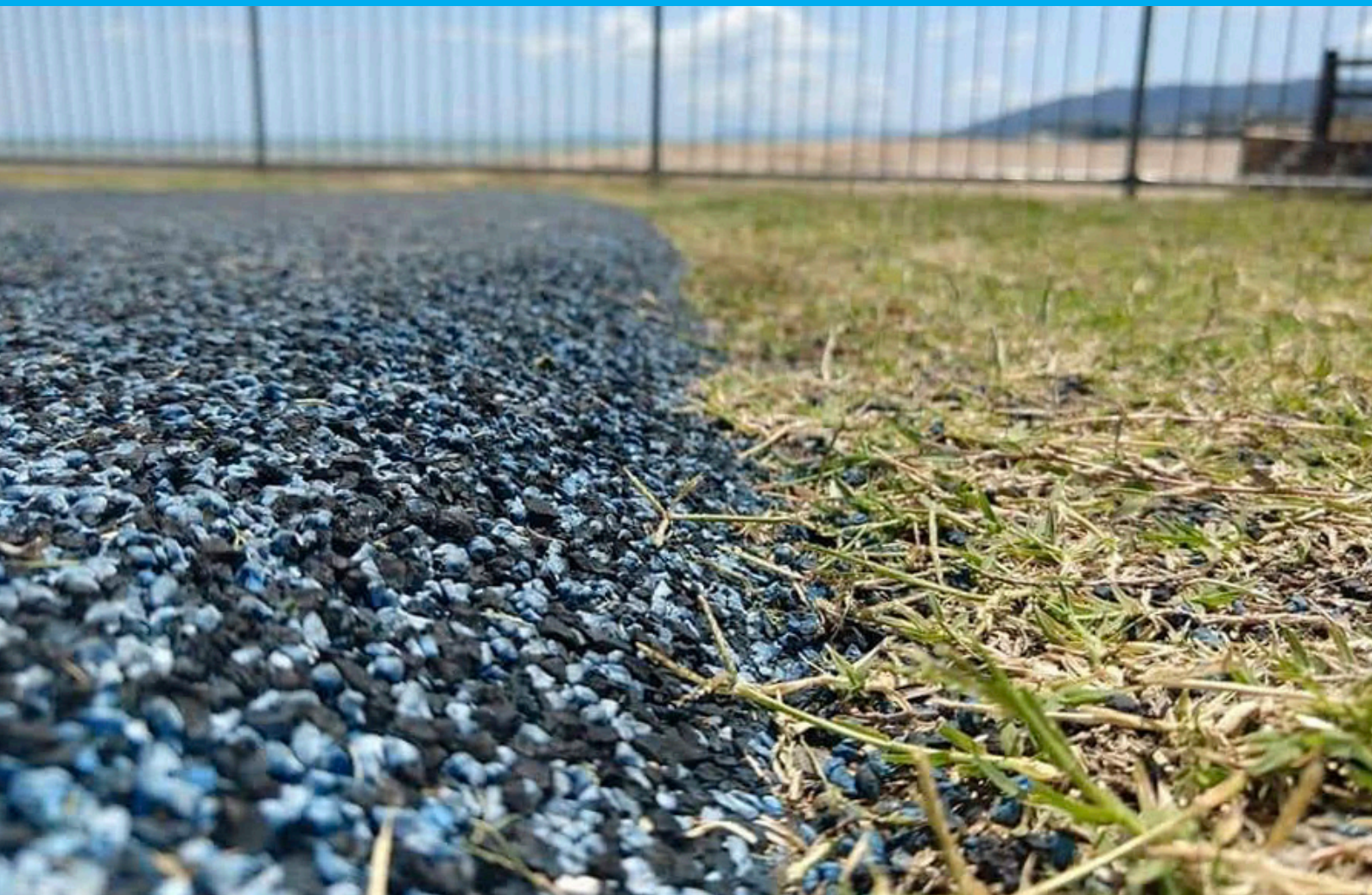




RUBBER CRUMB LOSS ASSESSMENT FROM PLAY AREAS IN THE GREAT BARRIER REEF CATCHMENT



Australian Government



AUSTRALIAN
MARINE DEBRIS INITIATIVE



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Summary

Introduction

Many play areas have soft fall surfaces made of recycled rubber tyres applied as small pieces of crumb (1-5 mm in size). The development of the use of rubber crumb in playgrounds and synthetic sports fields has been partially as a result of the promotion of the Tyre Stewardship Scheme. This scheme aims to provide a pathway for the use of the end-of-life tyres that considers environmental, health and safety impacts.

Rubber crumb and the chemicals associated with these (e.g. metals, PAHs, tyre anti-degradants), however, have been found in international studies to leach into waterways and cause harm to aquatic life. Limited information exists on the potential loss and impacts associated with local sites and with the Great Barrier Reef considered a sensitive ecosystem, a focus on this region was considered a priority.

Aim & Approach

The aim of this study was to document rubber crumb loss from play areas in the GBR catchment.

Six locations were selected to determine site and condition as factors for loss (Fig.1). All sites were located close to shorelines and/or waterways. Sampling was conducted at three distances of 0, 2, 4 metres from the play area using replicated cores. Cores removed the top 2 cm of substrate. Samples were sieved and rubber and other microlitter enumerated and characterised (e.g. size, colour). Site conditions were also recorded at the time of sampling.



Figure 1: Site Locations in Study

OVERALL FINDINGS

Sampling was undertaken between April and May 2021. Rubber loss was found at all sites with a decreasing trend away from each play area. Mean loss for all GBR sites was 12,890, 3081 and 1404 pieces per m² at 0 m, 2 m and 4 m, respectively (Fig. 2). This implies that for a play area with a 40 m circumference, over 1.2 million rubber crumb pieces are being lost on average out to 4 m, and for some individual sites this would be well over 2.5 million pieces.

The Cardwell and Bowen sites had the greatest rubber loss with levels over 25,000 per m² recorded adjoining the play area. The Pallarenda Park site in Townsville was the newest site studied and recorded the least loss. The age of the surface, the UV exposure, the frequency of use and type of surrounding surface (e.g. grass versus path or bare soil) are factors that can affect both loss and movement from a site.

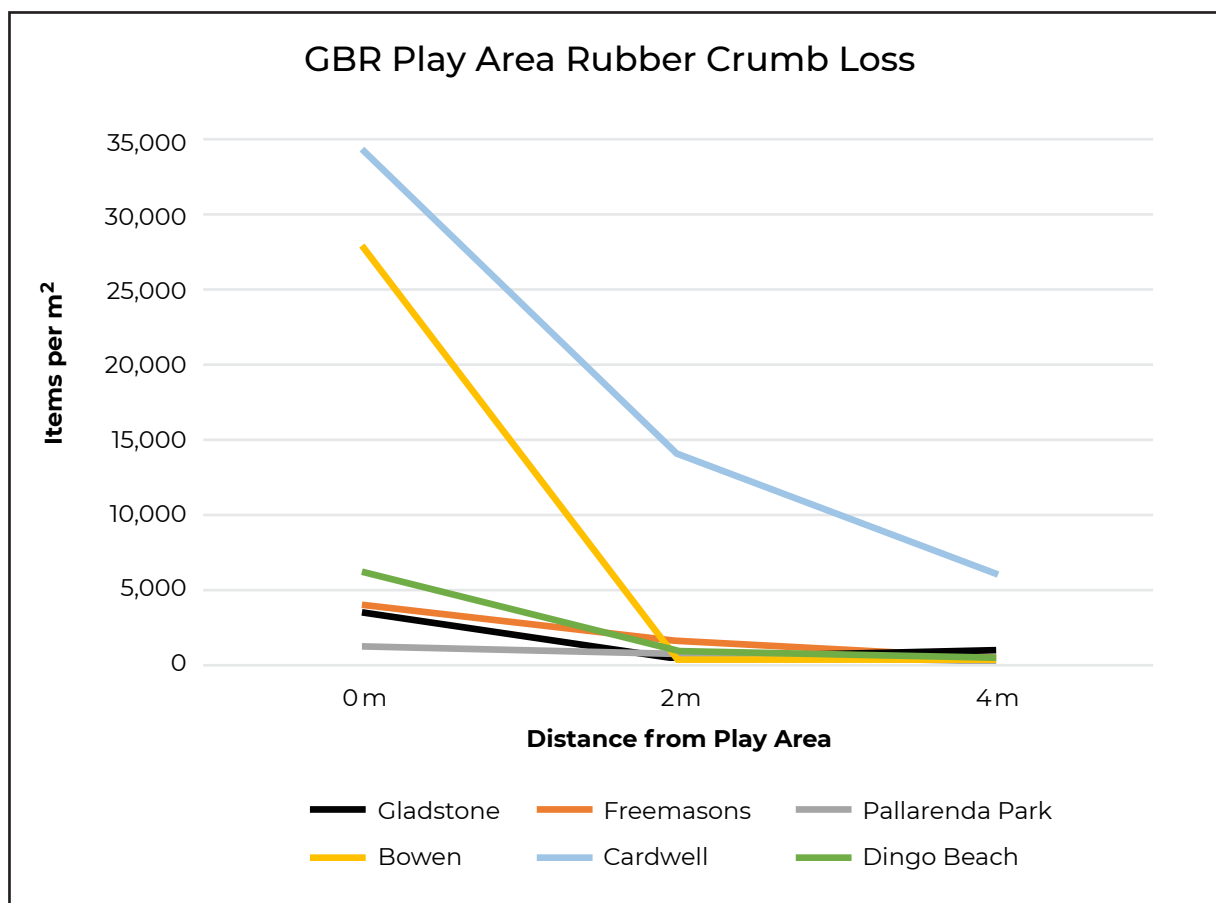


Figure 2: Play area rubber crumb loss at the 6 sites along the GBR

OVERVIEW

1. SITE BACKGROUND AND DESCRIPTION

George Davidson Park (AKA Mullers Lagoon Park) play area is 11 m x 8 m containing a swing, slide and climbing equipment. The play area is immediately surrounded by grass and the nearest waterway is Mullers Lagoon, approximately 40 m from the play area. The play surface is approximately 10 years old and made up of light blue, orange/olive, grey and dark blue coloured rubber.



2. SAMPLING

Sampling was conducted on the 25/04/2021. Moderate rainfall occurred (13.2 mm) in the 72 h before sampling. The condition of the play surface was graded as deteriorated with obvious signs of damage. The play area has limited shading. Twelve cores (8 cm diameter x 2 cm depth) were taken at 0 m, 2 m and 4 m away from the play area.



3. GEORGE DAVIDSON PARK RESULTS SUMMARY

Parameter	0 m	2 m	4 m
Total No. of Microlitter	2,134	26	9
Total Weight (g)	41.14	4.56	4.14
Amount of crumb per m²	27,952	341	105

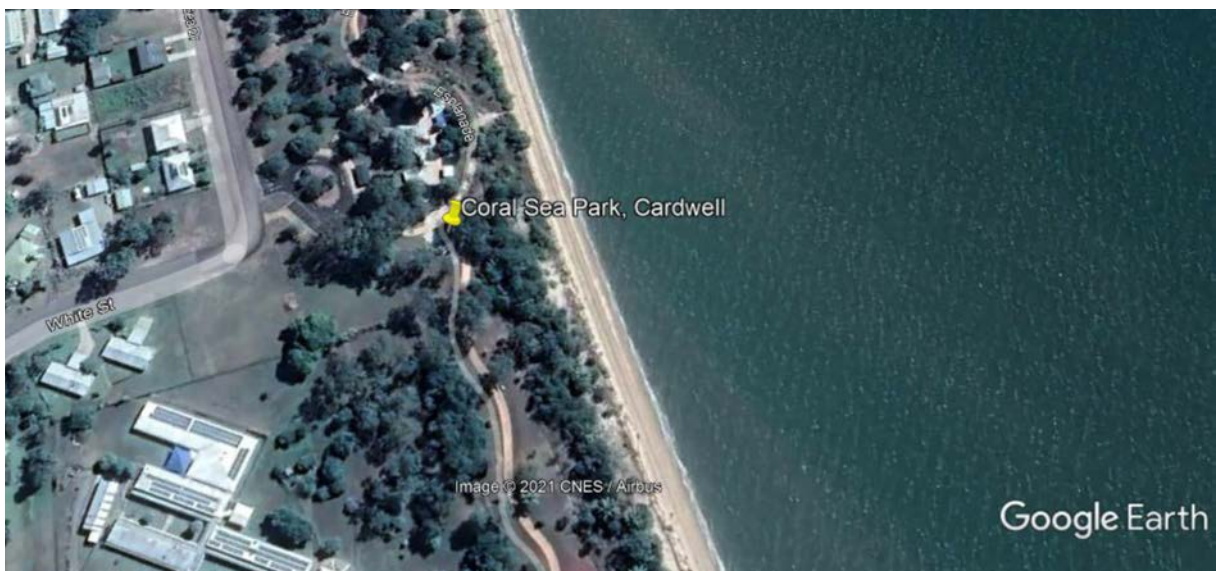
The results indicate:

- Very high rubber crumb loss close to the play area
- Grass surrounding the play area impedes movement of rubber at further distances away
- Rubber was mostly 1 - 5 mm in size and black (natural) (55 %) or blue (45 %) coloured
- One synthetic fibre was also found.

OVERVIEW

1. SITE BACKGROUND AND DESCRIPTION

Coral Sea Park play area is 20 m x 18 m containing a swing and seat is only one of a selection of play areas in the park. The area is immediately surrounded by concrete path (30 %), sand (30 %), bark (20 %) and grass (20 %) and is 40 m from the beach. The play surface is approximately 8 years old and made up of predominantly dark blue coloured rubber.



2. SAMPLING

Sampling was conducted on the 30/05/2021. Minimal rainfall occurred (0.2 mm) in the 72 h before sampling. The condition of the play surface was graded as deteriorated with obvious signs of damage. The play area has limited shading. Twelve cores (8 cm diameter x 2 cm depth) were taken at 0 m, 2 m and 4 m away from the play area from the sand/bark/grass areas.



3. CORAL SEA PARK RESULTS SUMMARY

Parameter	0 m	2 m	4 m
Total No. of Microlitter	2,606	984	439
Total Weight (g)	27.75	15.97	8.36
Amount of crumb per m²	34,134	14,060	6,273

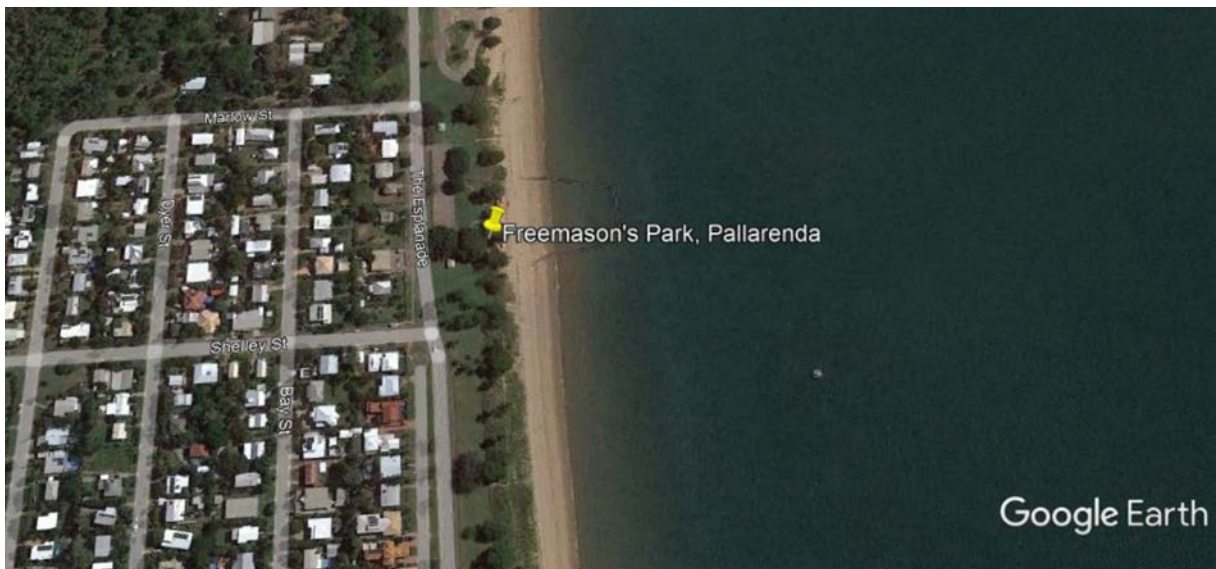
The results indicate:

- Very high rubber crumb loss close to the play area
- Very high rubber crumb loss close to the play area and still considerably high amounts were found up to 4 metres from the site
- Sand as a substrate allows movement of rubber at further distances away
- Rubber was mostly 1 – 5 mm in size and blue in colour (68 %). The remainder were black (natural) (32 %).
- No other synthetic micro litter were found.

OVERVIEW

1. SITE BACKGROUND AND DESCRIPTION

Freemasons play area is 32 m x 6 m containing slides and climbing equipment. The area is immediately surrounded by grass (50 %), exposed ground (45 %) and a path along one side (5 %). The park runs along the beach with the play area 28 m from the water. The play surface is approximately 10 years old and made up of black, red and dark blue coloured rubber.



2. SAMPLING

Sampling was conducted on the 17/04/2021. No rainfall occurred in the 72 h before sampling. The condition of the play surface was graded as deteriorated with obvious signs of damage. The play area is part shaded by a large tree. Ten cores (8 cm diameter x 2 cm depth) were taken at 0 m, 2 m and 4 m away from the play area.



3. FREEMASONS PARK RESULTS SUMMARY

Parameter	0 m	2 m	4 m
Total No. of Microlitter	251	113	28
Total Weight (g)	10.0	4.8	1.9
Amount of crumb per m²	3,930	1,760	393

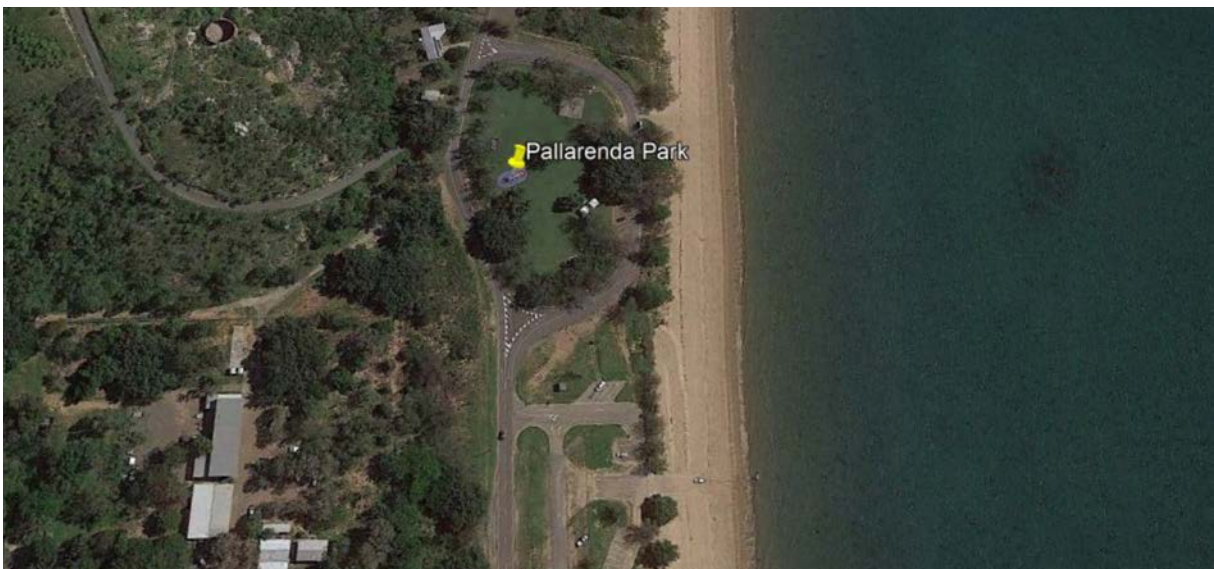
The results indicate:

- Moderately high rubber crumb loss close to the play area and proportional declines were found up to 4 metres from the site
- Shading may be reducing deterioration rates and grass adjoining the area further limits movement of rubber away
- Rubber was mostly 1 – 5 mm in size and a mix of colours related to the play area (56 % blue, 34 % black, 9.5 % red, 0.5 % green).
- Other micro litter found included two synthetic fibres, one hard fragment and one glass fragment.

OVERVIEW

1. SITE BACKGROUND AND DESCRIPTION

Pallarenda Park main play area is 15 m x 8 m containing a slide and climbing and other play equipment. The area is surrounded by a grass reserve and the beach is approximately 100 m from the play area. The play area has a shade cloth and a blue coloured rubber surface with a concrete edging around the periphery.



2. SAMPLING

Sampling was conducted on the 08/05/2021. No rainfall occurred in the 72 h before sampling. The condition of the play surface was good with the surface relatively new (approximately 2 years old). The grass in the park had recently been mowed. Twelve cores (8 cm diameter x 2 cm depth) were taken at 0 m, 2 m and 4 m away from the play area.



3. PALLARENDA PARK RESULTS SUMMARY

Parameter	0 m	2 m	4 m
Total No. of Microlitter	101	53	22
Total Weight (g)	10.5	2.0	2.5
Amount of crumb per m²	1,358	743	300

The results indicate:

- Moderate rubber crumb loss close to the play area and proportional declines at distances away from the site
- The new surface and the concrete bunding are likely factors reducing the rubber loss. The shading may also reduce deterioration rates over time
- Rubber was mostly 1 – 5 mm in size and mostly blue (80%) or green (18%)
- A small amount of other microlitter was found including hard fragments, film, fibre, paper and metal.

OVERVIEW

1. SITE BACKGROUND AND DESCRIPTION

Palm Point Park is located at Gladstone Marina and managed by the Gladstone Ports Corporation. The play area is 22 m x 9 m and has toddlers play equipment (slides and climbing apparatus). The area is surrounded by a grass reserve and the harbour is approximately 24 m from the play area. The play surface is relatively new (3-4 years old) and made up of dark blue coloured rubber.



2. SAMPLING

Sampling was conducted on the 11-12/05/2021. No rainfall occurred in the 72 h before sampling. The condition of the play surface was good with the grounds well maintained. A shade cloth covered the play area and it was a highly visited site for play groups. Twelve cores (8 cm diameter x 2 cm depth) were taken at 0 m, 2 m and 4 m away from the play area.



3. PALM POINT PARK RESULTS SUMMARY

Parameter	0 m	2 m	4 m
Total No. of Microlitter	290	57	181
Total Weight (g)	17.2	8.9	12.7
Amount of crumb per m²	3,746	560	1,138

The results indicate:

- Moderate rubber crumb loss close to the play area and declines at distances away from the site, although rubber was higher at 4 m than 2 m. This is possibly due to the microtopography of the site, where depressions allow more rubber to settle.
- Despite heavy use, the relatively new surface is a likely factor in lower rubber crumb loss at this site. The shading may also reduce deterioration rates over time
- Rubber was mostly 1 – 5 mm in size and was predominantly blue (98%)
- A small amount of other microlitter was found including hard fragments, fibre, and glitter.

OVERVIEW

1. SITE BACKGROUND AND DESCRIPTION

Dingo Beach play area has a circumference of 40 m and contains a slide and climbing equipment. The immediately area is surrounded by sand and grass and the beach is 54 m from the play area. The play surface is of unknown age and made up of a blue, black and terracotta (red) coloured rubber mix.



2. SAMPLING

Sampling was conducted between the 10 - 18/04/2021. Minor rainfall occurred (5-10 mm) in the 72h before sampling. The condition of the play surface was graded as deteriorated with obvious signs of cracking. A shade cloth covered the site. Twelve cores (8 cm diameter x 2 cm depth) were taken at 0 m, 2 m and 4 m away from the play area.



3. DINGO BEACH RESULTS SUMMARY

Parameter	0 m	2 m	4 m
Total No. of Microlitter	475	93	106
Total Weight (g)	12	5.5	4.5
Amount of crumb per m²	5,934	1,022	216

The results indicate:

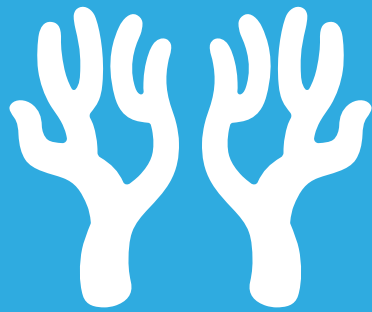
- Moderately high rubber crumb loss close to the play area and proportional declines at distances away from the site
- Shading may be reducing deterioration rates and grass adjoining the area further limits movement of rubber away
- Rubber was mostly 1 – 5 mm in size and a mixture of blue, black, red and yellow colours
- A small amount of other microlitter was found including hard fragments, synthetic fibres, glass and metal.



RECOMMENDATIONS

As a result of the findings from this study the following general recommendations can be made:

- Rubber crumb based soft fall play areas should be avoided near sensitive environments particularly close to waterways;
- A well maintain and watered grass cover around the periphery of the play area will reduce movement further afield;
- Installation of a grilled drain system around the periphery with an associated pit trap with fine mesh netting will catch loose crumb;
- Other physical barriers, like bunding or concrete around the periphery will reduce the amount of rubber crumb loss;
- Shading, either using tree cover or shade sails, should be applied to reduce UV degradation;
- The play area should be well maintained with repairs and patching undertaken to help prolong the overall life of the matting; and
- Further research is needed to examine movement of rubber crumb outside of the four metre study area and an investigation of the potential risks for migration into local waterways and biota.



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