

Appendix 1. Summary of chemical testing

Parameter	Crushed glass samples				DECC Waste Guidelines – upper limits for inert waste classification (Table A4) Total concentration SCC1 (mg/kg) Leachable concentration TCLP1 (mg/L)
	-4mm un-washed	-4mm +2mm	-1mm +0.4mm	-2mm +1mm	
Aluminium (acid extractable) (mg/kg)	140	92	200	170	
Aluminium (water leachate) (mg/L)	5.1	3.8	6.4	4.1	
Antimony (acid extractable) (mg/kg)	<3.0	<3.0	<3.0	<3.0	
Antimony (water leachate) (mg/L)	0.016	<0.01	0.011	<0.010	
Barium (acid extractable) (mg/kg)	<13	<13	<13	<13	
Barium (water leachate) (mg/L)	0.12	0.049	0.13	0.067	
Chromium (acid extractable) (mg/kg)	1.2	<1	1.3	<1	Total concentration: 1900
Chromium (water leachate) (mg/L)	0.048	0.034	0.035	0.023	
Copper (acid extractable) (mg/kg)	43	<1.0	35	4.1	
Copper (water leachate) (mg/L)	0.43	0.082	0.41	0.22	
Iron (acid extractable) (mg/kg)	160	70	390	420	
Iron (water leachate) (mg/kg)	6.3	4.6	9.3	5.2	
Lead (acid extractable) (mg/kg)	14	<2	32	52	Total concentration: 1500
Lead (water leachate) (mg/L)	0.44	0.16	0.54	0.32	TCLP1: 0.5
Magnesium (acid extractable) (mg/kg)	43	53	63	50	
Manganese (acid extractable) (mg/kg)	12	<2.0	20	5.4	
Manganese (water leachate) (mg/L)	0.96	0.11	0.56	0.29	
Nickel (acid extractable) (mg/kg)	4.3	<3	<3	<3	Total concentration: 1050
Nickel (water leachate) (mg/L)	0.057	<0.02	0.040	0.026	TCLP1: 0.2
Silicon (acid extractable) (mg/kg)	160	190	170	220	
Silicon (water leachate) (mg/L)	32	27	29	23	
Strontium (acid extractable) (mg/kg)	<15	<15	<15	<15	
Strontium (water leachate) (mg/L)	0.081	0.047	0.11	0.067	
Tin (acid extractable) (mg/kg)	5.0	<3.0	4.3	<3.0	
Tin (water leachate) (mg/L)	0.19	0.089	0.072	0.052	
Titanium (acid extractable) (mg/kg)	7.8	2.6	9.5	7.1	
Titanium (water leachate) (mg/L)	0.10	0.10	0.11	0.094	
Vanadium (acid extractable) (mg/kg)	<1.0	<1.0	<1.0	2.2	

	NEPM Soil Investigation Levels — Health Investigation Levels (HILs) and Ecological Investigation Levels (EILs)	NEPM Groundwater Investigation Levels — Aquatic Ecosystems	NEPM Groundwater Investigation Levels — Drinking Water and Agricultural	ANZECC 2000 trigger values for freshwater (95% protection)
		0.005 if pH < 6.5 0.1 if pH > 6.5	0.2 – 5.0	0.055 if pH>6.5
		0.03 (fresh waters)	0.003	
	EIL: 300			
			0.7	
	HILs: 100-500			
	HILs: 1000-5000 EIL: 100			
		0.002-0.005	0.2-2.0	0.014
		1 (fresh waters)	0.3-1.0	
	HILs: 300-1500 EIL: 600			
		0.001-0.005	0.01-0.2	0.034
	HILs: 1500-7500 EIL: 500			
			0.1-2.0	1.9
	HILs: 600-3000 EIL: 60			
		0.015-0.150	0.02-1.0	0.011
	EIL: 50			

Parameter	Crushed glass samples				DECC Waste Guidelines – upper limits for inert waste classification (Table A4) Total concentration SCC1 (mg/kg) Leachable concentration TCLP1 (mg/L)
	-4mm un-washed	-4mm +2mm	-1mm +0.4mm	-2mm +1mm	
Vanadium (water leachate) (mg/L)	0.012	<0.01	0.019	0.011	
Zinc (acid extractable) (mg/kg)	140	<2.0	53	33	
Zinc (water leachate) (mg/L)	1.6	0.21	1.3	0.58	
Ammonia (water leachate) (mg/L)	0.40	0.070	0.31	0.21	
Boron (acid extractable) (mg/kg)	<11	<11	<11	<11	
Boron (water leachate) (mg/L)	0.12	<0.03	0.069	0.037	
Calcium (acid extractable) (mg/kg)	500	360	860	630	
NOx – N (water leachate) (mg/L)	0.14	0.060	1.2	0.77	
TKN (water leachate) (mg/L)	11	1.6	14	7.3	
Phosphorus (acid extractable) (mg/kg)	18	<4.0	52	20	
Phosphorus (water leachate) (mg/L)	1.5	0.42	2.5	1.3	
Free reactive phosphorus (water leachate) (mg/L)	0.48	0.11	0.71	0.42	
Nitrite – N (water leachate) (mg/L)	0.05	0.02	0.05	0.03	
Nitrate – N (water leachate) (mg/L)	0.094	0.042	1.1	0.73	
Potassium (acid extractable) (mg/kg)	40	23	78	54	
Sodium (acid extractable) (mg/kg)	760	710	870	1200	
Sulphur (acid extractable) (mg/kg)	29	<20	74	27	
Chlorpyrifos (ug/kg)	12	<10	<10	<10	Total concentration: 7500
BOD (water leachate) (mg/L)	280 120 after filtering out paper etc.	29 18 after filtering	220 88 after filtering	130 57 after filtering	
COD (water leachate) (mg/L)	600 240 after filtering	170 37 after filtering	620 220 after filtering	400 120 after filtering	
Total Suspended Solids (water leachate) (mg/L)	1300	280	500	350	
C15-C28 hydrocarbons (mg/kg)	54	34	44	<15	Total concentration: 5000 (C10-C36 petroleum hydrocarbons)
MBAS (water leachate) (mg/L)	0.24	<0.12	0.26	0.20	
Formaldehyde (mg/L)			0.1	0.1	
Bis-2-ethyl hexyl phthalate (mg/kg)	0.86	0.17	0.92	0.54	
pH (water leachate)	9.8	10	9.8	9.8	
pH (glass) using AS1289 method	7.1	8.7	7.9	7.1	

	NEPM Soil Investigation Levels — Health Investigation Levels (HILs) and Ecological Investigation Levels (EILs)	NEPM Groundwater Investigation Levels — Aquatic Ecosystems	NEPM Groundwater Investigation Levels — Drinking Water and Agricultural	ANZECC 2000 trigger values for freshwater (95% protection)
			0.1	
	HILs: 7000-35000 EIL: 200			
		0.005-0.050	2-20	0.008
				0.9
	HILs: 3000-15000			
			0.3-5.0	0.370
	EIL: 2000			
			3-10	
			30-50	0.7
	EIL: 600			
	HILs: 90-450 (C16-C35 aromatics) 5600-28000 (C16-C35 aliphatics)			

Appendix 2. Sydney Water Engineering Product Specification

SYDNEY WATER CORPORATION



ENGINEERING PRODUCT SPECIFICATION

EPS 100

Blended Recycled Glass Granulates And Sand Pipe Embedment

SYDNEY WATER CORPORATION

ENGINEERING PRODUCT SPECIFICATION
EPS 100
BLENDED RECYCLED GLASS GRANULATES AND SAND
PIPE EMBEDMENT

1. SCOPE

This specification covers graded, processed recycled glass granulates blended with sand for use as pipe embedment material. Embedment may comprise 1 – 100 percent glass granules blended with sand conforming to specification WSA PS-350.

2. REQUIREMENTS

Glass Granules Component

- (a) Wet strength of glass granules shall be not less than 80 kN when determined in accordance with AS 1141.22.
- (b) Wet strength / dry strength variation of glass granules shall not exceed 20% when determined in accordance with AS 1141.22. Weak particles in glass granules shall not exceed 0.1% when determined in accordance with AS 1141.32.
- (c) Before and after treatment conducted in accordance with method RTA T1002, there shall be no discernable difference in grading of granules and no discernable difference in granule shapes when subjected to microscopic examinations at 10X magnification.

Sand Component

- (a) Blended sand material shall consist of hard durable inert grains of washed river, marine or dune sand or hard rock sand or a blend of these naturally occurring sand types.

Blended Glass Granulates and Sand Embedment

- (a) Embedment shall be free from noxious weeds as proclaimed by the relevant regulators and free from dangerous chemicals as proclaimed by the relevant regulators.
- (b) Resistivity shall be greater than 1500 Ω .cm when tested in accordance with AS 1289.4.4.1.
- (c) pH shall be in the range of 5 – 9 when determined in accordance with AS 1289.4.3.1.

3. QUALITY CONTROL AND ASSURANCE

- (a) The supplier shall undertake relevant production quality control testing at a frequency necessary to provide confidence that material supplied to the market conforms to the requirements of this specification. Procedures shall be incorporated in the supplier's quality management system ^{Note 1}.
- (b) Recycled materials shall be collected, processed, and supplied undercover of a documented and internally audited quality management system.
- (c) The supplier shall declare that only such product that is safe and conforms to this specification and relevant regulations will be supplied to the market.

SYDNEY WATER CORPORATION

Table 1: Grading of Blended Glass Granules and Sand

Sieve Size (mm)	% Mass Passing
6.7	100
4.75	95-100
2.36	90-100
1.18	70- 100
0.60	40-70
0.30	10-50
0.15	1-7
0.075	0-3

Note 1: Effectiveness of Washing.

In addition to assuring conformance to the above technical requirements, production quality control shall include the following process:

To 1litre of boiled water contained in a clean glass beaker, a 500g sample of washed glass shall be added. The water / glass shall be stirred for 10 seconds and allowed to stand undisturbed for 48hours at 20 - 35 degrees C. At the end of this period, the water shall not be odorous.

In the event of this test failing, glass represented by the test shall be re-washed.

Appendix 3. Sample Quality Control procedure

BENEDICT SAND & GRAVEL
ABN 99 073 763 292

Quality Control Procedure

Product High Grade Compaction Sand (Glass Blend)

Client Sydney Water & Approved Contractors.

Specification Sydney Water

- 1) Glass Granulates to visually inspect and appropriately test all incoming raw feed to ensure that the material meets the agreed specification prior to processing.
- 2) Compaction Sand (glass blend) will be produced in minimum stock piles of 150 tonne.
- 3) All sampling for testing will be collected as per the appropriate Australian Standard for stockpile sampling.
- 4) The samples will be visually inspected and then tested to check conformance with Sydney Water's specification, all details available on request. A field analysis will be conducted on stock piles to identify organic levels are within specification.
- 5) Stockpiles will be monitored to ensure that moisture levels are maintained at a level that acts to eradicate or minimise dust levels.
- 6) Conforming stockpile numbers will be recorded on the delivery dockets to ensure traceability of material.
- 7) External testing will be performed every twelve months, to check conformance against Sydney Water specification, details forwarded to a nominated contact at Sydney Water. This testing will be conducted by an approved NATA certified laboratory.
- 8) Benedict Sand & Gravel will maintain a quality control log / register for all stockpile test results and product quality issues.

The above procedure will be implemented by Benedict Sand & Gravel to ensure that product quality and consistency is achieved and maintained.

Floyde Gilbert
Quality Assurance Officer

PO BOX 875
ST IVES NSW
2075

TEL: 02 9986 3500
FAX: 02 9986 3555

Appendix 4. Sample Material Safety Data Sheet





MATERIAL SAFETY DATA SHEET

Revised 21/05/2005

Benedict GlassSand™

Glass Granulates Pty Ltd



Statement of Hazardous Nature

Enquiries

IMPORTANT NOTICE

The Glass Granulates is a 50% Joint Venture between Visy Pty Ltd and Benedict Sand & Gravel. Both Visy and Benedict have extensive knowledge and experience with the Recycling of domestic and building waste materials. Glass Granulates Pty Ltd produces the product **GlassSand™**

This product is classified as non-hazardous according to the criteria of the National Occupational Health and Safety Commission (NOHSC).

GLASS GRANULATES

ph: (02) **9986 3500**
 fax: (02) 9986 3555
 0425 282 208 (emergency phone number)
 address: 146 Newbridge Rd MOOREBANK NSW 2170
 post: PO BOX 875 ST IVES NSW 2075

This material Safety Data Sheet (MSDS) is issued by Benedict Sand & Gravel and Glass Granulates, in accordance with National Occupational Health and Safety Commission (NOHSC) guidelines. As such the information in it must not be altered, deleted or added to, Benedict Sand & Gravel and Glass Granulates will issue a new MSDS when there is a change in product specifications and/or NOHSC guidelines/regulations. Benedict Sand & Gravel and Glass Granulates will not accept any responsibility for any changes made to its MSDS by any other person or organisation.

Product Name	GlassSand™
Applicable in	Australia
Other Names	Glass, Glass Fines, Glass Granulates, Glass Aggregate
Manufacturers Product Code	Not Applicable
UN Number	None Allocated
Dangerous Goods Class & Subsidiary Risk	None Scheduled
Hazchem Code	None Allocated
Poisons Schedule Number	None Allocated

Uses

Used as filling medium, turf underlay, pipe bedding, drainage medium, industrial filler, shot-blasting medium and as a fine aggregate in asphalt, mortar and concrete.

Characteristics

PHYSICAL DESCRIPTION	PROPERTIES
<i>Appearance</i>	Granular product ranging in colour from fawn/brown to transparent.
<i>Boiling Point (°C)</i>	Not Applicable
<i>Melting Point (°C)</i>	Approximately 900°C
<i>Vapour Pressure</i>	Not Applicable
<i>Specific Gravity (H₂O=1)</i>	2.2 – 2.5
<i>Flashpoint</i>	Not Applicable
<i>Flammability Limits</i>	Not Applicable
<i>Solubility in Water</i>	Insoluble
<i>Auto-ignition Temperature (°C)</i>	Does not auto-ignite
<i>Odour Threshold</i>	Normally no odour
<i>pH, at Standard Concentration</i>	Not Applicable
<i>Molecular Weight</i>	Not Determined
Chemical Name	Precipitated Silica
CAS Number	112926 – 00 – 8
Proportion	100%
Exposure Limits	10 mg/m ³ TWA
COMPOSITION	PROPORTION
Bound Metal Oxides (Ca, Mg, Na, Li, K, Al)	20% – 30%
Bound Amorphous Silica	70% – 80%
Other Metal Oxides	<1%
Free Crystalline Silica	<1%

GlassSand™ may contain small amounts of paper and plastic pulp fragment which are not toxic.

GlassSand™ particles are not larger than 5mm and contain no free crystalline silica particles. Toxicological testing reveals that all harmful contaminants are undetectable according to current NATA testing limitations.

HEALTH HAZARD INFORMATION

GlassSand™ is a blended granular product used as a filling sand, turf underlay, pipe bedding, drainage medium, industrial filler, shot-blasting medium and as a fine aggregate in asphalt, mortar and concrete. The health hazards are mainly related to dust generated by manual handling but may also include physical contact with the product.

Repeated inhalation of GlassSand™ may cause respiratory discomfort (see below – Health effects). Repeated inhalation of amorphous silica may add to or multiply the serious health effects caused by tobacco smoke.

HEALTH EFFECTS

ACUTE

- Swallowed** Unlikely under normal conditions of use, but swallowing this product will result in abdominal discomfort.
- Eye** Dust from this product may irritate the eyes causing watering and redness.
- Skin** *GlassSand™* and dust may be irritating and abrasive to the skin.
- Inhaled** The dust may irritate the nose, throat and respiratory tract.

HEALTH EFFECTS

Inhaled: Repeated inhalation of **GlassSand™** dust may exacerbate existing respiratory disorders including asthma, lung cancer and bronchitis, and may increase the risk of scleroderma (thickening of the protective tissue) and kidney disease.

FIRST AID

Swallowed Give water to drink. Seek medical advice.

Eye Flush eyes thoroughly with running water

Skin Wash skin with soap and water

Inhaled Remove to fresh air

Advice to Doctor Treat symptomatically

CHRONIC

PRECAUTIONS FOR USE

Exposure Standards Australian Occupational Exposure Standards (OES); (NOHSC 1003 National Exposure Standards) and ACGIH Threshold Limit Values: All exposures must be minimised to as low as is reasonably practicable for inspirable dust containing no asbestos and less than 1% crystalline silica. Inspirable Dust: In all situations below 10mg/cubic metre. Respirable Dust: In all situations below 3mg/cubic metre.

Engineering Controls Keep exposures to dust as low as practicable, with the aim of maintaining respirable dust levels to below 0.05 mg/m³ TWA (time-weighted average). Work in the open air and the opening of external openings (such as doors and windows in buildings) generally provides adequate ventilation. Local mechanical ventilation or extraction may be required in areas where dust could escape into the working environment.

Ventilation None required if engineering and handling controls are adequate. If dust is generated, wear respiratory protection for particulates conforming to Australian Standards AS/NZS 1715 and 1716, category P1 or P2.

Special Considerations for Repair/Maintenance Avoid breathing dust. Where possible vacuum or wash down gear, equipment or mobile plant prior to maintenance and repair work. If compressed air cleaning cannot be avoided, wear eye and respiratory protection and clothing as listed below.

Personal Protection/ Skin Protection Wear loose comfortable clothing and gloves (standard duty leather or equivalent AS 2161: Industrial safety gloves and mittens). Wash work clothes regularly.

Eye Protection Dust resistant non-fogging safety goggles or glasses (AS/NZS 1336: Recommended practices for eye protection in the industrial environment) should be worn if exposed to dust.

Respiratory Protection None required if engineering and handling controls are adequate. If dust is generated, wear a P1 or P2 particulate respirator (dust mask) conforming with Australian Standards AS/NZS 1715: Selection, use and maintenance of respiratory protective devices and AS/NZS 1716: Respiratory protective devices when exposed to dust.

Personal Hygiene Flush dust off skin with water or wash skin with mild soap and water after working with product.

Flammability GlassSand™ is not flammable, does not support combustion of other materials, and does not cause dust explosions.

SAFE HANDLING INFORMATION

Storage And Transport

Avoid breathing dust. Respirable dusts can be generated during processing, handling, and storage. Use proper control measures including ventilation, enclosure of materials, covering loads on trucks, and wetting down material whilst in use.

When stockpiling and handling large quantities of GlassSand™, care should be taken to avoid having the faces of the stockpile steeper than the natural angle of repose of the material. Steep faces can fall without warning and trap persons resulting in injury and possibly suffocation. When transporting by road, all loads should be covered.

Bulk bags must not be stacked on top of each other due to instability related to product settlement.

Spills and Disposal

Spilled material should be wet down with water to reduce dust generation before cleanup. If unable to reuse or recycle, dispose of waste materials at an authorised landfill site in accordance with local authority guidelines. (see Ecological and Disposal Considerations)

Care should be taken to prevent leakage of material into drains and other catchment areas.

Fire/Explosion Hazard

GlassSand™ is non-flammable

Smoking & Other Dust

Benedict and Glass Granulates recommend that all work areas should be non-smoking areas.

ECOLOGICAL & DISPOSAL CONSIDERATIONS

Ecological Information

GlassSand™ is produced to conform to the highest Australian industry standards in direct consultation with government recycling bodies. As such, it conforms to the best category as defined by the Environment Protection Authority.

Disposal Information

GlassSand™ has no disposal restrictions and can be disposed of at any authorised landfill site in accordance with local authority guidelines.

**CONTACT POINT
for further information**

GLASS GRANULATES Pty Ltd

ph: (02) 9986 3500
fax: (02) 9986 3555
0425 282 208 (emergency phone number)
address: 146 Newbridge Rd MOOREBANK NSW 2170
post: PO BOX 875 ST IVES NSW 2075

The Glass Granulates Pty Ltd is a 50% Joint Venture between Visy Pty Ltd and Benedict Sand & Gravel.

Terms & Conditions

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