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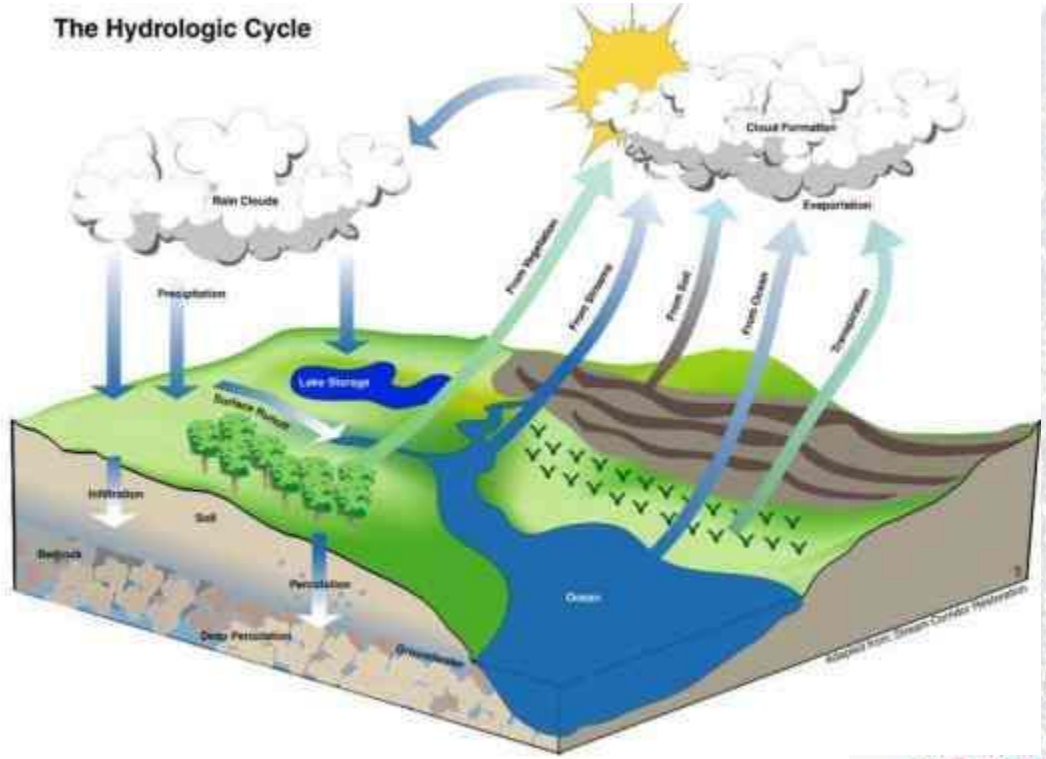
URBAN RUNOFF

We have an emerging problem in this country. As land development continues to boom, more land changes from a pervious surface to an impervious surface. The stormwater runoff from these paved surfaces are directed to downstream receivers rather than soaking into the soil where it fell.

Stormwater runoff creates an imbalance in the natural ecosystem and leads to a host of problems:

- erosion
- flash floods
- water table depletion
- pollution of rivers, lakes, and coastal waters



NATIVE HYDROLOGIC CYCLE

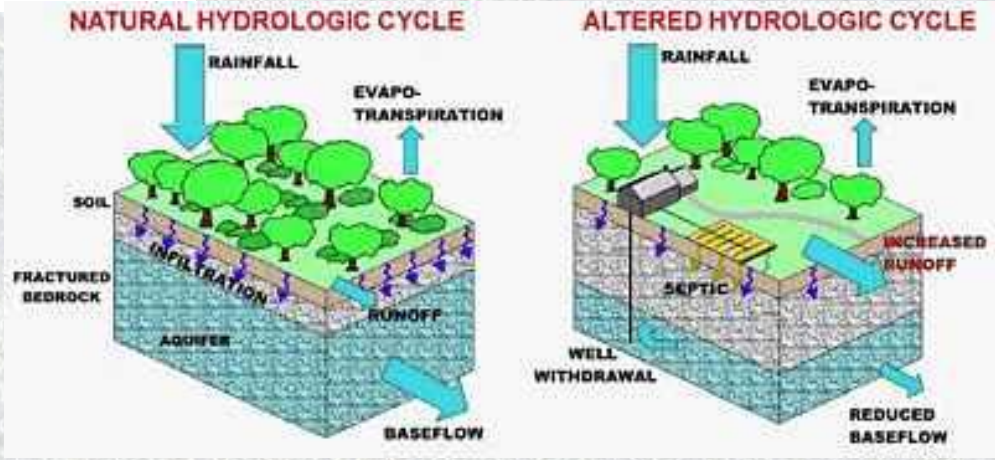
SOURCE: RAINFALL

EVAPO-TRANSPORATION	**50%**
RUNOFF	**20%**
INFILTRATION	**30%**

URBANIZED HYDROLOGIC CYCLE

SOURCE: RAINFALL

EVAPO-TRANSPORATION	**5%**
RUNOFF	**95%**
INFILTRATION	**0%**



Courtesy of Cahill and Associates

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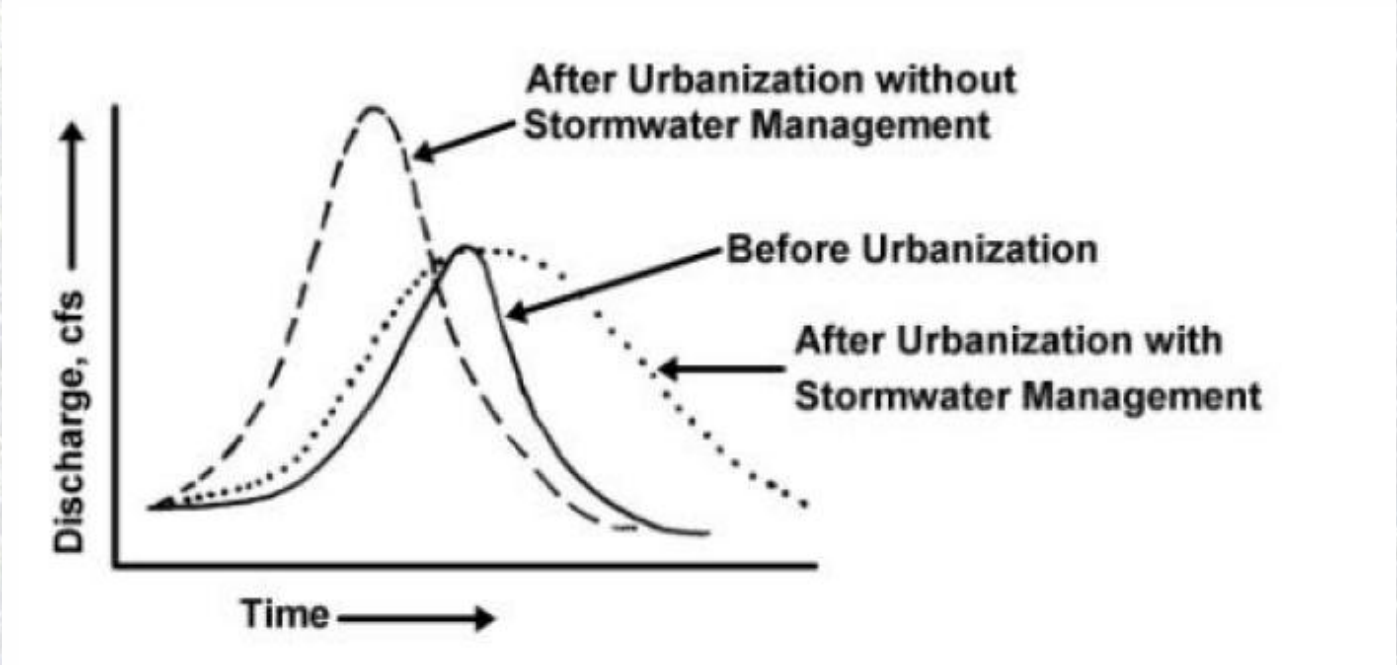
HYDROLOGIC CYCLE

URBAN RUNOFF

As stormwater passes over the paved surface, it picks up the oils, grease, antifreeze, deicing agents, etc.

According to the U.S. Environmental Protection Agency, about 90 percent of surface pollutants are carried by the first 1-1/2 inch of rainfall.

As a result, the EPA and many local and regional authorities are requiring more stringent stormwater management practices.



Courtesy of State of Michigan Department of Environmental Quality

URBAN RUNOFF

These stormwater runoff issues can be mitigated by a number of best management practices.

Pervious pavements and infiltration practices is one solution that has a proven track record to mitigate these issues. It also is designed to contain at least the first 1-1/2” of rainfall.

PERVIOUS CONCRETE

Pervious concrete, in its earliest form, has been in use in Europe for more than 150 years.

Pervious concrete was successfully employed in various applications in the Southeastern portion of the United States a little more than 20 years ago. *(Source: American Concrete Institute 2006)*

PERVIOUS CONCRETE

Courtesy of National Ready Mixed Concrete Association

INFILTRATION

Table 2. *Median Pollutant Removal (%) of Stormwater Treatment Practices*

POLLUTANT	INFILTRATION PRACTICES	*Stormwater Wetlands*	*Stormwater Ponds Wet*	*Filtering Practices*	*Water Quality Swales*	*Stormwater Dry Ponds*
Total Phosphorus	70	49	51	59	34	19
Soluble Phosphorus	85	35	66	3	38	-6
Total Nitrogen	51	30	33	38	84	25
Nitrate	82	67	43	-14	31	4
Copper	N/A	40	57	49	51	26
Zinc	99	44	66	88	71	26
TSS	95	76	80	86	81	47

Source: Winer, Rebecca, "National Pollutant Removal Performance Database for Stormwater Treatment Practices", 2nd Edition, June 2000, Center for Watershed Protection, Ellicott City, Maryland.

WHAT IS PERVIOUS CONCRETE?

Pervious concrete:

- Includes more air void space and larger aggregate than conventional concrete, approximately 15-25% void space
- Offers infiltration capabilities of approximately 3-8 gallons/min/sq. ft.
- Allows rainfall to drain through the pavement and infiltrate into the ground below
- Improves filtration by allowing an enormous amount of surface area to catch oils and chemical pollutants
- Allows ground water to be recharged
- Is supported by the U.S. EPA
- Requires less winter maintenance and lowers the chance of “black ice”
- Has functioned effectively for well over 20 years

Courtesy of Cahill and Associates, Inc.

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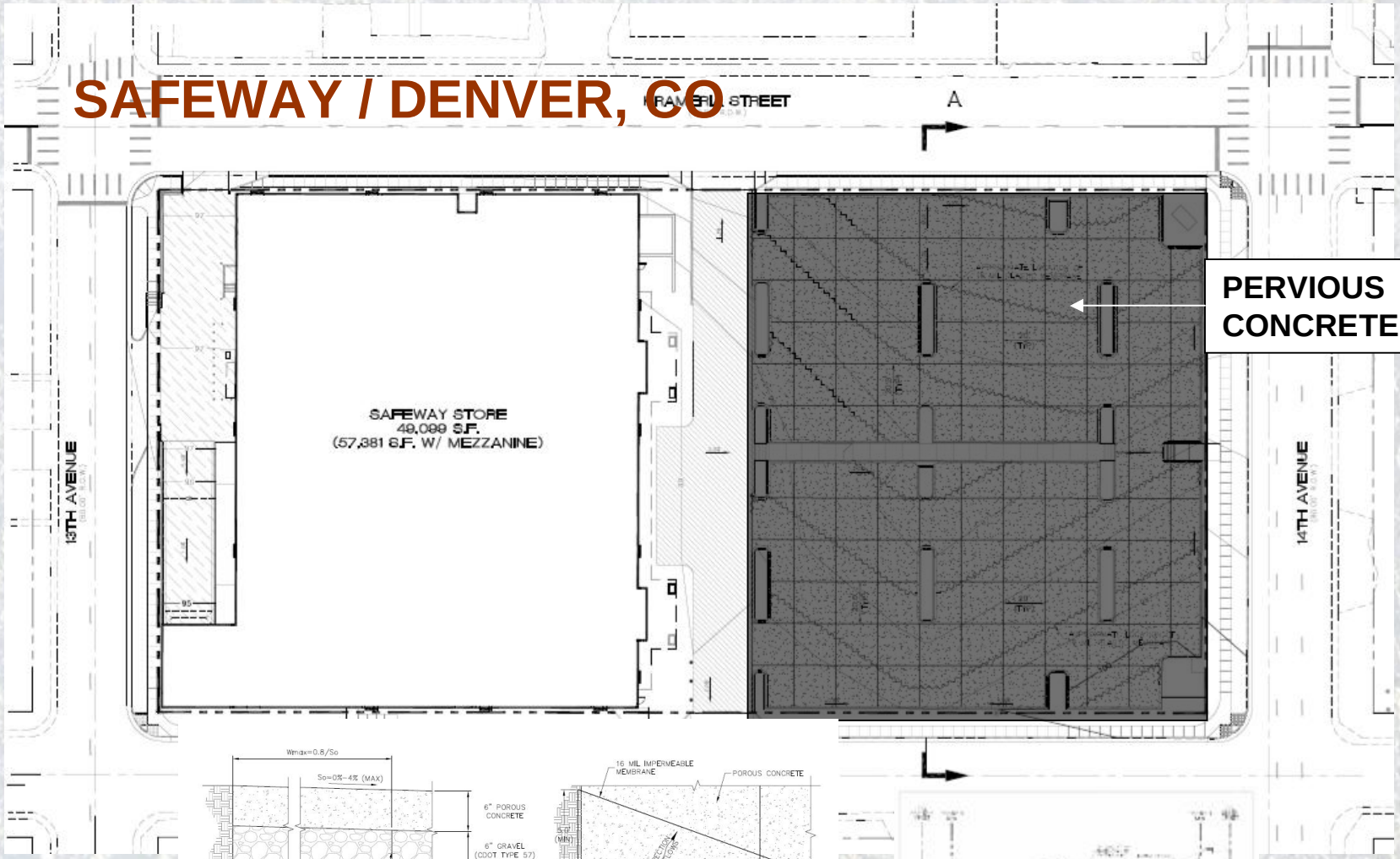
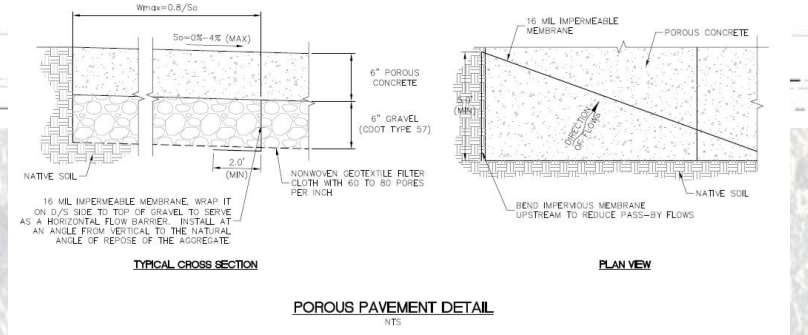
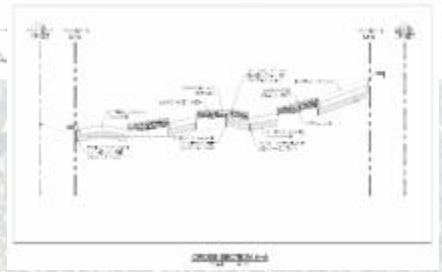
WHAT IS PERVIOUS CONCRETE?

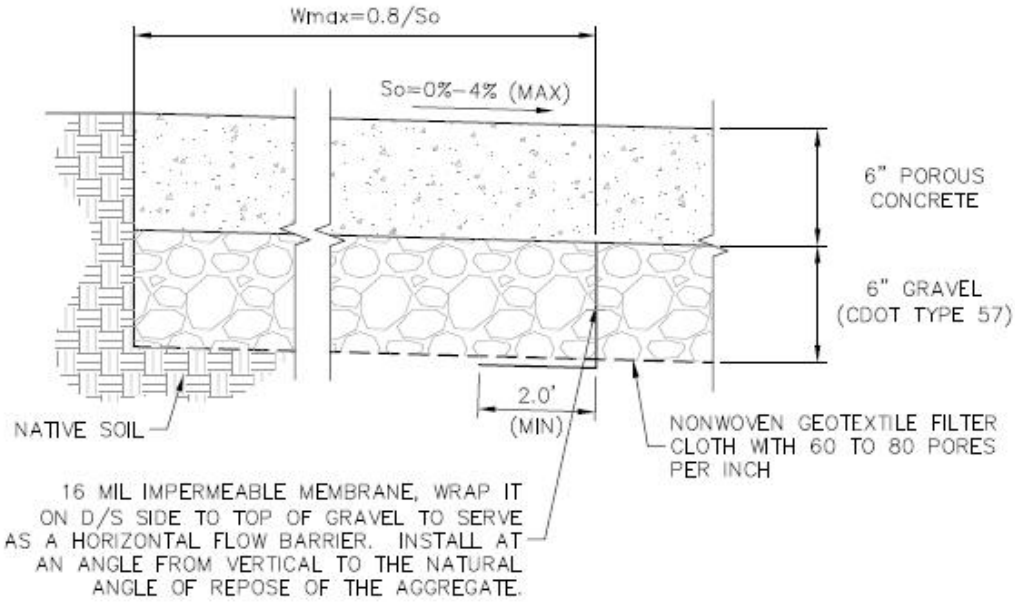
SAFEWAY / DENVER, CO



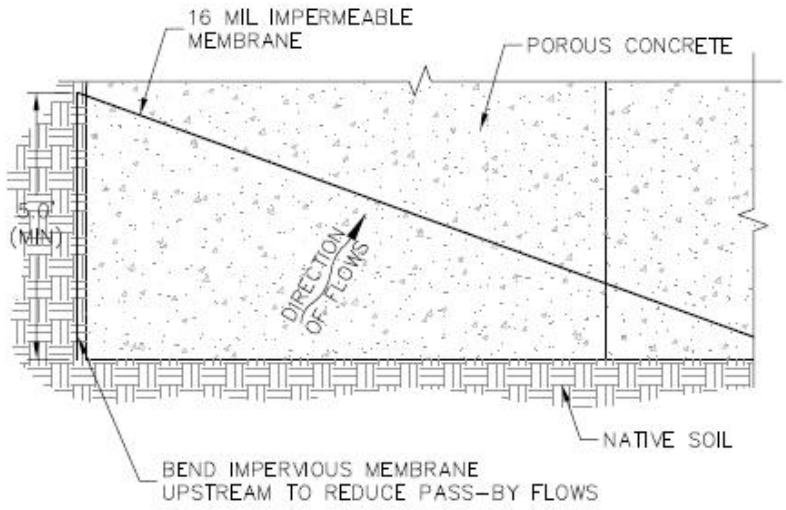




SAFEWAY / DENVER, CO



TYPICAL CROSS SECTION



PLAN VIEW

POROUS PAVEMENT DETAIL

NTS

SAFEWAY / DENVER, CO

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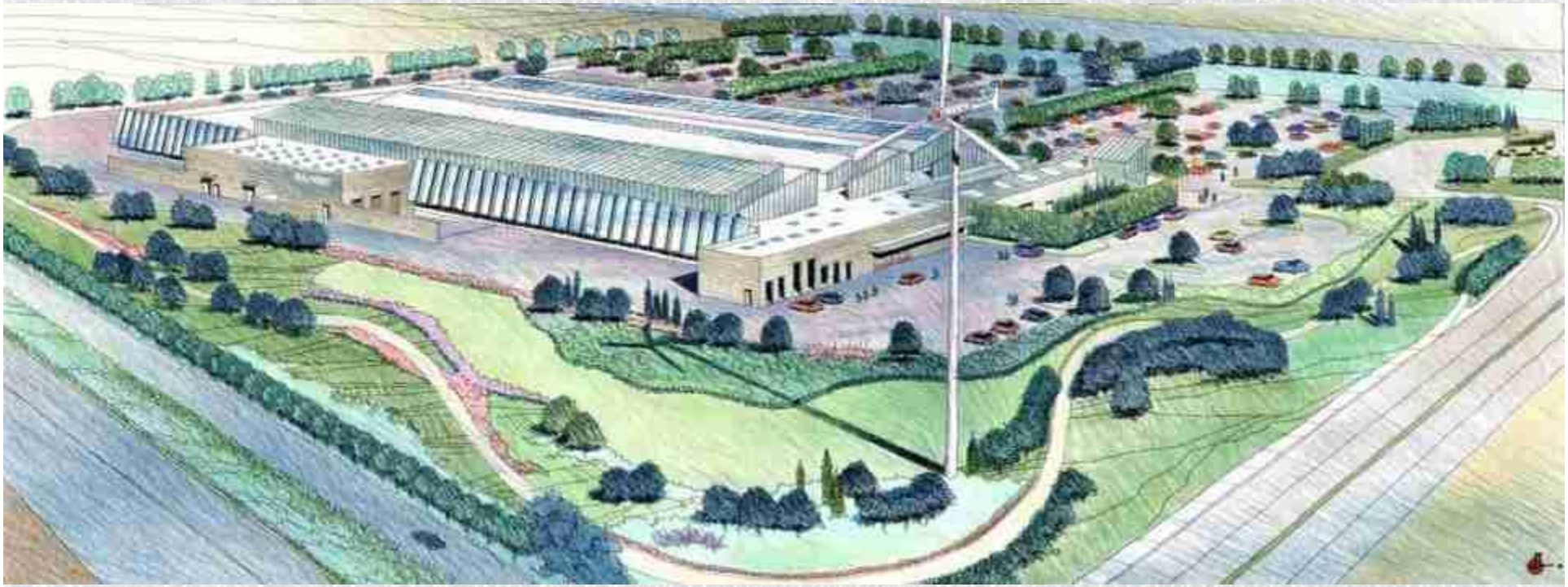
WAL-MART / AURORA, CO

Wal-Mart has invested in the construction of two environmental stores – McKinney, TX and Aurora, CO.



Design Development Collective

WAL-MART / AURORA, CO

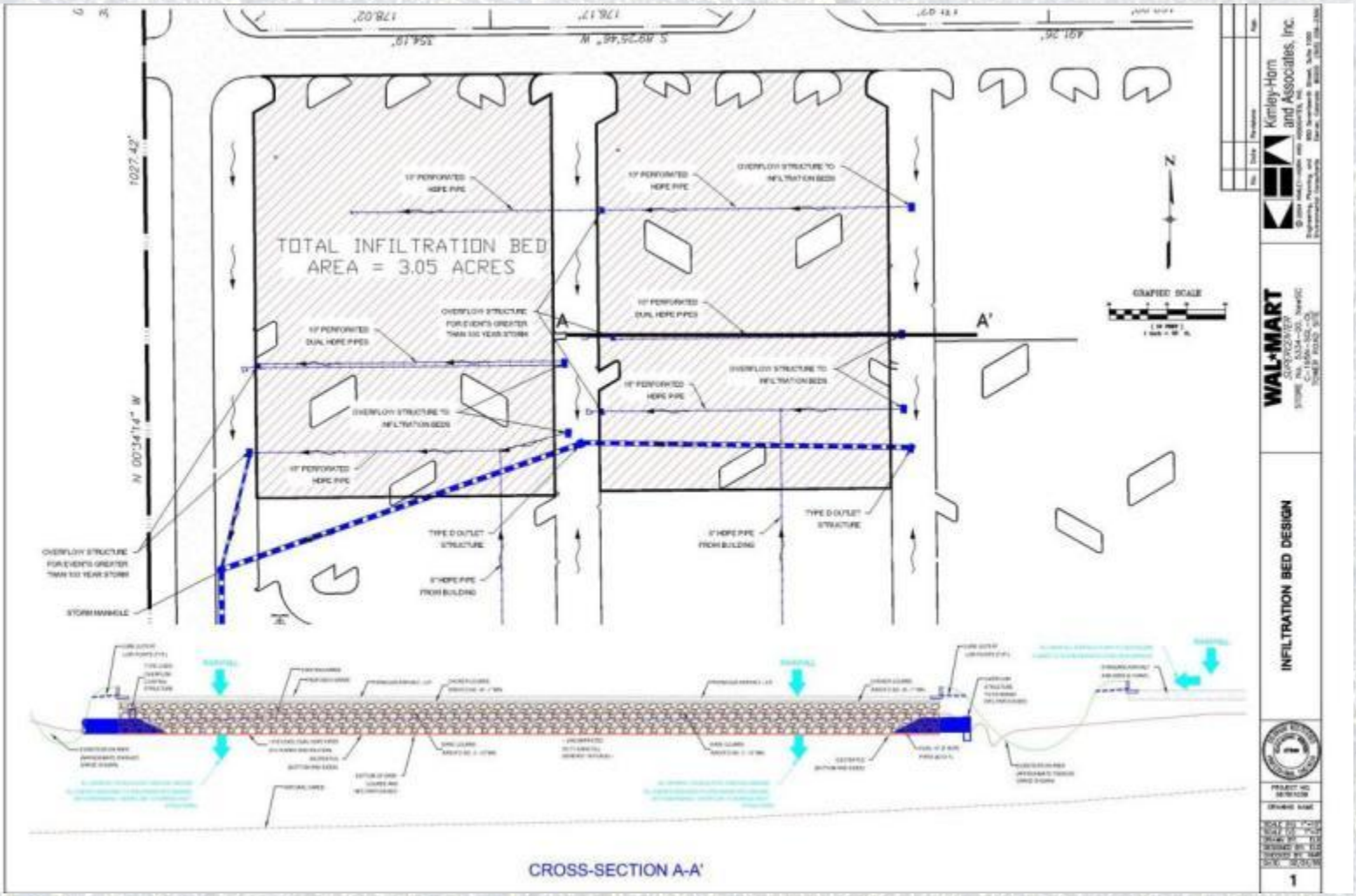
INFILTRATION

Table 3. Summary of soil permeability testing performed on December 7, 2004

Test Location	Fill Depth (in.)	Bench Depth*	Soil Tested	Permeability Rate (in/hr)
1	0	14	Native	3.2
1**	0	14	Native	1.0
2	18	14	Fill	5.2
2	18	24	Native Clay	0.1
3	42	11	Fill	5.4
3	42	24	Fill/Native	1.6
4	48	22	Fill	7.2
5	66	32	Fill	1.5
5**	66	32	Fill	1.5
6	72	none	none	n/a
7	42	30	Fill/Native	0.6
7	42	50	Native	0.6
8	0	24	Native	4.2
9	46	14	Fill	0.9
9**	46	12	Fill	0.75
10	80	18	Fill	6.0
10	80	36	Fill	6.6
11	96	30	Fill	5.6
AVERAGE	**44.7**	**23.6**	**---**	**3.1**

* Depth of percolation holes from the bench were generally 10 to 12 inches
** Test performed with double-ringed infiltrometer

PERVIOUS CONCRETE & POROUS ASPHALT



BED PREPARATION

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PERVIOUS CONCRETE