UNIT 13 - SEYMOUR PARK, 2 SEYMOUR AVENUE, KINGSTON 10, JAMAICA, W.I.
TEL: (876)978-8950 (876)978-7415 FAX: (876)978-0685
EMAIL: INFO@SMITHWARNER.COM

June 8th 2012

Director - Application Management Division
National Environment and Planning Agency
10 & 11 Caledonia Avenue
Kingston 5
Jamaica, W.I

Attention: Mr Ainsley A Henry

Dear Mr Henry

Re: Application for a License under the Beach Control Act, 1955 in respect of the Construction and Maintenance of Three (3) Groynes, Two (2) Breakwaters, Dredging and Reclamation Works at Grand Palladium, Hanover - Ref: 2012-07017-BL00016

The National Environment and Planning Agency (NEPA) has reviewed the beach license application and the supporting documentation in respect to the captioned and has requested additional information in order to clarify certain aspects of the submission. The additional request relates to the preliminary engineering of the beach design for the expansion of the new Grand Palladium Royal Suites in Lucea, Jamaica. This letter report is intended to respond to clarifications requested regarding:

1- The dredging activity
2- The removal and relocation of any sensitive marine flora and fauna
3- The monitoring and relocation of marine resources
4- The indication that signs have been posted and that neighbours have been notified

In addition, in order to adequately address some of the questions that have been posed, a detailed benthic investigation has been carried out. The overall findings from that work are attached (presented as an addendum to our Preliminary Engineering Report) to this letter.

In order to facilitate the NEPA review process, short answers have been given in response to each question posed by NEPA. These have been presented in the context of the four general headings shown above.

1. **Dredging activity**
    a. **The intended method of dredging**

There seems to be a misunderstanding on the terminology of the word dredging used in the preliminary engineering report. It is understood that dredging and excavation are two different methods of deepening the seabed. Dredging is a marine based activity whereas excavation is a land based activity. It is our intention to clarify the term referred to as "dredging" in the report.

For all construction in the nearshore of the project site the term used as "dredging" actually refers to excavation or deepening of the seabed. The deepening of the seabed in the nearshore of the project site will be accomplished by the use of an excavator or other land based equipment, operating from created access pads. Material excavated will be placed into trucks and taken offsite for disposal. At the end of the excavation works, the access pads will be removed and the stones either re-used in the construction of the groyne and breakwater works, or taken off site.

The dredging mentioned in the report should only refer to the 9,600m3 of sand required to nourish the beach and that is to be located from a selected offshore or land source. If an appropriate source of sand is located further offshore of the project site then dredging will take place with marine based equipment such as a dredge barge. If the sand is to be located from an inland source then land-based equipment such as a backhoe or excavator will be used. In either case dredging will not take place in the nearshore of the project site.

    b. **The impacts on sediment transport**

A morphological analysis was conducted in the preliminary engineering report, which identified the sediment transport pathway in and out of the beach coves. The analysis revealed that in existing conditions the central portion of each beach cove is subject to cross-shore transport, while alongshore transport to the southwest occurs over the existing reef. The increase in sediment transport between both beach coves suggests that the sand is produced locally by the existing reef system while the rocky headlands help contain the sand within each bay. Numerical modeling results suggest that the beach will remain stable and protected for most of the year by the existing Grand Palladium headland, which is situated just north of the project site, except under swell and hurricane conditions and when sediment transport tends to be more predominant with longer period waves coming from a clustered northwest angle.

Using this information, various solutions were proposed and detailed in Appendix C (of the Preliminary Engineering Report), leading to a final recommended solution presented in that report. The recommended solution consists of two partially emergent breakwaters, and northern and southern emergent groynes. These groynes are designed to delineate both coves and are used as headland reinforcement to promote the accretion of sand within the beach coves and avoid loss of sediment to the south. The proposed structures are to be implemented along with foreshore excavation and beach nourishment to create two wider and stable beach coves and to enhance swimming conditions.

To evaluate impacts on overall sediment transport once the proposed concept is in place, computer simulated beach response modeling was carried out (and also described in the Preliminary Engineering Report) to test the various concepts and to evaluate the effectiveness of the proposed solution. Using two different swell conditions as well as Hurricane Dean Statistics, hydrodynamics, waves and sediment

transport were simulated using the MIKE21 program. The model was set first with existing conditions and then configured with the proposed optimum solution to predict what would happen during the same swell/storm conditions. Numerical modeling results showed the proposed beach coves were stable under swell conditions. It was found that:

- The potential sediment movement is substantially decreased in the lee of the proposed structures but the pathways and trends of sand movement remain the same.
- The mechanism of erosion and deposition is reduced by almost 100% along both of the proposed beach coves.
- The proposed breakwaters contribute to diminishing the sediment drift to the south while still allowing for natural current flow to the south. This will promote natural sand accretion along both of the beach coves
- The proposed groyne structure was efficient in enhancing accretion along the proposed beach and stabilizing the beach by preventing the loss of the nourished beach sand at the south and north end of the beach
- The use of two small beach coves retained with along shore groynes was found to be very stable and preferred as compared to a longer beach that would tend to be unstable over time.

Overall the pathways and trend of sand movement remained the same with the proposed solution in place, but with a lower intensity. Observations demonstrated that the proposed emergent structures are very efficient in reducing the swell-induced erosion and contribute to beach enhancement along both beach coves. Results also suggested that the downdrift impact caused by the implementation of the protective structures would be very small.

In term of sediment transport during construction it is known that the pre- and post-construction phases will generate turbidity. This turbidity can affect sensitive resources directly by smothering, or indirectly by occluding the water column in the vicinity of the construction. The dominant component of the sediment in the project area is sand; however there is also some amount of fines present in the sediment.

However, as summarized in table 7-1 of the Preliminary Engineering Report, turbidity of the water column is a reversible impact that is considered to be of short duration and magnitude and is localized to the project site itself. The limited circulation in these embayments, presented in the numerical modeling analysis, makes it unlikely that the turbidity generated will lead to the formation of plumes affecting resources further alongshore.

It is proposed that to minimize impacts on sediment transport due to construction phases of the project, the areas of coastal construction should be surrounded by silt curtains where the depth of water is sufficient to allow their deployment. Properly deployed and maintained turbidity screens can significantly reduce the transportation of sediment-laden waters along the coast and offshore as well as prevent/control silt entering the water column.

c. The impacts on the newly created beach and encroachments on the current/wave regime in the area

The comparison of the results between the existing and proposed beach enhancement solution showed the overall wave and current sheltering effect of the proposed structures providing a calmer area in their lee and up to the project shoreline and decreasing the alongshore sediment transport rates and the amount of sediment lost in the system. This was found to be beneficial to enhancing accretion along the proposed beach. Results showed:

- The breakwaters reduced wave heights in their lee by up to 70%.
- The breakwaters reduced maximum alongshore current speeds from 30% leeward of the proposed northern breakwater, to 40% leeward of the southern breakwater, and close to 100% along both of the proposed beach coves. Overall however, currents were still sufficient to allow for natural flushing of the beach coves.
- Observations also showed there was no increase in current speeds between the breakwaters; as the design allowed for currents to flow around the structures without the formation of rips currents. An increase in current speeds around nearshore structures often leads to partial scouring around the structure, which is seen as a negative impact.
- No downdrift impact to the adjacent property was observed with the structures in place

Overall the model results demonstrate that the proposed structures will decrease alongshore current speeds while still allowing for natural flushing of the bays to occur and promote a stable beach and safe swimming conditions along both of the proposed beach coves. The coastal process investigations show that the impact on the adjacent shorelines will be minimal due to the existing natural headlands north and south of the project site, which contain the coastal processes significantly more than the structures that are being proposed here.

d. Details on the disposal of dredge spoils

As has been discussed in point (a) of this letter, the deepening of the seabed in the nearshore of the project site will be accomplished by the use of an excavator and other land based equipment. Material not suitable for replanting and landscaping will be placed in trucks and taken offsite for disposal at an approved location.

2. Detailed plans for the removal and relocation of any sensitive marine flora and fauna (seagrass, corals, gorgonians etc.), including, but not limited to:

a. The name(s) and qualification of the persons responsible for the removal/relocation/replanting:

Smith Warner International Ltd will be responsible for the removal, relocation and replanting of the sensitive marine flora and fauna. The project team will include a marine biologist.

b. Dated historical and recent aerial photographs and geo-referenced maps showing size of the impact and proposed relocation/replanting sites

A Google aerial satellite image dated from 2009 has been used as a geo-referenced map to show the extent of the benthic survey (transect lines and areas), along with the coordinates of the layout points and the size of proposed coral relocation sites. A detailed plan for the relocation of these resources is presented in section 7.1-Benthic Survey of the Preliminary Engineering Report. Figure 1 below give a representation of the impacted site areas and the location of monument corals that are to be moved.

A study presented in the report by CL Environmental and CEAC "Proposed Seagrass Relocation and Replanting and Coral Relocation Methodology (2006)", investigated in details suitable relocation sites for sensitive benthic organisms that would be impacted by the coastal works of the existing Phase1. Figure 18 - "Ideal replanting areas and areas that are currently bare" of this report indicates seagrass relocation sites than are considered to be suitable for the reclamation works at the Grand Palladium.

c. Geo-referenced location of all donor areas (where applicable)

Figure1 hereunder indicates the geo-referenced location of all donor areas. Additional geo-referenced locations are also shown in Figure 18 of the report by CL Environmental and CEAC. GPS coordinates were extracted from the C.L. Report for the spaces1 that were found in the zone suitable for seagrass replanting, and these coordinates were uploaded into the GPS instrument. Each of the four areas identified as suitable spaces were snorkeled along with the surrounding seagrass meadow, and general observations were recorded. It should be noted that the structures shown in the main bay to the south in that figure, have not been built.

[1] Ibid p36 at Figure 18

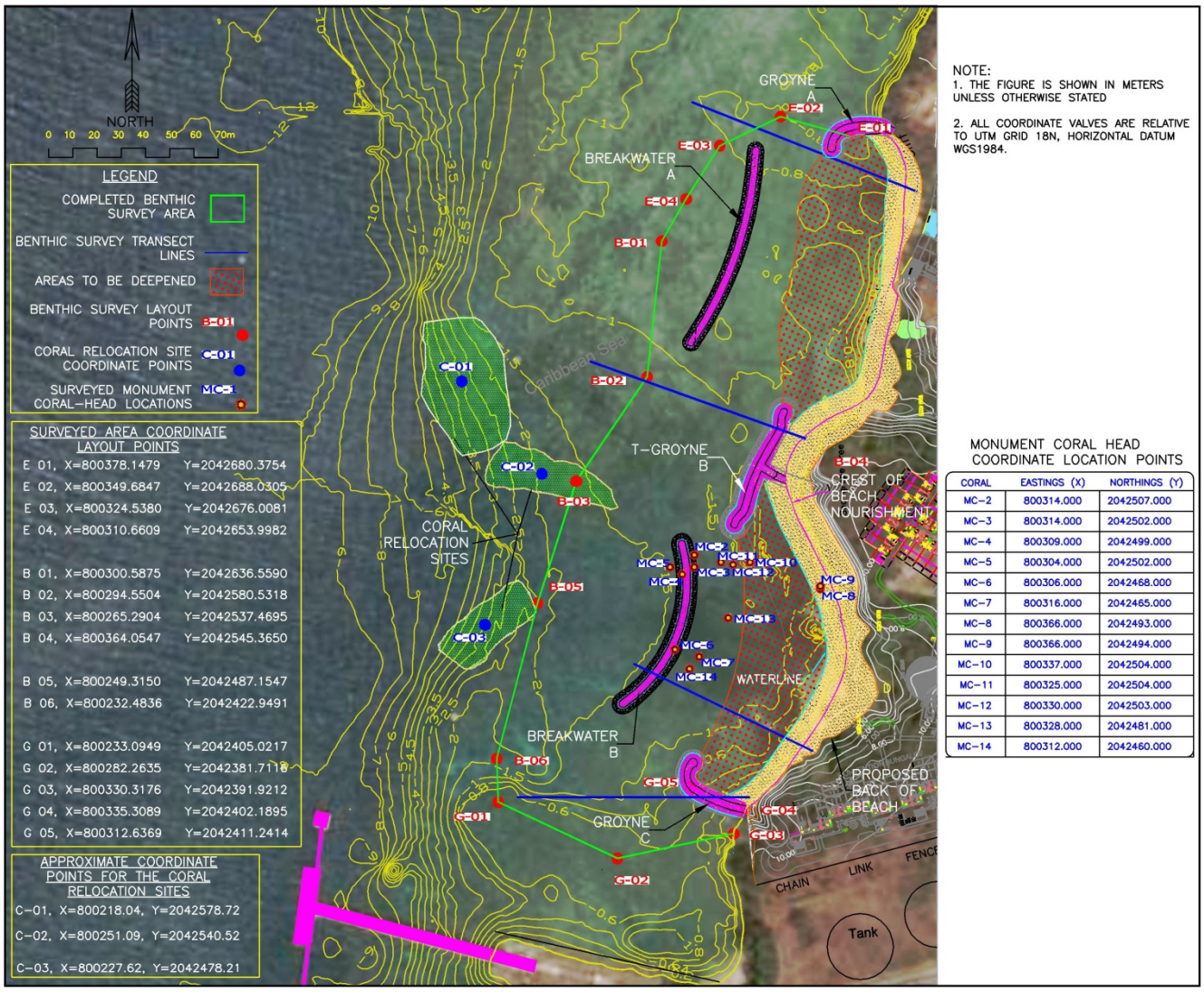


Figure 1-Georeferenced map showing the size of the impact area along with donor areas and monument coral locations

d. Detailed description of the impact and proposed relocation/replanting sites (inclusive of geographic coordinates) as well as methodologies for the activity

A detailed description of the expected impact has been presented in Section 3 - Findings of the Benthic Survey Addendum, attached with this letter response. That document further indicates that the survey carried out in April 2012 confirmed that:

i. There were no 'monument' corals present in the footprint of beach area 1 (the northern beach area); i.e. no coral colonies >0.1m observed in this area and 60% of the area was comprised of seagrass beds.

ii. There were four 'monument' corals present in the footprint of beach area 2 and these are reported on below in the section on monument corals. It was also noted that 40% of the beach area 2 was covered by seagrass, among which part of it appeared to be flowering.

iii. 60% of the Northern groyne foot print was covered by seagrass.

iv. 80% of the T-Groyne was covered by seagrass

v. 20% of the Southern Groyne was covered by seagrass

vi. 95% of the northern breakwater was covered by seagrass

vii. 50% of the southern breakwater was covered by seagrass

The proposed relocation/replanting sites for both coral and seagrass are mentioned in the CL Environmental Report. In addition proposed seagrass relocation sites are described in detailed in Sections 3 - 10, Seagrass Relocation Sites, of the Benthic Survey Addendum, while proposed coral relocation sites with geographic coordinates are detailed in Figure1 of this letter.

The methodology for relocation/replanting is given in Section 5.1 - Relocation of Ecosystem Resources, of the Benthic Survey Addendum.

e. Dated photographic evidence of all works, including species to be relocated, and relocation/replanting sites.

All photographs have been dated from June 2011 and April 2012. A benthic survey was first conducted in June 2011 so as to identify sensitive marine resources in the footprint and the vicinity of the proposed construction site. Given the changes that were made to the proposed design, a second field trip was conducted on the 14th and 15th of April 2012 and a GPS instrument was used to identify the approximate location and extent of each of the proposed coastal structures and the areas of coastal works on the ground. All sensitive areas were examined by snorkeling and photographs and video evidence were collected. Photographs of all works are presented in Appendix E of the Preliminary Engineering Report and in the Benthic Survey Addendum attached with this letter. A detailed methodology of how and when photographs were taken is shown in Section 2 –Methodology, of the Benthic Survey Addendum.

f. Total number and size/area of species to be relocated.

The detailed description of the impact is detailed in Section 3 – Findings, of the Benthic Survey Addendum.

g. All corals must be identified (by species), tagged and spatially mapped, using GPS coordinates.

The list of impacted species located in and outside of the footprint of the proposed coastal structures is presented in Section 3.9 - "Monument Corals" and "Photo Appendix-Monument Corals" of the Benthic Survey Addendum to the Preliminary Engineering Report, which is attached with this letter.

h. Time and date of monitoring and analysis

A detailed description of the time and date of monitoring and analysis has been presented in Section 5.4 – Monitoring, of the Benthic Survey Addendum.

i. Estimate of survival success rate expected to be achieved at the end of the five (5) year monitoring period

It is expected that the estimated survival success rate that will be achieved at the end of a 5 year monitoring period will be 75% for the corals relocated and 100% for the seagrasses against background levels. It is not considered practical to estimate survival success rates for the invertebrates relocated.

j. An estimate of the timeline for completion of the activity

It is estimated that this activity can be completed within a two to three month time frame.

k. Details of the following:

i. Total area, health and zonation of seagrass beds/number and species of corals, gorgonians etc. within impact site as well as areas surrounding proposed replanting sites.

The detailed description of the impact is detailed in Section 3 – Findings, of the Benthic Survey Addendum.

It is estimated that the area to be replanted and/or restored will be approximately 4,800m2, which is an area that will likely be disturbed by the coastal works.

ii. Water column depth at donor and receptor sites

The water column depth at donor sites varies between 0 to 1m below mean sea level, the water depths at receptors sites varies between 1.5 and 3m below mean sea level. Details about depths contours are given in Figure 7.1 - "Extent of benthic survey along with transects/observation points location and coral/seagrass relocation sites", and Figure 2.3 - "Merged bathymetric data (left) combined with beach profiles to form seabed and land contours (right) at the project site of the Grand Palladium preliminary engineering report".

iii. Shoot density and leaf length of seagrass within impact site and surrounding the receptor sites (where applicable)

The description of leaf length has been given in Section 3 – Findings, of the Benthic Survey Addendum.

iv. Water quality and physiochemical conditions (suspended solids, nutrients {Nitrates and Phosphates} salinity , temperature, conductivity, Photosynthetically Active Radiation (PAR), pH, Dissolved Oxygen, BOD, faecal coliform, sediment depth, sediment type and composition, waves, currents (speed and direction) at impact and proposed receptor sites

The water quality and Physiochemical conditions are given in Sections 4 and 5 of the report by CL Environmental and CEAC, "Proposed Seagrass Relocation and Replanting and Coral Relocation Methodology (2006)".

Sediment type is given in Section 2.4 – "Sand Sample Analysis" of the Preliminary Engineering Report. Results of the sediment sample analyses indicate that samples were comprised primarily of gravels and sand with distinctive coarse and fine fractions and no or negligible amounts of mud. Gravels found in some samples were indicative of coral fragments. This information was used in the beach response modeling and provided guidance for the grain size distribution to be used for the nourishment of the proposed beach coves.

Information on the wave, current and sediment transport patterns at the impact and proposed sector sites are given in Section 4 - "Sediment Transport Regime" of the Preliminary Engineering Report.

v. Bathymetry and reef profile

Details about depths contours are given in Figure 7.1 - "Extent of benthic survey along with transects/observation points location and coral/seagrass relocation sites", Figure 2.3 - "Merged bathymetric data (left) combined with beach profiles to form seabed and land contours (right) at the project site and Figure 4.4 - "Bathymetry offshore (left) and detailed (right) flexible mesh for existing conditions" of the Grand Palladium Preliminary Engineering Report".

l. Sediment stabilization mechanisms for impacted replanted bed

Areas of coastal construction should be surrounded by silt curtains where the depth of water is sufficient to allow deployment. Properly deployed and maintained turbidity screens can significantly reduce the transportation of sediment-loaded waters along the coast and offshore.

Areas excavated of seagrass will be re-nourished with sand and therefore the edges of the seagrass beds will be flush with and contained by, the toe of the nourishment.

m. Type and specifications of the marine cement to be used to reinforce corals to donor substrate

It is proposed that the monument corals be re-attached to existing hard substrate in the relocation sites using Portland Type II Cement mixed with sand and molding plaster as a drying catalyst.

n. List of anthropogenic and natural (bioturbation-disturbance caused by shrimps, stingrays, turtles etc.) impacts affecting impact site and proposed receptor site(s)

The detailed description of the impact is detailed in Section 3 – Findings, of the Benthic Survey Addendum.

3. The Monitoring of the Relocated Marine Resources

a. Monitoring Reports

During the replanting activity a detailed daily log will be kept by the contractor and the log will be submitted to NEPA every 2 weeks. The information logged will include the total area of seagrass and the total number of corals relocated for the period. GPS coordinates of the harvest site and relocation site for the seagrass will be recorded. The actual coral colonies harvested will be noted along with the GPS coordinates of the replanting location on the coral reef. A dated photographic record will be kept of the work done in the relocation exercise.

As requested by NEPA, a minimum of 13 monitoring reports will be submitted in relation to the mitigation exercise and this will be carried out over a period of approximately 5 years. The first report will be made thirty days following the completion of the replanting exercise, thereafter every 3 months for the first year, and then every 6 months for the second and ensuing years. After the third year of monitoring, the changes from year to year will be evaluated and a decision will be taken in consultation with NEPA, as to the need, or not, to continue monitoring.

b. Persons Responsible for Monitoring

The monitoring will be carried out by Smith Warner International Ltd., and the team will include a Marine Biologist. Reports will include the names of the persons who carried out the monitoring.

c. Location of Relocation/Replanting Sites

The locations of the relocation and replanting sites, along with geographical coordinates, have been presented in the Preliminary Engineering Report submitted previously. In addition, during the actual relocation exercise, GPS coordinates of the harvest and replanting sites monitored will be noted.

d. Time and Date of Monitoring and Analysis

The time/date of the monitoring and analysis periods will be provided as requested by NEPA.

e. Description of Analytical Methods

A description of any analytical methods employed will be provided in the monitoring reports.

f. Timeline for Activity Completion

An estimate of the timeline required to complete the activity will be included in the monitoring reports.

g. Report Content

In relation to the relocated resources, the reports will also include data on:

- The percentage cover of relocated seagrass, corals, and general benthic cover (living and non-living) at the relocation site, and including species composition, health and size structure of coral and seagrass communities over time;
- Number and species composition of fish populations over time;
- Replanted unit survival, shoot density and leaf length and the status of transplanted corals over time. Populations of special interest, such as urchins, will be monitored to provide estimates of their density within and outside of the transplanted seagrasses.
- Any bleaching, disease, or other damage observed to the corals will be reported whether this occurs in the transplanted coral colonies or not.

Observations made in the field will be supplemented by photography to show the progression of replanted resources over time. These data will be superimposed onto aerial images and geo-referenced maps. In addition, if some remedial planting is required, this will also be shown on the images and mapping.

Water quality and physiochemical parameters will be monitored over time at the replanted sites.

For the first report, any problems encountered during replanting will be noted, and its likely impact on the subsequent integrity of the transplanted organisms will be commented upon.

4. Notification Requirements and Public Consultations

As requested, the Form B notification requirements will be carried out. This will include posting the forms and advising neighbours of the intent to carry out the works. Further, and as requested, a public consultation process will be conducted to acquaint the neighbouring public with the upcoming project. This will be facilitated through the placement of the project documents in strategic locations, including *inter alia*:

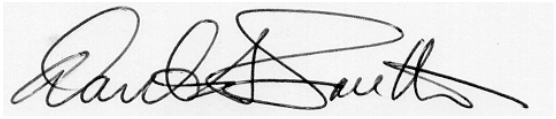
- Local library
- Parish Council Office
- Grand Palladium Hotel front desk
- NEPA website

Comments and/or concerns will be fielded directly to NEPA.

Should you require any further information, or clarification on any of the above, please do not hesitate to contact me at the address and numbers outlined above.

Yours Sincerely,

Smith Warner International Ltd.



Dr David Smith P.Eng

Managing Director