

LandMax[®]

**STORM WATER
RETENTION/DETENTION SYSTEM**



BLUE STRIPE: LEADING THE WAY.



I.D.



LANDMAX HELPS MUNICIPALITIES MEET EPA PHASE II OBJECTIVES

Phase II of the United States Environmental Protection Agency Storm Water Management Program requires municipalities to develop comprehensive plans to manage storm water runoff affected by construction development.

These plans must incorporate BMP (Best Management Practices) to address issues of paved surface runoff and the concentration of pollutants in runoff.

LANDMAX IS THE SOLUTION

One of the best solutions to the runoff problem is a storm water retention/detention system from Hancor. At Hancor, we've been hard at work producing storm water systems for more than a decade. And our work has been proven in more than 2,500 installations nationwide.

HOW DOES IT WORK?

Storm water retention systems hold storm water below ground, without an outlet. Over time, the storm water percolates into the native soil.

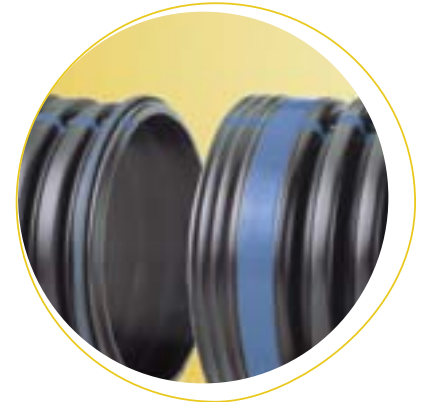
Storm water detention systems merely capture storm water temporarily and allow it to be released in a controlled fashion so that it won't be discharged to the natural waterway or existing storm sewer systems all at once.

A combined retention/detention system allows some of the runoff to percolate into the native soil, while the rest is released at a controlled rate.

Hancor offers the proven LandMax® pipe system – the flexible solution to storm water discharge. The LandMax pipe system is a series of pipes connected side by side, residing in a subsurface structure that acts like a massive underground holding tank.

The LandMax pipe system provides the following benefits:

- Increases the usable land available
- Reduces hazards and safety risks
- Reduces ongoing maintenance needs and costs
- Recharges ground water table more efficiently
- Reduces peak flow runoff from paved surfaces



LANDMAX RETENTION/DETENTION PIPE SYSTEM

Hancor's LandMax storm water pipe system provides the ideal solution for efficient, effective subsurface storm water retention and detention.

Hancor manufactures high-density polyethylene (HDPE) pipe in diameters up to 60", making our system one of the most versatile subsurface retention/detention systems available.

FEATURES & BENEFITS

- LandMax subsurface retention/detention systems increase the usable land available because they're installed below grade, providing space for parking lots, playgrounds and other land uses on top.
- LandMax systems decrease the safety risks and added costs associated with open ponds because they're completely inaccessible to the general public.
- Providing high strength without excessive weight, LandMax HDPE components allow easy handling and fast assembly. The end result is construction schedule compression.
- For maximum design flexibility, the LandMax HDPE pipe system utilizes Hancor products that offer complete compatibility – including BLUE SEAL®, Sure-Lok® ST and Hi-Q® – complemented by a complete selection of fittings, joints, couplers and adapters.

PROVEN TECHNOLOGY

Hancor has been designing and building storm water retention/detention systems since 1992. Our products have a proven track record and are the choice of many engineers. In fact, we have completed system designs in all 50 U.S. states, Mexico and Puerto Rico. See our case studies for examples of our work.

ONE SOURCE FOR ALL SYSTEMS

With Hancor's LandMax pipe system, you'll get everything you need to complete a subsurface storm water retention/detention system, including:

- BLUE SEAL, Sure-Lok ST and Hi-Q pipe products.
- Header pipes prefabricated with header connectors for joining to lateral pipe rows.
- Elbow, tees, wyes and other fittings.
- Clean-outs and risers can be added to the header and/or laterals.

Hancor representatives and engineers are ready to answer all of your questions regarding specifications, installations, backfill recommendations, and more.

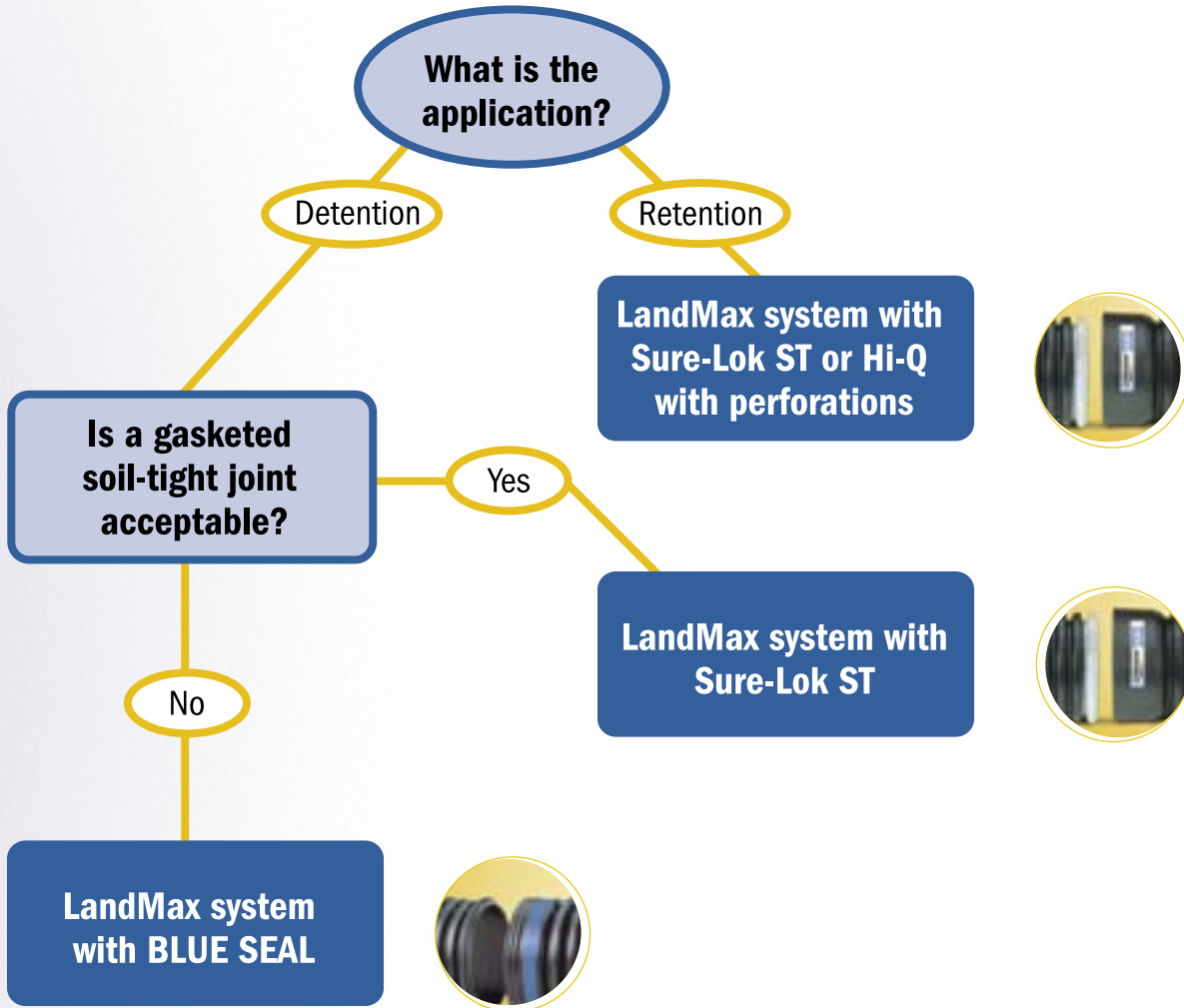
Here's a comparison of available retention/detention system options.

COMPARISON CRITERIA	LANDMAX	LANDSAVER	VAULTS	PONDS
Storm Water Treatment/BMP	100	100	100	100
Minimizes Ongoing Maintenance	100	100	100	60
Maximizes Use of Land	100	100	100	15
Minimizes Vectors/Pest Control	100	100	100	15
Minimizes Safety Risks/ Liability Exposure	100	100	100	10
Total Installed Cost/Value	100	100	80	90
Storm Water Recharge Capability	100	100	75	85
Storm Water Detention Capability	95	55	100	75
Design/Footprint Flexibility	90	100	80	60
Tap Connection Flexibility	80	100	50	N/A

100 is the highest rating

CHOOSING THE CORRECT LANDMAX SYSTEM

WHICH HANCOR PRODUCT SHOULD YOU USE?



STRUCTURAL INTEGRITY

Soil support is very important to the performance of subsurface retention/detention systems. When HDPE pipe carries load, it deflects, transferring the load to the surrounding backfill. This pipe-soil structure is capable of supporting considerable earth fills and surface live loads.

The spacing between parallel pipes within a retention/detention system has to be large enough to allow for compacted backfill material in the haunch area of the pipe. The need for supporting earth or backfill is specified in ASTM D2321, the industry standard for installing thermoplastic pipe and structures. Our engineers use this specification when providing design/installation guidance.

FIVE GUIDELINES TO BE CONSIDERED DURING SYSTEM EVALUATION

1. **Check** with federal, state and local agencies for information on current regulations on subsurface retention/detention systems.
2. **Decide** which Hancor LandMax pipe system is right for the project. LandMax retention systems utilize perforated Hi-Q or Sure-Lok pipe. LandMax detention systems utilize non-perforated BLUE SEAL, Sure-Lok ST and Hi-Q pipe.
3. **Calculate** the total linear footage of pipe needed to meet project requirements. (See table below.)
4. **Evaluate** your system's maintenance requirements. The need for clean-outs, catch basins, sumps and settling basins should all be considered.
5. **Determine** the system layout. Typically, it is more cost-effective to have a shorter header pipe with fewer, longer laterals. Hancor Application Engineers are available to help with system layouts.

PIPE STORAGE CAPACITY

Inside Diameter		"X" Spacing ¹		"S" Spacing ²		Pipe Volume		Stone Void Volume ^{3,4,5}		Total Retention Storage		Retention Surface Area Required		Detention Surface Area Required	
in.	mm	in.	mm	in.	mm	ft ³ /ft	m ³ /m	ft ³ /ft	m ³ /m	ft ³ /ft	m ³ /m	ft ² /ft ³	m ² /m ³	ft ² /ft ³	m ² /m ³
12	300	12	300	12.0	300	0.79	0.07	0.96	0.09	1.7	0.16	1.25	4.10	2.78	9.12
15	375	12	300	12.0	300	1.23	0.11	1.8	0.11	2.4	0.22	1.03	3.38	2.02	6.62
18	450	12	300	12.0	300	1.77	0.16	1.4	0.13	3.2	0.29	0.87	2.85	1.58	5.18
24	600	12	300	12.0	300	3.14	0.29	1.9	0.18	5.0	0.46	0.66	2.16	1.07	3.51
30	750	18	450	16.5	419	4.91	0.46	2.8	0.23	7.7	0.67	0.55	1.80	0.87	2.84
36	900	18	450	18.5	470	7.07	0.66	3.8	0.28	10.8	0.91	0.45	1.48	0.70	2.30
42	1050	18	450	21.5	546	9.62	0.89	4.9	0.34	14.5	1.20	0.39	1.28	0.60	1.96
48	1200	18	450	27.0	686	12.57	1.17	6.2	0.40	18.8	1.53	0.35	1.15	0.52	1.72
54	1350	18	450	32.0	813	15.90	1.48	7.9	0.46	23.8	1.89	0.32	1.05	0.46	1.51
60	1500	18	450	33.5	851	19.63	1.82	9.3	0.53	28.9	2.30	0.28	0.92	0.41	1.35

NOTES:

Bedding depth assumed six inches (0.15m)

¹Dimension measured from outside diameter and lateral to trench wall.

²Dimension is distance between outside diameters of adjacent laterals.

³Stone porosity assumed 40%

⁴Stone height above crown of pipe is not included in void volume calculations.

⁵Calculation is based on the average of the ID and the OD of the pipe.

LandMax®

PROVEN PERFORMANCE



PROJECT:

STORM WATER SYSTEM INSTALLED UNDER CONCRETE PARKING LOT OF A NEW 61,634 SQUARE FOOT STORE IN BATON ROUGE, LA.

Product:

4,400' (1320m) of 36" (900mm) diameter Sure-Lok ST pipe installed.

Installation Date: Spring, 1999

Conditions: Backfill of 610 limestone up to spring line. Sand used from spring line up.

NO DRAIN ON THE BUDGET WITH LANDMAX SYSTEM

When plans were under way for a new 61,634 square foot store in Baton Rouge, LA, keeping costs in line was paramount. Hancor's LandMax system provided the cost-effective solution for the storm water retention system.

Installed under the parking lot was 4,400' (1320m) of 36" (900mm) diameter Sure-Lok ST pipe. LandMax subsurface retention systems help free up usable land, providing space for parking lots, playgrounds or other public areas to be built on top. Since they are inaccessible to the public, LandMax systems also decrease the safety risks and added costs associated with open ponds and keep ongoing maintenance costs to a minimum. Adding to the cost effectiveness of LandMax is its fast, easy installation. All of the exact pipe products and components needed to assemble a complete retention system are available from a single source.



PROJECT:

HANCOR LANDMAX RETENTION/DETENTION SYSTEM BUILT UNDER SCHOOLYARD PLAYGROUND IN EDMONDS, WASHINGTON.

Product:

6,900' (2070m) of 36" (900mm) Sure-Lok ST perforated pipe; 19 36" (900mm) headers (size on size); and 1200' (360m) of 12" (300mm) Sure-Lok solid wall pipe with 4" (100mm) vertical cleanouts.

LANDMAX – THE DRAINAGE SOLUTION FOR SCHOOLYARD PROJECT

The engineers of this school rebuilding project had to implement a system to manage the quality and quantity of storm water runoff as outlined by the EPA's Phase II/BMP (Best Management Practices) mandate. A retention pond was considered too hazardous because of the close proximity to children. With the confined project site area, it was decided a LandMax subsurface retention/detention system was the best solution. This would prevent human tampering and the chance of accidental injury, and also maximize the amount of usable land allowing for a playground to be built on top. Hancor Sure-Lok ST pipe was used because of its soil-tight capabilities. The pipe was laid in a bed system where backfill was broadcast over top. After backfilling around the pipes, a geotextile was placed over the backfill, with native soil completing the job.



PROJECT:

INSTALLATION OF A LANDMAX RETENTION/DETENTION SYSTEM IMPROVES STORM WATER DRAINAGE UNDER WRIGLEY FIELD.

Product:

LandMax retention/detention system.

Installation Date: December 2004

IMPROVED STORM WATER DRAINAGE UNDER WRIGLEY FIELD

Wrigley Field is one of the premiere baseball venues in Major League Baseball. But even the best needs an occasional upgrade.

The space between the batting area and the backstop at Wrigley Field tended to flood during heavy rains – a serious obstacle to club officials who wanted to install three rows of premium seating behind home plate. Plans also called for an underground club level area beneath those seats.

The engineering plans from Osborn Engineering called for a lightweight design, with lateral lines to connect to the manifold. All fabrication had to be done off-site and easily hand-carried into the stadium.

The solution was a Hancor high-density polyethylene (HDPE) pipe retention/detention system, placed between the first base line and the visitors dugout. The engineer chose LandMax because it can be buried just four or five feet underground with sufficient volume capabilities.

The Hancor LandMax system met all of the criteria set by Osborn and enabled the contractor, McNally Construction, to complete the installation during the off-season.



PROJECT:

HDPE PIPE BREAKS NEW GROUND IN OHIO RESIDENTIAL DRAINAGE PROJECT.

Product:

Sure-Lok ST pipe in 20' (6m) lengths; 720' (220m) of 48" (1220mm) with a LandMax Header System; 200' (60m) of 36" (900mm).

Installation Date: March 2003

NEW SOLUTION TO RESIDENTIAL DRAINAGE PROBLEM

Until Hancor came along, city officials in Akron, Ohio, had only been using concrete and clay pipe to handle their drainage issues.

But with budgets pushed to the limit, and resident complaints, the City took a closer look at Hancor's corrugated HDPE pipe. The project involved an easement in a fully developed residential area along Sourek Road. Storm sewage and drainage problems had plagued that area for years.

The solution needed to have minimal impact on land use and – because it involved a residential neighborhood – could not include ponding because of the threat of mosquitoes or extensive construction.

The only option was underground retention. The engineering firm of GDP Group chose a 48" Hancor LandMax system manufactured from a high-density polyethylene.

One of the major benefits to the Hancor solution was the savings realized by the City.

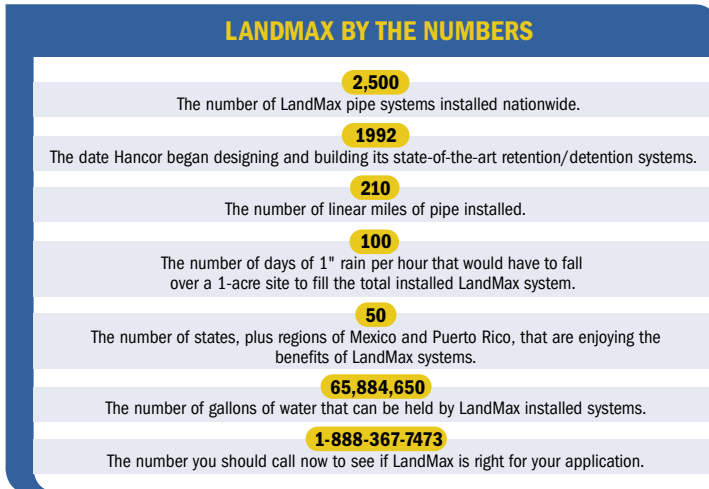
The savings on the Sourek Road project, based on other projects of this kind, was about \$25,000. Add to that reduced time and labor, and the project was a significant success for the City and Sourek Road residents.

CUSTOM SYSTEMS

Hancor is able to provide custom solutions based on unique requests.

Not only do our engineers offer design aid for traditional projects, they also offer engineering assistance, CAD drawings and product knowledge for custom jobs as well.

A bridge construction project in Orlando, FL serves as an excellent example of our products being used in a non-traditional manner. Hancor pipe was used to create a void space in the bridge decking, reducing the weight of the bridge by 24.5 million pounds and saving approximately \$375,000 in concrete costs. Other custom projects include air ducting systems, water circulation for shrimp farms, chlorine contact chambers and water elevation control for wetlands.



TECHNICAL SUPPORT/VALUE ENGINEERING

Hancor's Application Engineering and Regional Engineering staff can provide design guidance and aid for all storm water retention/detention and custom application projects. Design guidance includes information on manufacturing capability, various product offerings and options. They also offer value engineering, installation guidance, product capabilities and limitations, and information on various other areas of expertise. One of the most frequent forms of technical support is storage volume calculations and CAD design drawings. Our range of technical support provides design engineers with the confidence that they'll get a well-designed project at the lowest possible cost.



DIRECT CONTACT

Customer Service
888-FOR PIPE (367-7473)
Fax 888-FAX PIPE (329-7473) 24 hours a day

ELECTRONIC MEDIA

Web Site
Find market- and application-specific information and the latest industry news at our On-Line Pipeline – www.hancor.com

Hancor "Terms and Conditions of Sale" are available on the Hancor web site, www.hancor.com