HOUSTON PUBLIC WORKS

STORMWATER 101

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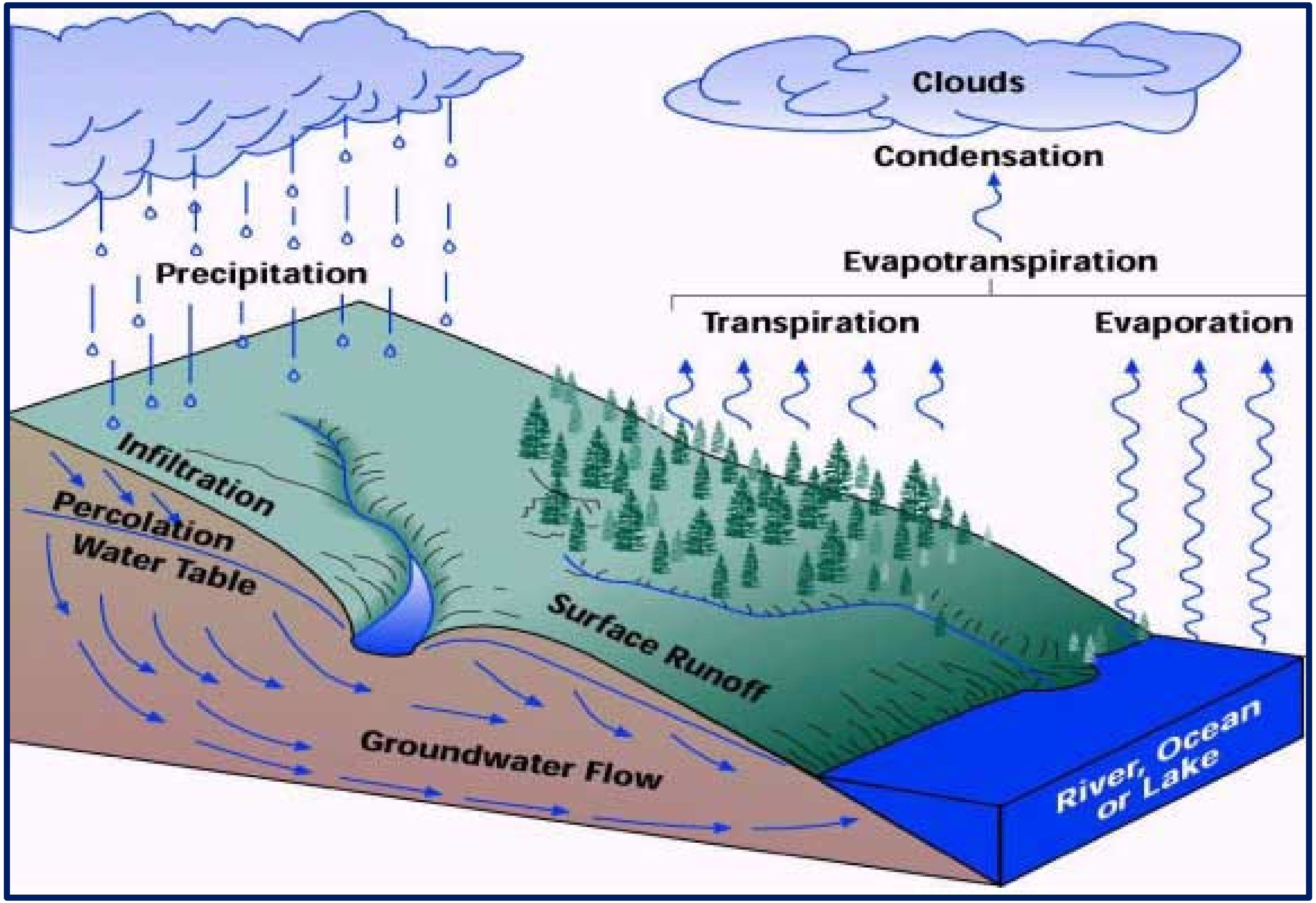
AGENDA

- Stormwater Basics
- Recent update on detention Infrastructure Design Manual (IDM) Chapter 9 Supplement
- Building Code Enforcement (BCE) and Office of the City Engineer (OCE) project connections
- Common reasons for storm plan review rejections

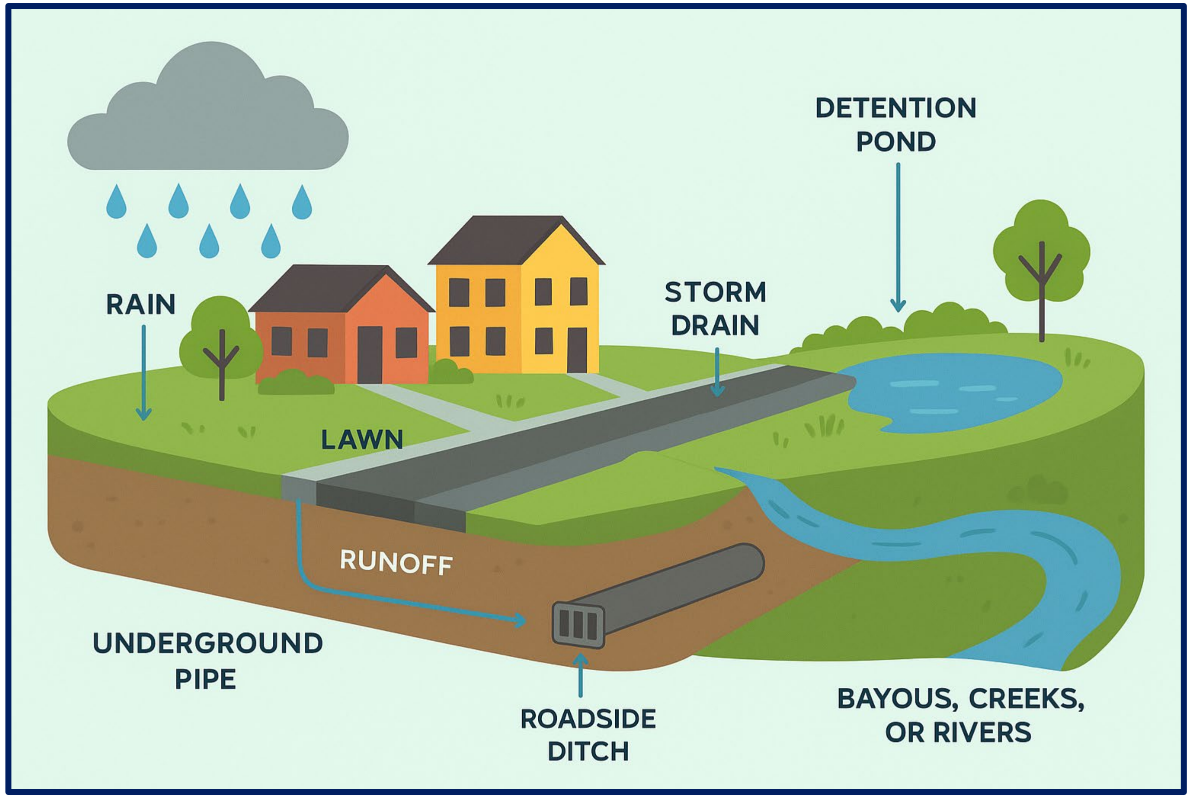
STORMWATER BASICS

OVERALL PICTURE – WATER CYCLE



THE JOURNEY OF URBAN RAINWATER

1. Rainfall on roofs and pavement
2. Runoff enters storm drains /detention pond
3. Flow through pipes and ditches
4. Released to bayous and rivers



BASIC DRAINAGE DESIGN

Runoff: Calculation of runoff

Rational Method - A method for calculating the peak runoff for a drainage system using the following equation for runoff:

	Q	=	I x (CA)
Where:	C	=	watershed coefficient
	A	=	Area (acres)
	I	=	rainfall intensity (inches)

Impervious Cover

- Hard surfaces stop water from soaking into the ground
- Examples: concrete, asphalt, pavers, gravel
- Minimum infiltration rate: 0.5 in/hr to be pervious

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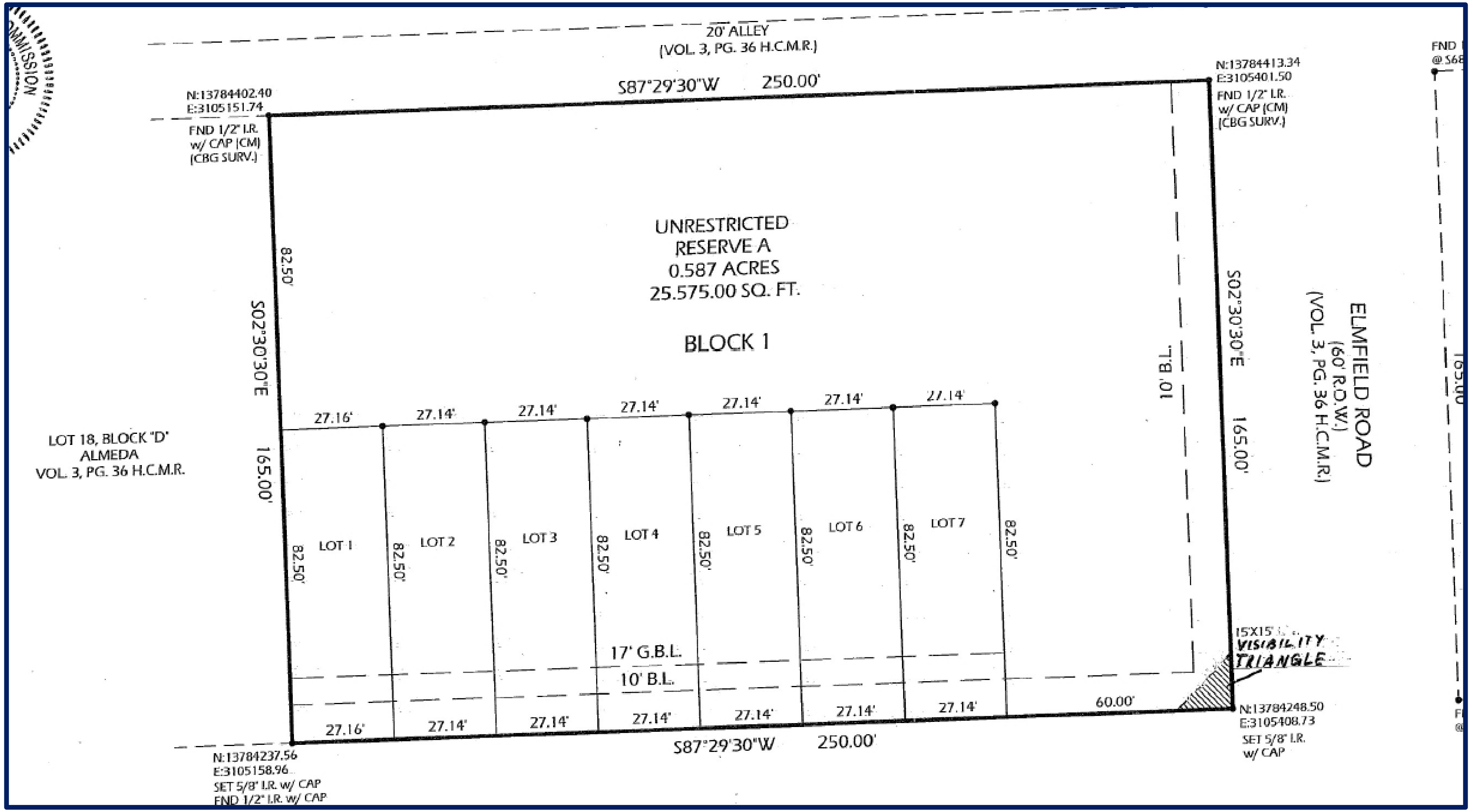
BASIC DRAINAGE DESIGN

Allowable outflow: 3 ways to determine your allowable flow

- Existing runoff
- City of Houston requirement:
  - 0.5 cubic feet per second per acre for a 2-year rain event, and
  - 2 cubic feet per second per acre for a 100-year rain event.
- Hydraulic analysis

LOTS AND TRACTS



City of Houston detention requirements are based on **TRACT SIZE** not lot size.

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RECENT UPDATE ON DETENTION INFRASTRUCTURE DESIGN MANUAL CHAPTER 9 SUPPLEMENT

RECENT CHANGES MAY 2025 SUPPLEMENT OVERVIEW

- Update residential exemptions
- Removed detention curve
- Credit for redevelopment
- De minimis impact
- Master drainage plans / Legacy projects
- Negligible impact / repair
- Outfall jurisdiction

Note: Drainage is still required even for projects that are exempt from providing detention.

DETENTION EXEMPTIONS (RESIDENTIAL) CRITERIA 1: SINGLE-FAMILY RESIDENTIAL (1 TRACT 1 HOUSE)

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continued

Table 9.3 - Detention Volume For Criteria 1

SFR Tract Size	Percentage/Total Impervious Area[i]	Detention Required (Y/N)	Detention Volume	Notes
One SFR tract ≤ 15000 SF	% Total impervious area ≤ 65% of tract	N	N/A	1-2
One SFR tract ≤ 15000 SF	% Total impervious area > 65% of tract	Y	0.75 ac-ft/ac rate × impervious area in excess of 65% of tract	1-2
One SFR tract >15000 SF	Total impervious area ≤ 9750 SF	N	N/A	1-2
One SFR tract >15000 SF	Total impervious area > 9750 SF	Y	0.75 ac-ft/ac rate × impervious area in excess of 9750 SF	1-2

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Table 9.3 - Detention Criteria 1

SFR Tract Size	Percentage/Total Impervious Area[i]	Detention Required (Y/N)	Detention Volume	Notes
One SFR tract ≤ 15000 SF	Total impervious area ≤ 65% of tract	N	N/A	1-3
One SFR tract ≤ 15000 SF	Total impervious area > 65% of tract	Y	0.75 ac-ft/ac rate × impervious area in excess of 65% of tract	1-3
One SFR tract >15000 SF	Total impervious area ≤ the greater of 9750 SF or 40% of tract	N	N/A	1-3
One SFR tract >15000 SF	Total impervious area > the greater of 9750 SF or 40% of tract	Y	0.75 ac-ft/ac rate × impervious area in excess of the greater of 9750 SF or 40% of tract	1-3

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DETENTION EXEMPTIONS (RESIDENTIAL) CRITERIA 2: ALL OTHER SINGLE-FAMILY RESIDENTIAL UNDER 1 ACRE

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continued

Table 9.4 - Detention Volume For Criteria 2

Tract Size	Percentage/Total Impervious Area[i]	Detention required (Y/N)	Detention Volume	Notes
Tract ≤ 15000 SF	Total % impervious area within tract ≤ 65% of tract	N	N/A	1-5
Tract ≤ 15000 SF	Total % impervious area within tract > 65% of tract	Y	0.75 ac-ft/ac rate × impervious area in excess of 65% of the tract	1-5
15000 SF < Tract < 1 acre	Total impervious area within tract ≤ 9750 SF	N	N/A	1-5
15000 SF < Tract < 1 acre	Total impervious area within tract > 9750 SF	Y	0.75 ac-ft/ac rate × impervious area in excess of 9750 SF	1-5
Tract ≥ 1 acre	All proposed impervious area	Y	Refer to requirements in Table 9.5	1-5

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Table 9.4 - Detention Criteria 2

Tract Size	Percentage/Total Impervious Area[i]	Detention required (Y/N)	Detention Volume	Notes
Tract ≤ 15000 SF	Total % impervious area within tract ≤ 65% of tract	N	N/A	1-6
Tract ≤ 15000 SF	Total % impervious area within tract > 65% of tract	Y	0.75 ac-ft/ac rate × impervious area in excess of 65% of the tract	1-6
15000 SF < Tract < 1 acre	Total impervious area within tract ≤ the greater of 9750 SF or 40% of tract	N	N/A	1-6
15000 SF < Tract < 1 acre	Total impervious area within tract > the greater of 9750 SF or 40% of tract	Y	0.75 ac-ft/ac rate × impervious area in excess of the greater of 9750 SF or 40% of tract	1-6
Tract ≥ 1 acre	All proposed impervious area	Y	Refer to requirements In Table 9.5	1-6

DE MINIMIS IMPACT CREDIT (RESIDENTIAL) CRITERIA 1: SINGLE-FAMILY RESIDENTIAL (1 TRACT 1 HOUSE)

- Tracts ≤ 15,000 SQUARE FEET: 5% of lot size up to 70%
- Tracts > 15,000 SQUARE FEET: 5% of lot size up to 750 SQUARE FEET

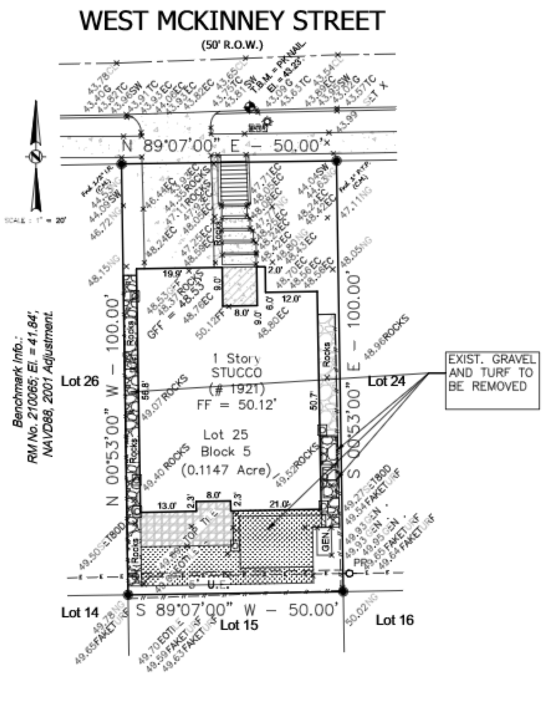
	Existing Sq. Ft.		Proposed Sq. Ft.		Final Sq. Ft.	Disturbed Sq. Ft.
1. Building(s) (e.g., house, garage, shed, carport)	2,210.48	+	⇨	=	2,210.48 ⇩+	⇩+
2. Paving (e.g., driveway, sidewalk, patio. etc.)	1,838.89	+	-808.66 ⇨	=	1,030.23 ⇩+	⇩+
3. Detention Ponds, etc.		+	⇨	=	⇩+	⇩+
4. Swimming Pool		+	240.09 ⇨	=	240.09 ⇩+	⇩+
5. Others		+	⇨	=	⇩+	⇩+
Totals	4,049.36	+	-568.57	=	3,480.80 sq. ft. (A)	sq. ft.

B. Total Area of Lot: 5,000 sq. ft.

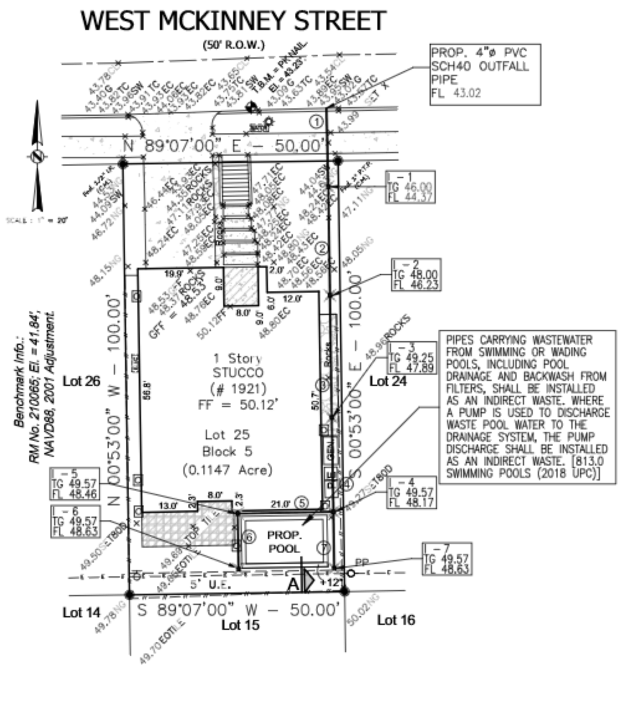
C. Percentage Impervious Area Calculation

(3,480.80 ÷ 5,000) x 100 = 69.62 %
A B C

For additions that are not exempt from detention. Can use multiple times until maximum credit allowance is reached.

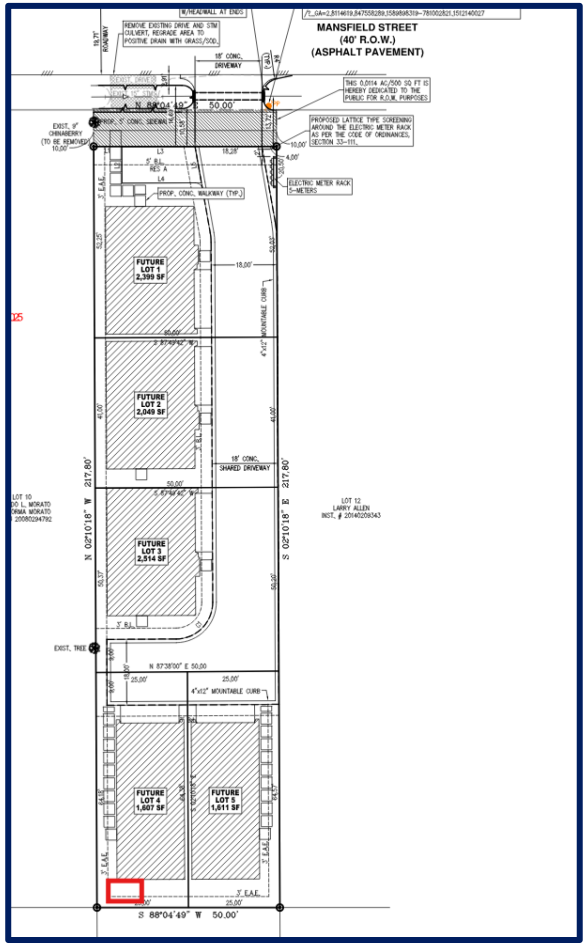


EXISTING SITE CONDITIONS
SCALE: 1"=20'

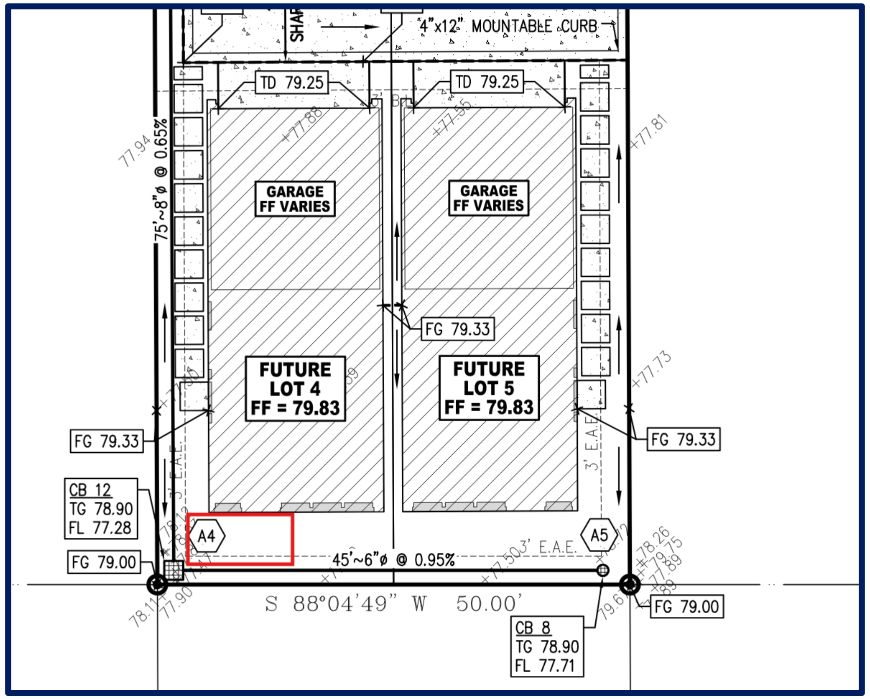


PROPOSED SITE CONDITIONS
SCALE: 1"=20'

DE MINIMIS IMPACT CREDIT (RESIDENTIAL) CRITERIA 2: ALL OTHER SINGLE-FAMILY RESIDENTIAL UNDER 1 ACRE



- **Tracts ≤ 15,000 square feet: 5% of lot size up to 70%**
- **15,000 square feet < Tracts < 1 acres: 5% of lot size up to 750 square feet**



- Tract size is 10,890 SF and all lots are under 65% impervious.
- Lot is 1,607 SF in size and proposed addition is 80 SF.

DETENTION REQUIREMENTS (COMMERCIAL) CRITERIA 3

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Table 9.5 - Detention Volume For Criteria 3

Tract Size	Proposed Percent Impervious[i]	Detention Required (Y/N)	Detention Volume	Notes
Tract < 1 acre	All proposed impervious area	Y	0.75 ac-ft/ac rate × proposed impervious area of the tract	1-2
1 acre ≤ Tract ≤ 20 acre	All proposed impervious area	Y	Follow Figure 9.2/Table 9.6 Minimum Detention Rate chart/table	1-4
Tract > 20 acre	All proposed impervious area	Y	Follow the most current version of the HCFCD PCPM; Minimum rate is 0.75ac-ft/ac	1-4

[i]Proposed percent impervious = proposed impervious area/Disturbed Area.

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Table 9.5 - Detention Criteria 3

Tract Size	Proposed Impervious area	Detention Required (Y/N)	Detention Volume	Notes
Tract ≤ 20 acre	All proposed impervious area	Y	0.8 ac-ft/ac rate × proposed impervious area of the tract	1-3
Tract > 20 acre	All proposed impervious area	Y	Follow the most current version of the HCFCD PCPM; Minimum rate is 0.75ac-ft/ac	1-3

DETENTION CREDIT (COMMERCIAL)

De Minimis Impact Credit

- Up to 1% of the tract *(one-time use)*
- Drainage is still required

Existing Impervious Cover Credit for Redevelopment

- Existing Impervious Cover Credit for Redevelopment
- Subtracted from the Detention required at 0.8 acre-feet/per acre
- Detention required cannot go below zero
- Survey up to 5 years old
- Existing Detention cannot be reduced

$$\text{Detention Volume Required} = (A_p \times r_d) - (A_e \times 0.4 \text{ acre-ft/acre})$$

Where:

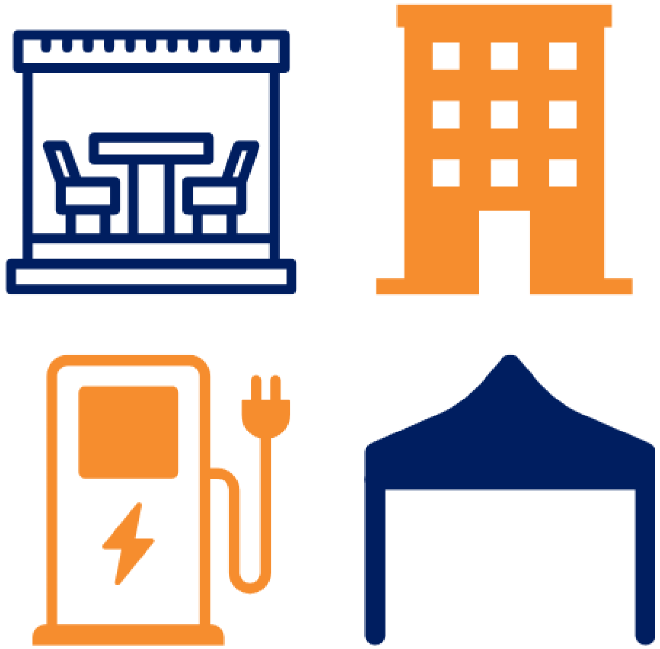
A_p = Proposed impervious area (SF)

A_e = Existing impervious area (SF) onsite to be removed with Redevelopment

r_d = Detention rate (acre-foot/acre) required by Table 9.5

EXAMPLES WHERE NO DETENTION IS REQUIRED (COMMERCIAL)

- Charging station equipment
- Canopies
- Shade structures
- Covered patio to existing deck
- Additional floors to the building without modifying the footprint



Note: Drainage is still required even for projects that are exempt from providing detention.

MASTER DRAINAGE PLAN / LEGACY PROJECTS

Master Drainage Plan

- Establishes current and future drainage (multiphase) for a development
- Insulates detention rate for all remaining phases

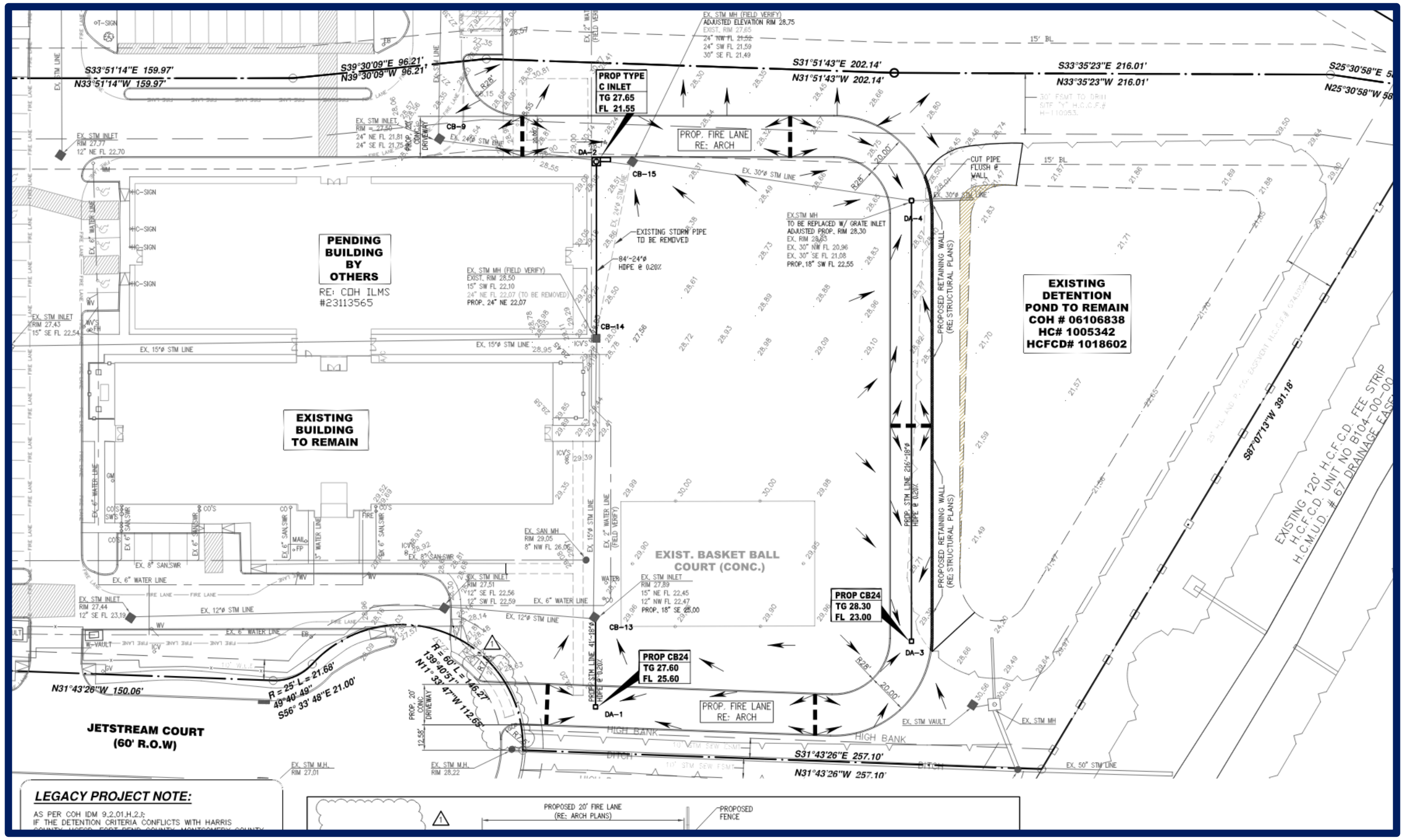
MASTER DRAINAGE PLAN / LEGACY PROJECTS

Considered Legacy if:

- Regional detention provided
- Permitted and constructed public infrastructure

To claim Legacy status:

- Submit original design documents
- Impervious cover not to exceed original design



CRITERIA WHEN THE OUTFALL DIRECTLY FLOWS INTO ANOTHER JURISDICTION

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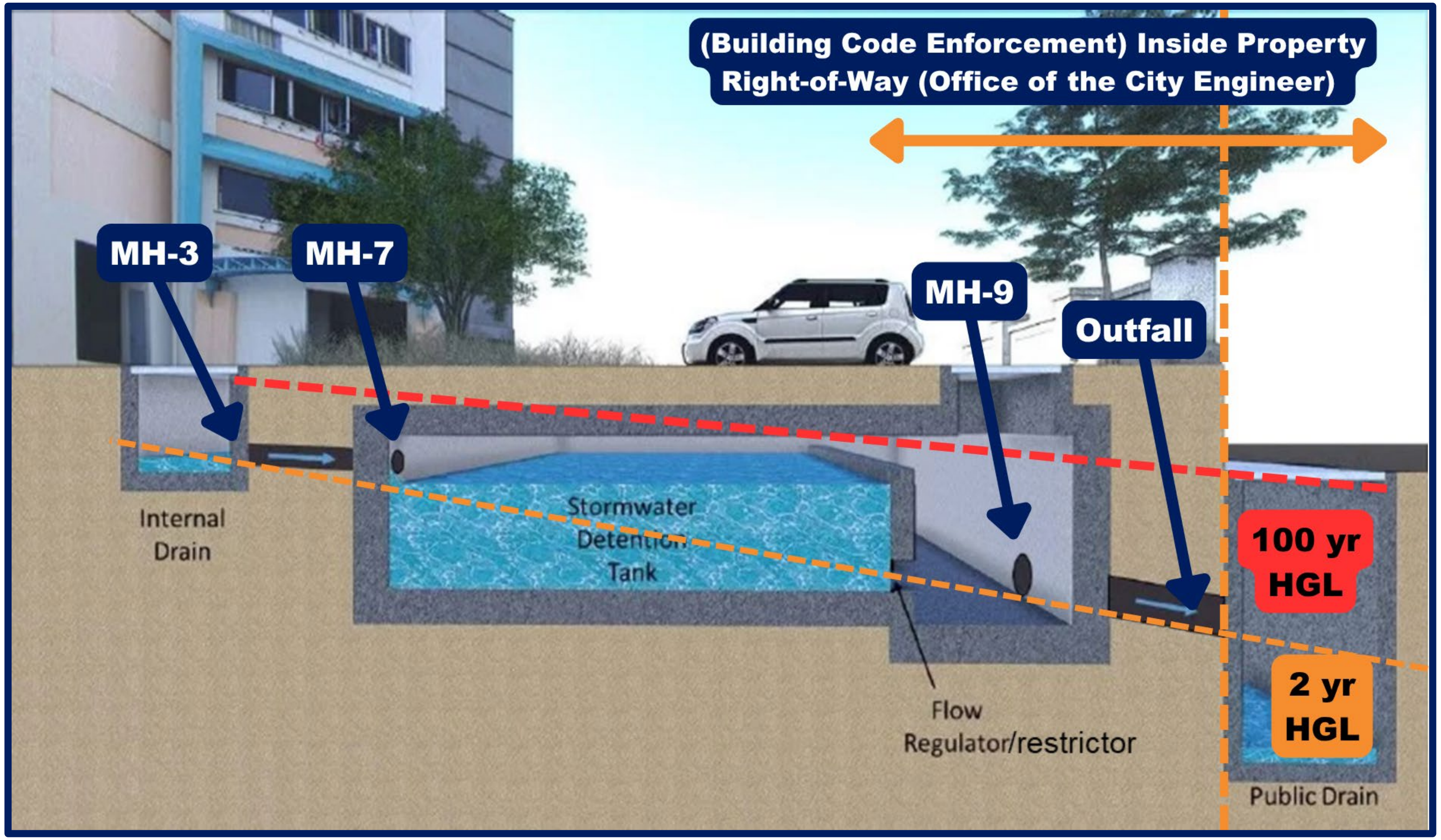
• Applies to all projects within the City of Houston and its Extraterritorial Jurisdiction. • When criteria conflict with another jurisdiction, **the more restrictive criteria apply**.	• Applies to all projects within the City of Houston and its Extraterritorial Jurisdiction. • When criteria conflict with another jurisdiction, **the criteria of the jurisdiction receiving the stormwater apply.**

BUILDING CODE ENFORCEMENT AND OFFICE OF THE CITY ENGINEER DRAINAGE & STORM PLANS

DRAINAGE & STORM PLANS

Drainage Plan

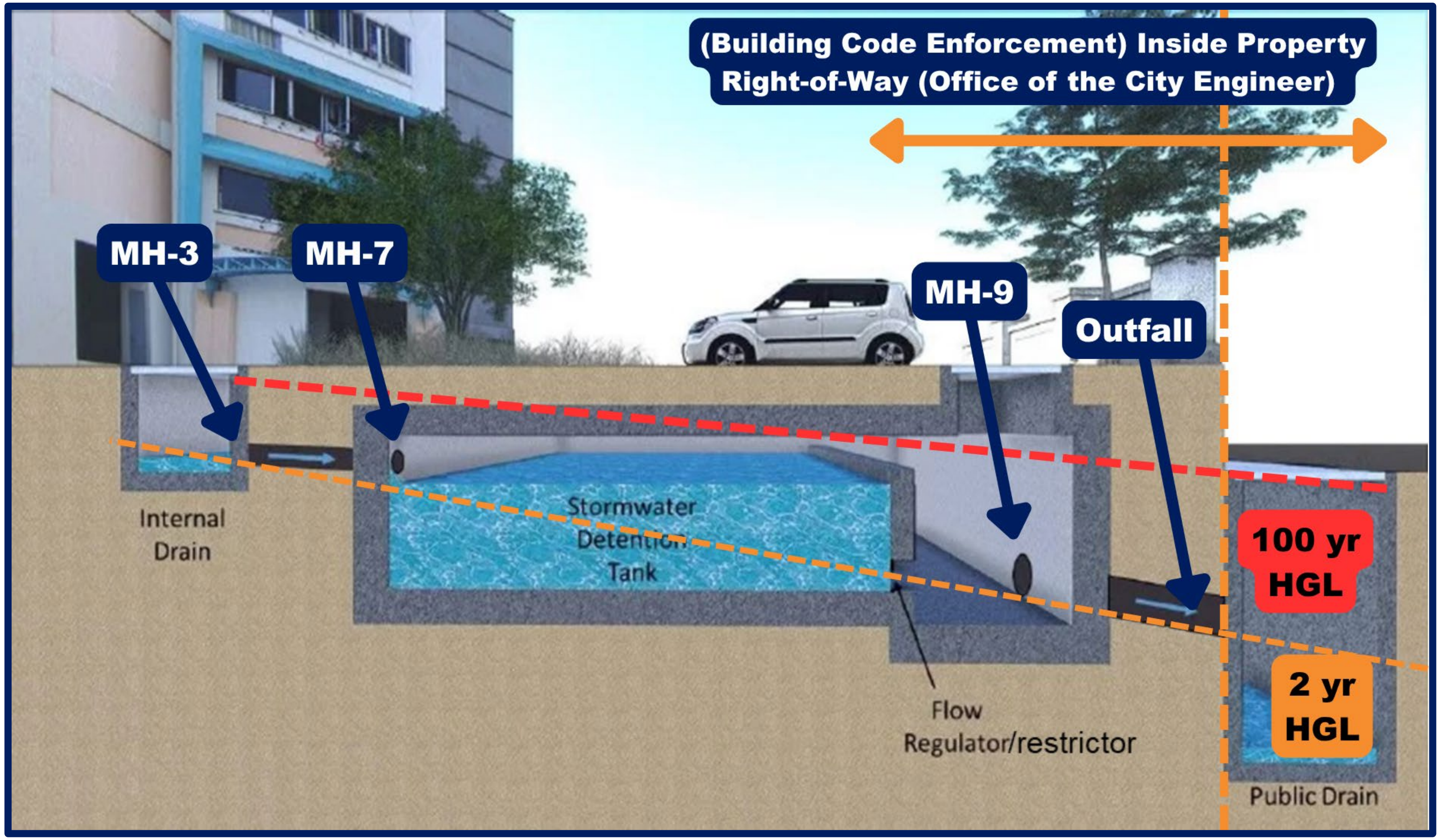
- Grading – No sheet flow to adjacent properties
- Drainage system – Point discharge to the right-of-way
- Identify discharge location



DRAINAGE & STORM PLANS

Discharge/Outfall (less than 20 acres)

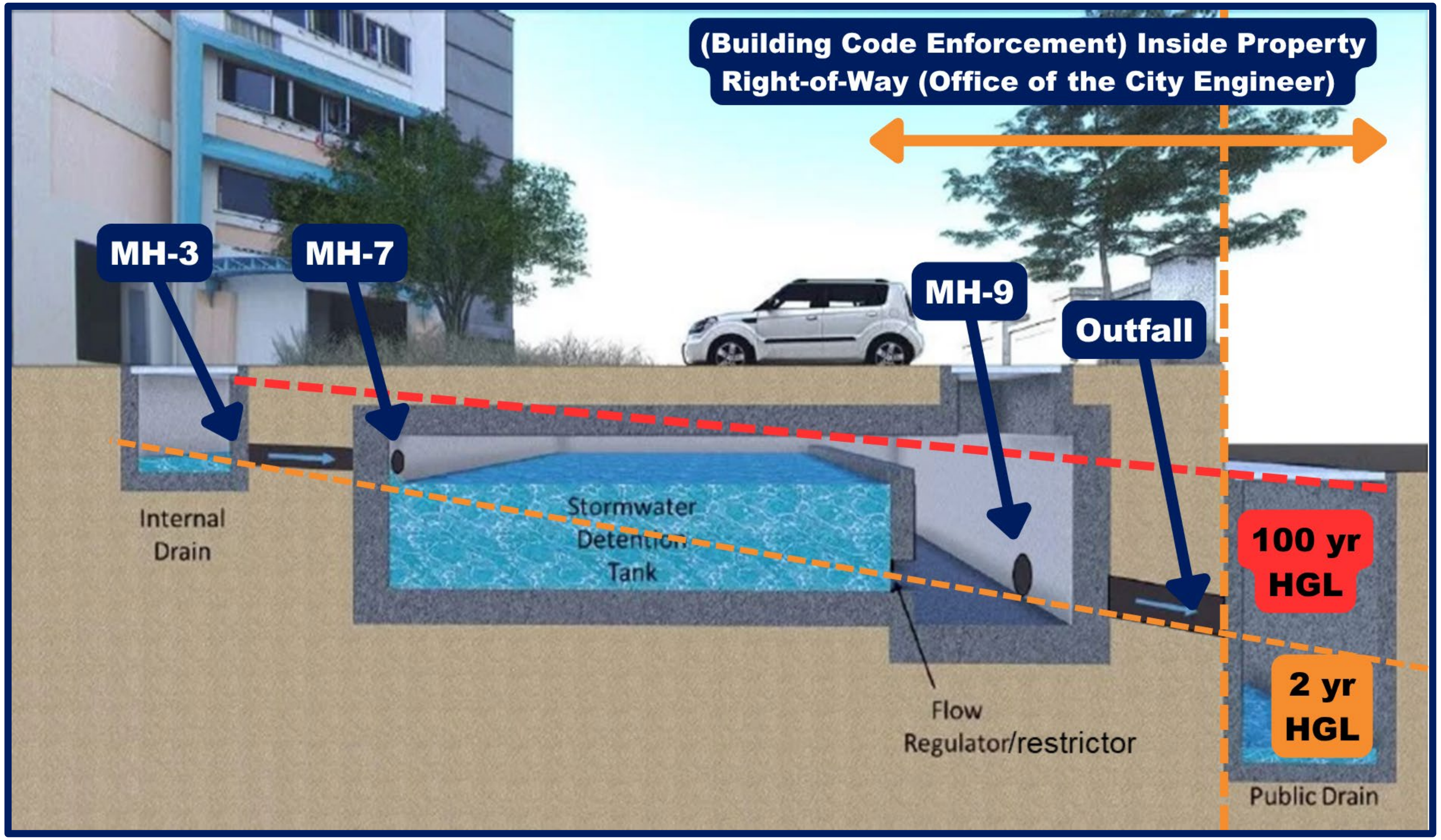
- Provide detention and flow restrictor
- 2-year hydraulic grade line at the top of the pipe
- One-hundred-year hydraulic grade line below the gutter line
- Storm sewer calculations (Figure 9.3)



DRAINAGE & STORM PLANS

Stormwater Quality

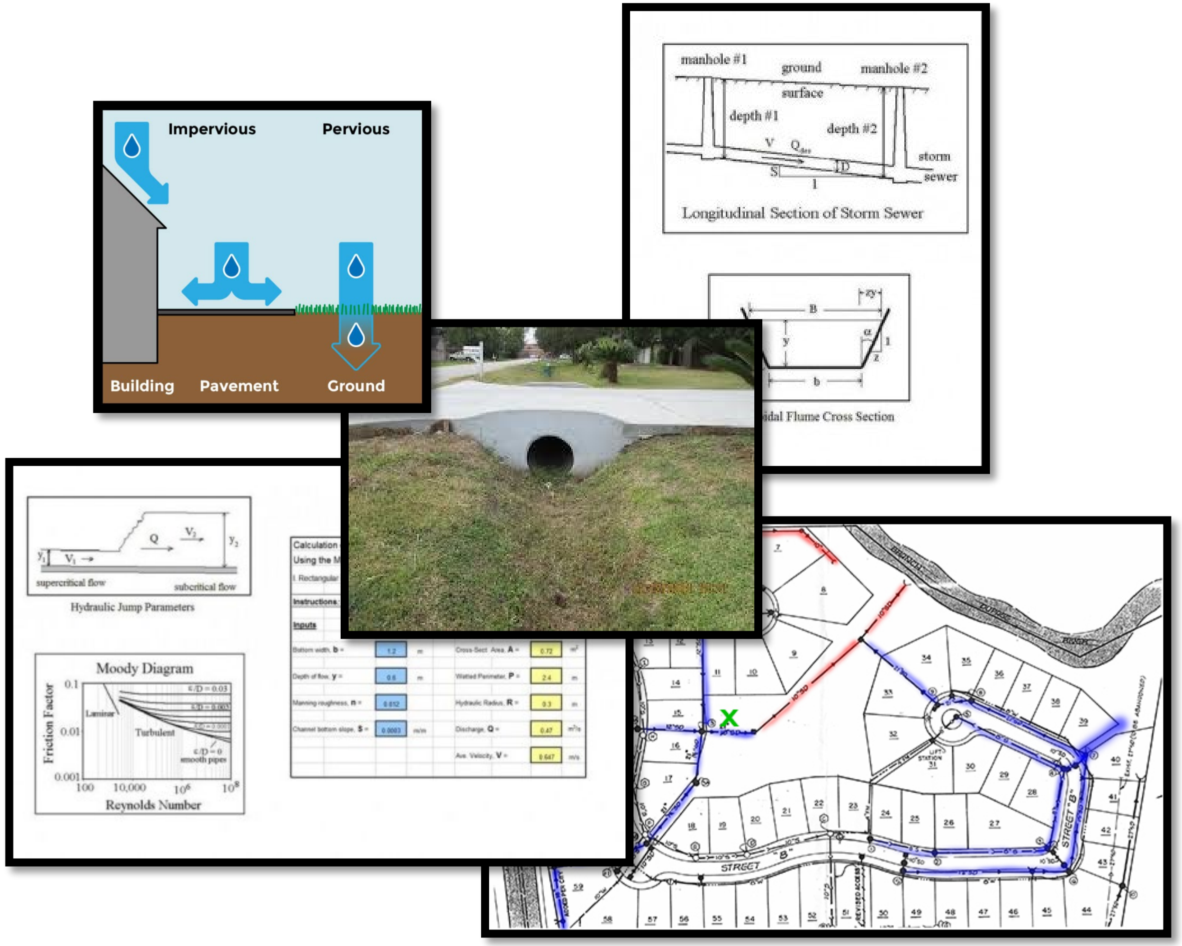
- Storm Water Pollution Prevention Plan (SWPPP)
- Permanent Best Management Practice (BMP)



DRAINAGE & STORM PLANS

- **Connection to storm sewer system:**
  - Lateral connection to storm sewer main line
  - Connection to curb inlet
- **Connection to roadside ditch**
- **Exception:**
  - No plan-and-profile is needed on proposed 4-inch Polyvinyl Chloride pipe (PVC) curb cut, for Single Family Residential development

COMMON REASONS FOR STORM PLAN REVIEW REJECTIONS



Building Code Enforcement (BCE) Storm Plan:

- Stormwater Information Form
- Storm Sewer Calculation (Figure 9.3)
- Detention / Restrictor
- Pond / Restrictor Cross-sections
- OCE Storm project number
- Easement encroachment

Office of the City Engineer (OCE) Storm Plan

- BCE Storm project number
- SWQ Permit required
- Restrictor
- 2 year & 100-year Hydraulic Grade Line (HGL)
- Utility clearances
- Culvert cover depth

CONTACT US

- Live Chat:
  www.houstonpermittingcenter.org
  Monday – Friday, 9 am – 2:30 pm
- Website: bit.ly/43PVrPv
- Email: stormplanreview@houstontx.gov
- Phone: 832-394-9000 | Option 3-4-3
- In-Person: 1002 Washington Ave,
  Houston, TX 77002

Bookings:
bit.ly/3LttHKb

QUESTIONS & ANSWERS

Do you have questions? We are here to help!

Contact Us

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