TRITON™ STORMWATER CHAMBERS & CULVERTS

DATA SHEETS INDEX

BLANK

DETENTION RETENTION EX-FILTRATION

STRONGER : LIGHTER : LARGER : GREENER : EASY INSTALL

BELOW GRADE STORMWATER CHAMBERS

TRITON
STORMWATER SOLUTIONS

Introducing the **next generation** of **stormwater CHAMBERS**

Introducing the Stronger, Lighter, Larger, Greener, Easier to Install Stormwater Solution

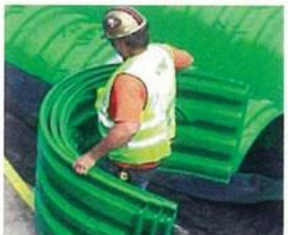
When you need a comprehensive solution to the stormwater management challenges on your project, you can count on the next generation of stormwater management products — Triton. Our patented design and use of advanced materials truly give you power over water.

Utilizing an earth-friendly soy resin-based polymer, Triton produces chambers that are significantly lighter, substantially larger and much stronger than conventional chambers. In fact, our strength rivals large-diameter pipe — at a fraction of the weight.

Our lightweight design, which nests better than any competitor, ships very efficiently and installs much quicker than heavier chambers. We can also save you valuable land space, as our chambers can be double-stacked in many applications, reducing the footprint.

If you need a comprehensive stormwater management solution, you can depend on Triton to give you power over water.

Lighter



- 46% lighter per cubic metre of storage
- Chambers weigh only 13 Kg
- One person can carry two or three at a time

Larger

- Up to 46% greater capacity Per lineal metre than competitive products.
- Chamber storage is equivalent to 1100mm diameter pipe

Stronger

- Exceeds the latest AASHTO LFRD Bridge Design Spec 1
- Tests validate chambers withstand a rear axle load of 210kN without a pavement layer

Greener

- Eco-friendly soy-oil based
- Carbon-neutral product
- Can achieve up to 21 LEED credits

Cost-Effective

- Lower shipping costs
- Fewer labour man-hours per cubic metre to lay.
- Soy-oil based, more stable cost than petroleum based

Easier to Install

- One-person installation
- Engineered connection allows easy placement of chamber sections

Lifetime System Warranty

- Manufactured in an ISO/TS 16949:2002 Certified Facility

TRITON™ STORMWATER CHAMBERS & CULVERTS
FEATURES AND BENEFITS

KEY FEATURES & BENEFITS OF THE TRITON CHAMBERS

- Triton chambers are open bottom corrugated arched structures chambers designed for stormwater / rainwater : Retention / Harvesting – Detention / Attenuation – Infiltration / Subgrade Recharge – Treatment / Filtration.
- Triton chambers are the strongest and most cost effective system of their type and are many times stronger than the competitor's chambers.
- Triton S-22 chambers have greater storage capacity per linear metre than competitor's equivalent chamber, allowing the same water storage volume with approx. 20% less footprint and 20% less stone.
- The Chambers greatly exceed the latest and New Zealand (AS 5100.2, AS/NZS 2566, HN-HO 72) heavy loading standards and AASHTO LFRD Bridge Design Spec 1.
- Triton chamber's reinforced soy resin's excellent creep resistance as compared to polypropylene based products assures that they maintain acceptable strain levels under load for extended periods therefore they can buried with a considerably greater cover depth and can be placed under heavily trafficked roadways and parking areas.
- Triton Chambers are stackable, double or triple height, allowing double or triple the water storage space in the same foot-print.
- The modular nature of the Triton system allows for a completely flexible shape / configuration of the installation.
- The Triton system can be designed to include a large easy-to-clean header row to give secondary filtration when the header row includes an impermeable floor and manhole / sump at each end for collecting suspended solids. This ensures superior water filtration before it enters the distribution chambers.
- Online calculator to create and save your system designs with a complete bill of materials .
- Triton's S-22 chamber is lighter than the competitors, it is more easily manhandled and meets New Zealand OSH requirements.
- Unlike the competition's stormwater chambers Triton's chambers are **not** made of petroleum-based resins, they are manufactured from renewable, environmentally - friendly , fibreglass reinforced soy-based resin which has been used extensively by the underground industrial burial tank and heavy industries for over 50 years.
- Triton products are independently tested and certified to ASTM-F 2418 by the University of Ohio,
- The University of Ohio, tests validate that the chambers withstand a rear axle load of 210kN which is 50% greater than the required AASHTO H-20 loading and are 5 times stronger than AASHTO HS-20 requirement with 450mm of cover and without a pavement layer. For a video of the actual test go to http://www.tritonsws.com/full_video.
- All chambers HS-30 stamped and and Federally (USA) Certified Carbon Neutral products.
- In ground service life of Triton products over 100 + years.
- Each product is date stamped and traceable through the entire process.
- Triton manufacturing plants are ISO/TS 16949: 2002 and ISO-14001:2004 certified facilities.
- Three sizes available.
- See how the Triton system works by clicking this link: http://www.tritonsws.com/low-impact-development

Triton is committed to ensuring they supply the very best product and are the only manufacturer in the Stormwater Chamber market that is totally vertically integrated as they do not outsource the manufacturing of their resins or products.

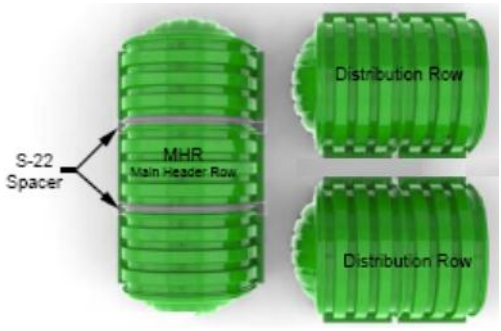
TRITON™ STORMWATER CHAMBER & CULVERT SPECIFICATION
ALL TRITON™ CHAMBERS EXCEED H-20 LOADING BY FIVE TIMES WITH 450MM COVER AND NO PAVEMENT

TRITON™ S-22 CHAMBER
1397mm W x 889mm H x 762mm L
The above dimensions overall dimensions.
Lay-up length of chamber 702mm
Weight 12.7kg
See table page 7 for chamber volume

S-22 CHAMBER ACCESSORIES
End Cap : Volume 0.11m^3
S-22 MHR Spacer

S-22 MHR spacer used at main header row in conjunction S-22 Chambers to maintain recommended distribution row spacing.
See set out drawing

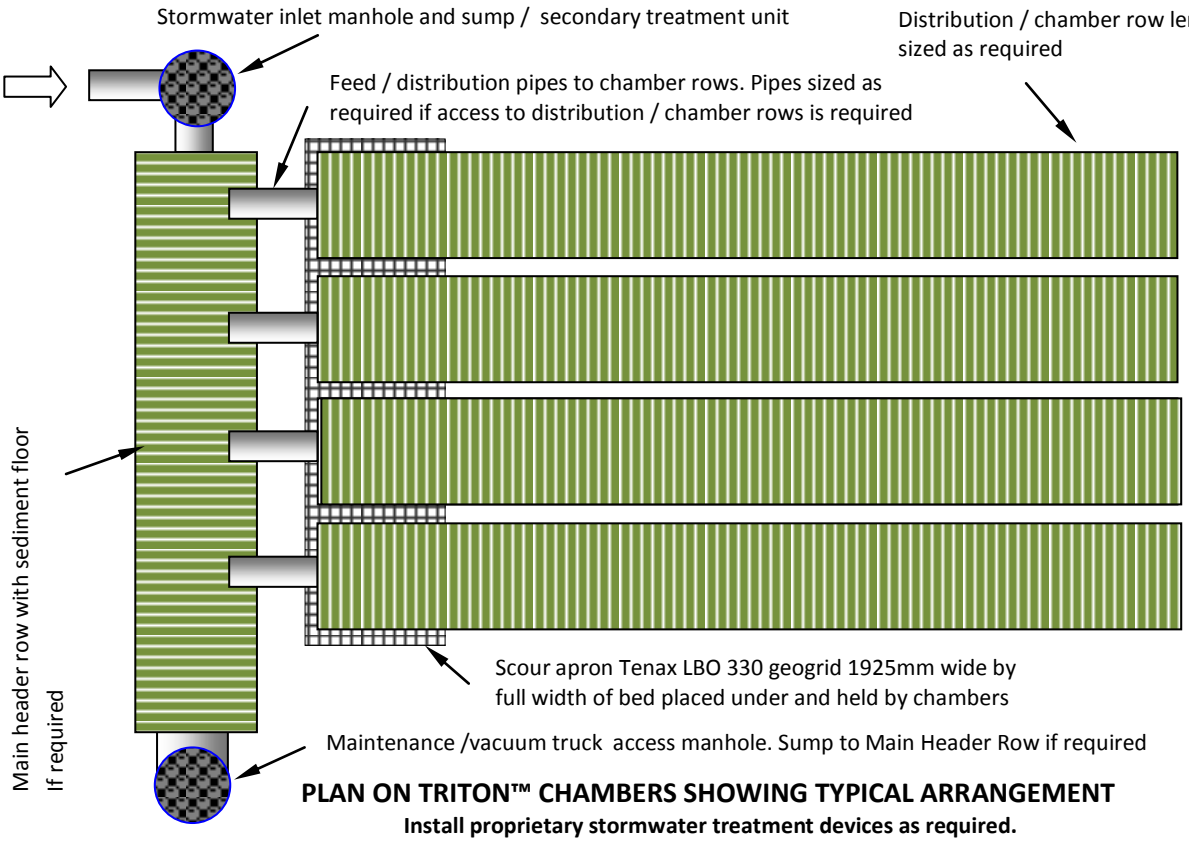
S-22 chamber employed as a culvert
Quick and easy to place and backfill.
Backfill with AP granular / compactable aggregate .Maximum particle size 50mm.
Construct culvert floor using insitu concrete, or 100mm aggregate in a wire mattresses
Concrete headwalls as required



Main Header Row (MHR) arrangement using MHR spacer,

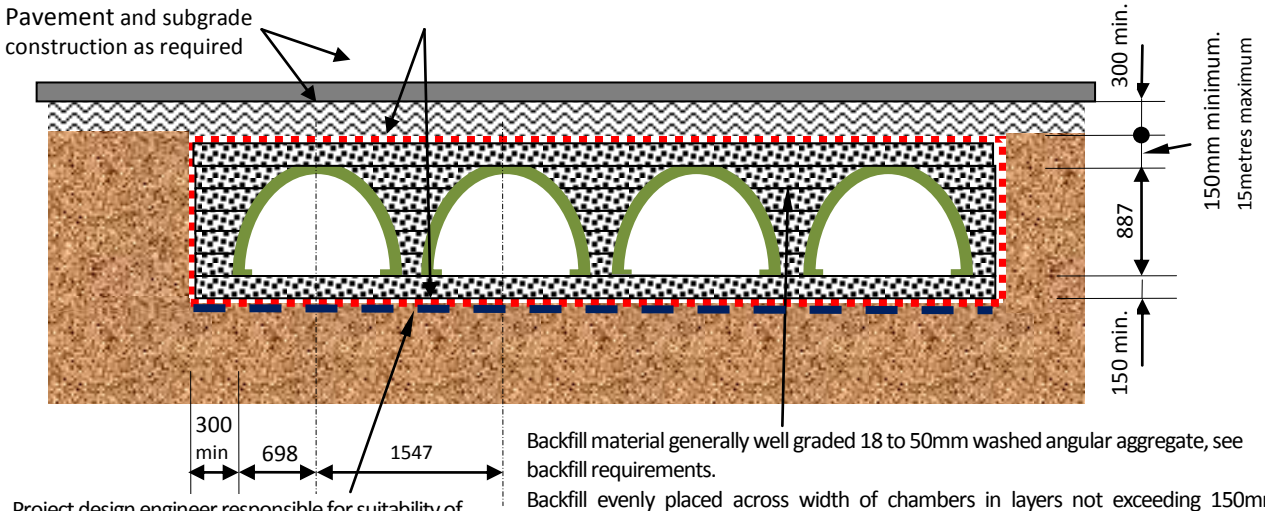
Spacing between distribution rows150mm

	**TRITON™ C-10 CHAMBER** 1016mm W x 635mm H x 812mm L O/A. Lay-up length 754mm Weight 7.2 Kg Free cross sectional area 0.37 m^2	Can be used as a culvert, See note on Triton S-22 chamber specification
	**TRITON™ M-6 CHAMBER** 865mm W x 445mm H x 812mm L O/A. Effective length 754mm Free cross sectional area 0.21 m^2 Weight 5.4 Kg	Can be used as a culvert, See note on Triton S-22 chamber specification



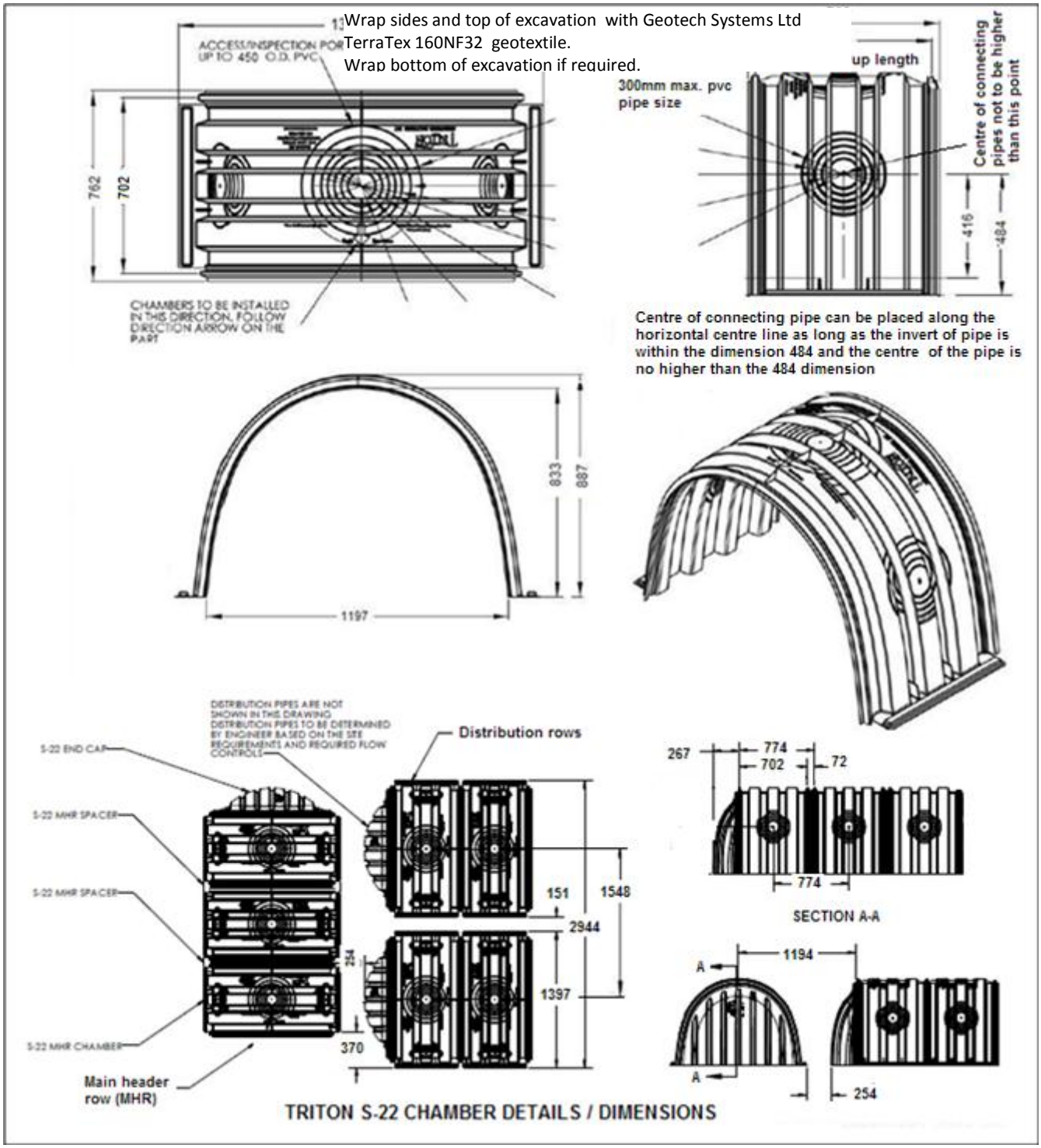
PLAN ON TRITON™ CHAMBERS SHOWING TYPICAL ARRANGEMENT

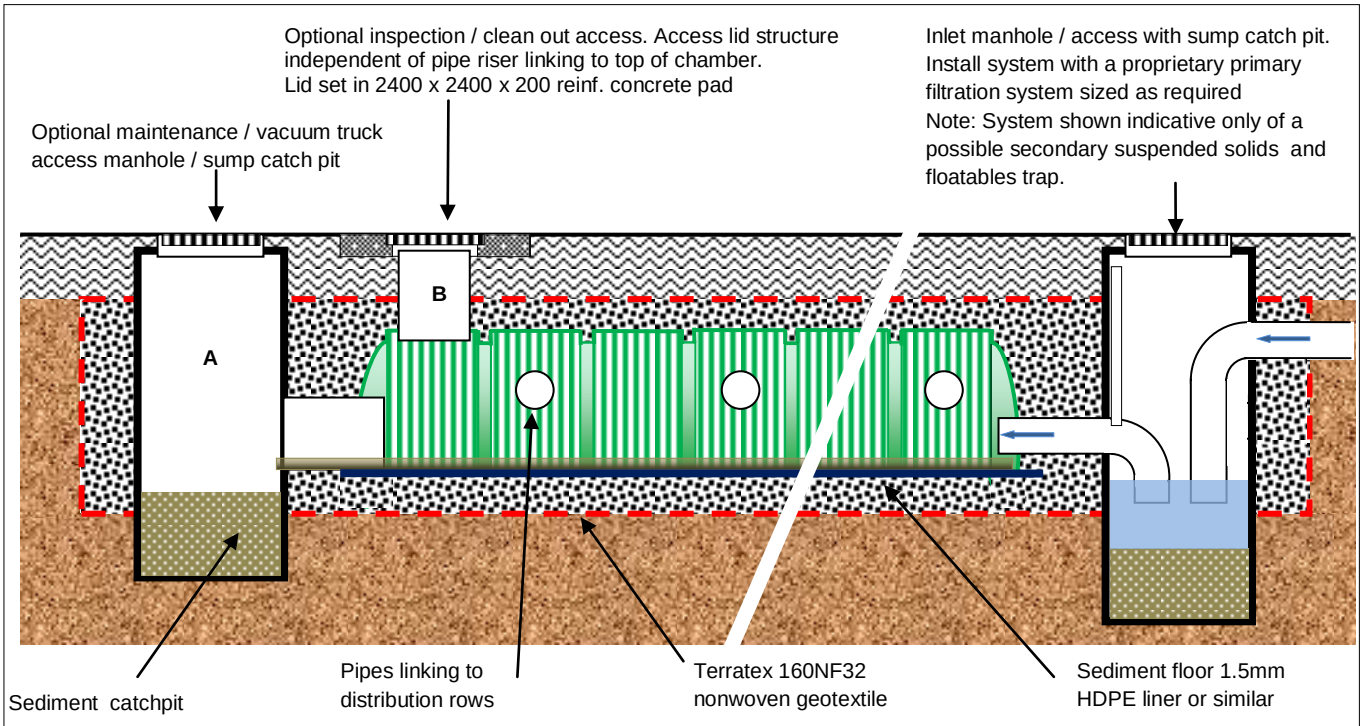
Install proprietary stormwater treatment devices as required.



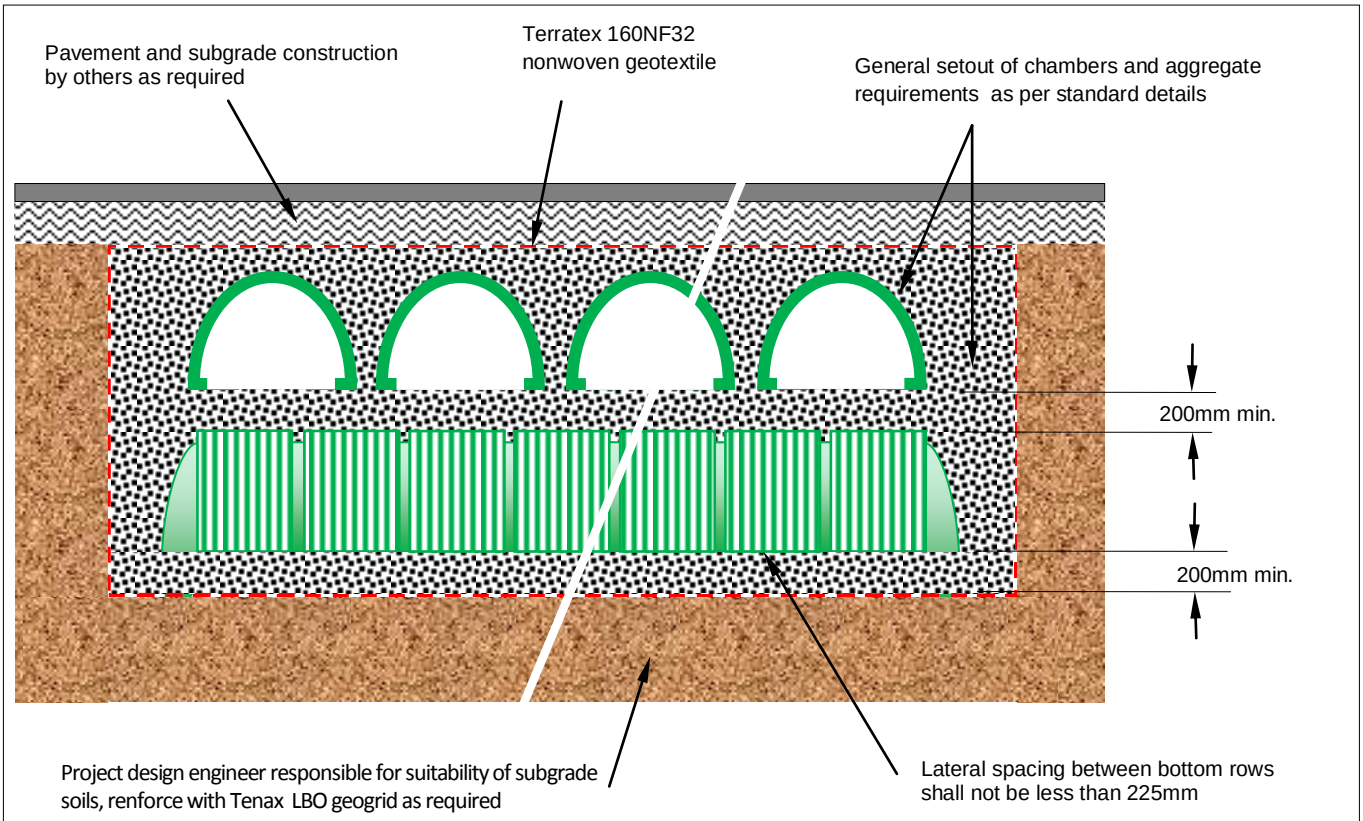
CROSS SECTION THRU TRITON™ S-22 DISTRIBUTION CHAMBERS SHOWING TYPICAL ARRANGEMENT

Wrap sides and top of excavation with Geotech Systems Ltd TerraTex 160NF32 geotextile.
Wrap bottom of excavation if required.





LONG SECTION OF S-22 CHAMBER MAIN HEADER ROW WITH SEDIMENT FLOOR SHOWING TYPICAL ARRANGEMENT / OPTIONS
Not to scale



CROSS SECTION THRU TRITON™ S-22 DOUBLE STACKED CHAMBERS SHOWING TYPICAL ARRANGEMENT
Not to scale

'THE BASE' SHOPPING CENTRE CARPAK : TE-RAPA HAMILTON : 1,700 S-29 CHAMBERS
CONTRACTOR : SAM PEMBERTON CIVIL LTD.

'SHOPPING CENTRE CARPAK : TE AWAMUTU : S-29 CHAMBERS
CONTRACTOR : SAM PEMBERTON CIVIL LTD.

COMPARISON OF PHYSICAL PROPERTIES OF NZ AVAILABLE STORMWATER CHAMBERS

MANUFACTURER		TRITON			STORMTECH / RAIN ARCH		ECOAID	CHAMBER MAXX	AQUA TUNNEL
MODEL	**UNIT**	**S-22**	**C-10**	**M-6**	**SC-310**	**SC-740**	**EC-1000**	**Standard**	**AT300**
Width overall Height overall	mm mm	1397 887	1016 635	865 445	863 406	1245 762	1160 680	1310 770	800 510
Lay-up length, (excludes lap)	mm	702	754	754	2170	2170	1000	2170	1220
Bare lay-up volume (no stone)	m^3 / Lm	0.87	0.371	0.212	0.184	0.594	0.516	0.645	0.245
Lay-up volume (with stone[1])	m^3 / Lm	1.2 6	0.525	0.412	0.414	0.976	0.822	1.0	--
Chamber weight	kg	12.7	6.8	6.8	16.8	33.5	15	34.92	11
SWL / axle load	kN	210[2]	210[2]	210[2]	142[3]	142[3]	-----	142[3]	35

The above table of figures / test results based on information freely available in the public domain.

Comparable chamber systems

Comparable chamber systems

[1] Based on 150mm aggregate below and above chamber, aggregate with 40% void to solid.

[2] Based on 450mm cover (no pavement) constructed as specified by Triton USA. Independently tested to AASHTO H20 / H25 standard with minimal to no deflection. Greater loads (AASHTO H30) can be achieved by employing pavement or geogrid systems or increasing cover to distribute the load.

[3] Based on 450mm cover with pavement. Tested to AASHTO H20 / H/25 standard

TRITON™ CHAMBER MATERIAL PROPERTIES CHART

COMPARISON WITH OTHER CHAMBER MANUFACTURERS

MANUFACTURER / Material	TRITON Reinf. Soy Vinyl Ester Resin	CHAMBERMaxx Polypropylene	ECOAID ……	STORMTECH Polypropylene
Tensile Strength - Ultimate	150 MPa	10 to 42 MPa	See note	10 to 42 MPa
Tensile Strength - Yield	150 MPa	55 to 80 MPa	See note	55 to 80 MPa
Tensile Modulus	12,000 to 15,000 MPa	4 to 9 MPa	See note	4 to 9 MPa
Flex Modulus	11,000 MPa	3,800 to 7,600 MPa	See note	3,800 to 7,600 MPa
Flex Yield Strength	17,900 MPa	48 to 145 MPa	See note	48 to 145 MPa
Compressive Strength	209 MPa	55 to 83 MPa	See note	55 to 83 MPa
Shear Strength	72 MPa	N/A	See note	N/A

Notes

The above table of figures / test results based on samples cut from chambers purchased on the open market by Triton USA
Tests carried out by recognised independent third party testing laboratory.
Soy based resins have a 50 + year history in the automotive, underground industrial tank and heavy farm equipment industries
Triton Chambers have an in ground service life of 100+ years in common soils.
ECOAID chambers were not sampled and tested by Trion USA

Creep Resistance:

SOY BASED RESIN can support over loads (over it's SW L, ie: 50% of its breaking strength) with minimal creep for an extended service life.
Reinforced soy resin's excellent creep resistance as compared to polypropylene based products assures that Triton chambers maintain acceptable strain levels under load for extended periods.

DURABILITY OF SOY BASED RESIN (soy-vinyl ester) MATERIAL

- **Characteristics of SOY BASED RESIN:**
  - High strength
  - High modulus
  - Dimensional stability
  - Low shrinkage
  - Low moisture regain
  - Thermal stability
  - Chemical resistance
- **Thermal Resistance of SOY BASED RESIN:**
  - Heat Deflection Temperature > 230 degrees C
  - Maintains excellent flexibility and strength at temperatures below freezing
- **SOY BASED RESIN Generally Resistant to :**
  - Salts
  - Organic acids
  - Organic solvents
  - Dry cleaning solvents
  - Oxidizing agents
  - Reducing agents
  - Sulphuric acid (acid rain)
  - Gases and fuels (petroleum)
- **UV Resistance:**
  - SOY BASED RESIN can withstand 400 hours in direct sunlight and will retain greater than 90% of its strength. (400 hours typically equates to two to six months aging in calendar time)
- **Safe Working Temperature Range**
  - Minus 40º C to + 80º C maximum
- **Chemical Resistance —Acids:—**
  - SOY BASED RESIN is highly resistant to most minerals and organic acids.
- **Chemical Resistance —Inorganic Salts:**
  - Does not effect SOY BASED RESIN even after one full year of exposure.
- **Chemical Resistance —Fertilizers:**
  - Effects of fertilizer on SOY BASED RESIN depends on the chemical composition and moisture content of the fertilizer but generally is not an issue in most applications.
- **Creep Resistance:**
  - SOY BASED RESIN can support a load over 50% of its breaking strength with minimal creep for an extended service life.
  - This excellent creep resistance assures that SOY BASED RESIN maintains acceptable strain levels under load for extended periods.
- **Summary Conclusions:**
  - SOY BASED RESIN is inert to a wide range of commonly encountered chemical classes normally encountered in soils.
  - SOY BASED RESIN is inert to commonly encountered soils having a pH range of 2 to 12.
  - SOY BASED RESIN is not affected by microorganisms in soil.
  - SOY BASED RESIN is highly resistant to Sulphuric acid (acid rain), Gases and fuels (petroleum)

REQUIREMENTS FOR TRITON® CHAMBER INSTALLATION

CHAMBERS INSTALLED IN ACCORDANCE WITH TRITON™ INSTALLATION INSTRUCTIONS SEE TRITON™ WEBSITE

www.**tritonsws**.com/support/**installation-manual**

TYPICAL BACKFILL AGGREGATE REQUIREMENTS

TRITON™ CHAMBER BACKFILL MATERIAL SPECIFICATION

Material Location	Description	AASHTO M43 Designation	AASHTO M145 Designation	Compaction/Density Requirement`
D. Fill material above 450mm as below and upto final grade level	Any soil/rock Materials. native soils or per engineer's plans. Check plans for pavement subgrade requirements.	N/A	N/A	Prepare per engineer's plans. Paved installations may have stringent material and preparation requirements.
C. Fill material for 150 to 450mm elevation above chambers for paved installation or 600mm for unpaved installation	Granular well-graded soil/ aggregate mixtures, <35% fines	3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	A-1 A-2 A-3	Compact in 150mm lifts to a min. 95% Proctor density
B. Embedment Stone surrounding and to 150mm elevation above Chambers	Washed. angular stone with the majority of particles between 18mm to 50mm	3, 357, 4, 467, 5, 56, 57	N/A	No compaction required
A. Foundation Stone below Chambers	Washed. angular stone with the majority of particles between 18mm to 50mm	3, 357, 4, 467, 5, 56, 57	N/A	Plate compact or roll to achieve a 95% Standard Proctor Density.

PLEASE NOTE : The above listed designations are for gradations only, the aggregate must also be crushed, angular and washed.

TRITON™ CHAMBER BACKFILL AGGREGATE DESCRIPTION

Washed Crushed Stone	Description	Criteria
Acceptable	Angular	Stones have sharp edges and relatively plane sides with unpolished surfaces
	Subangular	Stones are similar to angular description but have rounded edges
Unacceptable	Subrounded	Stones have nearly plane sides but have well-rounded corners and edges
	Rounded	Stones have smoothly curved sides and no edges

Note : The above aggregate grading achieves approximately a 40% void to solid ratio.

TRITON CHAMBER STORMWATER SYSTEM
REQUIREMENTS FOR INSPECTION AND MAINTENANCE

MAIN HEADER ROW INSPECTION FREQUENCY & ACCESS

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance.
The Triton Main Header Row™ is a patent pending technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

The frequency of inspection and maintenance varies by location.
A routine inspection schedule needs to be established for each individual location based on site-specific variables.
The type of land use ie: industrial, commercial, residential
Anticipated pollutant load, percent imperviousness, climate etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, Triton recommends annual inspections.

The Main Header Row should be inspected every 6 months for the first year of operation. In subsequent years, the inspection should be adjusted based on previous observation of sediment deposits.

The Main Header Row should incorporate a combination of standard manhole(s) and strategically located inspection ports.
The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

The distribution row chambers can be inspected through each distribution pipe that connects the Main Header Row to the distribution row chambers.
Access to the distribution row chambers can be achieved via the distribution pipes if they have been sized accordingly.

MAIN HEADER ROW INSPECTION

If, upon visual inspection, it is found that sediment has accumulated, a stadia rod should be inserted to determine sediment depth.

When the average depth of sediment exceeds 250mm in the bottom of the manhole sump and/or if there is 75mm throughout the length of the Main Header Row, the Sump and Main Header Row should be cleaned.

The Main Header Row was designed to reduce the cost of periodic maintenance. By capturing sediment in just one row, costs are dramatically reduced by eliminating the need to clean each row along the storage bed.

If inspection indicates the need for maintenance, access is provided via manholes located at the ends of the Main Header Row.
If entry into the manhole is required, please follow OSH rules for confined space entries.
The inside dimensions of the Triton Main Header Row chambers measure 833mm tall by 1197mm wide.

MAIN HEADER ROW MAINTENANCE GENERALLY

Sump basin Maintenance is accomplished by removing the sediment that has built up in the basin using a standard vacuum truck.

Main Header Row Maintenance is accomplished via the manholes / inlet structure using a JetVac process or can be cleaned using a water tank truck equipped with a hose to flush the sediment to the downstream sump.
To use a water tanker, simply insert the hose into the upstream catch basin / inlet structure and flush the sediment to the end of the Main Header Row where the Sump is located.

NOTE: The JetVac or high pressure hose process should only be performed on the Main Header Row where the Triton Sediment Floor System has been installed, and only if there is 75mm of sediment throughout the length of the Main Header Row.

MAIN HEADER ROW STEP BY STEP MAINTENANCE PROCEDURE

Step 1. Inspect Manhole Sump and Main Header Row for sediment

Inspection ports (if installed)

- **i.** Remove lid from access box frame
- **ii.** Remove cap from inspection riser
- **iii.** Using a flashlight and stadia rod, measure depth of sediment in the Sump and record results in the maintenance log
- **iv.** If sediment is at or above 250mm depth, proceed to Step 2.
  If not, proceed to step 3

Main Header Row

- **i.** Remove cover from manhole at upstream end of Main Header Row
- **ii.** Using a flashlight and stadia rod, measure depth of sediment in the Sump Basin and record results in the maintenance log
- **iii.** If sediment is at- or above 250mm depth, proceed to Step 2.

Be sure to have proper footing when entering into Main Header Row
Follow OSH regulations for confined space entry if entering Main Header Row,
If not entering the Main Header Row, proceed to Step 3

Step 2. Clean out the Sumps with a vacuum truck

i. Remove any secondary filtration media that may be installed in the Sumps
ii. Vacuum Sumps as required

Step 3. Replace all caps, lids, and covers, record observations and actions.

Step 4. Inspect and clean catch basins and manholes upstream of the system

SAMPLE MAINTENANCE LOG

Date	Stadia rod readings		Sediment depth	Observations / Actions	Inspector
	M/H at grade to sump bottom	M/H at grade to sediment top			
4/11/07	2700mm	2600mm	100mm	Very little sediment in sump : No action required	gfb
21/07/08	2700mm	2550mm	150mm	Some debris/sediment is visible in sump assembly but not interfering with outlet	mal
9/04/09	2700mm	2400mm	300mm	Some debris/sediment is visible in sumps - maintenance is due	mal