,500 \text{ m}^3$ detention-and-recharge cells. Light green: the other parks within reach, available for future cells. Green squares: the 28 street intakes; the red diamond is the interception chamber that cuts off the other sectors' water; the dashed line is the 800 mm gravity connection to Trunk Leg 1. Today's flooding is shown faded blue beneath.

The Works, In Order of Implementation

Element	Specification (screening)
1 Street intakes at 25 m spacing (28 no.)	grated catch-pits along the ponding streets per CPHEEO sag practice, with the road edge channelised to lead water to each grate — reinstating the kerb line where it is broken or absent; silt trap and first-flush bypass on each
2 Interception chamber on the incoming lines	upstream of the pocket, diverting the $\approx 25,000 \text{ m}^3$ that today surcharges onto the street directly into the new gravity line
3 Collector + 800 mm trunk connection	197 m to Leg 1 laid at 1.2% with three drop chambers absorbing the 10.12 m of fall; carries $1.45 \text{ m}^3/\text{s}$ at 2.9 m/s (within the 3 m/s scour limit); non-return valve at the leg
4 Two detention-and-recharge cells	$2 \times 2,500 \text{ m}^3$ under the parks at H.No-1977 (26 m away; cell uses 27% of the park) and H.No-1877 (281 m; 39%); surface restored to park use
5 Six recharge wells in the cell floors	planning rate 8 L/s each; cells empty in about 27 hours, ready for the next storm
6 Small backup pump	retained for hours when Leg 1 itself is surcharged; not the primary drainage path

The network edit tested in the Scenario Laboratory

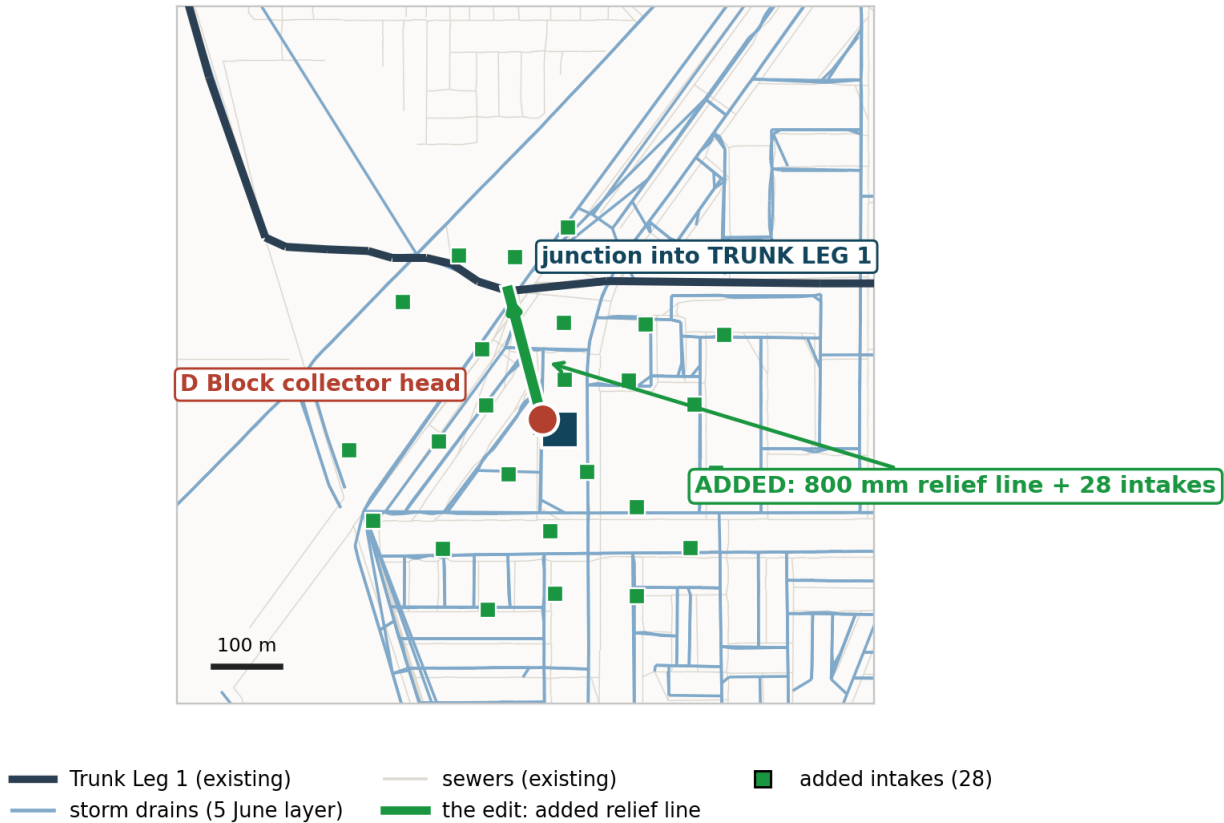


Figure 8: How the works enter the model: the drainage network exactly as mapped in the 5 June MCG layer, with the tested addition drawn in green — the 800 mm relief line from the D Block collector head to Trunk Leg 1, its 28 street intakes, and the detention-and-recharge cell. This edited network is what runs R4 and R5 solve.

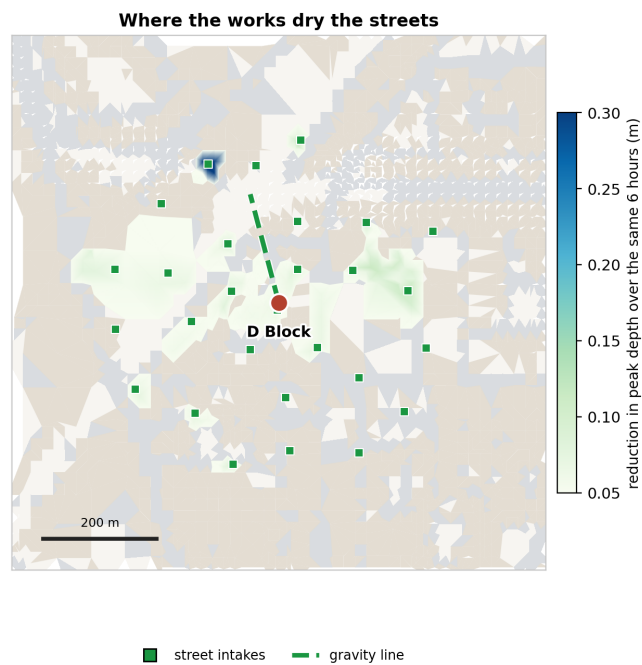


Figure 10: Where the works dry the streets: reduction in peak depth over the same six hours, from the model runs. Deeper green is a larger reduction; the squares are the intakes doing the work.

What the scheme achieves (model-verified, run R5)

Water removed from the streets	24,451 m ³
delivered to Leg 1 by gravity	23,476 m ³
Peak depth	0.46 → 0.40 m
Standing at hour 12	6,000 m ³ (–79% from peak)
Streets	recovered overnight

The peak itself is set by the hour of heaviest rain and by the drain surcharge; it yields fully only when the interception chamber (element 2) is built. What the collection system changes decisively is the *recovery*. The detention cells contribute little to these particular numbers — their value is the day Leg 1 is itself surcharged and the line cannot discharge, and the ≈40,000 m³ a year they return to the aquifer.

The recharge dividend

Groundwater beneath both parks is 28 m down, in loam — ideal for recharge and far below any tank. At about eight fill-and-drain cycles a monsoon, the cells return ≈40,000 m³ a year to the aquifer — year-round water for roughly 800 people — from a colony that today pumps that aquifer down.^a

^aWell capacity of 8 L/s is a standard planning figure for alluvium, not a site measurement; the first well should be test-drilled and the remaining five confirmed against it.

The three clocks — what each element can and cannot do

Conveyance (intakes + gravity line) fights the storm itself, in cubic metres per minute. **Detention** (the park cells) buffers the worst half hour, in cubic metres per hour. **Recharge** (the wells) works the season, in cubic metres per day — the ground absorbs in days what the sky delivers in minutes, so no recharge structure can reduce a cloudburst peak, and none should be promised to. Each element is essential on its own clock; none substitutes for the one above it.

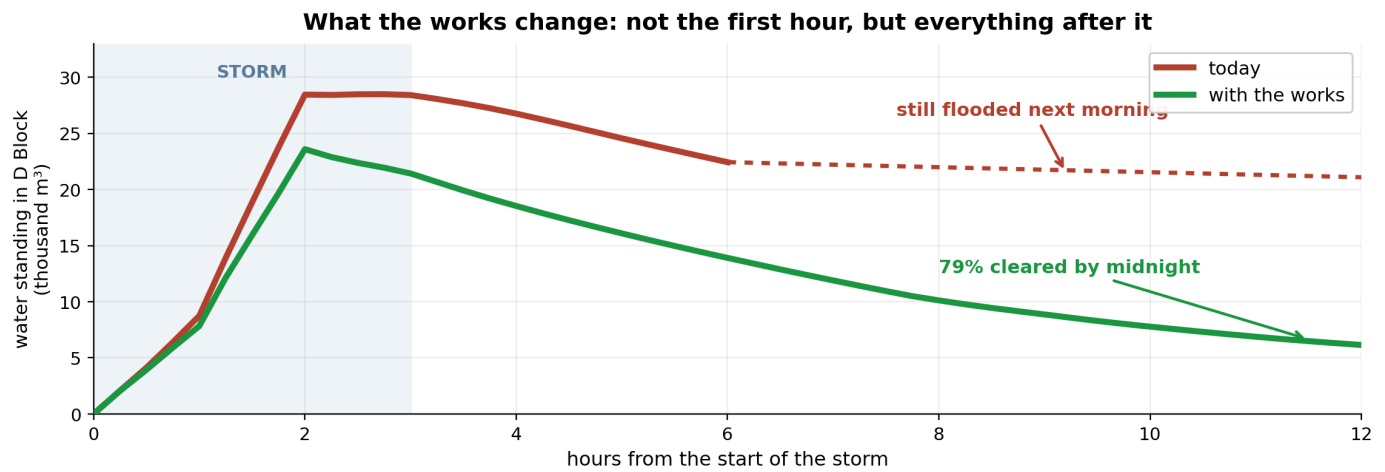


Figure 9: The decisive comparison, from the 12-hour solver runs. Today the pocket fills and stays flooded into the next morning. With the works, the same storm still peaks briefly — no pipe can absorb the heaviest hour — but the streets then empty steadily by gravity and are largely clear by midnight.

Three confirmations required before design

- 1. Level survey.** The Leg 1 invert used here (10.12 m below D Block) is a model value assimilated from terrain and drainage records. The scheme rests on it; it must be confirmed by instrument survey.
- 2. Utility clearance on the 197 m route.** A 5.13% line arrives deep at the downstream end and will cross services.
- 3. Street and park condition survey.** The street survey must record the kerb and edge condition along the intake runs — where the kerb line is broken or absent, edge channelisation is part of the works, since without a defined edge water will not reach the grates. Park boundaries in the register are rectangular envelopes; the two host parks should be measured, and the test recharge well drilled, before the cells are finally sized.

Immediate actions recommended		
Action	Owner	Timeline
Instrument survey: Leg 1 invert at the junction point, and the four trunk-leg outfall inverts	MCG Engg. + GMDA	2 weeks
Street walk of the surcharge openings (page 3 map) during the next rain, with photographs — confirms the drain-surcharge finding on the ground	Ward 4 JE	next rain event
Utility clearance survey along the 197 m alignment	MCG Engg.	4 weeks
Boundary survey of the two host parks + one test recharge well at H.No-1977 (confirms the 8 L/s planning rate)	MCG Horticulture + Engg.	6 weeks
Detailed engineering design of the works (intakes, interception chamber, 800 mm line with drop chambers, cells and recharge wells)	MCG Engg.	10–12 weeks
Pre-monsoon desilting of the existing 338 mm lines towards Krishna Chowk (maintenance value; not a substitute for the works)	MCG O&M	before monsoon
Technical timeline: the surveys (weeks 1–6) run in parallel and feed the detailed design (weeks 6–12), so the engineering is complete within one quarter. Every component is conventional construction with established design practice.		

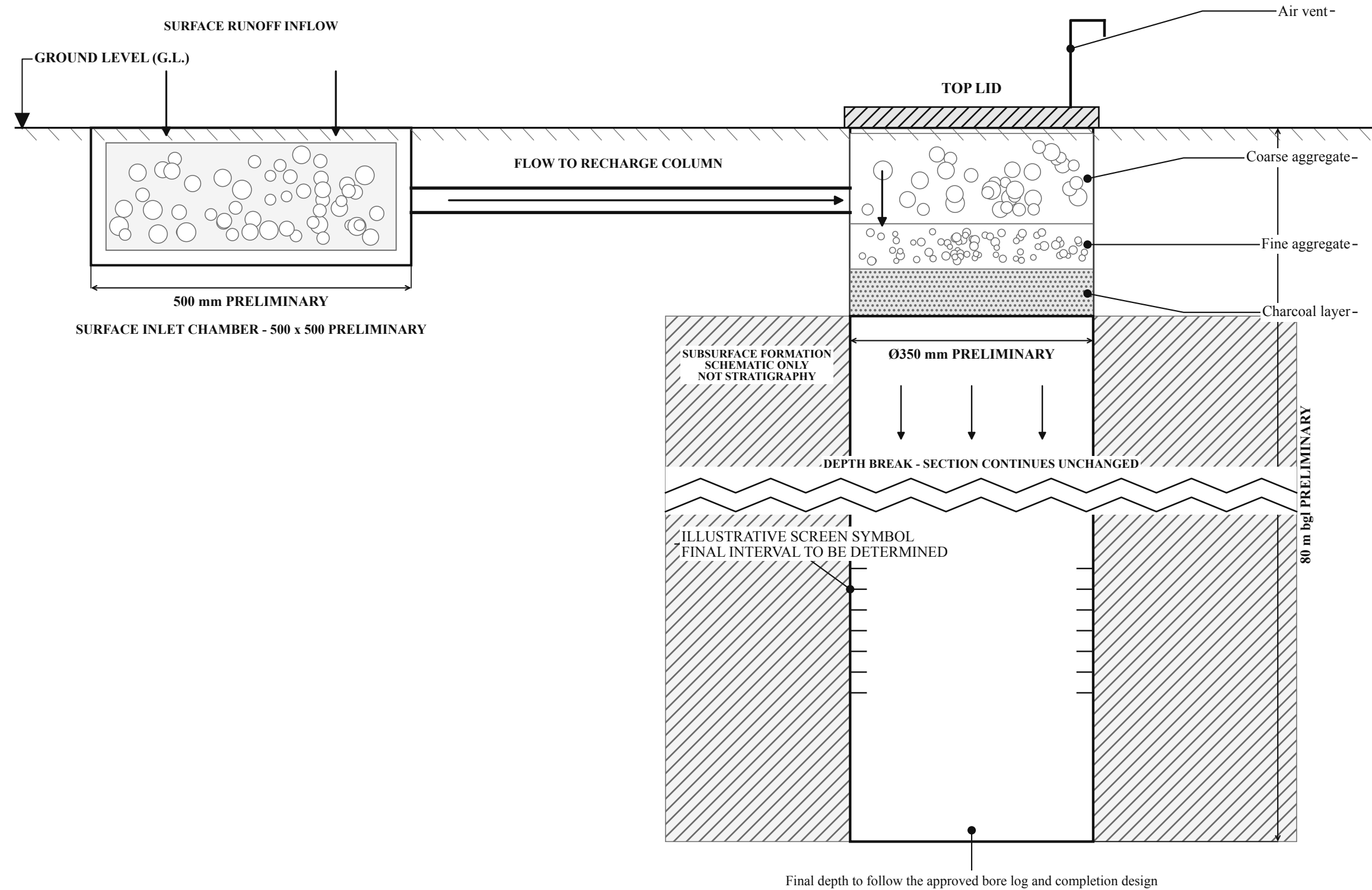
Recharge Well - General Arrangement

Prepared for Municipal Corporation of Gurugram (MCG)

PRELIMINARY DESIGN
NOT FOR CONSTRUCTION

DETAIL A - SURFACE INLET / FILTER CHAMBER

SECTION B - CONSTANT-DIAMETER RECHARGE COLUMN



GENERAL NOTES

1. Dimensions and units

All dimensions are in millimetres unless noted otherwise. Depth is stated in metres below ground level (m bgl). Written dimensions govern. Establish the survey datum before detailed design.

2. Drawing use

Scale: NTS. Do not scale from this drawing. The 500 mm inlet, Ø350 mm constant section and 80 m depth are preliminary design dimensions.

3. Subsurface representation

No aquifer, target horizon or stratigraphic boundary is assigned. Subsurface hatching is schematic only and shall not be interpreted as a geological section.

4. Completion design

Casing, screen interval and slot size, pack, annular seal and final depth shall follow hydrogeological investigation, bore logs, water-quality profiling and hydraulic testing.

5. Hydraulic and water-quality controls

Provide pretreatment, first-flush isolation, safe overflow and bypass, flow and pressure monitoring, non-return protection and approved water-quality acceptance criteria.

SYSTEM INTERFACE

Coordinate the recharge wells with the proposed street intakes, interception chamber, gravity connection, detention cells, treatment train, controls and monitoring for Palam Vihar D Block.

DESIGNED BY

Prof. Vivek Kapadia

Indian Institute of Technology Gandhinagar

Prepared for Municipal Corporation of Gurugram (MCG)

DRAWING NUMBER

D-BLOCK-RW-CONCEPT-01

RECHARGE WELL - GENERAL ARRANGEMENT

STATUS / SCALE

PRELIMINARY

NTS

DATE / REVISION

24 AUGUST 2026

REV 03

SHEET

1 OF 1

UNITS: mm / m bgl