SCALING SOLAR ZAMBIA PROJECT
IDC/SP/011/2015

REVISED FINAL ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT

FOR THE PROPOSED NGONYE SOLAR PV PLANT UNDER ROUND 1 SCALING SOLAR ZAMBIA PROJECT

VOLUME 3 – FIGURES AND APPENDICES

PREPARED FOR:

Industrial Development Corporation (Z) Limited
Plot F10723, Lusaka South Multi-Facility Economic Zone
Chifwema Road, New Kasama,
Lusaka, Zambia.

PREPARED BY:

Knight Piésold Zambia
24 Enos Chomba Avenue
Parklands, Kitwe
Tel. +260 212 228466 • Fax. +260 212 223649

KI302-00332/01
Rev 7
Date: March 2017

Knight Piésold
CONSULTING
www.knightpiesold.com

Knight Piésold CONSULTING

INDUSTRIAL DEVELOPMENT CORPORATION (Z) LIMITED

FINAL

ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT FOR THE PROPOSED NGONYE SOLAR PV PROJECT UNDER ROUND 1 SCALING SOLAR ZAMBIA PROJECT

IDC/SP/011/2015

VOLUME 3 - FIGURES AND APPENDICES

MARCH, 2017

Boston Katongo
Principal Environmental Scientist

Patrick Kampengele
Managing Director

Knight Piésold Zambia

24 Enos Chomba Avenue
Parklands, Kitwe
Tel. +260 212 228466 • Fax. +260 212 223649

Introduction

The Industrial Development Corporation (IDC) is in the process of implementing Round 1 of the 600 MW Solar power program, which consists of two Solar PV Plants, namely the Bangweulu Solar PV Plant and the Ngonye Solar PV Plant. The Ngonye Solar PV plant will be built and operated at a project site (Site 1) located within the Lusaka South Multi-Facility Economic Zone (LS-MFEZ) and partly on 11 ha piece of land located in the Lusaka National Park area owned by the Ministry of Tourism and Arts. The 11 ha piece of land is physically located outside the park boundary fence.

As part of environmental permitting (approval process), IDC is required to prepare and submit an Environmental and Social Impact Assessment (ESIA) Report for the proposed Ngonye Solar PV Plant project to the Zambia Environmental Management Agency (ZEMA) for approval. IDC commissioned Knight Piesold Consulting Zambia to prepare the ESIA Report. The report has been prepared in compliance with the Environmental Management Act No.12 of 2011 read together with the Environmental Impact Assessment Regulations, Statutory Instrument No. 28 of 1997, and in compliance with IFC Performance Standards, Guidelines and Policies.

The ESIA Report presents the findings of the environmental and social impact assessment study for the proposed Ngonye Solar PV Project. It is presented in 3 volumes:

- **Volume 1** is a Non-Technical Summary, which presents and highlights the main issues pertinent to the decision-making process on the Project in a non-technical language readily understood by decision-makers and other stakeholders.
- **Volume 2** presents the details on the proposed Project and the findings of ESIA study.
- **Volume 3** contains all relevant technical baseline information (Figures / Technical Data and other specialist information used for the ESIA study), which have been referenced within the body of the ESIS.

This document is Volume 3 of the ESIA Report. It includes Figures and Appendices listed below:

List of Figures

Figure 3.1a: Location of the Proposed Ngonye Solar PV Project (Site 1)

Figure 3.1b: Location of the Proposed Scaling Solar Project (Site 1 and Site 2) in relation to LS MFEZ.

Figure 3.2a: Satellite image of the Proposed Ngonye Solar PV Project site (Site 1A/1B) showing existing facilities

Figure 3.2b: Ngonye Project Site Layout Boundary.

Figure 3.2c: Ngonye Solar PV Project Boundary and Infrastructure in the vicinity of the site – classified as PV SITE 2.

Figure 3.4: Overview of a Grid-connected Solar PV Plant

Figure 4.1: Topographic map of the project site showing the general sloping trends of the project area.

Figure 4.2: Drainage and hydrology of the Project Area.

Figure 4.2b: Possible flood lines and Sub-basins draining the project area.

Figure 4.3: Location of boreholes in the project area

Figure 4.4: Geology of the proposed Solar Plant Site located within the LS MFEZ

Figure 4.5: Cross section of rock types at the Solar Project site

Figure 4.6: Dust (PM10 and PM2.5) monitoring points

Figure 4.6b: Noise monitoring at project site

Figure 4.6c: Vibration monitoring points

Figure 4.7: Number of Species per family

Figure 4.8: Location of some areas in the vicinity of the project site.

Appendices

Appendix A: ESIA Study Terms of Reference

Appendix A-1: Minutes of the Public Disclosure Meetings

Appendix B: Hydrology and Hydrogeology Studies Reports

Appendix C: Soils and Geology & Geotechnical Investigations Reports

Appendix D: Air Quality and Noise Impact Assessment Report

Appendix E: Biodiversity Impact Assessment Report

Appendix F: Archaeology and cultural heritage Impact Assessment Report

Appendix G: Social Impact Assessment

Appendix H: Vibration Impact Assessment

Appendix I: Enel Green Power S.p.A Track Record and Company Profile.

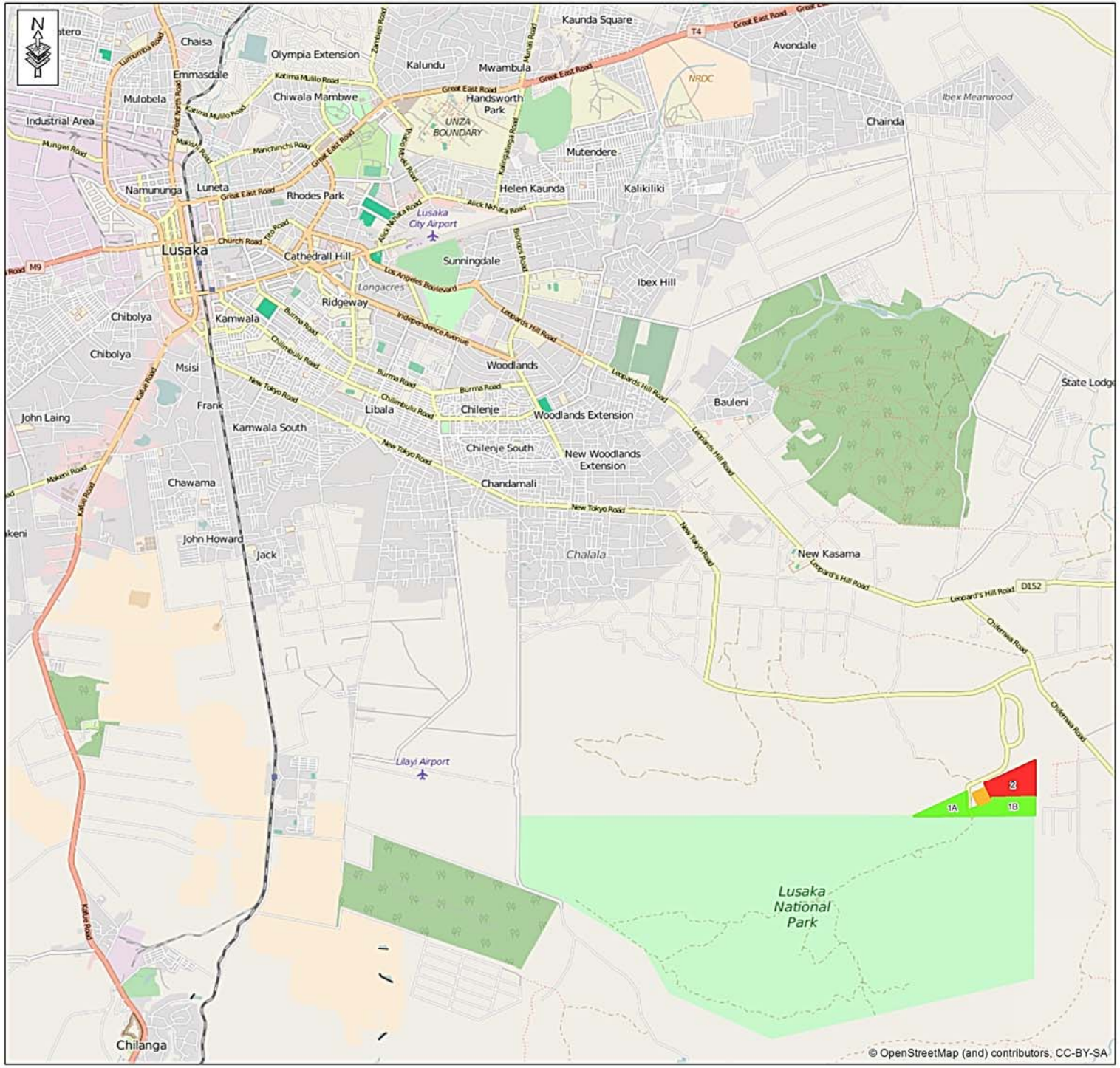


Figure 3.1a: Location of the Proposed Ngonye Solar PV Project (Site 1)

Legend:

SITES

- Site 1
- Site 2
- ZESCO

Projection: UTM 35South on WGS84

0 0.75 1.5 3 4.5 6 Kilometers

Proposed LS-MFEZ Solar PV Sites Project Location

Knight Piésold CONSULTING

302-00332-01	June 2016

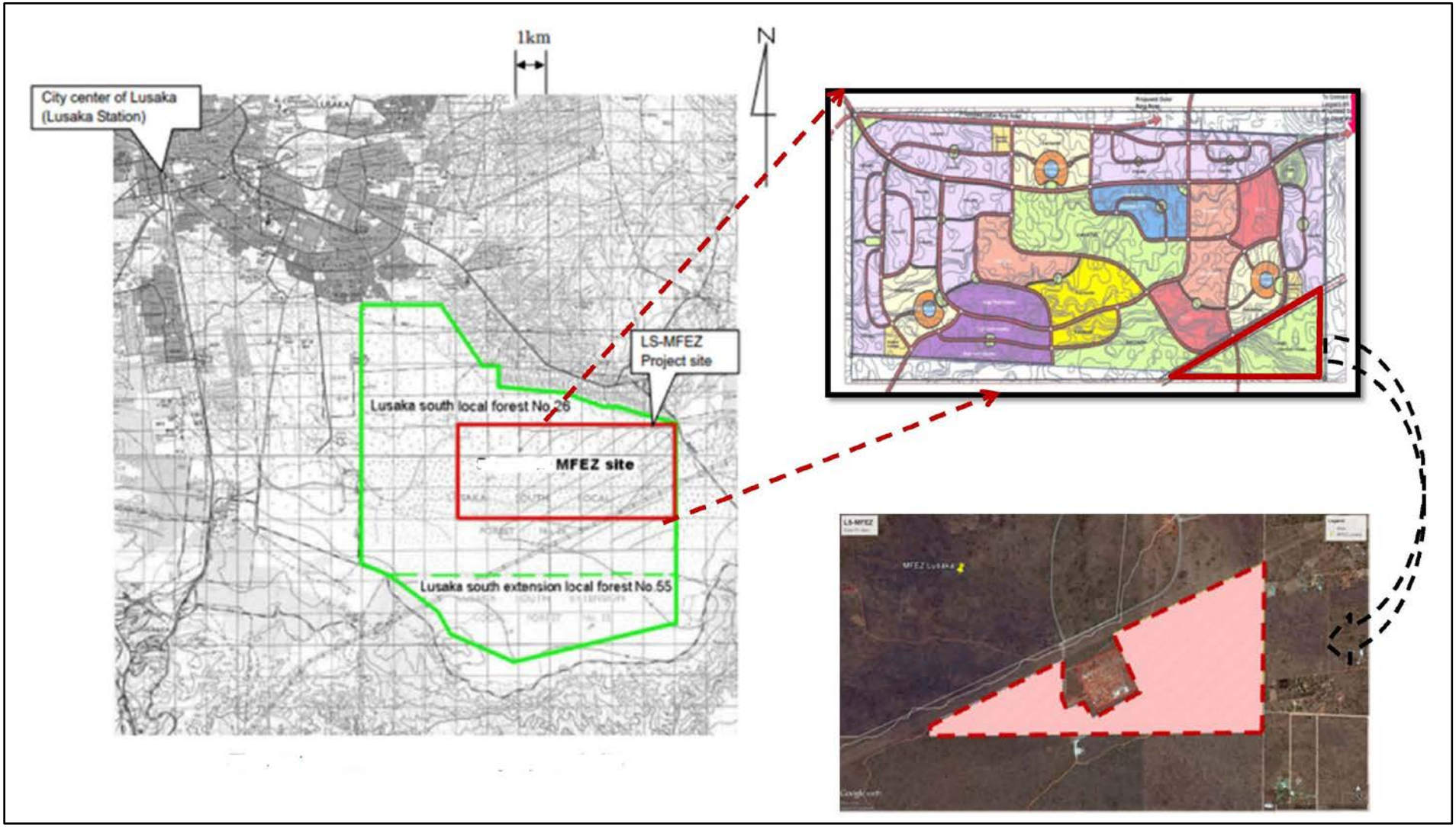


Figure 3.1b: Location of the Proposed Round 1 Scaling Solar Project Site (Site 1 and Site 2) in relation to LS MFEZ.

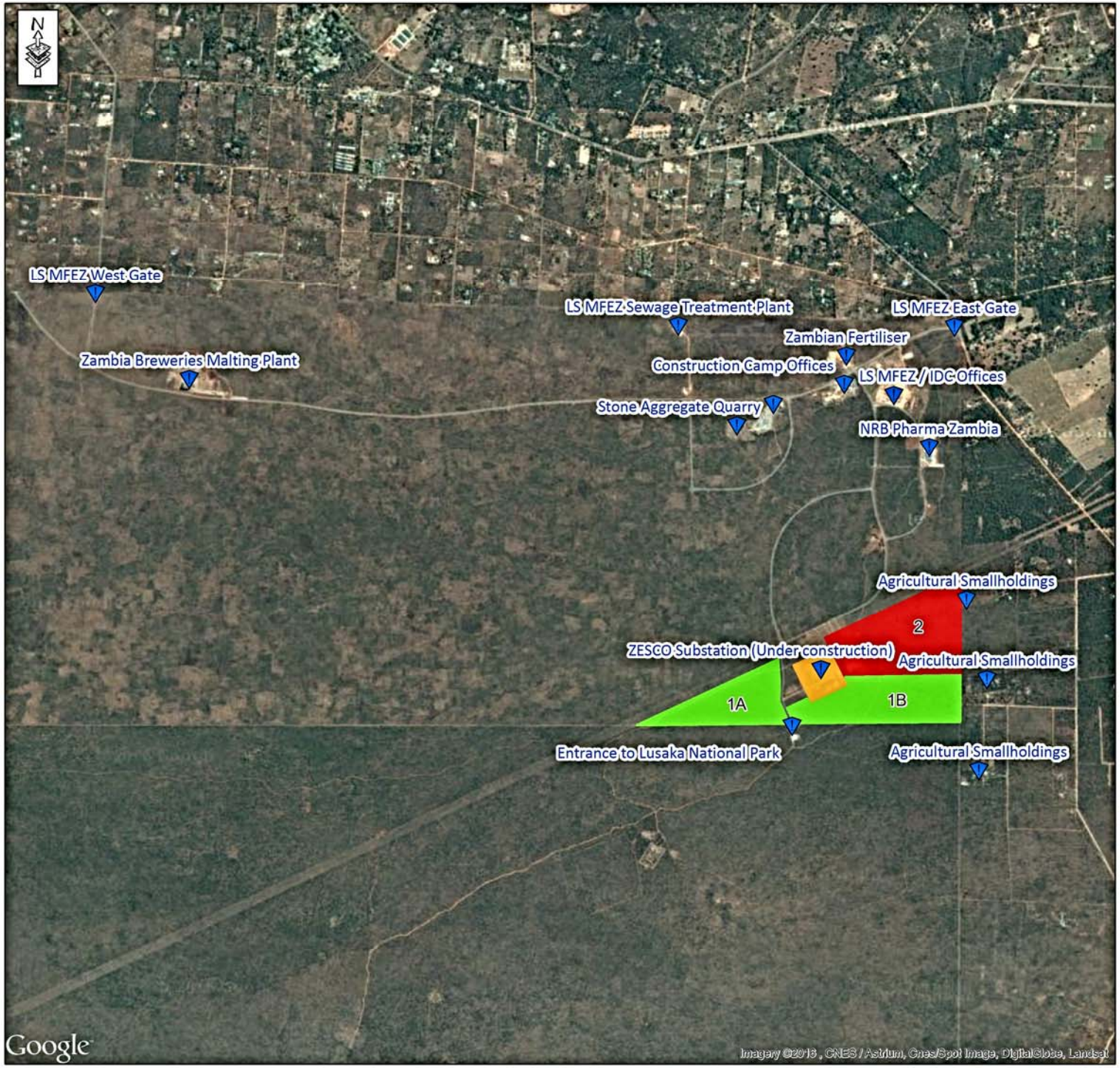


Figure 3.2a: Satellite image of the Proposed Ngonye Solar PV Project site (Site 1A/1B shaded green) showing existing facilities

Legend:

Other Facilities

SITES

Site 1

Site 2

ZESCO

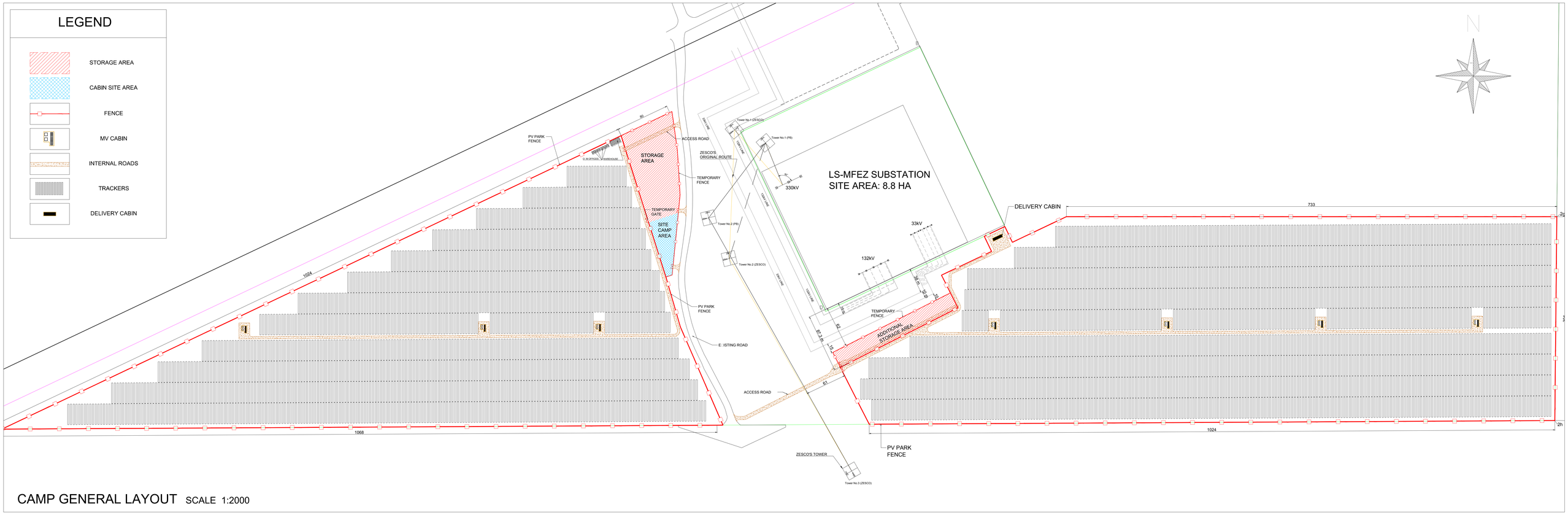
Projection: UTM 35South on WGS84

0 250 500 1 000 1 500 2 000 Meters

Proposed LS-MFEZ Solar PV Sites Other Facilities

Knight Piésold CONSULTING

302-00332-01	June 2016



CAMP GENERAL LAYOUT SCALE 1:2000

A norma di legge si riserviamo la proprietà di questo elaborato grafico con il divieto di riprodurlo o di renderlo noto a consegnarlo a terzi senza l'autorizzazione della TerniEnergia S.p.A.

TerniEnergia S.p.A.
Sede legale in Nera Montoro - 05035 Narni (TR) - ITALY

LAYOUT OF THE PROPOSED NGONYE SOLAR PV PROJECT

E□ECUTIVE PROJECT

REV. REV.	DATA DATE	DESCRIZIONE DESCRIPTION	PREPARATO PREPARED	CONTROLLATO CHECKED	APPROVATO APPROVED
1	31/03/2017	emission	Simone Contessa	Matteo Mantini	Ing. Franco Diomedi
0	29/03/2017	emission	Simone Contessa	Matteo Mantini	Ing. Franco Diomedi

VALIDO PER IMPIANTI / ISSUE FOR PLANT: -

PROGETTO / PROJECT: Mosi - o4 - Tunya

REV. 00 - EMISSIONE / REV. 00 - ISSUED

DATA DATE	PREPARATO PREPARED	CONTROLLATO CHECKED	APPROVATO APPROVED

NOME FILE / FILE NAME:

CLASSIF.ICAZIONE / CLASSIFICATION: RIAFCHIVIO / ARCHIVED D

FORMATO/FORMAT: A0 — SCALA PLOTT. / PLOT SCALE: 1 = 1

SCALA/SCALE: various — TAVOLA / SHEET: 1 / 1

Enel Green Power

TITOLO / TITLE: **Construction Camp - Architectural Layout & Construction Details**

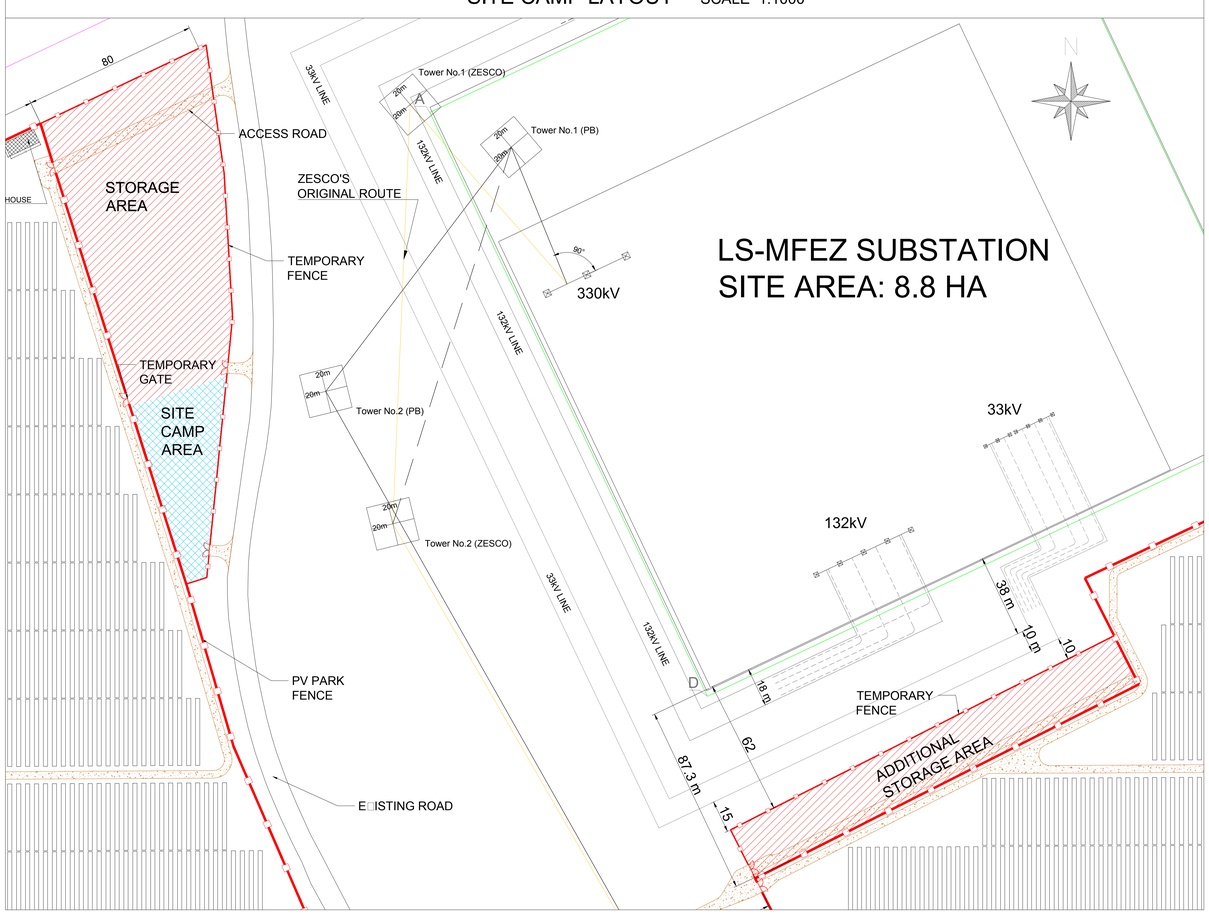
ENGINEERING & CONSTRUCTION
ENGINEERING

CODICE / CODE

TIPO DOC.	RIFERIM. ZONA	PAESE COUNTRY	ESN ESCO	IMPIANTO PLANT	SISTEMA SYSTEM	PROGRESSIVO PROGRESSIVE	REVISIONE REVISION
D	2 7	Z M	P	8 9 6 0 8	0 0	1 6 8	0 0

Questo documento contiene informazioni di proprietà di Enel Green Power SpA e deve essere utilizzato esclusivamente da/da/destinatario in relazione alle finalità per le quali è stato inviato. E' vietata qualsiasi forma di riproduzione o di divulgazione senza l'esplicito consenso di Enel Green Power SpA.
This document is property of Enel Green Power SpA. It is strictly forbidden to reproduce this document, in whole or in part, and to provide to others any related information without the previous written consent by Enel Green Power SpA.

SITE CAMP LAYOUT SCALE 1:1000



TYPICAL SUPPORTING STRUCTURES SCALE 1:20

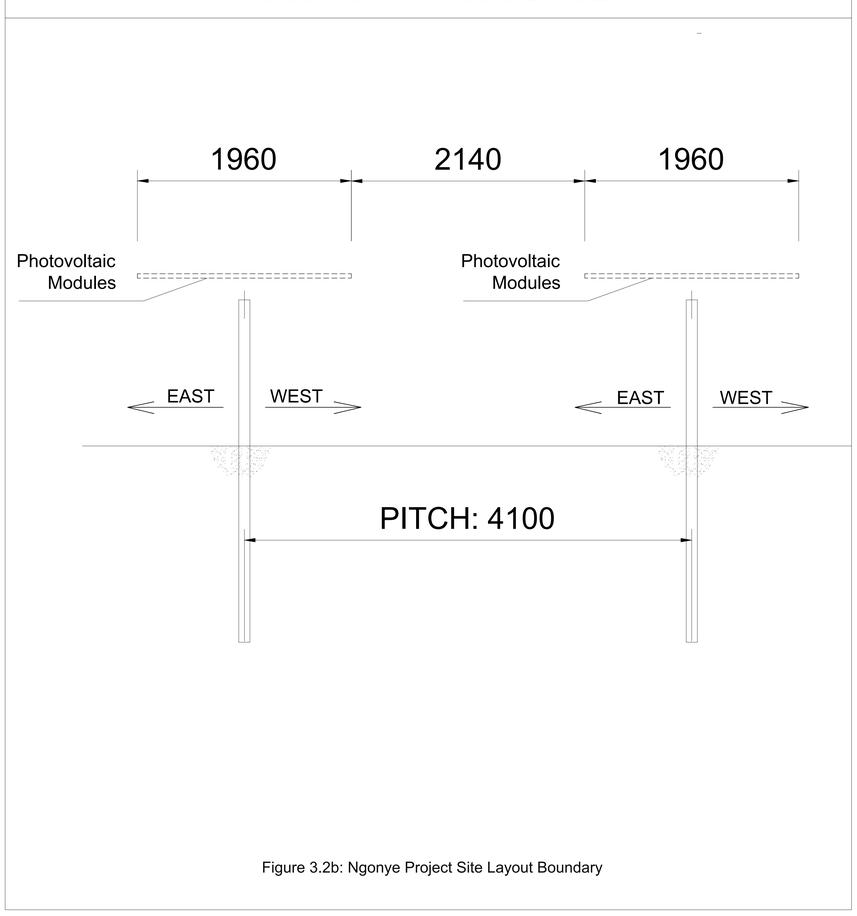


Figure 3.2b: Ngonye Project Site Layout Boundary

Figure 3.2c: Ngonye Solar PV Project Site and Infrastructure in the vicinity of the site - classified as PV SITE 2.

Legend

- Solar PV Site Boundary
- ZESCO SS Fence
- Existing Fence
- Existing Road
- 330 kV OHL
- 11 kV OHL
- ZESCO 330 kV Route
- PB 330 kV Route
- 132 kV Underground Cable
- 132 kV OHL
- 33 kV Underground Cable
- 33 kV OHL
- Back-up area

Coordinates UTM 27 (Arc1950 UTM 35S)

No	X	Y
1A	651714.63	8283954.55
1B	652639.73	8284392.85
1C	652707.12	8284179.76
1D	652728.16	8284107.28
1E	652791.83	8283960.55
1F	653010.27	8283961.86
1G	652967.14	8284046.75
1H	653142.90	8284135.71
1I	653118.23	8284184.45
1J	653193.03	8284219.85
1K	653182.23	8284242.45
1L	653212.94	8284257.05
1M	653224.13	8284233.55
1N	653304.93	8284271.85
1O	654037.53	8284271.85
1P	654034.53	8283967.35
1AA	652716.50	8284147.40
1BB	652715.81	8284184.72
1CC	652726.16	8284258.00
1DD	652727.66	8284303.94
1EE	652725.10	8284358.54
1FF	652723.84	8284370.16
1GG	652715.59	8284428.78

No	X	Y
2A	653055.54	8284589.62
2B	654045.20	8285058.22
2C	654037.53	8284271.85
2D	653304.93	8284271.85
2E	653224.13	8284233.55

No	X	Y
4A	651935.00	8284059.02
4B	652764.83	8284022.78
4C	652984.18	8284013.20

Rev	Date	Description	By	Chk	App

PARSONS BRINCKERHOFF
Amber Court
William Armstrong Drive
Newcastle upon Tyne NE4 7YQ
Tel: 44-(0)191-226-2000
Fax: 44-(0)191-226-2104

Client:
INDUSTRIAL DEVELOPMENT CORPORATION

Site/Project:
LUSAKA MFEZ

Title:
SITE LAYOUT AND INFRASTRUCTURE

Drawn: RH		Checked: LS	
Designed: RH		Approved: LS	
Date: 28/02/2017	Scale: 1:7500 A1	Sheet: 1 OF 1	
Project Number:	Drawing Number:	Revision:	
62105071	D01	9	

© Copyright Parsons Brinckerhoff

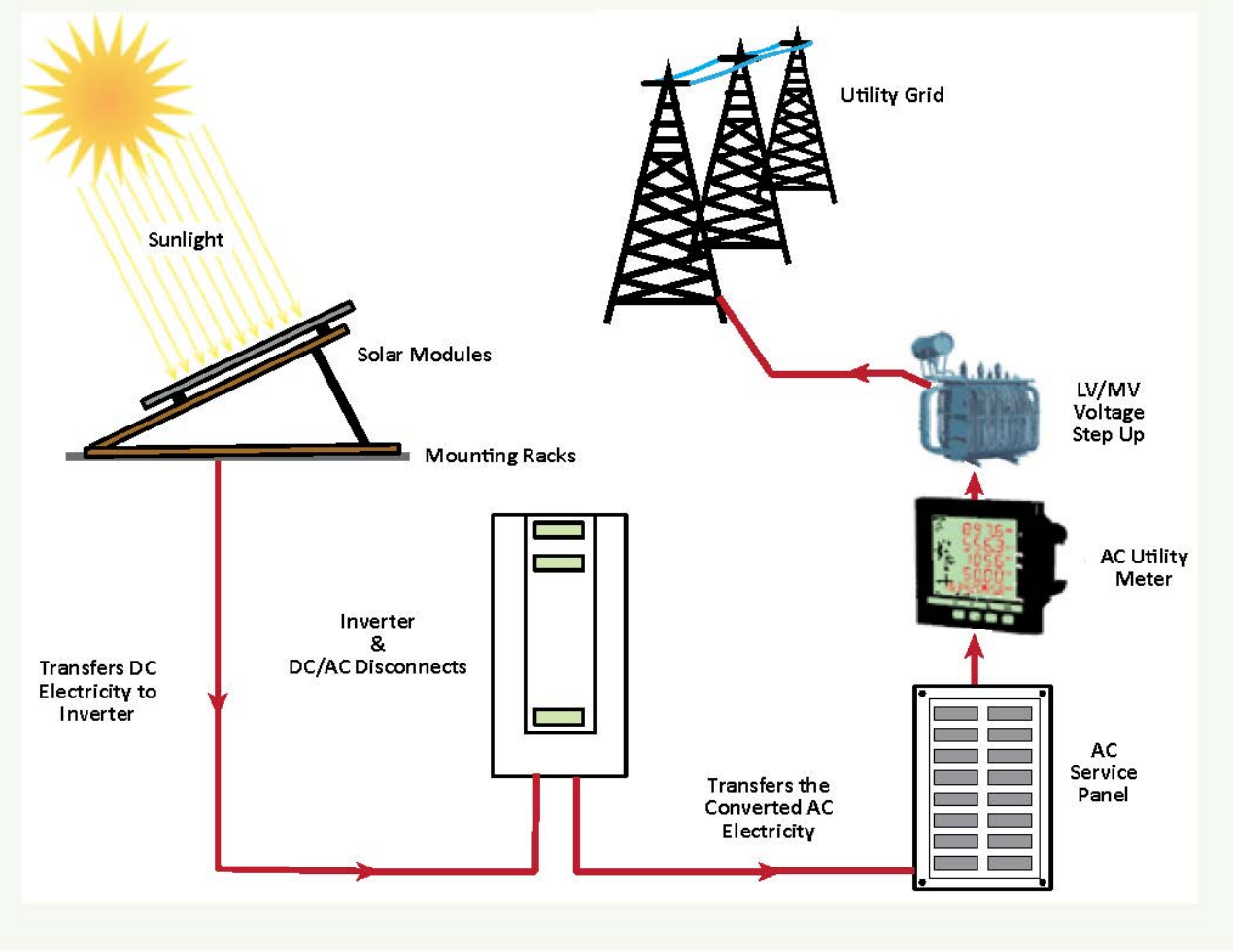


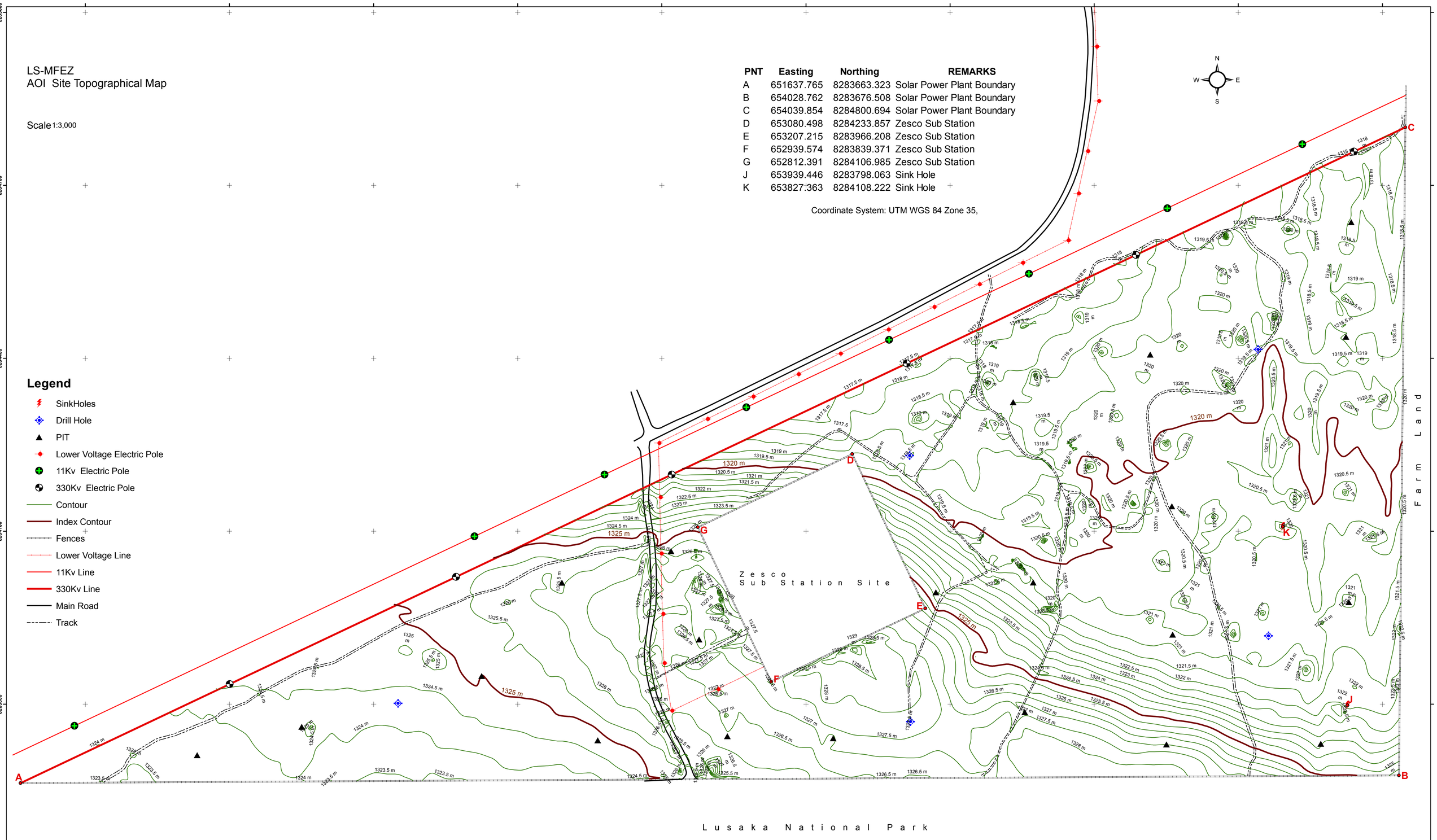
Figure 3.4: Overview of a Grid-connected Solar PV Plant

LS-MFEZ
AOI Site Topographical Map

Scale 1:3,000

PNT	Easting	Northing	REMARKS
A	651637.765	8283663.323	Solar Power Plant Boundary
B	654028.762	8283676.508	Solar Power Plant Boundary
C	654039.854	8284800.694	Solar Power Plant Boundary
D	653080.498	8284233.857	Zesco Sub Station
E	653207.215	8283966.208	Zesco Sub Station
F	652939.574	8283839.371	Zesco Sub Station
G	652812.391	8284106.985	Zesco Sub Station
J	653939.446	8283798.063	Sink Hole
K	653827.363	8284108.222	Sink Hole

Coordinate System: UTM WGS 84 Zone 35,



Legend

- SinkHoles
- Drill Hole
- PIT
- Lower Voltage Electric Pole
- 11Kv Electric Pole
- 330Kv Electric Pole
- Contour
- Index Contour
- Fences
- Lower Voltage Line
- 11Kv Line
- 330Kv Line
- Main Road
- Track

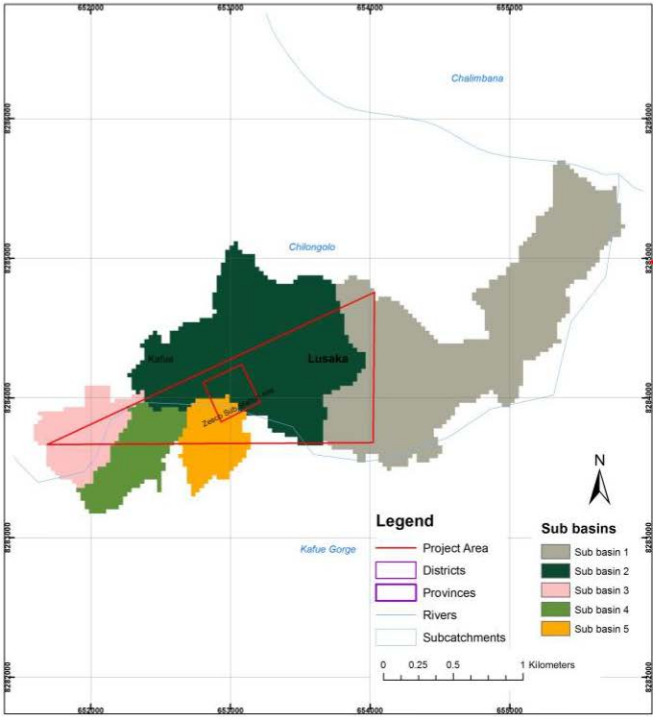
Area of Interest Shown here
Is Approx 134Ha

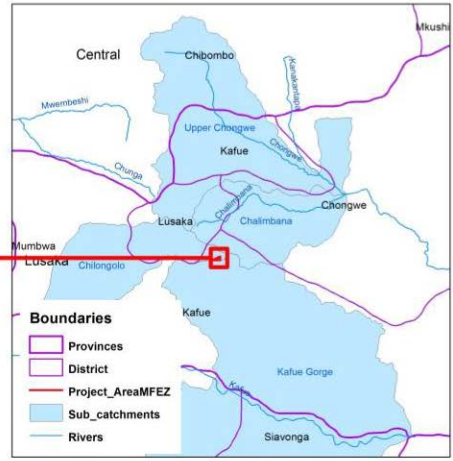
Coordinate System: UTM WGS 84 Zone 35,
Projection: Transverse Mercator
Datum: WGS 84

Figure 4.1: General Topographic Map of the Project Site (AMC, 2015 Topographic Survey.

HYDROLOGICAL STUDY AT MFEZ - LUSAKA FOR SCALING SOLAR PROGRAM

HYDROLOGY OF PROJECT AREA





Coordinate System: WGS 1984 UTM Zone 35S
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 10,000,000.0000
Central Meridian: 27.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

Data Credit: Department of Water Affairs
DIVA GIS

Figure 4.2a: Drainage and Hydrology of the Project Area (Source: AMC, 2015)

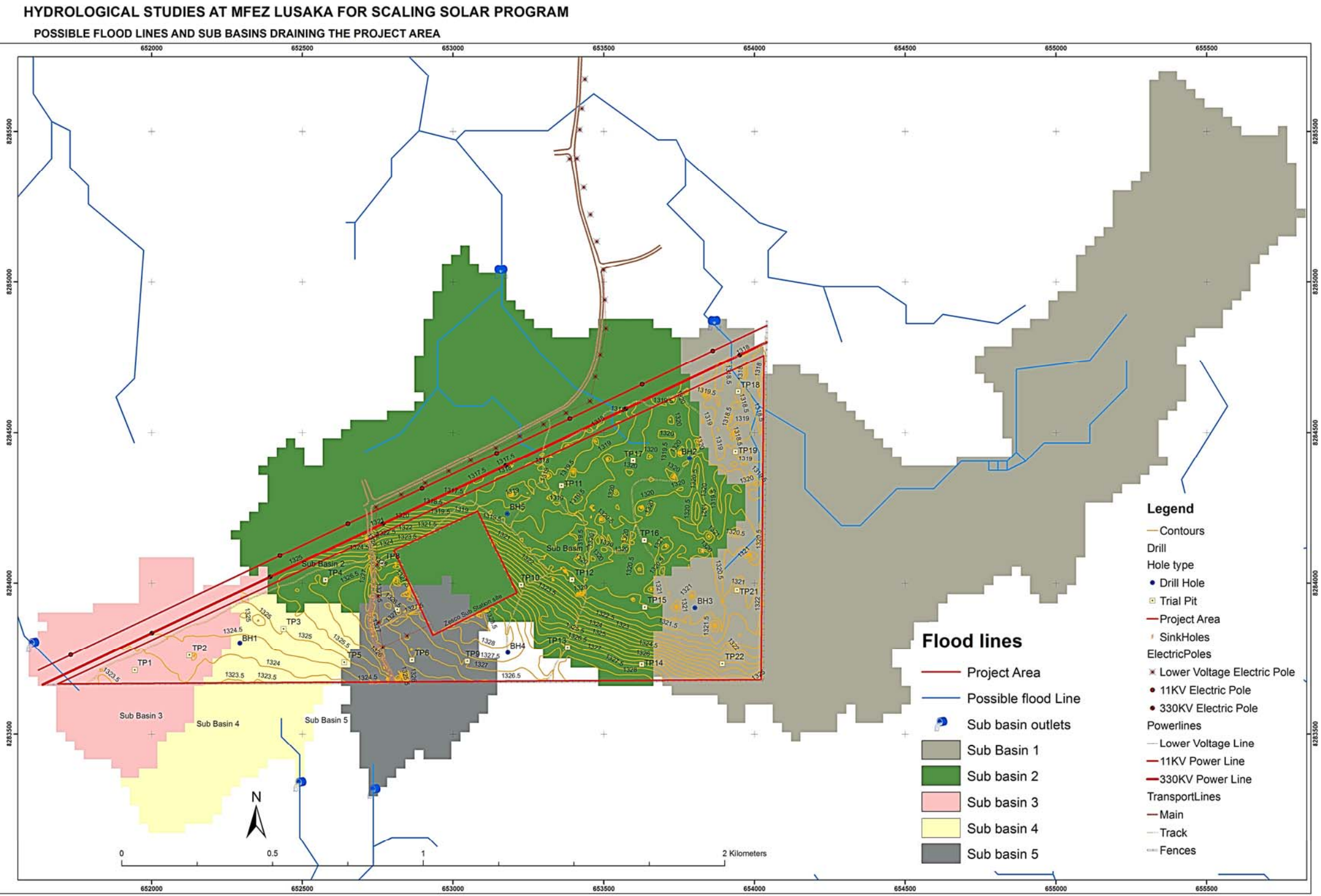
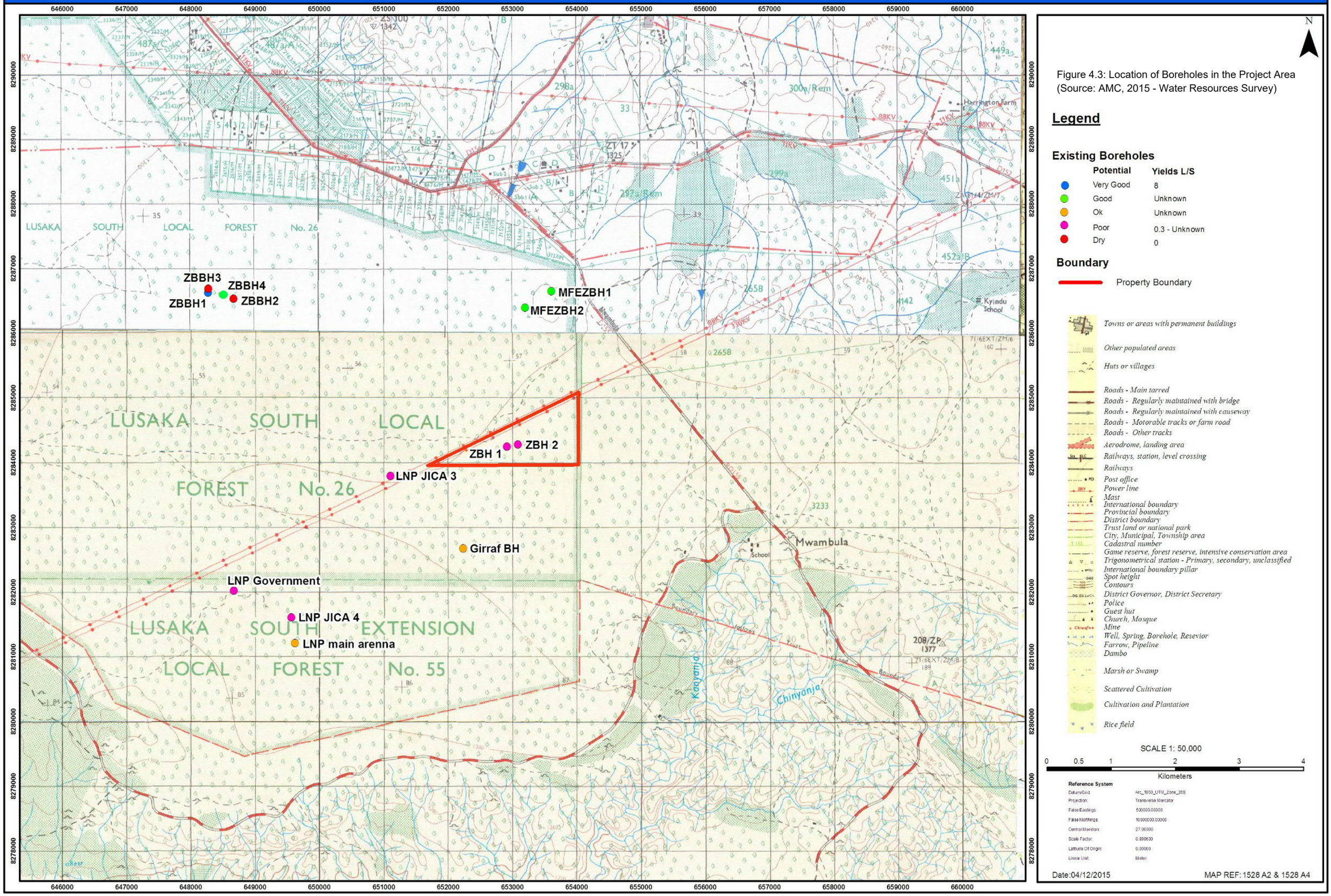


Figure 4.2b: Possible Flood Lines and sub-basin draining the Project Area (Source: AMC, 2015)

TOPO MAP SHOWING EXISTING BOREHOLES AT PROPOSED SOLAR ENERGY PLANT CONSTRUCTION SITE AND SURROUNDING AREAS - LS MFEZ



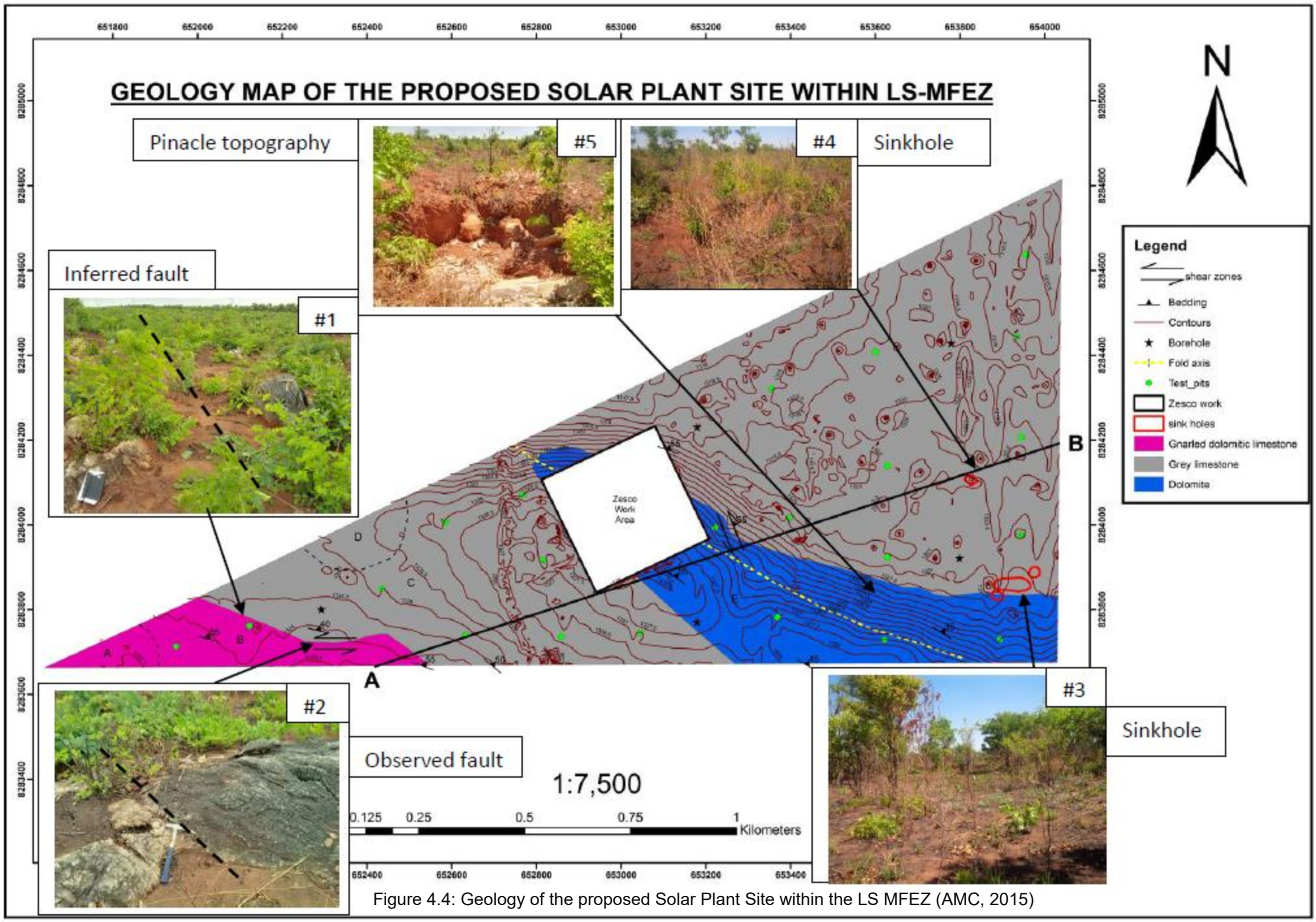


Figure 4.4: Geology of the proposed Solar Plant Site within the LS MFEZ (AMC, 2015)

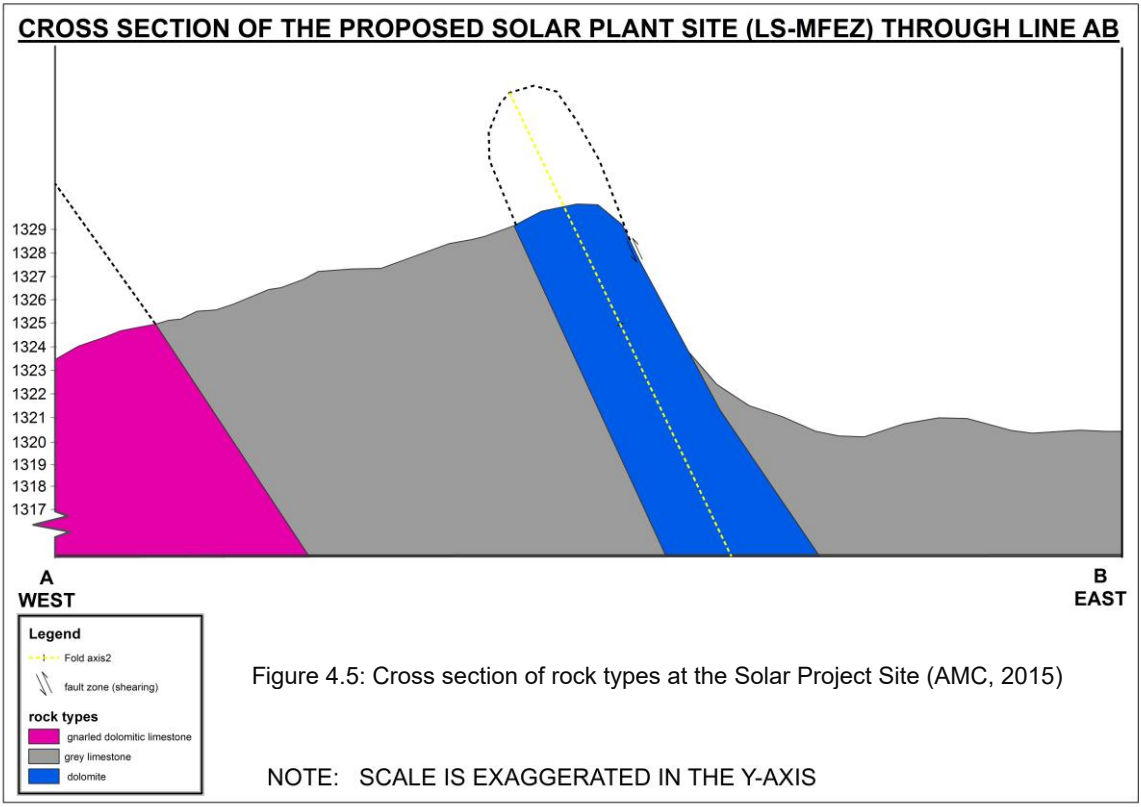
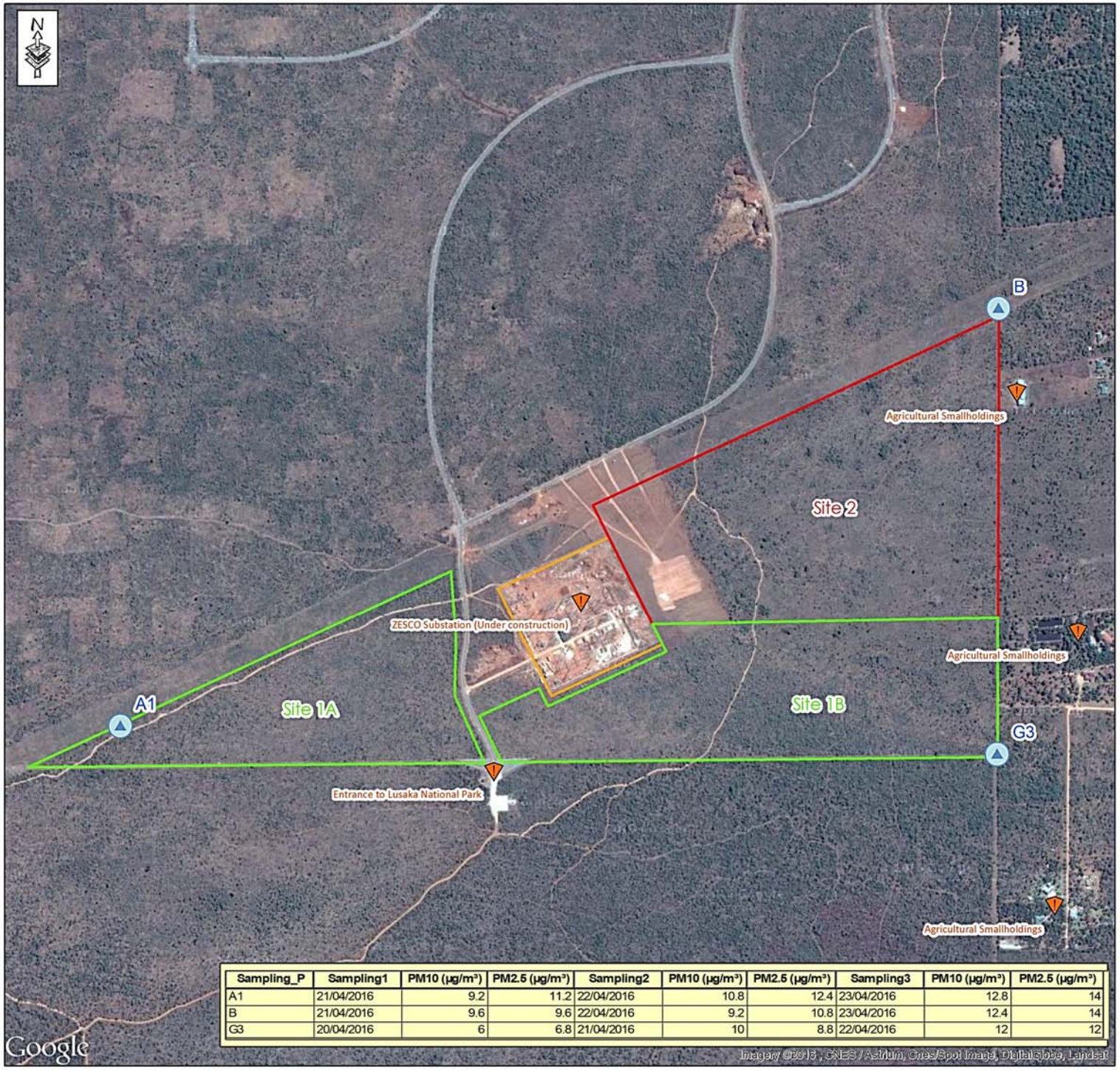


Figure 4.5: Cross section of rock types at the Solar Project Site (AMC, 2015)

NOTE: SCALE IS EXAGGERATED IN THE Y-AXIS



Sampling_P	Sampling1	PM10 (µg/m³)	PM2.5 (µg/m³)	Sampling2	PM10 (µg/m³)	PM2.5 (µg/m³)	Sampling3	PM10 (µg/m³)	PM2.5 (µg/m³)
A1	21/04/2016	9.2	11.2	22/04/2016	10.8	12.4	23/04/2016	12.8	14
B	21/04/2016	9.6	9.6	22/04/2016	9.2	10.8	23/04/2016	12.4	14
G3	20/04/2016	6	6.8	21/04/2016	10	8.8	22/04/2016	12	12

Legend:

Dust Monitoring

SITES

Site 1

Site 2

ZESCO

Projection: UTM 35South on WGS84

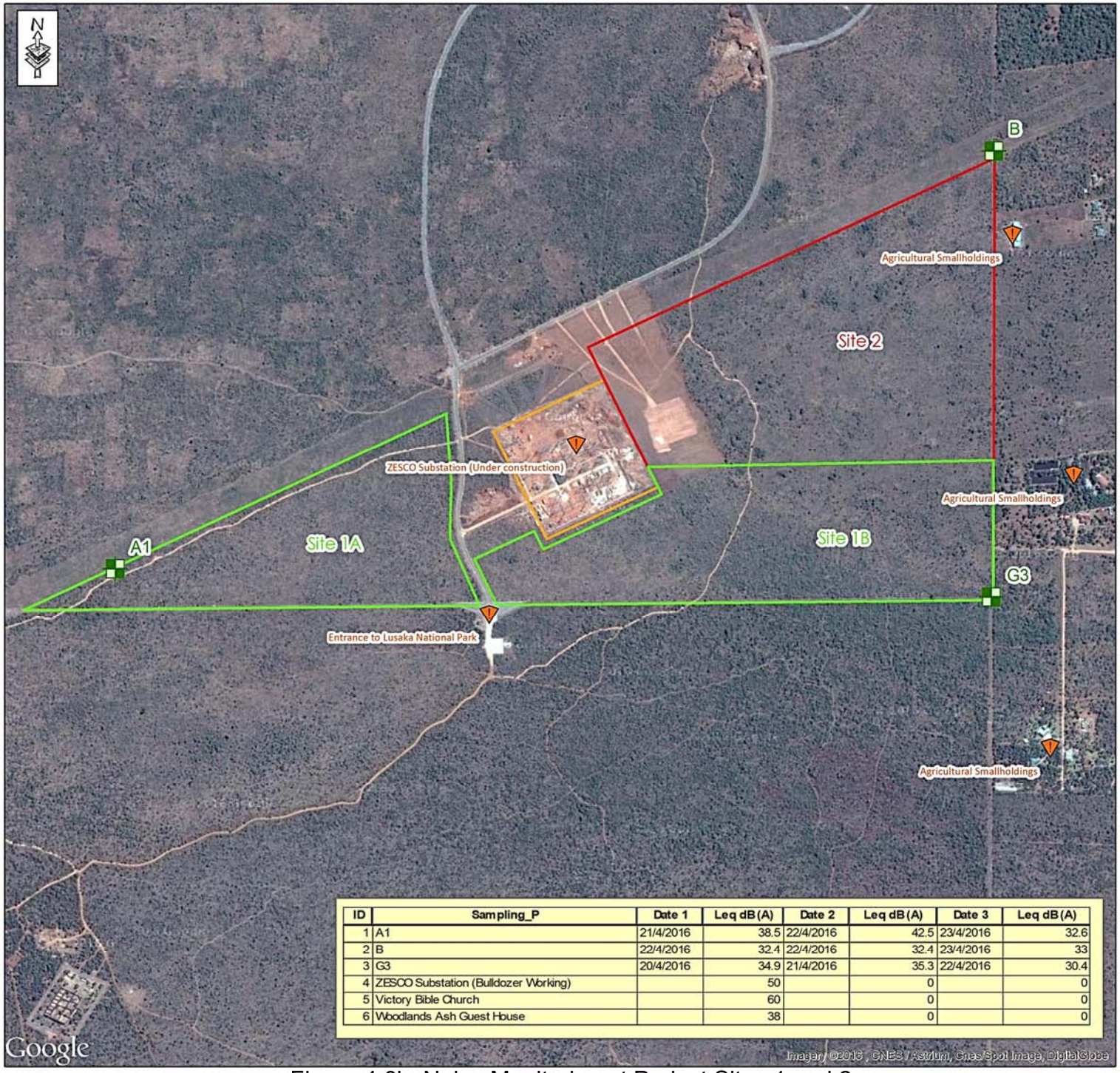
0 100 200 400 600 800 Meters

Proposed LS-MFEZ
Solar PV Sites
Dust Monitoring

Knight Piésold CONSULTING

302-00332-01 | June 2016

Figure 4.6a: Dust (PM10 and PM2.5) Monitoring Points



ID	Sampling_P	Date 1	Leq dB(A)	Date 2	Leq dB(A)	Date 3	Leq dB(A)
1	A1	21/4/2016	38.5	22/4/2016	42.5	23/4/2016	32.6
2	B	22/4/2016	32.4	22/4/2016	32.4	23/4/2016	33
3	G3	20/4/2016	34.9	21/4/2016	35.3	22/4/2016	30.4
4	ZESCO Substation (Bulldozer Working)		50		0		0
5	Victory Bible Church		60		0		0
6	Woodlands Ash Guest House		38		0		0

Figure 4.6b: Noise Monitoring at Project Sites 1 and 2.

Legend:

Noise Monitoring

SITES

Site 1

Site 2

ZESCO

Projection: UTM 35South on WGS84

0 100 200 400 600 800 Meters

Proposed LS-MFEZ Solar PV Sites Noise Monitoring

Knight Piésold CONSULTING

302-00332-01 | June 2016

ID	SITE	Sampling Points	Vibration (mm/s) peak
1	Site 1A	A1	0.07
2	Site 1A	B1	0.09
3	Site 2	B	0.03
4	Site 1B	P2	0.16
5	Site 1B	G3	0.20
6	Site 1B	A3	0.04
7	Site 1B	D3	0.08
8	Site 1B	P1	0.04
9	Zesco SS	Z1	0.04
12	Site 1A	E1	0.03
13	Site 1A	C1	0.08
14	Site 1A	D1	0.06
15	Main Gate	NRB Pharma	0.09
16	Main Gate	LS-MFEZ	0.15
17	East Gate	NP Gate	0.05

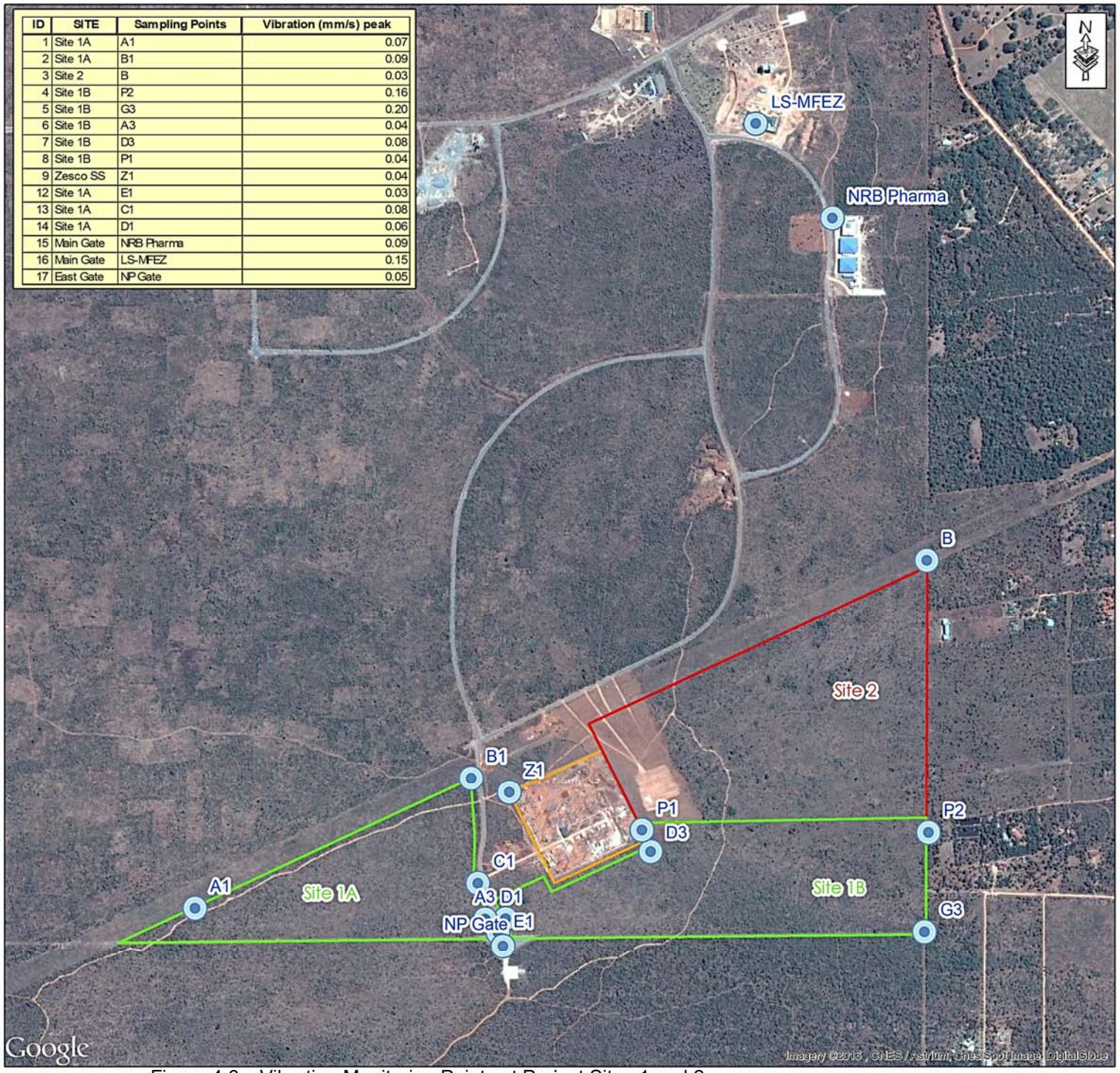


Figure 4.6c: Vibration Monitoring Points at Project Sites 1 and 2.

Legend:

Vibration Monitoring

SITES

Site 1

Site 2

ZESCO

Projection: UTM 35South on WGS84

0 125 250 500 750 1 000 Meters

Proposed LS-MFEZ Solar PV Sites Vibration Monitoring

Knight Piésold CONSULTING

302-00332-01 | June 2016

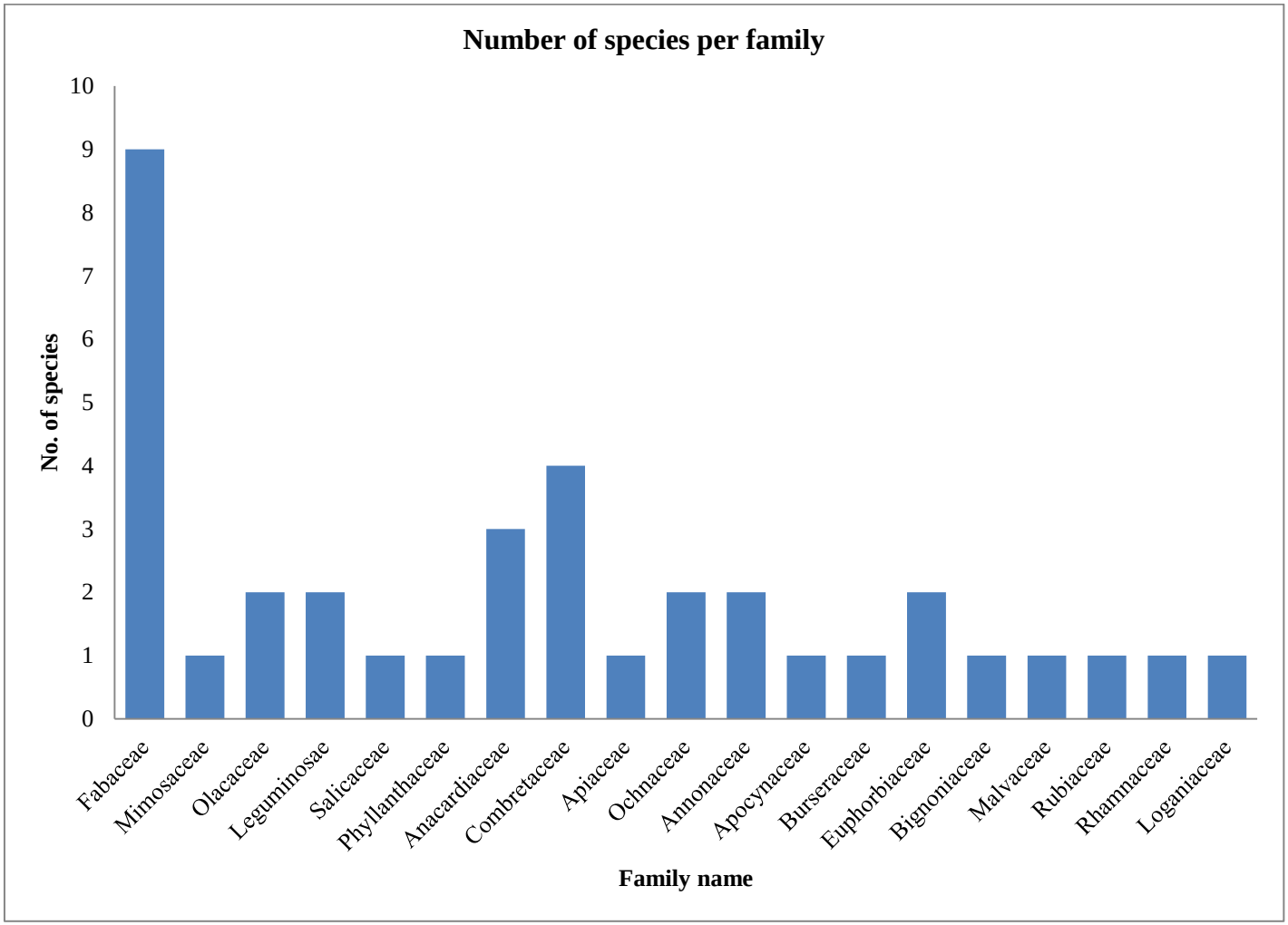


Figure 4.7: Number of Species per family

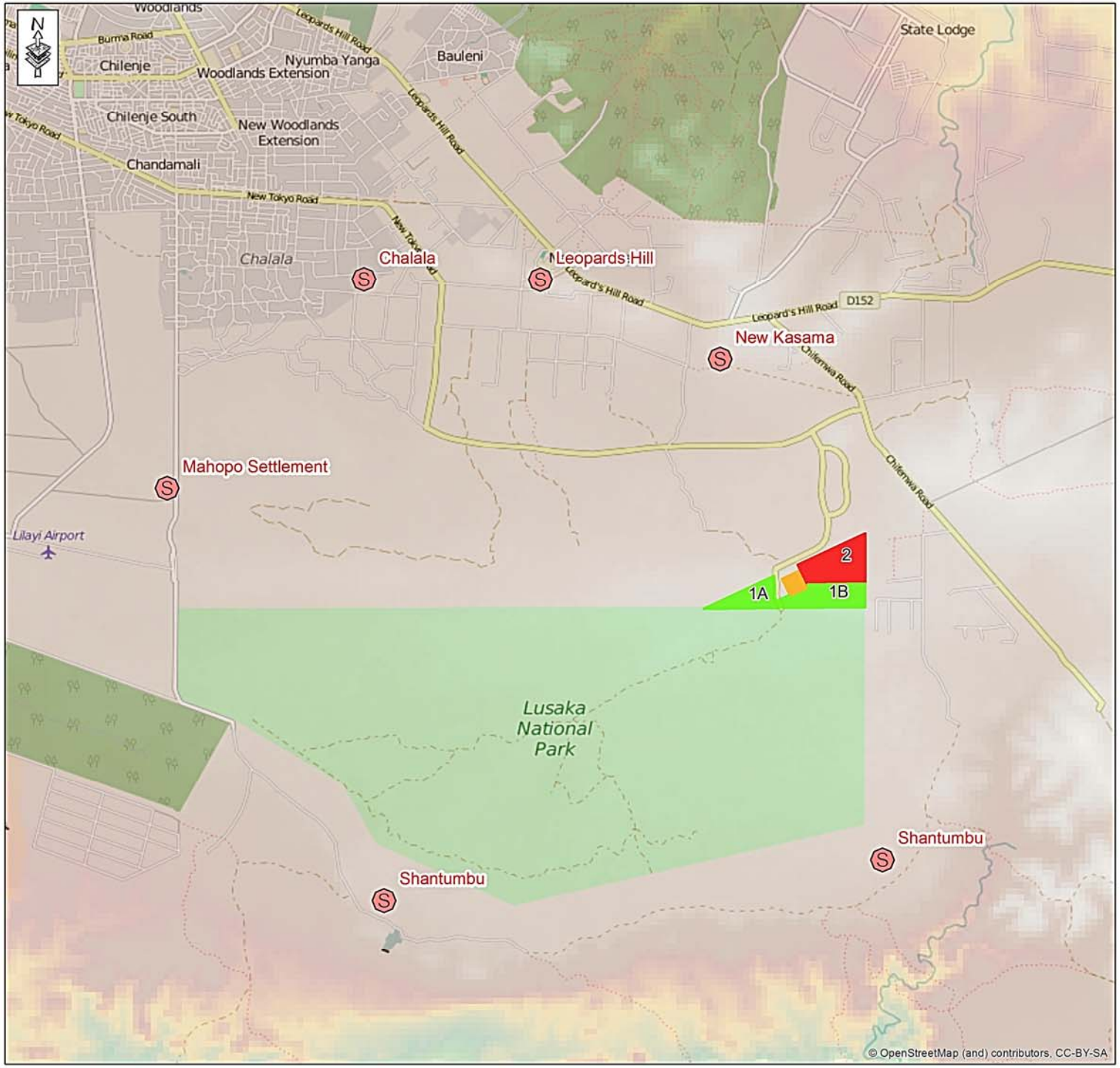


Figure 4.8: Location of Mahopo, Shantumbu, Chalala, New Kasama and other areas in the vicinity of the project sites.

Legend:

Settlements

SITES

Site 1

Site 2

ZESCO

Projection: UTM 35South on WGS84

0 500 1 000 2 000 3 000 4 000 Meters

Proposed LS-MFEZ Solar PV Sites Surrounding Settlements

Knight Piésold CONSULTING

302-00332-01	June 2016

Appendices

Appendix A: ESIA Study Terms of Reference

Appendix A-1: Minutes of the Public Disclosure Meetings

Appendix B: Hydrology and Hydrogeology Studies Reports

Appendix C: Soils and Geology & Geotechnical Investigations Reports

Appendix D: Air Quality and Noise Impact Assessment Report

Appendix E: Biodiversity Impact Assessment Report

Appendix F: Archaeology and cultural heritage Impact Assessment Report

Appendix G: Social Impact Assessment

Appendix H: Vibration Impact Assessment

Appendix I: Enel Green Power S.p.A. Track Record and Company Profile

Appendix A

ESIA Study Terms of Reference

Appendix A-1

Minutes of the Public Disclosure Meetings

Appendix B

Hydrology and Hydrogeology Studies Reports

Appendix C

Soils and Geology

Appendix D

Air Quality and Noise Impact Assessment Report

Appendix E

Ecological Impact Assessment Report

Appendix F

Archaeology and Cultural Heritage Impact Assessment Report

Appendix G

Social Impact Assessment

Appendix H

Vibration Impact Assessment

Appendix I

Enel Green Power S.p.A. Track Record and Company