Department of Transport and Regional Services

Cocos (Keeling) Islands GIS Utilities Update

Data Summary

September 2003

Contents

Appendices

1.   Introduction

GHD has been commissioned by the Department of Transport and Regional Services (DOTARS) to compile information on infrastructure services for the Cocos (Keeling) Islands that will ultimately be used to assist GeoScience Australia in updating of their Geographic Information System (GIS). The data layers featuring information on the power, water supply and wastewater services for the Cocos (Keeling) Islands have been compiled from existing sources of information held by GHD and others. The source information is a collection of drawings of completed works relating to the services infrastructure on the islands.

There are essentially two phases of work involved with the data extraction process. The first phase deals primarily with creating a spatial index on the information contained in the source drawings. The second phase integrates this index with the services information digitally extracted fro m the source drawings.

This report will detail the GIS data layers that GHD has compiled and how it can be used. The problems encountered will also be discussed with recommendations on any further work required to update the information.

1.1   Overview

The first phase dealt with the creation of a spatial index of all source information that would be used for the detailed extraction in phase two. This spatial index provides users with a quick reference and descriptions of the source CAD drawings on services features. This index is purely for first reference to the available information and does not allow complex analytical techniques to be applied.

The limitation of phase one is eliminated by the data-capture methods used in phase two. The information from the source CAD drawings is actually recorded separately in attribute tables that are linked to the services features themselves. This process essentially turns a static design drawing into a GIS data layer. Users are then able to run spatial queries and more complex analysis on the information itself.

End products from both phases have been saved in a format that is compatible and easily incorporated with the existing Cocos GIS. This GIS contains many features that include the islands' topography, infrastructure, environment, and cultural features. GHD's involvement was to provide additional information to the infrastructure with details of existing services on the islands.

1.2   Benefits

The benefits of such information are aimed at government decision makers, stakeholders and the general Cocos (Keeling) Islands community. For example, a group of planners proposing to develop a new commercial complex on the islands can easily access the Cocos Island GIS to determine the best location. Once they have some idea of where they want to develop, they can access the services information on the GIS system to quickly assess the existing services networks that are available.

One of the more significant issues for any community is the need for a utilities management system. GHD has been involved in the first step to integrate and structure the information so that it can be managed and administered accordingly. So long as the information is properly updated and maintained, it will serve as a powerful database for the utilities required in the functioning of the activities on the islands.

2. Data Capture

2.1 Description

As-constructed services information were extracted from existing plans and compiled into various data themes accordingly. The scope of the initial data extracti on agreement focused on three main categories consisting of power, wastewater, and water supply features. However, during the actual process of extraction, two additional data themes were created for Fuel and Telecommunications services.

The information collected covers most of the populated areas on the Home Islands and the West Islands. Figure 1 of Appendix A shows the coverage of the source drawings that were used. The limitation in coverage and reliability of the source drawings were a result of inconsistencies with initial data capture and drafting methods. GHD has resolved such problems and issues to the best interest of the intended users of the information.

Helmert transformations were applied to some drawings that were created in an arbitrary grid coordinate systems. The accuracy of these transformations has been documented and the residuals are acceptable for the purposes of the data (refer to Appendix C). It is recommended that the information contained in the data themes be used conjunctively with the source drawings themselves so that the user can decide how to best use the data.

A list of drawings from various projects that provided the information on the services infrastructure for both the Home Islands and the West Islands used for the data extraction can be found in Appendix B.

2.2 Data Capture Methods

The drawings that were available in digital CAD formats were directly converted into the ESRI Shapefile format within ArcView 3.2. This conversion allows attribute information such as layer names and elevation to be kept. Note that only the polyline features were kept as they provided the most relevant details. These polylines were then attributed with the information annotated on the corresponding drawings. Polylines are used to represent features such as power and telecommunications cables, water supply pipes, and sewerage pipes.

All point data were recorded by manual on-screen digitising within ArcView 3.2. These points were then attributed with the information contained on the associat ed drawings. The point features have been given the appropriate GHD survey codes that were then used in creating the appropriate legends. Note that the source drawings did not have any codes associated with the point features. These codes comply with th e standards used by GHD Surveys and provide a means for point features to be classed with some consistency.

2.3 Problems Encountered

A number of problems occurred during the extraction of the information from the source drawings such as mismatches in the location of some features. GHD has resolved these to the best of our knowledge with the intention of maintaining the integrity in the collected data. The problems include editing locks with three-dimensional (3D) features and arbitrary coordinate systems.

The majority of the source drawing files consisted of features saved in 3D. The process of converting these features to the ESRI shapefile format had complications when dealing with 3D features. Although 3D polylines can be converted to the ESRI shapefile format, the converted features cannot be merged seamlessly with two-dimensional (2D) polyline features. This type of editing is only available with more sophisticated software such as ESRI ArcInfo that have more complex functionality. The way around this was to first convert the AutoCAD drawing files to ESRI shapefiles and then export them in the DXF format without height attributes. These DXF files could then be imported into ArcView with all the features saved in 2D. The editing locks that prevent the manipulation of features are removed when dealing with 2D data in ArcView 3.2.

One of the more critical problems with the source drawing files was the fact that some of them had been saved in arbitrary grid coordinate systems. These files are indicated in the list of drawings in Table 1 of Appendix B. Fortunately, the cadastral boundaries were included in these drawings. By using derived Helmert transformation parameters from Terramodel, the drawings were converted to the Cocos (Keeling) Islands Grid (1992). Details on the accuracies of the transformation processes are documented in Appendix C.

3.   Data

3.1   Utilities

The various themes depict the existing services infrastructure currently on the Home Islands and the West Islands. Each category of data is made u p of a point feature layer and a polyline feature layer. The following is a list of ESRI shapefiles detailing the different utilities that can be found under the 'UTILITIES' directory on the CDROM:

- **Fuel**

    fuel_point_features.shp

    fuel_polyline_features.shp

- **Gas**

    gas_point_features.shp

    gas_polyline_features.shp

- **Power**

    power_point_features.shp

    power_polyline_features.shp

- **Telecommunications**

    telecommunications_point_features.shp

    telecommunications_polyline_features.shp

- **Wastewater**

    wastewater_point_features.shp

    wastewater_polyline_features.shp

- **Water Supply**

    water_point_features.shp

    water_polyline_features.shp

The point features show the approximate centre locations of the services features such as the centre of sewer manholes. The spatial index layers provi ded for phase one should be used with the data themes so that a quick reference can be made to the geographically related drawings. These indexes can be found under the 'SPATIAL_INDEXES' folder on the CDROM.

The source date indicated in the attribute tables of the data themes is a very important feature. It will allow users to determine the relevance and reliability of any duplicate information evident in the data layers. Please refer to the metadata statement in Appendix D for a more detailed description of the data. Figure 3 of Appendix A shows a sample of the features that were extracted from the source CAD drawings.

3.2   Getting Started

An ArcView 3.2 project has been set up with all the services information overlaid on some of the data available from the Cocos (Keeling) Islands GIS. This UTILITIES.APR file can be found under D:\APRS\ and have been set up to run off the CDROM. The data will be loaded with the recommended symbols for the features. A copy of the cadastral boundaries dataset has been provided with the CDROM, which has been sourced from the Cocos GIS June 2001 release.

If for some reason this does not work, you can create a new project within ArcView 3.2 and import the data themes directly from the CDROM. The legends should load properly provided that you have copied the font files from the FONTS directory on the CDROM to the FONTS directory under your WINDOWS directory on your local drive. It is essential that you do this before starting up an ArcView 3.2 session to enable the legends to display as intended.

For those that do not have ArcView 3.2, an ArcExplorer 2.0 project file has been set up. Again, this has been set up to run off the CDROM under the AEP folder (utilities.aep). The users of this project file will be limited to the symbols available for displaying the services features.

A copy of the installation file for ArcExplorer 2.0 has been supplied and can be found in the AE2_INSTALLATION directory. Once you have installed this application, you can add the data themes directly from the CDROM.

3.3   Troubleshooting

Any problems with displaying or importing the data themes into either of these applications should be directed to ESRI. For other problems with the data itself, please contact the following representative from GHD.

Mr. Barry Lei

GIS Analyst

GHD Perth

Ph: 08 94296666

Fax: 08 94296555

Email: permail@ghd.com.au

4. Recommendations

To make the data extraction more efficient and effective in future, it is recommended that the organisations responsible for drafting services information should be made aware of the importance of keeping a logical layer structure with their drawings. This is easily achieved by creating policies and procedures to ensure that the information contained in any drawing is consistent with its contents. For example, different water supply pipe sizes should be saved in separate layers within a drawing.

A geodatabase containing all the services data has been included. This is a new storage method designed by ESRI that allows better management and administration of the data. This geodatabase can be found under D:\UTILITIES\Utilities.mdb and can be accessed using any application from the ESRI ArcGIS 8.3 suites. For more information on how to use a geodatabase effec tively, please refer to the manuals provided by ESRI.

Appendix A

Figures

Home
Island

West
Island

42690mE

48890mN

N

LEGEND

- ▭ Home Island Distribution Pillars Contract
- ▭ HV Reticulation Stage 1 Contract
- ▭ HV Reticulation Stage 2 Contract
- ▭ HV Reticulation Stage 3 Contract
- ▭ Vacuum Sewerage Upgrade Contract
- ▭ Water Meter Installation Contract
- ▭ Water Supply Upgrade Contract

NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS

SCALE

0.5   0   0.5   1   1.5km

1:70000 at A4

LOCALITY MAP

Cocos (Keeling) Islands

COPYRIGHT

VIEW: 6113380-G1

CREATED BY	CHECKED	APPROVED
BL		

HORIZONTAL DATUM: WGS84	PROJECTION: CKIG92
HEIGHT DATUM: N/A	METADATA RECORDED: 100%

DATE	FILE LOCATION
29/08/03	N:\61\13380\GIS\APRS\PROJ2.APR
REVISION	DRAWING NO / LAYOUT NAME
0	6113380-G1 / 6113380-G1

GHD   MANAGEMENT
ENGINEERING
ENVIRONMENT

**Cocos (Keeling) Islands GIS
Utilities Update**

**FIGURE 1
Spatial Indexes**

LEGEND PAGE

POWER
Polyline Features
- Electrical Cables
- Electrical Features
- Electrical Reticulation Cable
- High voltage - Reticulation cable
- Low Voltage - Reticulation Cable
- Mains Cable
- Streetlighting cable
- Underground Power Cable

Point Features
- Traffic Signal
- Switch Box
- Power Pole
- Light Pole
- Meter
- Cable Box
- Cable Dome
- High Tension Cable Marker
- Distribution Board
- Transformer
- Substation
- Pit
- Earth Pit
- Miscellaneous
- Join

WASTEWATER
Polyline Features
- Gravity Main
- Plastic Pressure Main
- Pressure Main
- Sewer Pipe
- Vacuum Main
- Wastewater Features

Point Features
- Stop Valve
- Valve
- Scour Valve
- Air Valve
- Manhole
- Inlet/Outlet
- Tank
- Pump Station
- Pump
- Miscellaneous
- Bend
- Blank End
- Pump Pit

WATER
Polyline Features
- 100 AC
- 100 PVC
- 150 GWI
- 150 PVC
- 20 PE
- Bore Water Line
- Pipe
- 50mm Water Main
- 80mm Water Main
- Water Features
- Water Main

Point Features
- Water Tank
- Water Meter
- Stop Valve
- Hydrant
- Well
- Scour Valve
- Pump
- Bore
- Miscellaneous
- T-Joint
- Sluice Valve
- Blank End
- Join
- Pump Pit

FUEL
Polyline Features
- Fuel pipes

Point Features
- Fuel Tank
- Fuel Valve
- Miscellaneous

GAS
Polyline Features
- Miscellaneous
- Pipe

Point Features
- Miscellaneous

TELECOMMUNICATIONS
Polyline Features
- ASA Communications Cable
- Cable
- Telecommunications cable
- Telephone Cable

Point Features
- Pit
- Pillar
- Satellite Dish
- Tower
- Antenna
- Miscellaneous

CREATED BY	CHECKED	APPROVED
BL		

HORIZONTAL DATUM: WGS84	PROJECTION: CKIG92
HEIGHT DATUM: N/A	METADATA RECORDED: 100%

DATE	FILE LOCATION
30/06/03	N:\61\13380\GIS\APRS\PROJ2.APR
REVISION	DRAWING NO / LAYOUT NAME
0	6113380-G2 / LEGEND PAGE

GHD
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ENVIRONMENT

Cocos (Keeling) Islands GIS
Utilities Update

Figure 2
Legend Page

H o m e
I s l a n d

51955mE

LEGEND		SCALE		VIEW: 6113380-G3		

LEGEND

REFER TO LEGEND PAGE

SCALE

50   0   50   100   150m

1:5000 at A4

LOCALITY MAP

Cocos (Keeling) Islands

VIEW: 6113380-G3

CREATED BY	CHECKED	APPROVED
BL		

HORIZONTAL DATUM: WGS84   **PROJECTION:** CKIG92

HEIGHT DATUM: N/A   **METADATA RECORDED:** 100%

DATE	FILE LOCATION
29/06/03	N:\61\13380\GIS\APRS\PROJ2.APR

REVISION	DRAWING NO / LAYOUT NAME
0	6113380-G3 / 6113380-G3

GHD
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Cocos (Keeling) Islands GIS Utilities Update

FIGURE 3
Data Sample

NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS

GHD

Appendix B

Tables

Table 1 – Source Drawings

Table 1 - Source Drawings

Files to process	Spatially Relevant	Transformed to CKIG92	Used for Data Extraction	Reason Not Used
source\power\cocos hv retic upgrade stage 2 - as cons\				
54E16.dwg	**P**	-	**P**	
54E17.dwg	**P**	-	**P**	
54E18.dwg	**P**	-	**P**	
54E19.dwg	**P**	-	**P**	
54E20.dwg	**P**	-	**P**	
rwest.dwg	**P**	**P**	**P**	
rwest_scaled.dwg	**P**	**P**	-	Same as rwest.dwg with less features shown
title2.dwg	-	-	-	
west.dwg	**P**	-	-	Very similar to works_westis.dwg
works_westis.dwg	**P**	**P**	**P**	
source\power\cocos hv retic upgrade stage 3 - as cons\				
C01.dwg	**P**	-	**P**	
C02.dwg	**P**	-	**P**	
C03.dwg	**P**	-	**P**	
C04a.dwg	-	-	-	
C05.dwg	-	-	-	
C06.dwg	-	-	-	
C07.dwg	**P**	-	**P**	
C08.dwg	-	-	-	
civil.dwg	**P**	-	**P**	
cocos_west.dwg	**P**	-	-	Accuracy seems low
E01.dwg	-	-	-	
E02.dwg	-	-	-	
E03.dwg	-	-	-	
E04.dwg	-	-	-	
E05.dwg	**P**	-	**P**	

Table 1 - Source Drawings

Files to process	Spatially Relevant	Transformed to CKIG92	Used for Data Extraction	Reason Not Used
E06.dwg	P	-	P	
E07.dwg	P	-	P	
E08.dwg	P	-	P	
E09.dwg	P	-	P	
E10.dwg	P	-	P	
E11.dwg	P	-	P	
E12.dwg	P	-	P	
E13.dwg	P	-	P	
E14.dwg	P	-	P	
E15.dwg	-	-	-	
E16.dwg	-	-	-	
elect2.dwg	P	-	P	
newline.dwg	P	-	-	Duplicate information
west_civil.dwg	P	-	P	
source\power\home island distribution pillars\				
24E01.dwg	P	-	P	
24E02.dwg	P	-	P	
24E03.dwg	-	-	-	
24E04.dwg	-	-	-	
homeisl.dwg	P	P	-	Identical to homeisl_powermeter.dwg
homeisl_powermeter.dwg	P	P	P	
\source\wastewater\sewer\				
home_watermain.dwg	P	P	P	
homebase.dwg	P	P	P	
homesewer.dwg	P	P	P	
homesurvey.dwg	P	P	P	
westbase.dwg	P	P	P	

Table 1 - Source Drawings

Files to process	Spatially Relevant	Transformed to CKIG92	Used for Data Extraction	Reason Not Used
westsewer.dwg	P	P	P	
westsurvey.dwg	P	P	P	
source\wastewater\vacuum sewerage upgrade\				
48c80.dwg	P	-	P	
48c81.dwg	-	-	-	
48c82.dwg	P	-	P	
48c83.dwg	-	-	-	
homevac2.dwg	P	-	-	Very similar information to vac2.dwg
vac2.dwg	P	-	P	
source\water\water meters installation contract\				
H001.tif	P	-	-	No information on water meters
H002.tif	P	-	P	
H003.tif	P	-	P	
H004.tif	P	-	P	
H005.tif	P	-	P	
H006.tif	P	-	P	
H006.tif	P	-	P	
H008.tif	P	-	-	No information on water meters
H009.tif	P	-	P	
H010.tif	P	-	P	
H011-1.tif	P	-	P	
H012-1.tif	P	-	P	
H013-1.tif	P	-	P	
H014-1.tif	P	-	P	
source\water\water supply upgrade\				

Table 1 - Source Drawings

Files to process	Spatially Relevant	Transformed to CKIG92	Used for Data Extraction	Reason Not Used
HIH01.dwg	-	-	-	
HIS01.dwg	-	-	-	
WIE01.dwg	-	-	-	
WIH01.dwg	**P**	**P**	**P**	
WIH02.dwg	-	-	-	
WIH03.dwg	-	-	-	
WIS01.dwg	-	-	-	
source\works as cons 1994\				
underground_services_home_island.dwg	**P**	**P**	**P**	
underground_services_west_island.dwg	**P**	**P**	-	Lack of integrity in layer structure
source\additional information\				
buffet_close_subdivision.tif	**P**	-	**P**	

Appendix C

Transformation Summaries

Accuracy Statements Of Transformations

HomeIsl_CKIG92.dwg

GHD Surveys
239 Adelaide Tce   Home Is Arb(mm) to CKIG92
PERTH, WA, 6004
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Tuesday, 27 May 2003 7:58:41

PROJECT: N:\61\13380\gis\data\source\cad\power\tmodel\Transformed to CKIG92.pro
----
Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
1472	1453	1.0	0.004	-0.004		
1470	1454	1.0	0.008	-0.006		
1434	1460	1.0	0.005	0.003		
1432	1461	1.0	-0.028	0.008		
1431	1457	1.0	-0.013	0.002		
1459	1455	1.0	0010	-0.003		
1467	1466	1.0	-0.003	0.012		
1473	1468	1.0	0.006	0.008		
1469	1456	1.0	0.011	-0.020		

Centroid Control   52257.000E   60024.108N
Centroid Data   273671188.780E 8746248333.384N
Easting Shift-273618931.7798
Northing Shift-8746188309.2754
Rotation -0 26'49.5"
Scale factor 0.001000

rwest_2_CKIG92.dwg

GHD Surveys   rwest Arbitrary MGA (mm)
239 Adelaide Tce   ARB => CKIG92
PERTH, WA, 6004
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Thursday, 29 May 2003 10:09:40

PROJECT: N:\61\13380\gis\data\source\cad\power\tmodel\Transformed to CKIG92.pro
----
Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
10309	10310	1.0	-0.018	-0.050		
10312	10311	1.0	-0.036	-0.010		
10313	10314	1.0	0.031	0.025		
10316	10315	1.0	0.079	-0.022		
10317	10318	1.0	0.043	0.041		
10321	10322	1.0	-0.065	0.021		
10325	10326	1.0	-0.034	-0.004		

Centroid Control   45615.587E   52901.443N
Centroid Data   264378925.713E 8652496559.944N
Easting Shift-264333310.1251
Northing Shift-8652443658.5015
Rotation -0 27'02.4"
Scale factor 0.001000

underground_services_home_island_CKIG92.dwg

GHD Surveys
239 Adelaide Tce   Underground Services Home Is Arbitrary MGA (mm)
PERTH, WA, 6004   ARB => CKIG92
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Thursday, 29 May 2003 11:55:34

PROJECT: N:\61\13380\gis\data\source\cad\power\tmodel\Transformed to CKIG92.pro
----
Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
1472	10354	1.0	0.004	-0.004		
1470	10355	1.0	0.008	-0.006		
1434	10363	1.0	0.005	0.003		
1432	10357	1.0	-0.028	0.008		
1431	10358	1.0	-0.013	0.002		
1459	10362	1.0	0.010	-0.003		
1467	10361	1.0	-0.003	0.012		
1473	10359	1.0	0.006	0.008		
1469	10360	1.0	0.011	-0.020		

Centroid Control   52257.000E   60024.108N
Centroid Data   273670641.438E 8746230840.887N
Easting Shift-273618384.4374
Northing Shift-8746170816.7788
Rotation -0 26'49.5"
Scale factor 0.001000

underground_services_west_island_1_CKIG92.dwg

GHD Surveys   Underground Services West 1 Arb MGA (mm)
239 Adelaide Tce   ARB => CKIG92
PERTH, WA, 6004
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Thursday, 29 May 2003 10:57:46

PROJECT: N:\61\13380\gis\data\source\cad\power\tmodel\Transformed to CKIG92.pro
--------------------------------------- -----------------------------------
Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
10309	10336	1.0	-0.018	-0.050		
10312	10337	1.0	-0.036	-0.010		
10313	10338	1.0	0.031	0.026		
10316	10339	1.0	0.079	-0.021		
10317	10340	1.0	0.041	0.037		
10321	10343	1.0	-0.064	0.021		
10325	10342	1.0	-0.034	-0.004		

Centroid Control   45615.587E   52901.443N
Centroid Data   264378396.773E 8652479254.261N
Easting Shift-264332781.1853
Northing Shift-8652426352.8187
Rotation -0 27'02.5"
Scale factor 0.001000

underground_services_west_island_2_CKIG92.dwg

GHD Surveys   Underground Services West 2 Arb MGA (mm)
239 Adelaide Tce   ARB => CKIG92
PERTH, WA, 6004
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Thursday, 29 May 2003 11:24:28

PROJECT: N:\61\13380\gis\data\source\cad\power\tmodel\Transformed to CKIG92.pro
----
Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
10309	10345	1.0	-0.019	-0.049		
10312	10346	1.0	-0.035	-0.010		
10313	10347	1.0	0.031	0.024		
10316	10348	1.0	0.079	-0.024		
10317	10349	1.0	0.043	0.038		
10321	10350	1.0	-0.066	0.017		
10352	10351	1.0	0.002	0.015		
10325	10353	1.0	-0.036	-0.011		

Centroid Control   45438.505E   53253.384N
Centroid Data   271918006.630E 8652829793.000N
Easting Shift -271872568.1252
Northing Shift -8652776539.6161
Rotation -0 27'02.3"
Scale factor 0.001000

WORKS_westis_CKIG92.dwg

GHD Surveys   Works_Westls Arbitrary MGA
239 Adelaide Tce   ARB => CKIG92
PERTH, WA, 6004
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Wednesday, 28 May 2003 15:23:22

PROJECT: N:\61\13380\gis\data\source\cad\power\tmodel\Transformed to CKIG92.pro
--- ----------
Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
1471	1474	1.0	0.003	-0.005		
1476	1475	1.0	0.001	0.007		
1486	1485	1.0	0.002	-0.002		
1490	1489	1.0	-0.002	-0.012		
1487	1488	1.0	-0.009	0.010		
1482	1479	1.0	-0.010	-0.015		
1481	1480	1.0	0.013	0.008		
1483	1484	1.0	0.009	0.007		
1477	1478	1.0	-0.007	0.002		

Centroid Control   45136.525E   51920.827N
Centroid Data   263907.607E 8651512.243N
Easting Shift -218771.0816
Northing Shift -8599591.4163
Rotation -0 26'53.2"
Scale factor 0.999997

Appendix C

underground_services_home_island_CKIG92.dwg

GHD Surveys
239 Adelaide Tce   Underground Services Home Is Arbitrary MGA (mm)
PERTH, WA, 6004   ARB => CKIG92
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Thursday, 29 May 2003 11:55:34

PROJECT: N:\61\13380\gis\data\source\cad\power\tmodel\Transformed to CKIG92.pro
----
Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
1472	10354	1.0	0.004	-0.004		
1470	10355	1.0	0.008	-0.006		
1434	10363	1.0	0.005	0.003		
1432	10357	1.0	-0.028	0.008		
1431	10358	1.0	-0.013	0.002		
1459	10362	1.0	0.010	-0.003		
1467	10361	1.0	-0.003	0.012		
1473	10359	1.0	0.006	0.008		
1469	10360	1.0	0.011	-0.020		

Centroid Control   52257.000E   60024.108N
Centroid Data   273670641.438E 8746230840.887N
Easting Shift -273618384.4374
Northing Shift -8746170816.7788
Rotation -0 26'49.5"
Scale factor 0.001000

underground_services_west_island_1_CKIG92.dwg

GHD Surveys   Underground Services West 1 Arb MGA (mm)
239 Adelaide Tce   ARB => CKIG92
PERTH, WA, 6004
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Thursday, 29 May 2003 10:57:46

PROJECT: N:\61\13380\gis\data\source\cad\power\tmodel\Transformed to CKIG92.pro
----
Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
10309	10336	1.0	-0.018	-0.050		
10312	10337	1.0	-0.036	-0.010		
10313	10338	1.0	0.031	0.026		
10316	10339	1.0	0.079	-0.021		
10317	10340	1.0	0.041	0.037		
10321	10343	1.0	-0.064	0.021		
10325	10342	1.0	-0.034	-0.004		

Centroid Control   45615.587E   52901.443N
Centroid Data   264378396.773E 8652479254.261N
Easting Shift -264332781.1853
Northing Shift -8652426352.8187
Rotation -0 27'02.5"
Scale factor 0.001000

underground_services_west_island_2_CKIG92.dwg

GHD Surveys   Underground Services West 2 Arb MGA (mm)
239 Adelaide Tce   ARB => CKIG92
PERTH, WA, 6004
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Thursday, 29 May 2003 11:24:28

PROJECT: N:\61\13380\gis\data\source\cad\power\tmodel\Transformed to CKIG92.pro
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Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
10309	10345	1.0	-0.019	-0.049		
10312	10346	1.0	-0.035	-0.010		
10313	10347	1.0	0.031	0.024		
10316	10348	1.0	0.079	-0.024		
10317	10349	1.0	0.043	0.038		
10321	10350	1.0	-0.066	0.017		
10352	10351	1.0	0.002	0.015		
10325	10353	1.0	-0.036	-0.011		

Centroid Control   45438.505E   53253.384N
Centroid Data   271918006.630E 8652829793.000N
Easting Shift-271872568.1252
Northing Shift-8652776539.6161
Rotation -0 27'02.3"
Scale factor 0.001000

home_watermain_CKIG92.dwg, HOMEBASE_CKIG92.dwg, HOMESEWER_CKIG92.dwg, and HOMESURVEY_CKIG92.dwg

GHD Surveys   HOME ISLAND
239 Adelaide Tce   Unknown Grid to CKIG92
PERTH, WA, 6004
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Monday, 26 May 2003 11:19:31

PROJECT: \13380\gis\data\source\cad\wastewater\tmodel\Test Conversion Rev B.pro
----
Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
1520	1503	1.0	-0.012	-0.005		
1521	1504	1.0	0.013	0.001		
1522	1516	1.0	0.011	-0.005		
1527	1507	1.0	-0.005	0.012		
1526	1515	1.0	0.010	0.002		
1523	1512	1.0	-0.003	-0.004		
1525	1519	1.0	-0.004	0.011		
1528	1508	1.0	0.006	-0.005		
1524	1511	1.0	-0.014	-0.009		

Centroid Control   52175.537E   60043.540N
Centroid Data   270884.715E 8659691.689N
Easting Shift-218709.1778
Northing Shift-8599648.1486
Rotation -0 26'47.8"
Scale factor 0.999755

WESTBASE_CKIG92.dwg and WESTSEWER_CKIG92.dwg

GHD Surveys   WEST ISLAND
239 Adelaide Tce   Unknown Grid to CKIG92
PERTH, WA, 6004
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Monday, 26 May 2003 11:22:36

PROJECT: \13380\gis\data\source\cad\wastewater\tmodel\Test Conversion Rev B.pro
----
Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
1530	1531	1.0	0.002	0.003		
1533	1532	1.0	-0.000	0.011		
1534	1535	1.0	-0.007	-0.011		
1537	1536	1.0	-0.002	-0.008		
1539	1538	1.0	-0.001	-0.006		
1580	1579	1.0	0.011	0.006		
1581	1544	1.0	0.004	0.008		
1541	1543	1.0	0.002	-0.005		
1540	1542	1.0	-0.008	0.002		

Centroid Control   45058.796E   52002.417N
Centroid Data   263829.218E   8651593.195N
Easting Shift-218770.4212
Northing Shift-8599590.7783
Rotation -0 26'56.1"
Scale factor 0.999709

WESTSURVEY_CKIG92.dwg

GHD Surveys   WESTSURVEY ARBITRARY GRID UNKNOWN
239 Adelaide Tce   Unknown to CKIG92
PERTH, WA, 6004
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Monday, 26 May 2003 11:16:59

PROJECT: \13380\gis\data\source\cad\wastewater\tmodel\Test Conversion Rev B.pro
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Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
1605	1596	1.0	-0.004	0.000		
1604	1600	1.0	0.005	-0.001		
1602	1594	1.0	0.001	-0.001		
1603	1591	1.0	-0.002	0.002		

Centroid Control   44157.039E   54256.655N
Centroid Data   262923.365E   8653843.256N
Easting Shift-218766.3255
Northing Shift-8599586.6005
Rotation -0 00'01.1"
Scale factor 0.999994

48C60 as cons CKIG92.dwg and 48C61as consCKIG92.dwg

GHD Surveys
239 Adelaide Tce
PERTH, WA, 6004
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Monday, 18 August 2003 9:29:33
MGA to CKIG92
PROJECT: T:\gis\cocos\to transform\48C60 as cons_dwg.pro

Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
1485	1	1.0	-0.001	0.003		
1486	2	1.0	-0.003	-0.009		
1487	3	1.0	0.007	0.006		
1488	4	1.0	-0.000	0.009		
1489	1480	1.0	0.002	-0.003		
1490	1481	1.0	-0.003	0.012		
1491	1482	1.0	0.009	-0.001		
1492	1483	1.0	-0.008	-0.005		
1493	1484	1.0	-0.004	-0.012		

Centroid Control   52224.380E   59964.810N
Centroid Data   270934.177E 8659613.323N
Easting Shift -218709.7971
Northing Shift -8599648.5132
Rotation -0 26'45.7"
Scale factor 0.999748

HOMEBASE.dwg

GHD Surveys
239 Adelaide Tce
PERTH, WA, 6004
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Monday, 18 August 2003 8:58:30
MGA to CKIG92
PROJECT: T:\gis\cocos\to transform\HOMEBASE_DWG.pro

Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
1485	1	1.0	-0.001	0.003		
1486	2	1.0	-0.003	-0.009		
1487	3	1.0	0007	0.006		
1488	4	1.0	-0.000	0.009		
1489	1480	1.0	0.002	-0.003		
1490	1481	1.0	-0.003	0.012		
1491	1482	1.0	0.009	-0.001		
1492	1483	1.0	-0.008	-0.005		
1493	1484	1.0	-0.004	-0.012		

Centroid Control   52224.380E   59964.810N
Centroid Data   270934.177E 8659613.323N
Easting Shift -218709.7971
Northing Shift -8599648.5132
Rotation -0 26'45.7"
Scale factor 0.999748

WESTSEWER.dwg

GHD Surveys
239 Adelaide Tce
PERTH, WA, 6004
Tel:+61 8 9429 6666 Fax +61 8 9429 6555
Monday, 18 August 2003 8:09:02
MGA to CKIG94

PROJECT: T\gis\cocos\to transform\WESTBASE_dwg.pro

Helmert Transformation

Control Pt	Data Pt	Weight	Easting	Northing	Residual	Residual
1485	1	1.0	0.000	-0.003		
1486	2	1.0	0.000	-0.004		
1487	3	1.0	-0.013	0.007		
1488	4	1.0	0.004	0.009		
1489	1480	1.0	0.005	-0.016		
1490	1481	1.0	0.009	0.005		
1491	1482	1.0	0.008	0.004		
1492	1483	1.0	-0.002	-0.005		
1493	1484	1.0	-0.012	0.002		

Centroid Control   44990.481E   52079.719N
Centroid Data   263760.280E   8651669.985N
Easting Shift -218769.7997
Northing Shift -8599590.2663
Rotation -0 26'55.9"
Scale factor 0.999704

Appendix D

Metadata

Metadata Statement

Attribute Table Structures

DATASET

Title: Utilities
Custodian: GHD Pty Ltd
Jurisdiction: Australia

DESCRIPTION

Abstract:
The data supplied has been sourced from a collection of Computer Assisted Drawings (CAD) drawings detailing the services that are part of the overall infrastructure for Cocos (Keeling) Island. Information relating to these services were extracted from CAD drawings and converted to ArcView shapefiles. Although some of the files were in different grid coordinate systems, GHD has transformed the relative fils to the CKIG92 grid.

The CAD drawings used for the data extraction are all as constructed drawings. There are essentially three distinct categories of information that consists of power, wastewater and water supply. However, during the data extraction process, three additional categories were included that are made up of fuel, gas, and telecommunications services.

Purpose:
The information contained in each dataset should be used in conjunction with other GIS data from the Cocos Island GIS to enable users to make reliable decisions.

Supplementary Information:
Please take note that the information provided does not cover the entire area of the Cocos (Keeling) Islands. This is due to the availability of data as well as the proposed scope of works.

Search Words:
HUMAN ENVIRONMENT
URBAN
PLANNING
STRUCTURES
FACILITIES
SERVICES
UTILITIES
WASTEWATER
WATER
POWER
FUEL
TELECOMMUNICATIONS

Geographic Extent Names:
Cocos (Keeling) Islands

DATA CURRENCY

Beginning Date: 1994
Ending Date: 2003-03-25

Dataset Status

Progress: Complete
Maintenance and Update Frequency: As required

ACCESS

Stored Data Format:
Digital – ESRI Shapefiles: Points and Polylines
Digital – CAD generated files (DWG, DXF, DGN): Points, lines and polygons

Available Format Type:
Digital – ESRI Shapefiles: Points and Polylines

Access Constraint: The information provided has been a result of the data extraction process approved by Department of Transport and Regional Services. Hence, all legal and access restrictions will be as stated for the complete Cocos Island GIS.

DATA QUALITY

Lineage:
Source files include digital CAD drawing files in the AutoCAD format. Other sources such as hardcopy plans were also used in the production of the data layers. All data extracted is from as-constructed information. CAD files were converted to ArcView shapefiles that were then attributed with the information provided on the actual drawings. All point data were screen digitised at a scale of 1:500 or better.

Positional Accuracy:
All data has been converted to the CKIG92 grid coordinate system. Note that some positional errors do persist in the data.

Attribute Accuracy:
All attribute information was taken from annotations on the source drawings and plans. These details are believed to be true and accurate.

Logical Consistency:
The information is based on as-constructed drawings and as such the content of the data is limited to what can be detailed on a drawing. The data layers have been structured in way that further information can be included.

Completeness:
The data layers are considered complete until more information is brought forward or collected. GHD recognises a need for all services to be available as a complete network. This however would require extra time for manipulation and verification of the data.

SPATIAL REFERENCE

Horizontal Coordinate System:
Cocos (Keeling) Island Grid 1992 (CKIG92)

Projection:	Transverse Mercator
Datum:	WGS 1984
Spheroid:	WGS 1984
False Easting:	50000
False Northing:	1400000
Central Meridian:	96.875
Scale Factor:	1
Units:	Metres

Horizontal Positional Accuracy:
Some positional errors exist but are within 2m in horizontal accuracy. GHD does not warrant the actual positions of some of the features that have been identified and recorded.

CONTACT INFORMATION

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Metadata Date:	2003-06-27

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	Barry Lei	Peter French		Peter Seman		