Project Name: **Port Elizabeth Foreshore Rehabilitation: Short-Term Solution**

Project No.: **XPE.E.0030**

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1. INTRODUCTION

This Specification covers the variations to SANS 2001-CC1, Construction works, Part CC1: Concrete works (structural), for the supply, delivery, handling, fabrication, storage and installation of concrete works required for use on marine structures.

2. SCOPE

This specification covers the requirements for carrying out drone surveys.

3. DEFINITIONS

Engineer: To be interpreted as *Supervisor* or *Project Manager* depending on the context if the NEC conditions of contract are used.

4. SURVEY EQUIPMENT

An unmanned aerial vehicle (drone) with airborne LiDAR must be used to carry the survey. The drone must be able to operate effectively in wind speeds up to 8 m/s.

The data logger system must have adequate electronic storage capabilities. The system must store multiple inputs (Date, Time, X, Y, Z Position, Photographs) on an electronic medium, which can be transferred to a personal computer. The system must be provided with the necessary software to plot the positions of the recordings and draw maps, contours, cross profiles, etc.

The Contractor must submit to the Engineer for his acceptance all specifications of his proposed equipment and software.

5. SURVEY CONTROL AND SETTING OUT OF THE WORKS

5.1 General

The coordinate system to be used on the project is World Geodetic System 84 (WGS 84).

All survey work must be carried out and certified by a qualified land surveyor (SAGC recognized surveying course or equivalent).

5.2 Bench marks

The local bench mark used must be documented appropriately. If no existing local bench marks are available, a new bench mark must be established and clearly marked on site. The bench mark must be suitably located and adequately protected for future use during construction which may occur in future.

A schedule of the bench mark(s) used must be included in a final drawing(s), with the following information:

i. Bench mark designation;
ii. Spot level value; and

iii. Plan coordinates.

5.3 Technical requirements

1.1.1 Conditions

The survey must be undertaken at low tide. The LiDAR configuration must be such that the ground levels, rather than tree canopy, other vegetation levels or infrastructure levels are detected.

1.1.2 Accuracy

The X, Y coordinates must have a horizontal accuracy of 10 mm and the Z coordinates must have a vertical accuracy of 15 mm. Grid spacing of points must be 0.05 m or less.

5.4 Deliverables and data presentation

The *Contractor* must submit a survey quality control plan to the Engineer. A survey report must be submitted to the Engineer on completion of all surveys. The report must give a clear account of how the survey was carried out, the results achieved, the difficulties encountered and the shortcomings. Emphasis must be placed on the analysis of achieved accuracies.

The *Contractor,* upon completion of the survey, must produce the following:

i. High resolution digital geo-referenced orthophotos at 1.76 cm/pixel
ii. Digital Elevation Model (DEM) extracted from the Digital Surface Model (DSM)
iii. Survey report indicating the datum used, time of survey, conditions during survey, survey personal, equipment used and methodology.
iv. Date, time and X, Y, Z data, stored in ASCII format: comma separated values (CSV), txt or tab delimited.
v. ASCII text file with each line containing a single point consisting of the following attributes, [PositionX], [PositionY] and [PositionZ] are all described as floating point numbers, while the colors [ColorR], [ColorG] and [ColorB] are unsigned bytes described as values from 0-255.
vi. Coordinated ReCap (.rcp) file

6. PERMITS

The Contractor obtains the necessary drone survey permit(s). The *Contractor* is advised that various processes may be required to obtain a drone survey permit for the Port of Richards Bay. The *Contractor* must ensure that the relevant authorities are identified and consulted prior to an application being made. The *Contractor* must allow for adequate time for these processes to be completed.