The Highland Council

Agenda Item	**8.**
Report No	**SCC/ 13/16**

Sutherland County Committee

24 May 2016

Golspie Links Coastal Protection Works

Report by Director of Community Services

Summary

This report updates Members with regard to the Golspie Links Coastal Protection Works.

1. Background

1.1 The Golspie Links coastal protection scheme was originally constructed by Sutherland District Council during the 1970s. The coastal protection consists of rock armour to the beach and dunes over approximately 1.2km. The works were constructed to reduce the risk of flooding and erosion to the adjacent golf club.

1.2 The coastal protection works were adopted by The Highland Council following the incorporation of the Sutherland District Council. However, it should be noted that this "adoption" was limited to the works undertaken within the original 1970s scheme only.

1.3 During the storms of 2013, the rock armour was overtopped with some stones washed out. Remedial works were undertaken by Community Services using locally available stone. However, there is the risk of further damage in future storms.

2. Present Condition of the Coastal Protection Works

2.1 In August 2015 Community Services commissioned Wallace Stone to assess the Golspie Links coastal protection works, to report on its condition and to recommend remedial works as appropriate. The report can be found in **Appendix 1**.

2.2 The report notes that overall 70% of the rock armour is in satisfactory condition with 30% requiring remedial works. Typical defects include:

- mix of small and larger stones
- rock armour now lying at too shallow an angle to prevent over topping.
- crest levels too low to protect the dunes to the rear
- no evidence of a secondary layer of rock armour or a geotextile
- poor armouring in bays; and

- lack of interlock between stones, due to round stones rather than angular ones used in remedial works.

2.3 The report recommends the following:

- where required, raise the rock armour crest to a suitable level to prevent erosion or overtopping;
- rebuild the rock armour with angular imported stones to a satisfactory gradient;
- the minimum size of any rock armour should not be less than a nominal 0.75t; and
- ror a 1v : 2h slope the rock armour should be up to a nominal 3t maximum. This can be reduced to a 2t nominal maximum for a 1v : 3h slope.

3. Remedial Works

3.1 Following Wallace Stone's recommendations, a topographic survey will be undertaken along the existing coastal protection works. The survey will be used to :

- calculate the volume of rock required to raise the crest levels;
- design the cross sections where the existing structure has failed; and
- prepare a cost estimate for the remedial works.

3.2 Works within the marine environment may require a licence prior to commencement. Community Services will consult with Marine Scotland Licensing Operations Team and apply for any licences as required.

4. Implications

4.1 Remedial works to the existing coastal protection structure will reduce the risk of future flooding and deterioration.

4.2 This report has no impact on equality, Gaelic, climate change / Carbon Clever considerations.

4.3 All work will be managed within budget allocations from a resource perspective with the Council delivering its legal responsibilities.

Recommendation

Members are invited to note the updated situation with regard to Golspie Links Coastal Protection Works.

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Appendix

THE HIGHLAND COUNCIL

GOLSPIE LINKS ROCK ARMOUR

INSPECTION REPORT

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GOLSPIE LINKS ROCK ARMOUR

INSPECTION REPORT

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THE HIGHLAND COUNCIL
GOLSPIE LINKS ROCK ARMOUR

INSPECTION REPORT

1. Introduction

Wallace Stone were commissioned by The Highland Council to carry out an independent review and inspection of the rock armour along the edge of Golspie Golf Course.

The armour was inspected by two Engineers on 21st July 2015 and this report details their findings.

An aerial photograph is included in Appendix B marked up with point numbers which locate where details of the armour condition were recorded, the position fix was taken using a hand held GPS. The inspection commenced from the outfall at the beach to the north of the golf course and extended down to the gabion wall at the 7th tee. Appendix A contains photographs of the armouring.

Cross sections of the armour slope were made at intervals and armour stone size recorded.

2. Inspection Findings

Points 1 to 2 – the armour in this section is relatively flat, of mixed armour stone size (from the odd larger piece at 3t to generally 0.2t to 0.4t), the armour is poorly interlocked, resembling more of a rip rap protection than armour. The slope steepens up towards point 2 but appears too steep for the size of the armour and as a consequence has suffered damage.

Point 3 – armoured slope improved with more regular size larger armour of 1.4t but lots of gaps between stones and some armour lying on the beach.

Point 4 – trial pit confirmed that the toe stones are present under the sand at least 2m beyond the toe as it meets the beach.

Point 5 – erosion of the dune at the top of the armour with a timber sleeper wall visible.

Point 6 – erosion of the dune over some 6m length, with top armour stones missing.

Point 7 – eroded dune at the top of the armour over approximately 6m length.

Point 8 - eroded dune at the top of the armour over approximately 30m length.

Point 9 - eroded dune at the top of the armour over approximately 10m length.

Point 10 – armour height very low (less than 2m) exposing dune to erosion.

Point 11 – armour buried in sand, crest height low exposing dune to erosion.

Point 12 – good section of armour with crest above dune by 0.5m and armour extending landward over the crest.

Point 13 – poor section of armour with lots of gaps between stones.

Point 14 - poor section of armour with lots of gaps between stones.

Points 15 to 16 – timber wall present, crest of armour too low, armour appears to have slumped.

Points 17 to 18 – bay with shingle in amongst armour and at base, high level of armour crest at 18.

Point 19 – good section, high crest, large single sized armour 1.8t with some erosion of dune at the top.
Point 20 – shingle bay with very little armour next to the 4th green, crest too low and armour only 1m high.

Point 21 – armour following a bay and crest lowering with dune level rather than maintaining a minimum crest level.

Point 22 – armour done well at this bay maintaining a crest level, slope angle was surveyed at 1 in 2.9.

Point 23 – shingle exposed on top of slope behind crest armour, some movement of crest stones and erosion at the top.

Point 24 – top of slope covered with shingle.

Point 25 – crest of armour low.

Points 26 to 27 – gabion baskets at top of slope along edge of green, armour high with generally round stones at the top, these are too small and will be moved in a storm. Beyond the gabions a timber wall is present, but the same issue of the round stones placed against it. This detail extends to the next tee. The slope angle was surveyed at 1 in 2.8 at this section.

Point 28 – poorly armoured slope with too small armour and use of round stones. The angle of the slope was surveyed and varies from 1 in 3 at the top to 1 in 5 at the toe.

Point 29 – gabion basket wall constructed at 7th tee, poorly armoured slope below it with a mixture of size of stone, some of which is round. Slope fairly flat, appears to be slumped.

3. Conclusions

The most northern section of armouring is in a poor condition with a mixture of small size armour and larger armour, but predominantly small. This has been damaged during storms and is now lying at a shallow angle more like rip rap than armouring.

The crest level of the armour from Points 3 to 11 is generally too low with erosion of the dune occuring at the top of the armour. There is no evidence of an underlayer (or secondary armour layer) or any geotextile to separate the rock armour and dune comprising sand and shingle.

Between Points 13 and 14 the armour slope is poorly constructed. There are however some good sections of armour with a crest height above the dune level and no erosion occurring.

The armouring generally improves beyond Point 15**.** However, a series of bays have been poorly armoured with the crest going down with the level of the land behind, so subject to overtopping and damage during storms.

The remedial work carried out at Points 26 to 27 using rounded stones will be unlikely to survive the next significant storm event as it is under sized compared to the armour stone.

The section of armour near the 7th tee, Points 27 to 28, is in a poor condition and already at a slack gradient. Further failure or erosion here may lead to undermining of the gabion wall.

The current condition of the armoured slope is approximately 30% poor and 70% good. A detailed topographic survey is needed to pick up crest and toe levels of the armouring along this 1.2km length. This will establish where the crest needs to be raised to avoid further erosion of the dunes and identify the sections requiring rock armouring to be rebuilt with imported armour.

Comparing the rock armouring Wallace Stone designed on a similar shoreline at Dornoch, the size of armour for the slope at 1 in 2 should be a minimum of 0.75t but typically 0.75t to 3t or 0.75 to 2t for 1 in 3. Where smaller stones of 0.3t to 0.4t have been placed, they now lie at a slope angle of 1 in 5. This is consistent with what would be expected by back analysis for such size armour in the same wave climate.

Appendix A - Photographs

Point 1

Point 2

Point 2

Point 3

Point 4

Point 5

Point 6

Point 6

Point 7

Point 8

Point 11

Point 12

Point 14

Points 15 & 16

Points 15 & 16

Points 15 & 16

Point 16

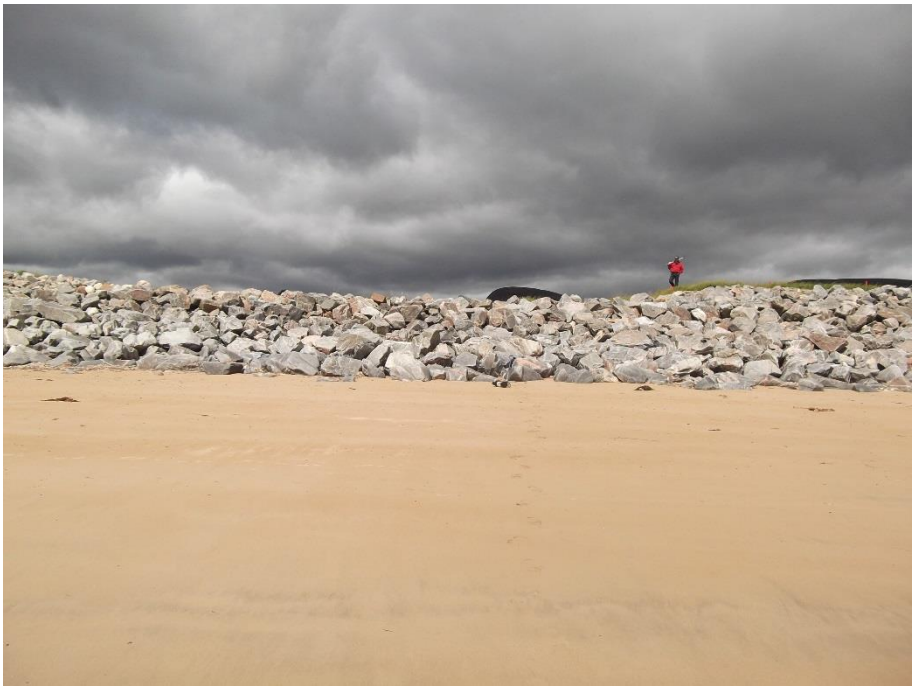
Point 18

Points 17 & 18

Point 20

Point 20

Point 22



Point 22

Point 23

Point 26

Point 27

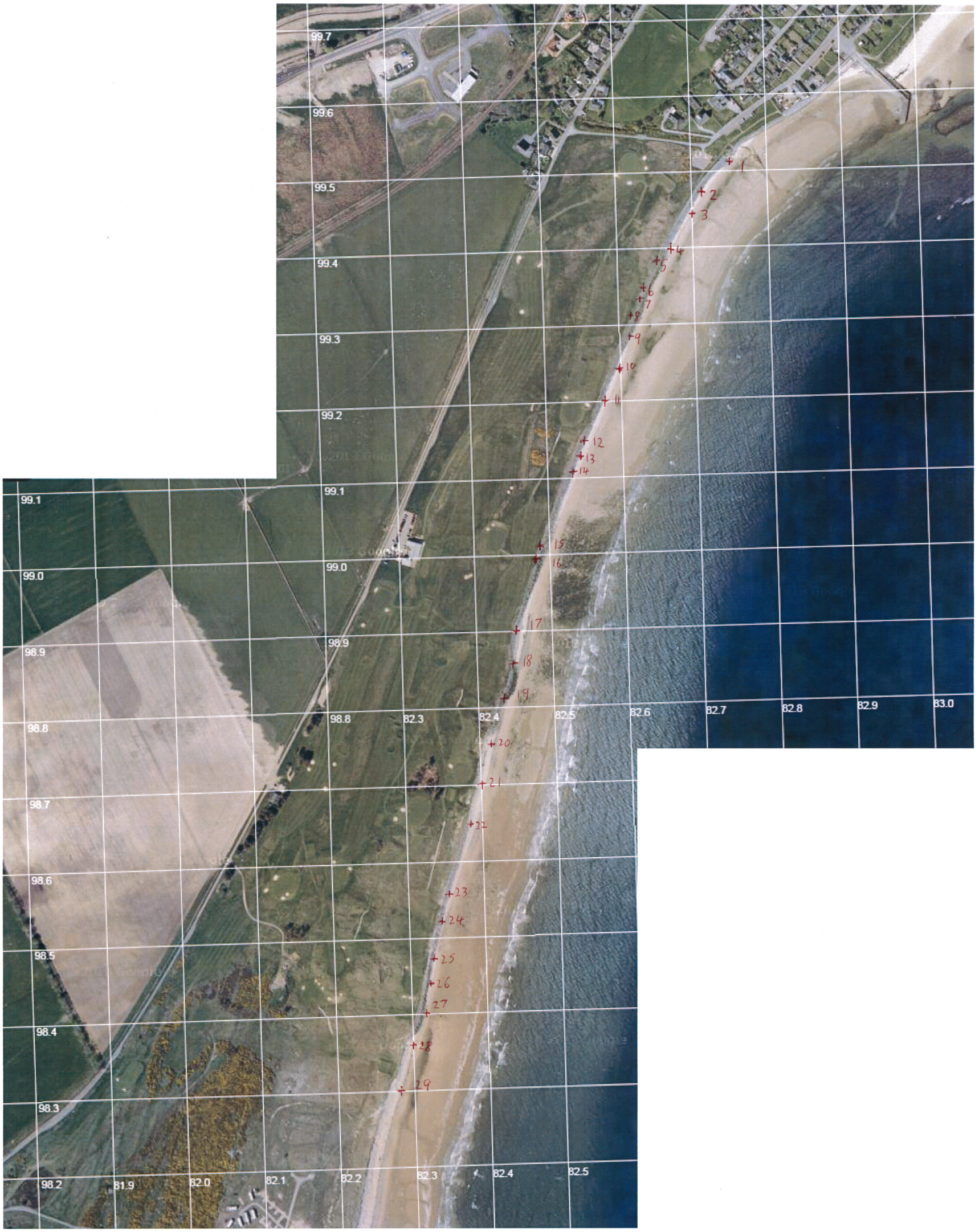
Point 27

Point 28

Point 28/29

Point 29

Appendix B - Marked up Aerial Photograph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