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We refer to your request on educating the public concerning the Sand Replenishment Programme on the Durban's Central Beachfront. Numerous articles and comments were published in newspapers, both locally and nationally.

The following facts should be noted in terms of the sand pumping activities.

The primary purpose of the sand pumping scheme is to transfer sand from the southern side of the harbour entrance to the northern side therefore mimicking the natural northern movement of sand up the coast. The break waters are essential for providing safe navigating condition for vessels entering and leaving Durban's port. The sand that is nourished onto the southern beaches is intercepted and gradually moved northwards by the littoral current.

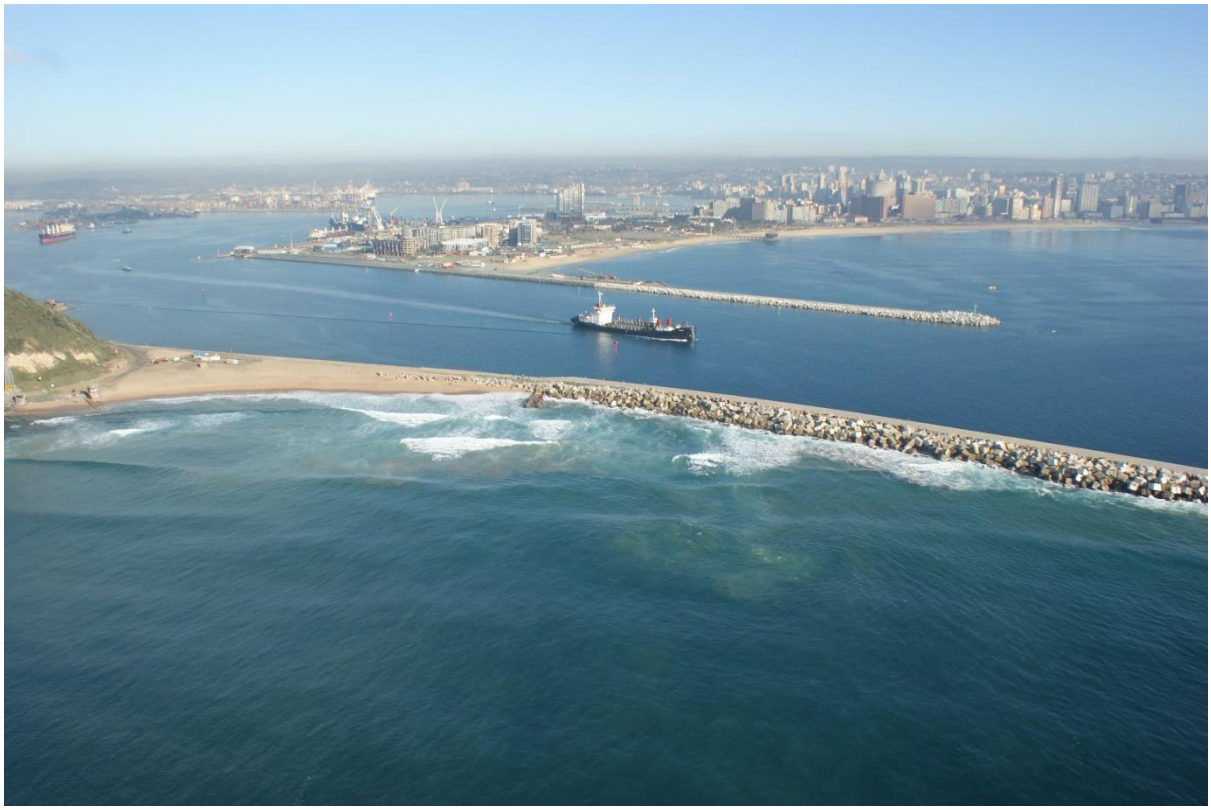

Figure 1: Durban Harbour Entrance Channel showing the Southern and Northern break waters respectively.

The value of the sand replenishment programme is difficult to quantify precisely in rand value however the benefits can be indirectly estimated based on the purpose it serves. The sand replenishment programme provides protection to infrastructure located along this stretch of beach which has historically been developed to be an iconic world renowned tourist destination. The beaches which are replenished periodically with sand via the sand pumping operation attract local, national, and international, holiday makers and tourists throughout the year, with the peak season traditionally being the Easter and Christmas Holidays seasons.

Background:

Our waves are formed by storm systems very far from our coastline. These systems move from west to east on average in a region south of the country. This means that the waves generated by these systems approach our coastline (on average) from an angle of about 121 degrees (nautical). The oblique angle drives a near shore (restricted to the surf zone) current that moves from south to north. As this current moves it picks up and deposits sediment along the coastline. It effectively acts like a conveyor belt that supplies/removes sand to/from the beaches.

The southern breakwater acts like a very large sand trap: slowing down and diverting the northern LST (longshore transport). As more sand accumulates on the southern side of the breakwater this process is amplified, i.e. more sand is deposited and the current is diverted even more. It is almost like the waves are forming a beach on the southern side but the beach is aligned with (parallel) the southern breakwater. Eventually accumulated sand is moved by the LST around the southern breakwater. The accumulated sediment reduces the water depth south of the breakwater and increases the magnitude of the current, as it does this the current starts to 'pick' up sediment into the water column but as it (the current) passes around the breakwater it encounters very deep water (since the breakwater extends very far out). This change in depth reduces the speed of the current and as this happens sand is deposited out of the water column at the tip of the breakwater and so starts the formation of a sand bar aligned parallel to the southern breakwater that extends seaward. This sand actually 'wants' to move around the harbour to replenish the northern beaches. Therefore as it is moved around the southern breakwater it is deposited into the harbour channel. This obviously reduces the entrance channel depth, making it unsafe for ships to pass. Therefore this channel is dredged and in doing so maintains the spit that forms off the end of the southern breakwater.

Current Operation:

The Durban bight is not a natural beach and the sand replenishment programme is critical for the establishment and maintenance of a beach zone in this vicinity. The sand replenishment programme is a joint exercise between the City and Transnet. The operation is done using the Transnet dredgers which are shared amongst Durban and others ports in South Africa. The Transnet Dredger is only permitted to supply sand from the approved sand trap onto the beaches. This sand replenishment process has been in practice for the last 40 years. The sand trap is located just south of the harbour entrance. The sand trap is an area or depression that is dredged on the sea bed to remove the accumulated northward moving sand which is trapped by the south breakwater and prevent it from building a sandbank in front of the harbour entrance. This process aids in maintaining a safer, clear and deep enough entrance channel that allows for the safe passage of ships entering and leaving the harbour.

Figure 2: Historical Photo showing the southern Beaches at the beginning of the sand pumping operation (approximately 1980)

Figure 3: Historical Photo showing Durban's Golden mile with the sand replenishment programme (approximately 1985)

The Sand Replenishment programme is operated to provide about 480 000 m^3 of sand to the beaches every year (equivalent to the amount of sand eroded from the beach annually). The bypass scheme is necessary due to the harbour entrance breakwaters impeding the northern long shore sand drift. The predominant/nett migration of sand is from south to north along our coast. The harbour breakwaters impacts this sand movement, and it is for this reason that dredging and pumping must occur. The central beachfront piers also function as a sand trap and results in a beaches being formed between the piers.

Figure 4: eThekwini Sand Hopper prior to being demolished in 2008

The previous hopper station was owned and operated by the City and the Harbour widening project resulted in the City's hopper being demolished and replaced by a hopper built and operated by Transnet The pump stations are linked to the newly constructed Hopper station owned and built by Transnet at A Berth. The new Hopper station connects to the B0 station at the north pier and this pumps along the 5 booster stations owned and operated by the City. This Hopper station project has experienced delays which has subsequently resulted in delaying the commissioning of the booster stations as they are dependent on the hopper station driving the sand replenishment operation and receiving slurry from it. This being said, the city's' new booster station at North Pier (after the Harbour widening) was completed in 2013, B0.

The interim solution over the years has been for Dredging Services pumping directly through a 900 diameter pipe which can pump as far as Addington Beach as it is not connected to the booster stations.

In the interim, while the final commissioning of the scheme is being undertaken, sand transfer has continued to be pumped onto the beaches via direct discharge from the dredger onto the southern beaches. Dredging Services pumps directly through a 900 diameter pipe which can pump to the southern beaches as far as Addington Beach as it is not connected to the booster stations.The sand that is nourished on the southern beaches is intercepted by the littoral current and moved gradually northwards. It must be highlighted that historically this process has proven to be successful in the nourishing the beaches on the northern side of the harbour.

Although there has been a delay in the commissioning of the hopper station, sand pumping has not ceased at all.The table below shows the combined sand volumes dredged from the sand trap and pumped onto the beaches via the direct discharge pipeline or via deposition onto the mound

YEAR	PERIOD	VOLUME (m3 cubic meters)
2012/13	Apr2012 - Mar2013	269391
2013/14	Apr2013 - Mar2014	344980
2014/15	Apr2014 - Mar2015	402540
2015/16	Apr2015 - Mar2016	189782
2016/17	Apr2016 - Mar2017	705345
2017/18	Apr2017 - Mar2018	535055

Coastal Monitoring:

The city also implements a coastal monitoring programme that amongst other activities includes monitoring the sand profiles along the eThekwini coastline. This monitoring programme dates as far back as 1980 when the scheme was first commissioned by the city. Beach surveys are undertaken frequently using mobile ground based LIDAR in order to track the gain or loss of sand onto the Durban beaches. The information from these surveys are used to estimate the volume of sand which has been eroded or deposited onto our beaches along our stretch of coastline and track areas of erosion or deposition. The effect that high swell and wave events has on our beaches are also monitored and tracked using this information.

CLIMATE CHANGE IMPACTS – ADAPTATION/MITIGATION

There has been evidence of increase in adverse wave conditions experienced along the KZN coastline which has increased the erosion rates on our beaches.

In terms of existing developments along the beachfront, additional environmentally acceptable protection methods are required. Protection of infrastructure is being undertaken on a priority basis.

In terms of future/planned development on the beachfront, the effects of long term erosion and sea level rise is taken into account at planning stage. Additional protection requirements are incorporated at approval stage to mitigate the effects of climate change impacts.

WAY FORWARD

1. **Immediate Intervention:** We have a plan in place to nourish the central beaches via an off -shore pipeline using the dredger to directly discharge onto the beaches if and when needed on an ad hoc basis. The operation normally lasts for a month with the focus being the central beaches, and the beaches near the Pirates Club and Suncoast Casino. This plan is not our preferred method of nourishment as the preferred method of nourishment will be to nourish the beaches through the existing sand replenishment scheme. This option is used as a last resort for replenishment of our beaches.

2. **Short Term:** We understand that Transnet's hopper station at A Berth is in its final testing stage. The city's sand replenishment scheme via the booster stations will be in a position to replenish the central beaches once the commissioning of the new hopper station is completed and fully operational. We expect full operation in the next few months should no unforeseen technical difficulties arise.

3. **Long Term:** Resume the Sand Replenishment Operations with the new Bx sand hopper driving the process via the city's existing Booster stations. Direct discharge onto the beach on an ad hoc basis.