Atlantis®
Water Management for Life

Atlantis Corporation's Submission to IPART. - 30th September 2005.

"Investigation into Water and Wastewater Service Provision in the Greater Sydney Region – Draft Report".

ATLANTIS PROPOSES SUSTAINABLE SOLUTION

FOR

SYDNEY'S WATER SUPPLY.

"BRING WARRAGAMBA INTO SYDNEY!"

Atlantis Corporation Pty Ltd
ABN 99 003 233 681

3/19-21 Gibbes Street
Chatswood NSW 2067
Australia

Ph +61 2 9417 8344
Fx +61 2 9417 8311

Email info@atlantiscorp.com.au
Web www.atlantiscorp.com.au

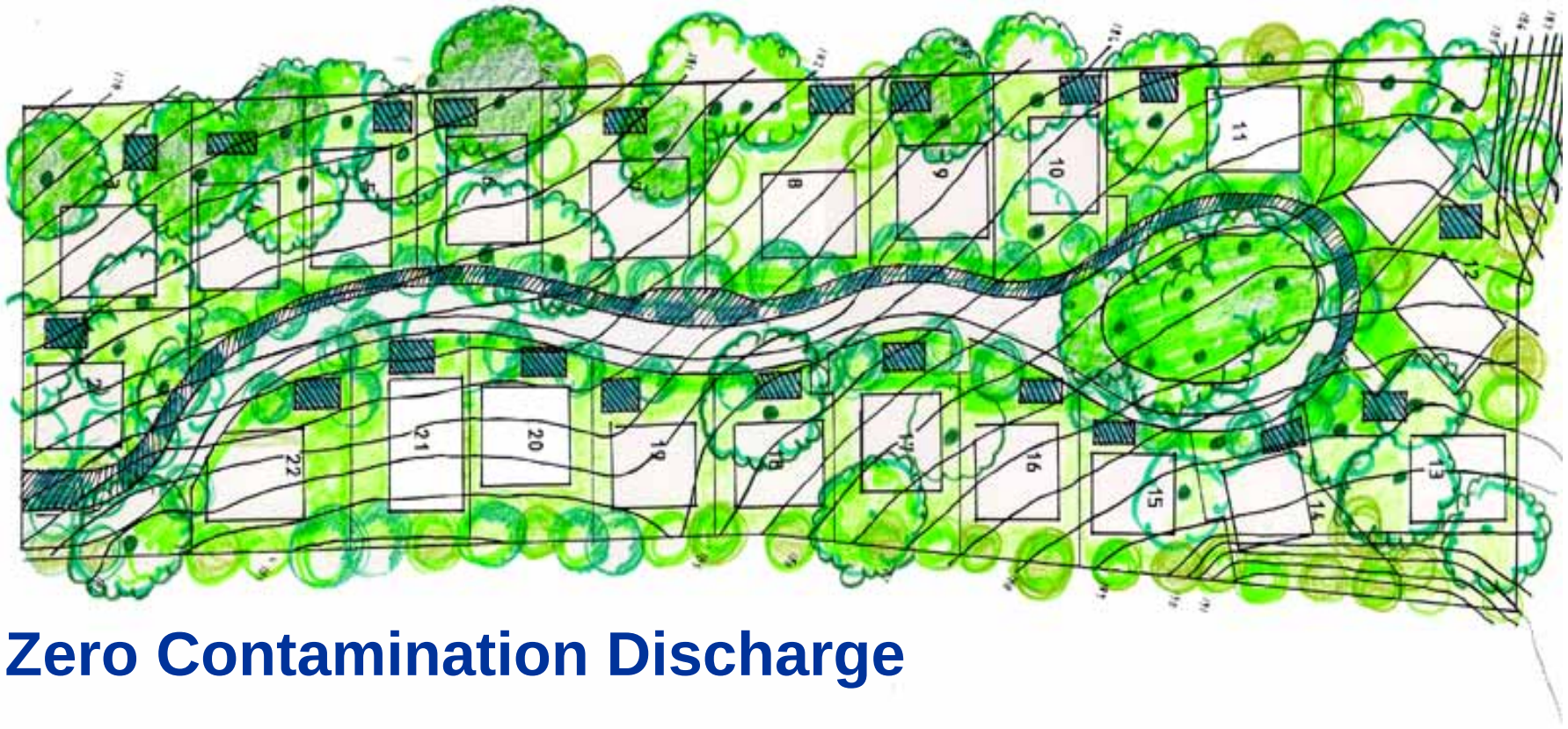
Atlantis Corporation – Proposal to IPART

CONTENTS

Atlantis®
Water Management for Life

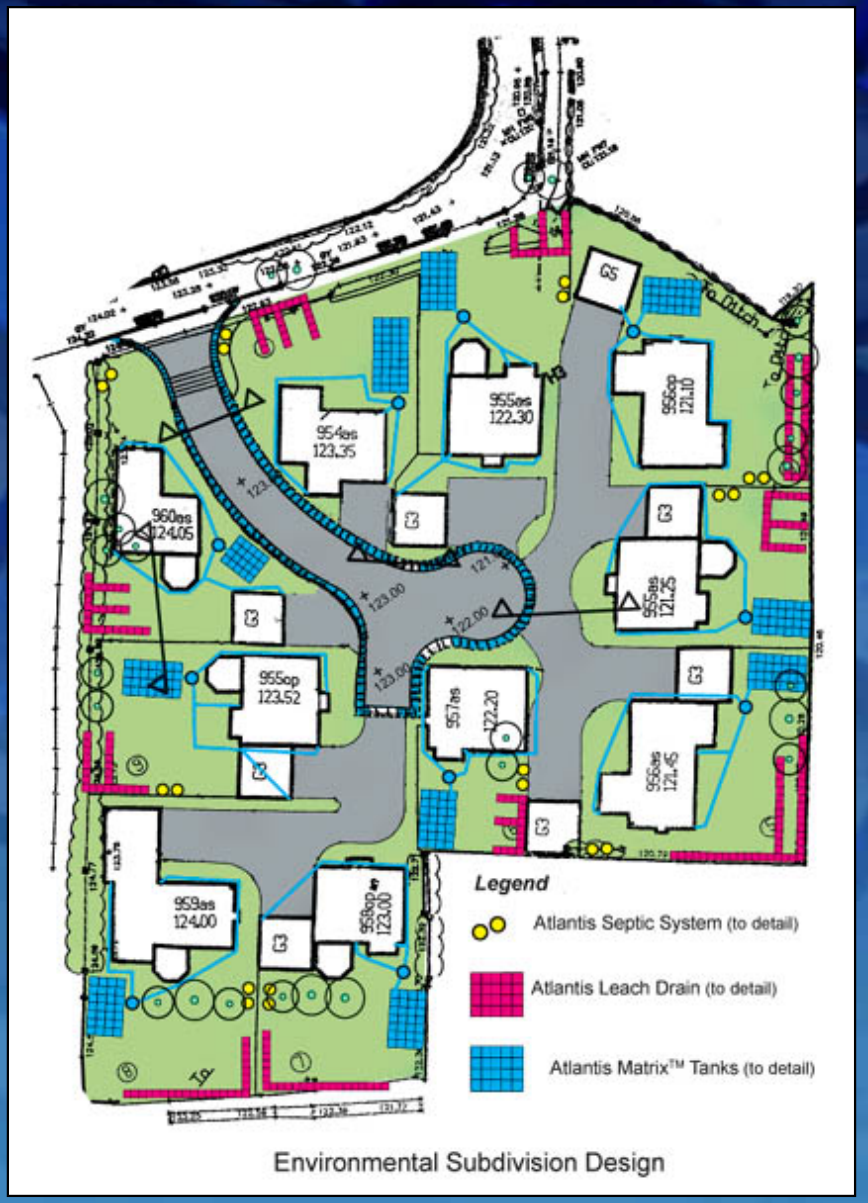
1. The Issue:	"Sydney's current water demand exceeds it's current long term sources of sustainable water supply."
2. Major Objective:	"To obtain more water for the Sydney Metropolitan Area on a sustainable long term basis".
3. ATLANTIS Concept:	"Since it rains considerably more in the Sydney Metropolitan area than in the current dam catchment areas (1006.8mm for Sydney vs 641mm for Warragamba Dam – Sep '04 to Aug '05) ……why not capture and harvest the rainwater efficiently where it falls in Sydney?" "BRING WARRAGAMBA INTO SYDNEY!"
4. ATLANTIS System:	The main components of the Atlantis System include Matrix Rainwater Tanks and 52mm and 30mm Drainage Cells. These products are used to provide numerous flexible solutions for water management. The Atlantis System creates and utilises permeable surfaces which allow water to infiltrate the soil, thereby emulating the natural water cycle. Infiltration has the ability to remove water borne pollutants, purifying the water as it infiltrates into the soil above the Matrix Rainwater Tanks. Water can then be stored and harvested in 8 replenishment cycles to serve the city's needs each year. This water, which is stored below ground level, has been filtered naturally and is of excellent quality.
5. The ATLANTIS Solution:	We propose a point source solution for Sydney - by capturing and harvesting the rainwater in Sydney, which has high rainfall, the pressure on dams will be alleviated in an ecologically sustainable way. The Atlantis System will bypass the existing stormwater system resulting in ZERO CONTAMINATION DISCHARGE

Atlantis Corporation Pty Ltd
ABN 99 003 233 681
3/19-21 Gibbes Street
Chatswood NSW 2067
Australia
Ph +61 2 9417 8344
Fx +61 2 9417 8311
Email info@atlantiscorp.com.au
Web www.atlantiscorp.com.au



Zero Contamination Discharge

Environmental Subdivisions



Environmental Subdivision Design

6. BENEFITS of
The ATLANTIS Solution:

- Environmentally Sustainable
- Highly efficient – all water stored can be used
- Modular System – flexible design to suit needs
- Very little water wasted – no evaporation losses (subsurface storage) and no transport losses (point source capture, harvest and re-use).
- NO ACCESS is required to Sydney Water's Supply Network.
- Negligible operating costs from passive system.
- Negligible energy consumption
- Compliance with existing regulations
- Used extensively in over 32 countries
- Immediate start with quick results
- Water supplied is cost competitive with Sydney Water
- Long term reduction and potential elimination of stormwater pollution on beaches and in waterways.

Atlantis Corporation Pty Ltd
ABN 99 003 233 681
3/19-21 Gibbes Street
Chatswood NSW 2067
Australia
Ph +61 2 9417 8344
Fx +61 2 9417 8311
Email info@atlantiscorp.com.au
Web www.atlantiscorp.com.au

Summary:

- **Reduce or eliminate the environmental impact of storm water runoff without creating other environmental problems.**

DO

- ✓ Store more water in less space
- ✓ Reduce your footprint
- ✓ Improve Water Quality
- ✓ Effectively handle high water tables or shallow hardpans
- ✓ Recharge groundwater
- ✓ Replace curb and gutter drainage systems with natural infiltration

DON'T

- Over-Excavate
- Put additional trucks on the road hauling out spoils or hauling in stone
- Create Avoidable Construction Delays
- Build Breeding Grounds for Insects
- Create Trash Depositories

7. ATLANTIS Approach:

The ATLANTIS System is flexible in design, with 4 major options for water storage in the Sydney Metropolitan Area as follows:

OPTION 1: Roadside Tank Storage

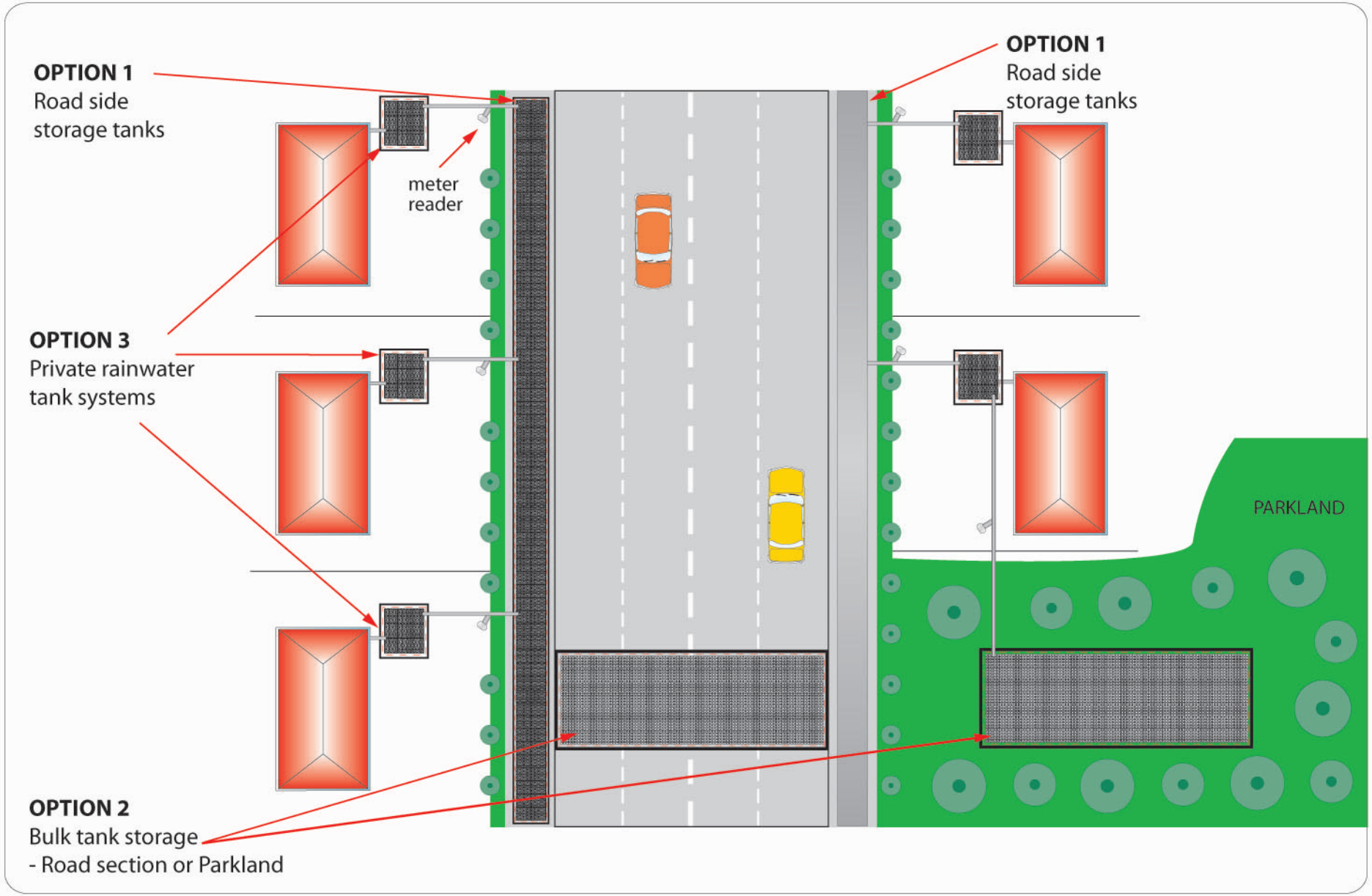
Atlantis Matrix Tanks have been installed in many countries around the world. In the USA, the Atlantis D-Raintank has a certified H20 loading for heavy duty vehicles where numerous installations have been carried out successfully. The matrix tanks have a void ratio in excess of 90%, which means they are extremely efficient storage devices with high compressive and shear strengths to withstand extreme loadings from heavy vehicles.
It is proposed to install the Atlantis Matrix Tank system throughout the Metropolitan Area of Sydney to provide significant storage capacity in the area of high rainfall.
The roadside storage of water can be provided to households on a metred basis, either to fill or topup existing water tanks on private property.
Water quality for roadside storage will be high, due to the washed sand filtration above the tanks, and the fact that water is stored underground and will be kept cool at optimum temperature.
Existing kerb drainage pits could be blocked off to prevent stormwater from flowing into the existing pipe network and contaminating waterways and beaches.

OPTION 2: Bulk Tank Storage (Roads and Parkland)

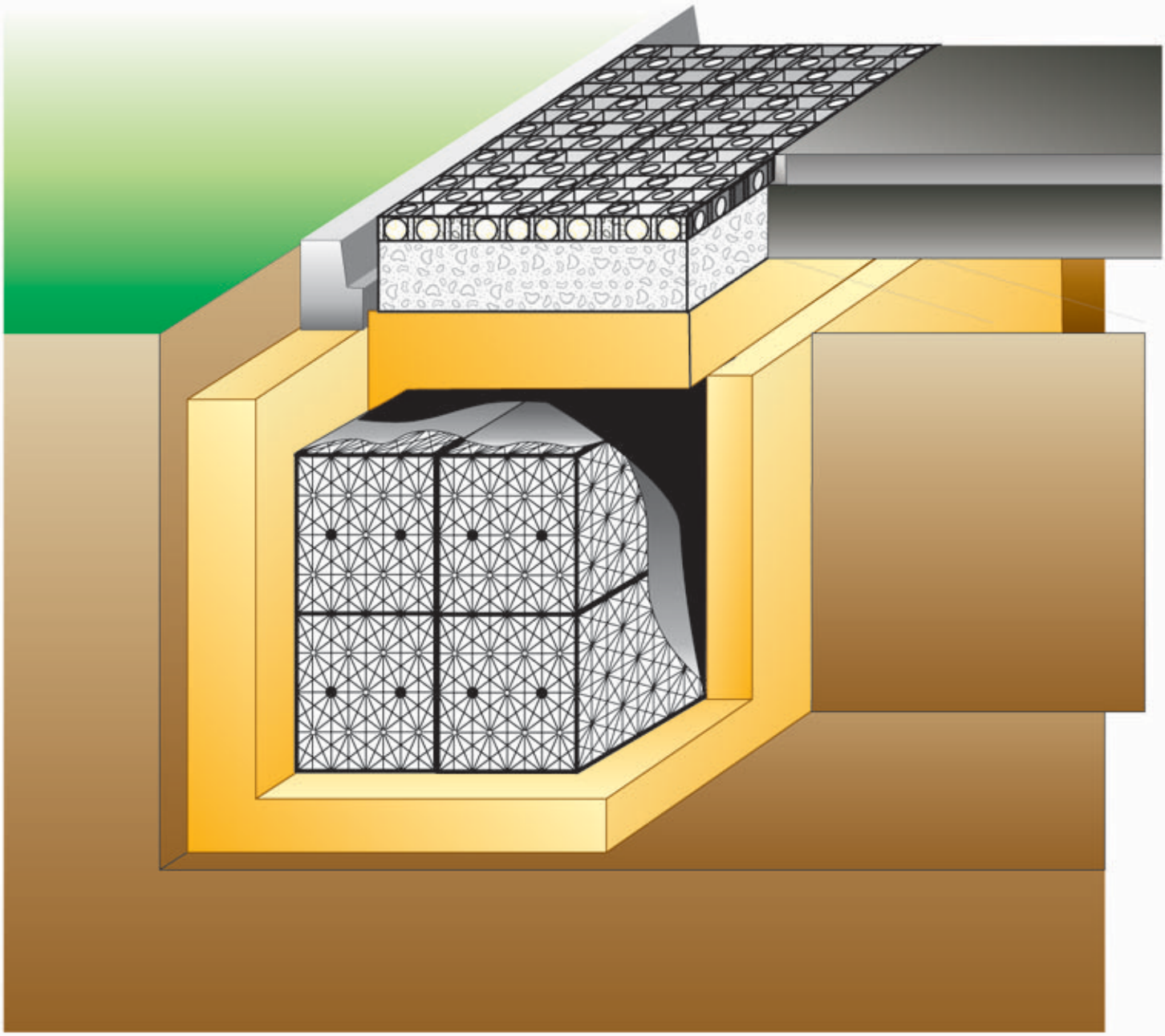
As supplementary water storage to the roadside storage provided in option 1, it is proposed to place bulk storage tanks either under roads or in parklands as additional storage for a given street or sub-division.
Water quality will be high and similar in nature to option 1 above. Bulk storage of water can be used to either fill or topup existing private tank storage, or feed directly into private property on a metered basis.

Atlantis®
Water Management for Life

ECOLOGICALLY SUSTAINABLE WATER SUPPLY FOR HOUSING AND ROADS

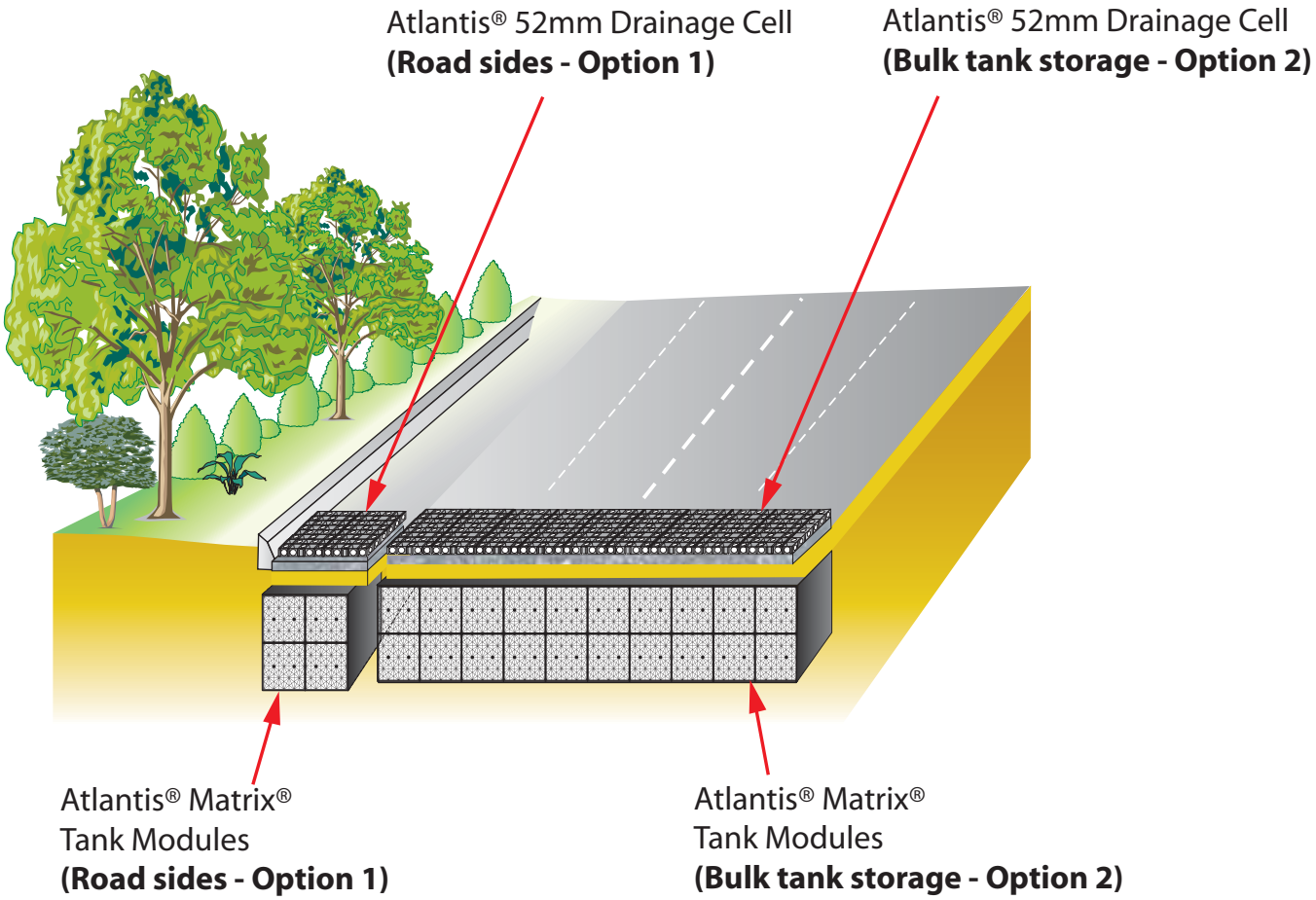


Road side storage tanks *Option 1 - cross section*



Atlantis®
Water Management for Life

Ecologically sustainable water supply for housing and roads
Option 1 & 2



OPTION 3: Private Tank Storage in Households.

All domestic dwellings in Sydney Metropolitan Area should be required to install rainwater tanks for harvesting rainwater on site. This is referred to as option 3 in our proposal diagrams, as it is the opportunity for 1.5 million households to become self-sufficient in their water supply in the long term. Each house should install between 5m3(kilolitres) and 40m3(kilolitres) of tank storage, depending on the local site conditions. The average household in Sydney consumes
290 000litres (290m3) of water per year (approx. 800 litres per day). (Refer Section 5.2 of NSW Govt Metropolitan Water Plan 2004)

Those houses with 40m3 storage would be self-sufficient in their annual water supply with 8 cycles of rainwater replenishments, equivalent to 320 000 litres per annum. This could be achievable from Sydney's annual rainfall of 1006mm (Sep '04 to Aug '05)
Those houses with less than 40m3 tank storage would receive regular replenishments from the metered roadside tank storage, or bulk storage supplies shown in option 2 above.

Certain Government incentives are already in place. However, improved incentives need to be provided to ensure a higher participation of existing households by retrofitting tank storage.

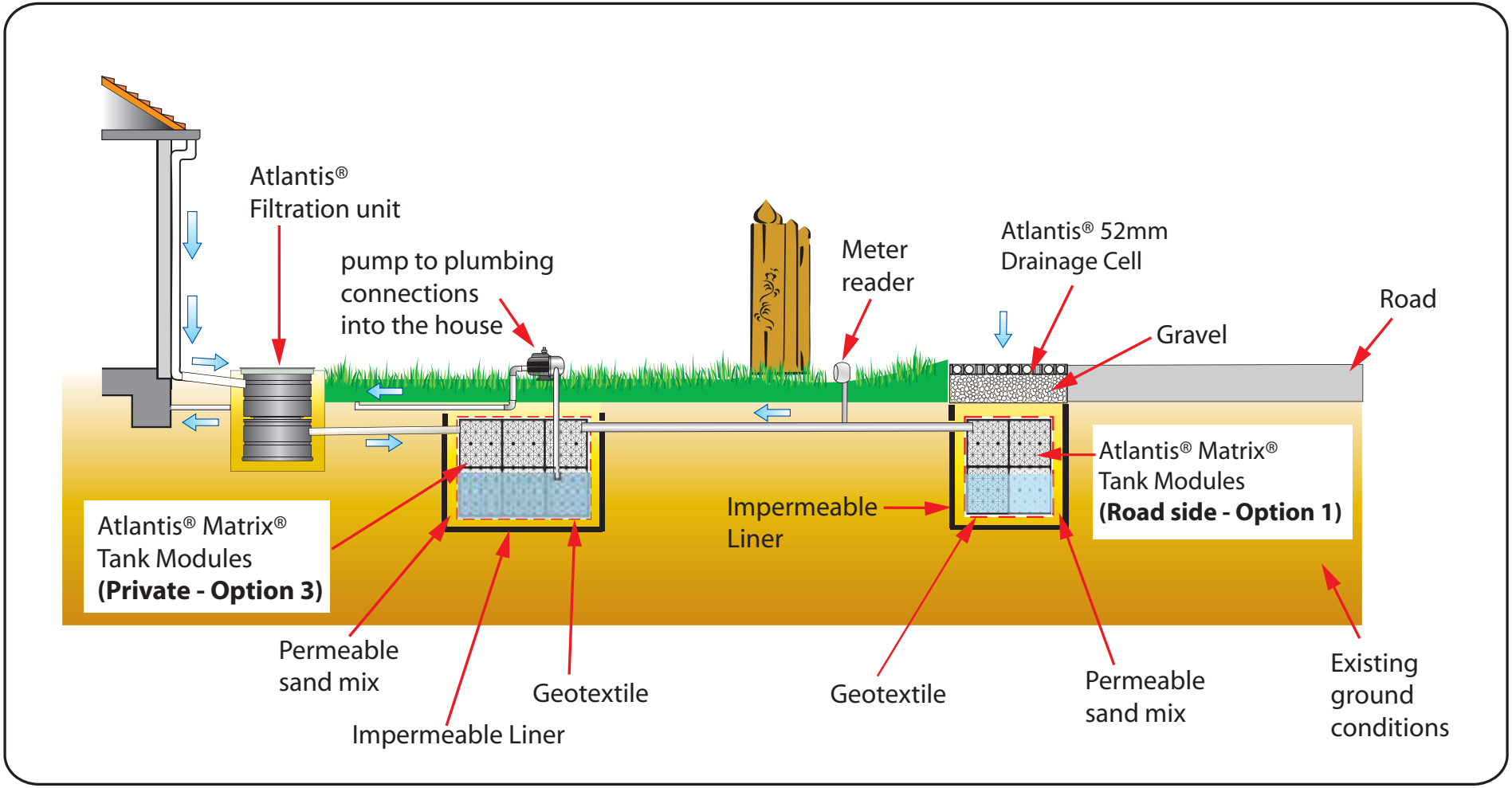
OPTION 4: Stormwater Channels - Tank Storage.

Sydney Water provides stormwater drainage facilities to approximately 450 000 homes and businesses. It operates
436 kms of stormwater channels, mostly in the south and south-western suburbs of Sydney. These channels capture excess runoff from the existing stormwater drainage system, and result in highly polluted systems which carry significant volumes of water during heavy rains.
The Atlantis tank storage system has been used successfully for stormwater channels in countries like Malaysia and Spain. Purified water flows in these channels, which have been filled in to provide a useful, improved public amenity. The 436 kms of channels in Sydney would be ideal for similar treatment, including water storage and harvesting, with improved amenity.

Atlantis®
Water Management for Life

Ecologically sustainable water supply for housing and roads

Option 1 & 3



8. Costing of the Atlantis System:

The major cost component of the Atlantis System is the initial capital cost of installation. The operating costs are negligible, and require approximately 10 mins of privately operated pumps per day to replenish house water tanks.

This capital cost can be shared both by public and private sector funding, Public funding would be used for roadside tank storage (option 1) , bulk storage in roads and parklands (option 2) and channel storage (option 4). Private funding would be used for house tank storage (Option 3) and possibly for bulk storage in community parklands (Option 2).

If lifecycle costing of 25 years is adopted, as used in the IPART report introduction where "…….In October 2004, the NSW Government released its Metropolitan Water Plan for Sydney which sets out actions required over the next 25 years to ensure sustainable water supplies for Sydney"….. , then the Atlantis
System can deliver rainwater to Sydney residents "at prices competitive to Sydney Water".

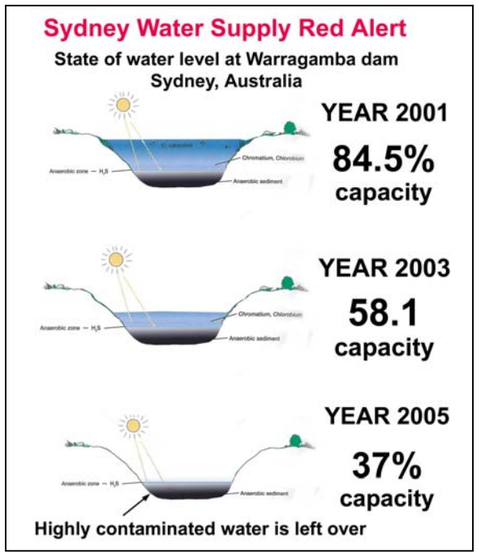
A big advantage in using the ATLANTIS System is that NO ACCESS TO SYDNEY WATER'S EXISTING WATER SUPPLY NETWORK IS REQUIRED!!

Being a "POINT SOURCE" solution, Atlantis delivers water to residents where it falls.

Other competitive water supply systems RELY ON THE USE OF SYDNEY WATER'S SUPPLY NETWORK!!

Atlantis Corporation Pty Ltd
ABN 99 003 233 681
3/19-21 Gibbes Street
Chatswood NSW 2067
Australia
Ph +61 2 9417 8344
Fx +61 2 9417 8311
Email info@atlantiscorp.com.au
Web www.atlantiscorp.com.au

9. COMPARISON OF SYDNEY'S SOURCES OF WATER SUPPLY

Criteria	(i) Sydney's Dams		(ii) Atlantis System		(iii) Desalination	
	Warragamba Dam = 80% of Sydney water supply 		 ATLANTIS Ecologically Sustainable House and Roads		Typical discharge from Kuwait Desalination Plant 	
	Existing System		**Proposed Point Source Solution**		**Proposed Emergency Plant**	
1. Sustainability	*Not sustainable in long term without other source of supply. *Dam levels falling *Less rain in catchment areas *Increasing demand from rising population	X X X X	*Long Term sustainability with point source solution *More rain in Sydney Metro area *Restores ecological cycle	✓ ✓ ✓	*Environmentally Not sustainable in both short and long term	X
2. Design Flexibility	*Highly Inflexible *No more dams to be built *Existing dams and network to remain.	X X	*Highly Flexible Design *Modular System can be installed in areas of highest rainfall *Most efficient design outcomes with Atlantis System	✓ ✓ ✓	*Highly Inflexible Design *Once committed to site and area, very expensive to change	X X
3. Centralized or Decentralized Operation	*Centralized - Dams and reservoirs into pipe network	X	*Decentralized - Point source solution with capture, harvest and use on site.	✓	*Centralized - Desalination Plant to supply existing Sydney Water Network	X
4. Water Storage Efficiency	*Moderately efficient *Large evaporation losses *Large losses through pipe network – laminar flow and pipe leakages.	✓ X X	*Highly efficient *Point source storage of all water where it falls *No transport or evaporation losses as storage is below ground level and no pipe network required.	✓ ✓ ✓	*Very Inefficient *Only 50% operating efficiency *Large evaporation losses *Large pipe network losses.	X X X X
5. Availability of "Feedstock" water	*Poor availability *Relies on dam catchment rainfall which is 40% lower than Sydney Metro rainfall *Current water demand exceeds ongoing supply.	X X X	*Moderate availability *Relies on Sydney Metro Catchment rainfall, which has averaged 1200mm p.a. over 100 years. *Most recent rainfall was 1006mm (12mths to August 2005)	✓ ✓ ✓	*High availability of seawater "Feedstock".	✓

Criteria	(i) Sydney's Dams		(ii) Atlantis System		(iii) Desalination	
	Existing System		**Proposed Point Source Solution**		**Proposed Emergency Plant**	
6. Energy	*Moderate *Requires pumping through network with intermediate storage	✓ X	*Negligible *Private pumps operate when required to top-up storage tanks *Estimated 10mins operating time for pump each time it operates.	✓ ✓ ✓	*Extremely High *Reverse Osmosis Plant requires high energy for membrane technology to operate satisfactorily. *Pumping of water to catchment is additional to pumping in existing network	X X X
7. Water Quality	*Moderate water quality *Relies on heavy chemical dosing for optimum results	✓ X	*Good water quality *Natural rainwater is sand filtered on site ready for use.	✓ ✓	*Poor water quality *50% seawater is returned to ocean as Brine with very high saline content *Water taste will differ to rainwater	X X X
8. Access to Sydney Water Pipe Network	*Has current access	✓	*No access required *Point source solution treats water where it falls	✓ ✓	*New pipe system required to pump water to catchments for storage - very expensive *Access fee to be paid to Sydney Water of approximately $1-00 per kilolitre	X X
9. Maintenance Costs	*Maintain pipe network fixing leaks *Maintain existing reservoirs & Dams *Moderate costs	X X X	*Negligible costs *Atlantis is a passive system - only private pumps require periodic maintenance	✓ ✓	*High costs *Replace reverse osmosis membranes *Pipe, reservoir & dam network maintained	X X X
10. Installation Period	*Existing Network	✓	*Incremental Installation with ongoing commissioning of additional tank storage capacity.	✓	*Minimum of 26 months prior to earliest water available *Long lead times.	X X
11. Operating Costs	*Sydney Water operating costs estimated at $1-51 per kilolitre	X	*Negligible operating costs	✓	*Desalination operating costs estimated at $1-44 per kilolitre	X
12. Capital Costs	*Sydney Water's existing pipe and reservoir network	✓	*Atlantis capital costs of tank storage and local pipes for domestic supply *Atlantis costs competitive with Sydney Water over 25 year product life cycle.	X ✓	*Desalination capital costs of approximately $2 billion for initial plant.	X

WASTE WATER

CONTAMINATION OF OCEAN	*No contamination from dam water supply. *Very high contamination from discharge of wastewater into the ocean creating acidic environment	X	*No contamination from rainwater on site. *Ability to treat wastewater on site with ZERO CONTAMINATION DISCHARGE	✓	*Extremely High contamination of Ocean from BRINE discharge, which has high saline solution and has a detrimental effect on sea ecosystem.	X

10. Staging of the Construction: (Refer attached bar-chart)

Stage 1: Approximately 2.5 years
Commencement beginning 2006. Completion early 2008.
Provision of storage capacity to supply 100ML/day – assuming 8 replenishment cycles in the Sydney Metropolitan catchment area per year.

Stage 2: Approximately 3.5 years
Commencement early 2008. Completion late 2011.
Provision of additional storage capacity to supply extra 400ML/day – assuming 8 replenishment cycles in Sydney catchment per year.

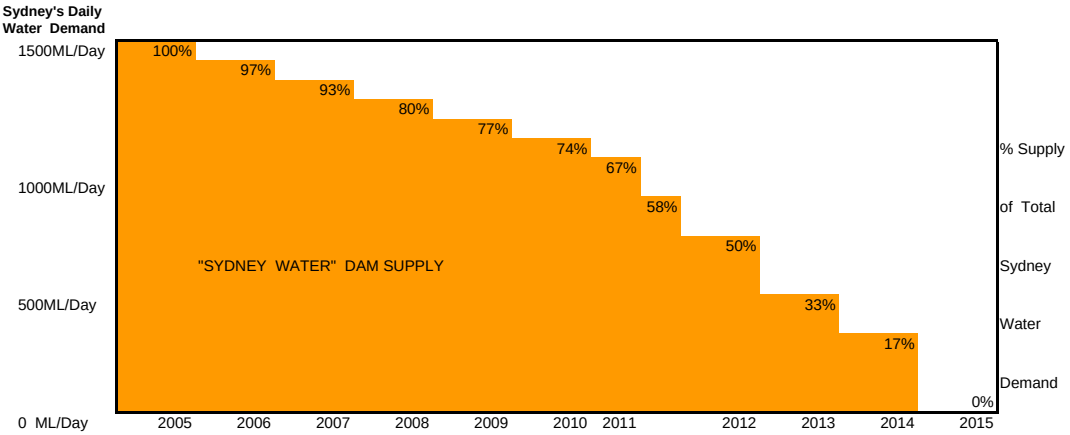
Stage 3: Approximately 4.5 years
Commencement late 2011. Completion end of 2015.
Fast track the provision of additional storage capacity to supply extra 1000ML/day, thus make Sydney self sufficient in water supply. Assume 8 replenishment cycles in Sydney catchment per year.

TOTAL AVAILABLE SUPPLY at the end of 10 year period
= 1500ML/day (current demand for Sydney).

Major Advantages of Staging of Construction:

a) Allows targeting of highest rainfall areas for initial contract with most efficient results in shortest period.
b) Allows supplementary water supply for Sydney's water requirements at an early stage, with ongoing incremental capacity being made available as contract proceeds.
c) Provision of alternative infrastructure to Sydney Water's pipe network can eventually take over full water supply to Sydney on sustainable basis.
d) Warragamba Dam and other competitive suppliers can be used for emergency top-up requirements prior to completion of Atlantis infrastructure in 2015.

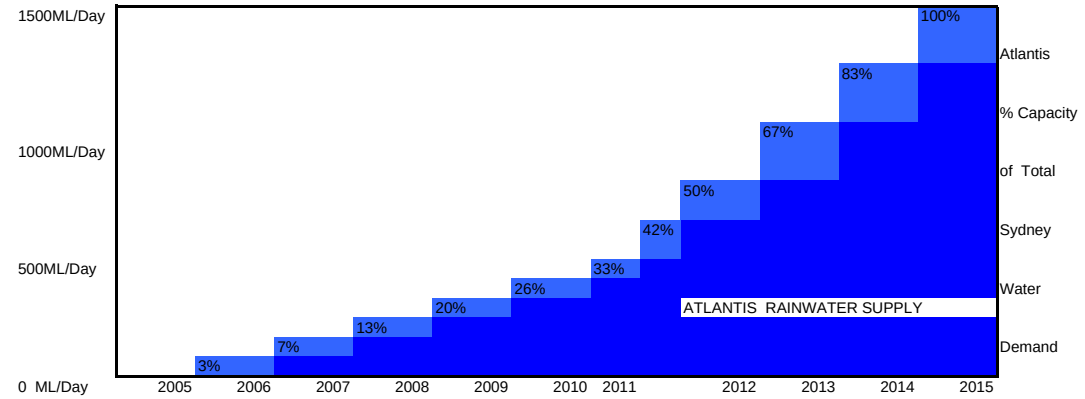
Reducing Dependence on Sydney's Dams.



a)Decreasing dependence on Sydney Water's Dam Capacity to supply SYDNEY Metropolitan Area.
b)In 2008, Sydney's Dams only supply 80% of Sydney's Demand.
c)By 2015, Sydney's Dams phased out as supply, and only used for emergency use.

"Bring Warragamba into SYDNEY".

The Staging of Atlantis Systems to Supply Sydney with Water.

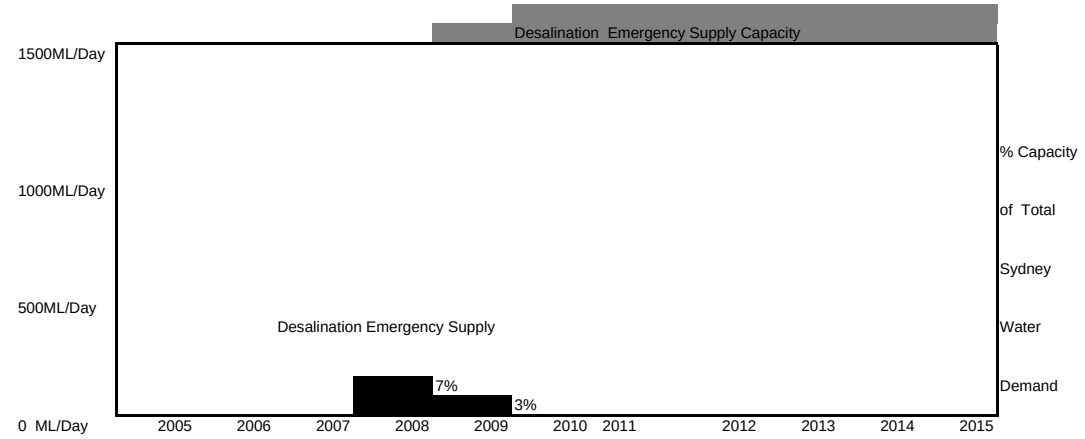


a)Annual supply provided by Atlantis Tank Storage - Initially 3% of Demand in year 1. (assumed 2006)
b)In year 2 (assumed 2007), additional 4% of Demand available from Atlantis Tank Storage.

a)Total Atlantis Storage Tank Capacity - 7% (100ML/Day) by end of year 2 (assumed 2007).
b)Total Atlantis Storage Tank Capacity - 33% (500ML/Day) by middle of year 6 (assumed 2011).
c)Total Atlantis Storage Tank Capacity - 100% (1500ML/Day) after 10 years (assumed 2015).

"Bring Warragamba into SYDNEY".

Desalination Emergency Supply

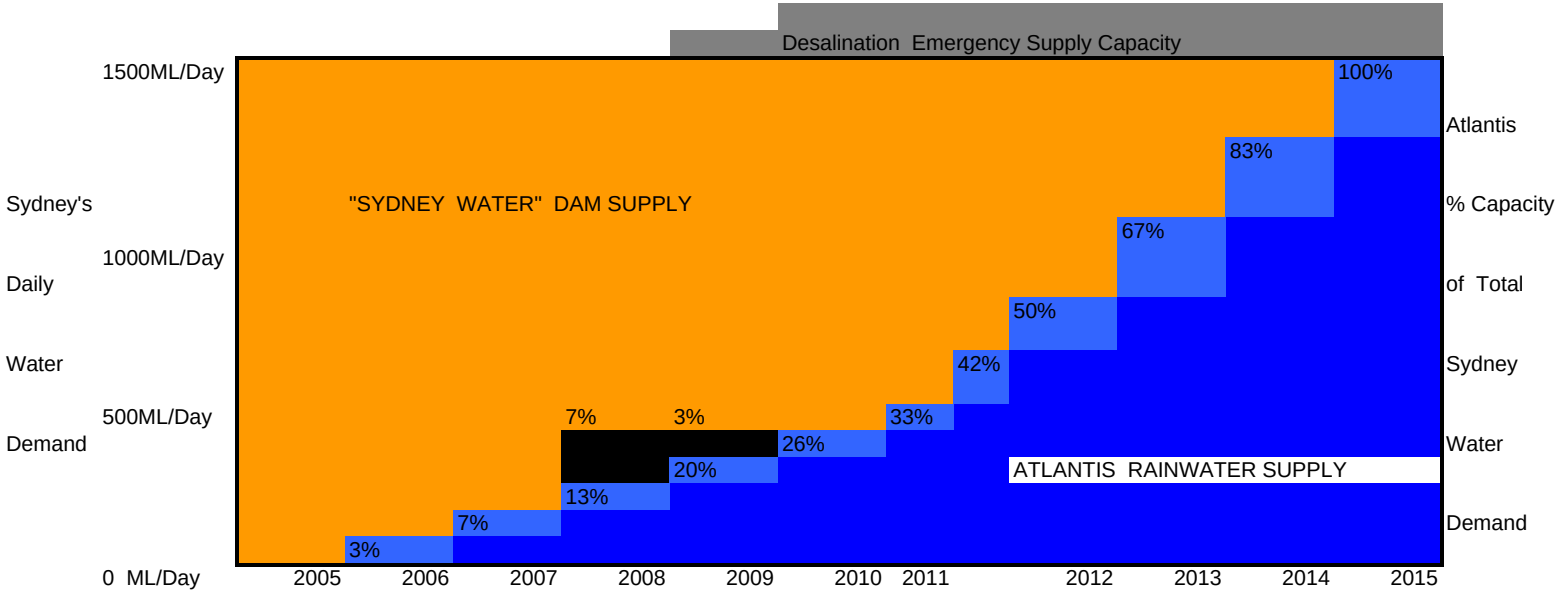


a)Desalination Emergency Supply - 7% (100ML/Day) during year 3 (assumed 2008)
b)Desalination Emergency Supply - 3% (40ML/Day) during year 4 (assumed 2009)

a)Total Desalination Emergency Supply - 7% (100ML/Day) from year 3 as required.

"Bring Warragamba into SYDNEY".

The Staging of Atlantis Systems to Supply Sydney with Water.



a)Decreasing dependence on Sydney Water's Dam Capacity to supply SYDNEY Metropolitan Area.
b)In 2008, Sydney's Dams only supply 80% of Sydney's D
c)By 2015, Sydney's Dams phased out as supply, and only used for emergency use.

a)Annual supply provided by Atlantis Tank Storage - Initially 3% of Demand in year 1. (assumed 2006)
b)In year 2 (assumed 2007), additional 4% of Demand available from Atlantis Tank Storage.

a)Total Atlantis Storage Tank Capacity - 7% (100ML/Day) by end of year 2 (assumed 2007).
b)Total Atlantis Storage Tank Capacity - 33% (500ML/Day) by middle of year 6 (assumed 2011).
c)Total Atlantis Storage Tank Capacity - 100% (1500ML/Day) after 10 years (assumed 2015).

a)Desalination Emergency Supply - 7% (100ML/Day) during year 3 (assumed 2008)
b)Desalination Emergency Supply - 3% (40ML/Day) during year 4 (assumed 2009)

a)Total Desalination Emergency Supply - 7% (100ML/Day) from year 3 as required.

11. Track Record of Atlantis Systems:

11.1 Roadside Tank Storage (Option 1)

Ecological Roads
- Cost Benefits
- Replace pond storage with road storage
- Curb & Gutter….Gravel Cell in Spain
- Gravel Cell Road….UK

Lake Macquarie Roadside Tank Storage
- Pipe Bypass
- Cross Section of Pipe Bypass

Concord Council Roadside Tank Storage
- Curb Gully Channel…..Atlantis Turf Cell
- Excellent Water Quality….Test Results

11.2 Bulk Tank Storage (Option 2)

- Villa Riva Condominiums….Jacksonville, Florida
- Atlantis Infiltration Tank…..UK
- Wendy's Restaurant……Morgantown, West Virginia

11.3 Private Tank Storage (Option 3)

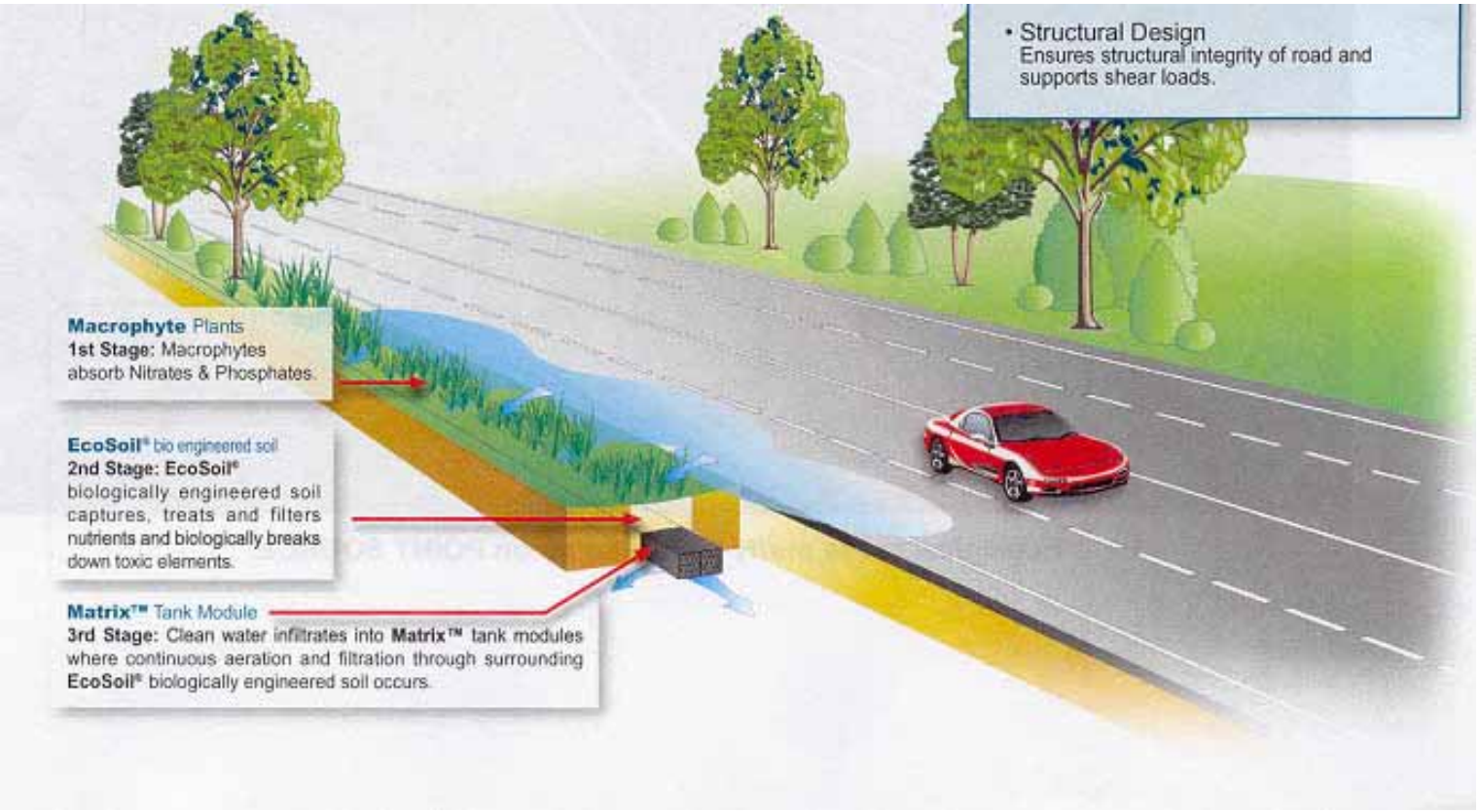
- Warriewood Tank Installation…..Sydney
- Water Storage and Recycling…..Sydney

11.4 Stormwater Channels (Option 4)

- Road Channel……Spain
- Ecological Road Safety …..Spain
- Virginia Department of Transport (VDOT)…..USA
  - Water run-off problem
  - Atlantis tanks installed in swale
  - Swale performed efficiently, withstood hurricane.

Ecological Roads

Benefits: COST!



Benefits...

Road Safety

- Saves Lives
  Dangerous open water channels are eliminated.

Environment

- Flood Reduction
  Stormwater runoff is immediatley infiltrated into the ground reducing the burden on existing infrastructure and urban flooding.
- Reduced Erosion
  Reduces erosion by infiltrating water at the source.
- Water Re-use/Harvesting
  Water is purified, stored and recycled on site.
- Improve Urban Health Conditions
  The Atlantis® system is located underground, eliminating stagnant ponds that host mosquitoes infestations and open drains that house vermin and vectors. All gross pollutants are kept out of the system, dissolved pollutants are treated within the system resulting in clean healthy water released into the environment.

Economical

- Increase Land Use
  The Atlantis® system is sub surface providing more land space for recreational areas.
- Save Time & Labour
  The Atlantis® system is cheaper and faster to install than traditional concrete based methods.
- Maintenance Free Channel
  All gross pollutants and sediment are prefiltered ensuring that Atlantis® channels are maintenance free.
- Increases Road Lifetime
  Effectively relieves hydrostatic pressure preventing potholes and maintaining optimum road conditions.

Engineering

- High Compressive Strength
  Supports heavy loads up to 148.58t/m².

What Can You Replace?

- ***Curb & Gutter?***
- ***Piping?***
- ***Drop Inlets?***
- ***Ponds?***

Ecological Roads

Replace Pond Storage with Storage Along Road

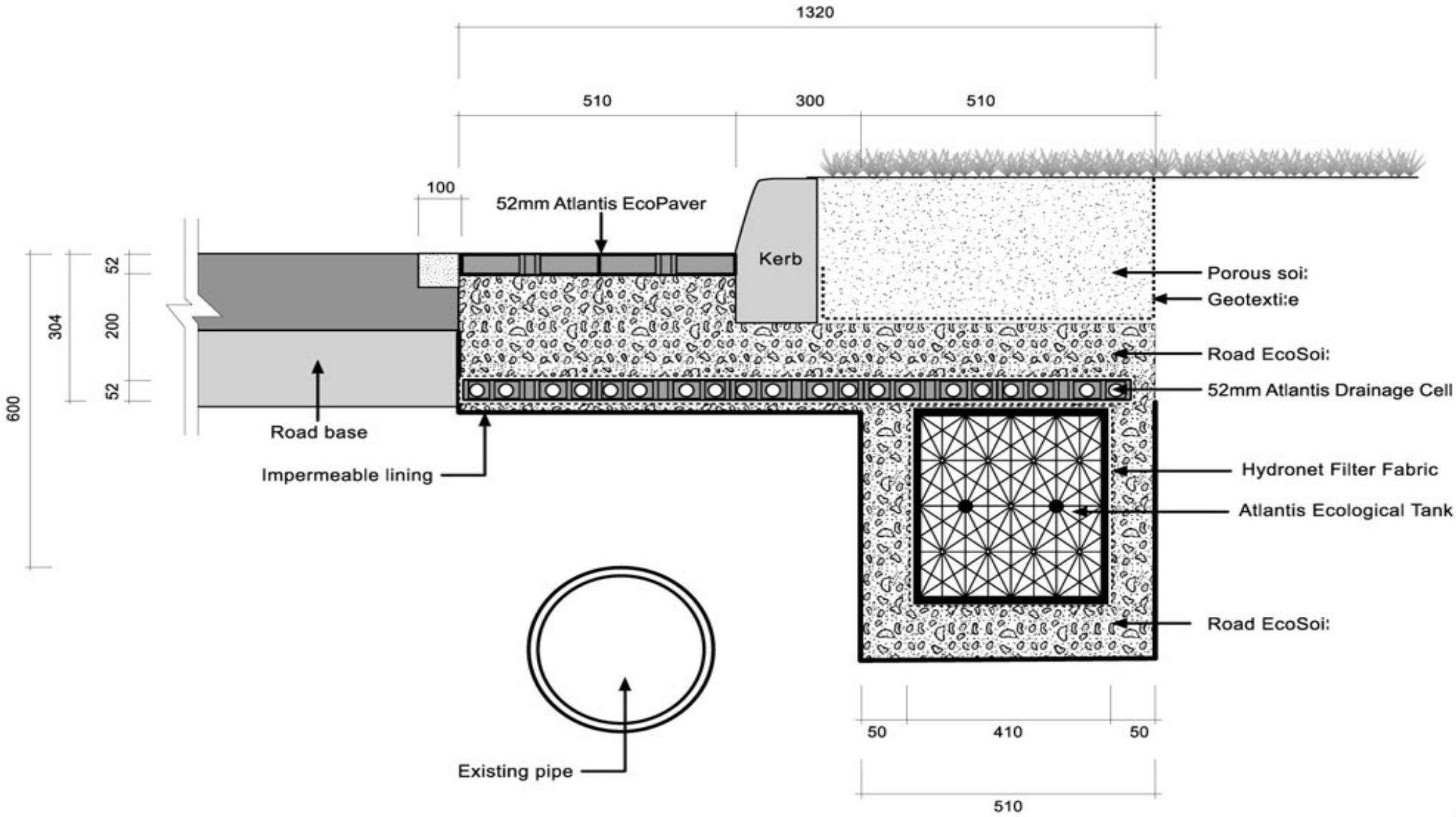
Ecological Roads

With Curb & Gutter… GRAVEL

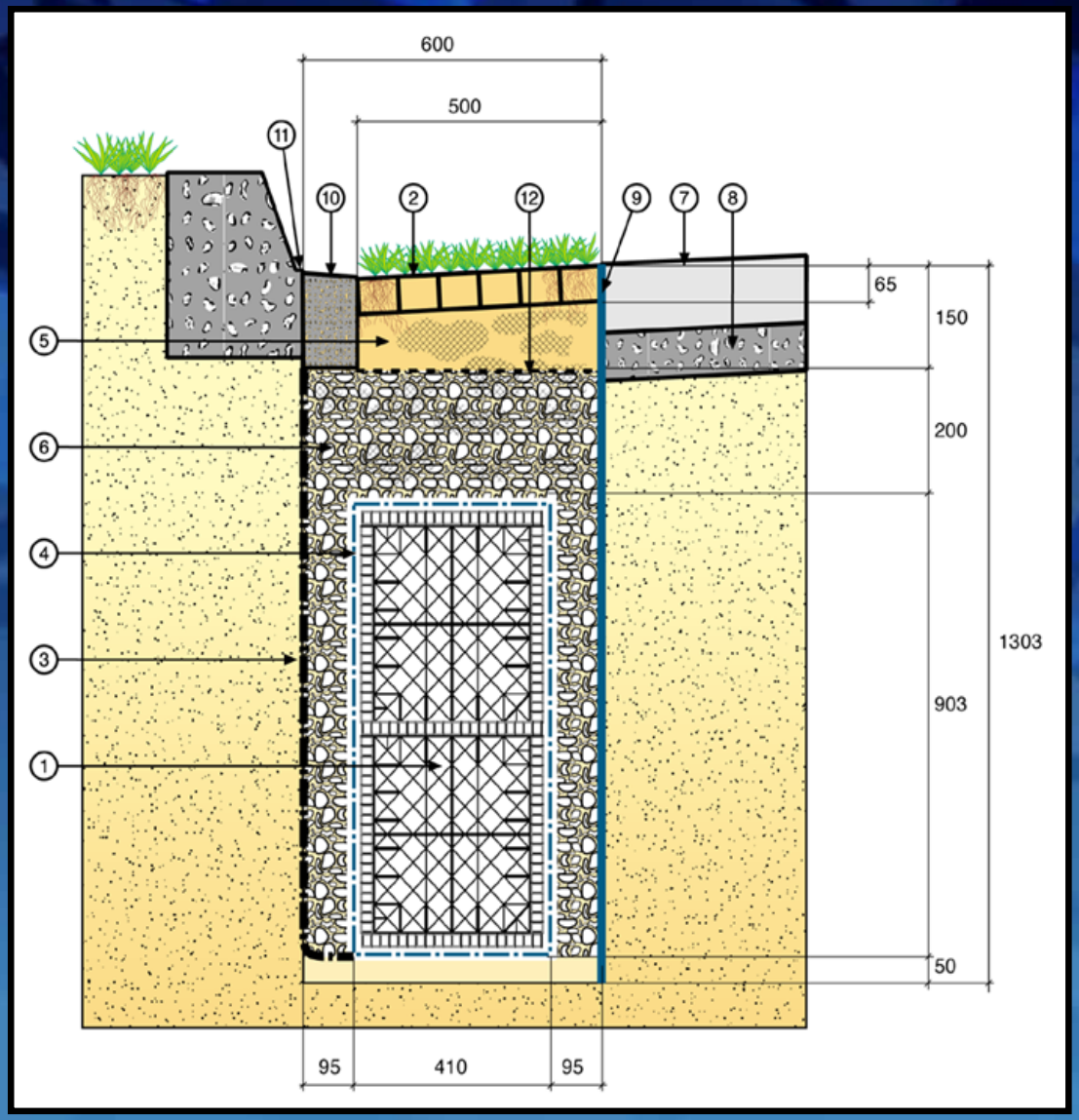
Gravel Cell™ Road - UK

Lake Macquarie Cross Section

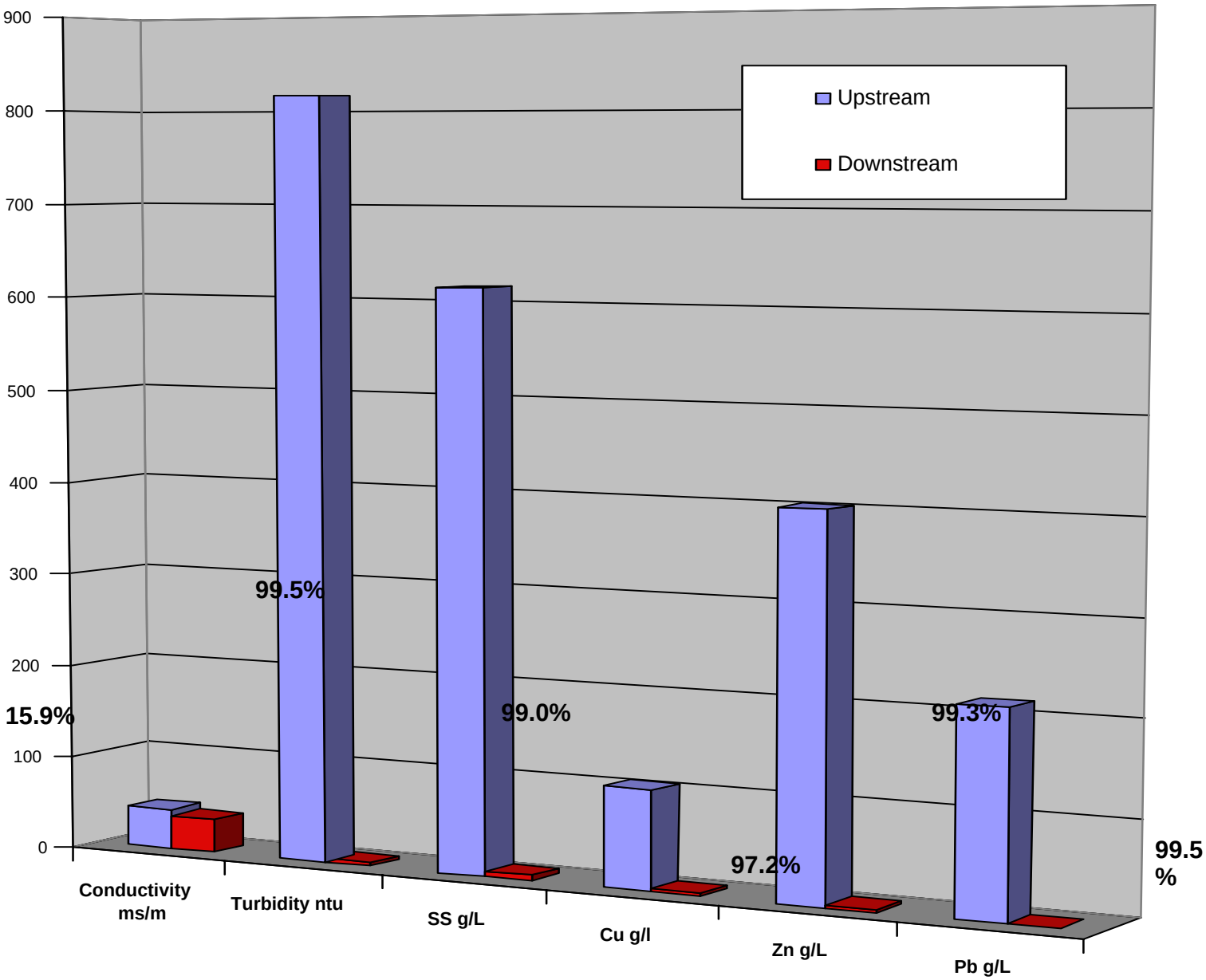
Typical Section



Curb Gully Channel



Graph 1b: Concord Water Quality



Atlantis Infiltration Tank - UK

Installation of 1500m³ (52.971 CU FT) tank.

Wendy's Restaurant

Morgantown, WV

Assembled Atlantis Tank System

Road Channel - Spain

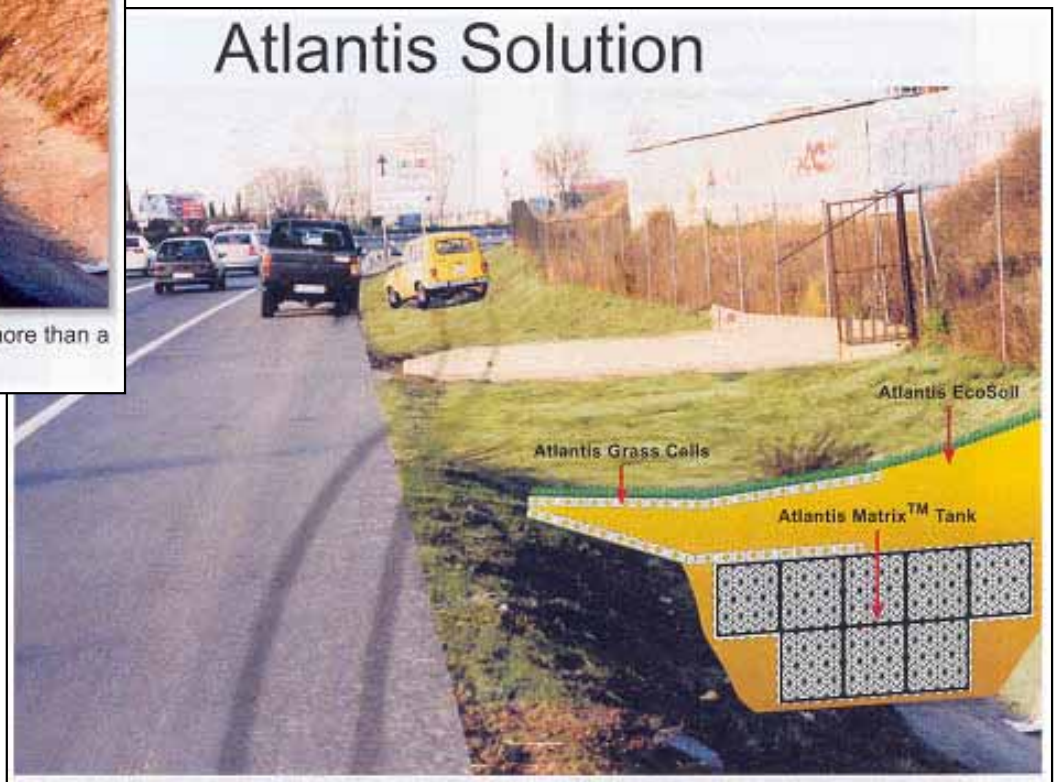
Installation of 1.5 kilometer (4,921 l/FT) of **Atlantis® D-Raintank™** infiltration road channel.

Problem (Murderous road)

Spain

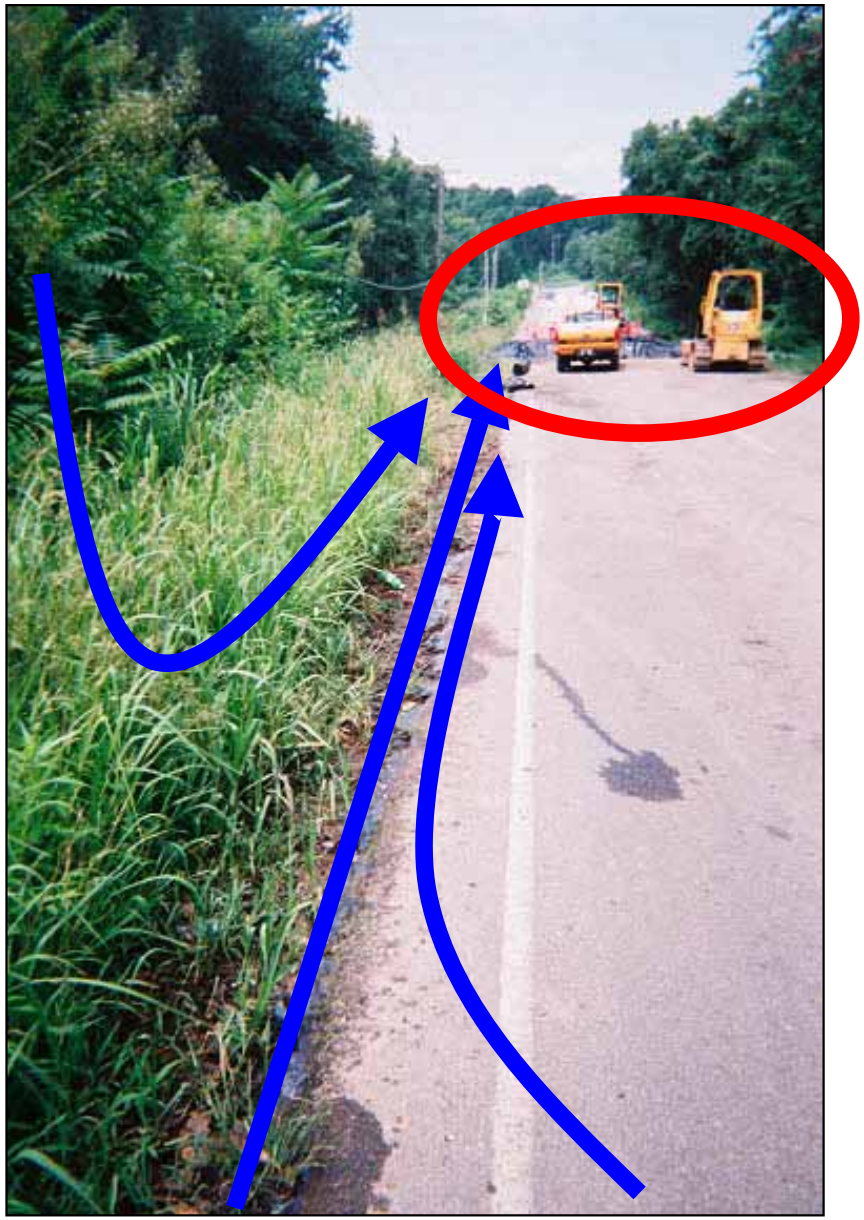
Existing road drainage are environmentally detrimental and dangerous, more than a thousand people die every year in Spain alone.

Atlantis Solution



Atlantis solution solves three major problems, first of all safety, second environmental, eliminating water contamination, promoting recycling and finally aesthetically.

VDOT Test Project:
Route 10 Hopewell, VA



Water running off the road and down an embankment flows downhill and across road, leading to Major Road Repair.

Backfilled with Sand, and day-lighted RainTanks with twin 8” pipes.

VDOT Test Project:
Route 10 Hopewell, VA

Hurricane Gaston Dropped 14” of Rain in Less than 24 Hours on this site within weeks of installation. The swale worked perfectly and suffered almost no damage.