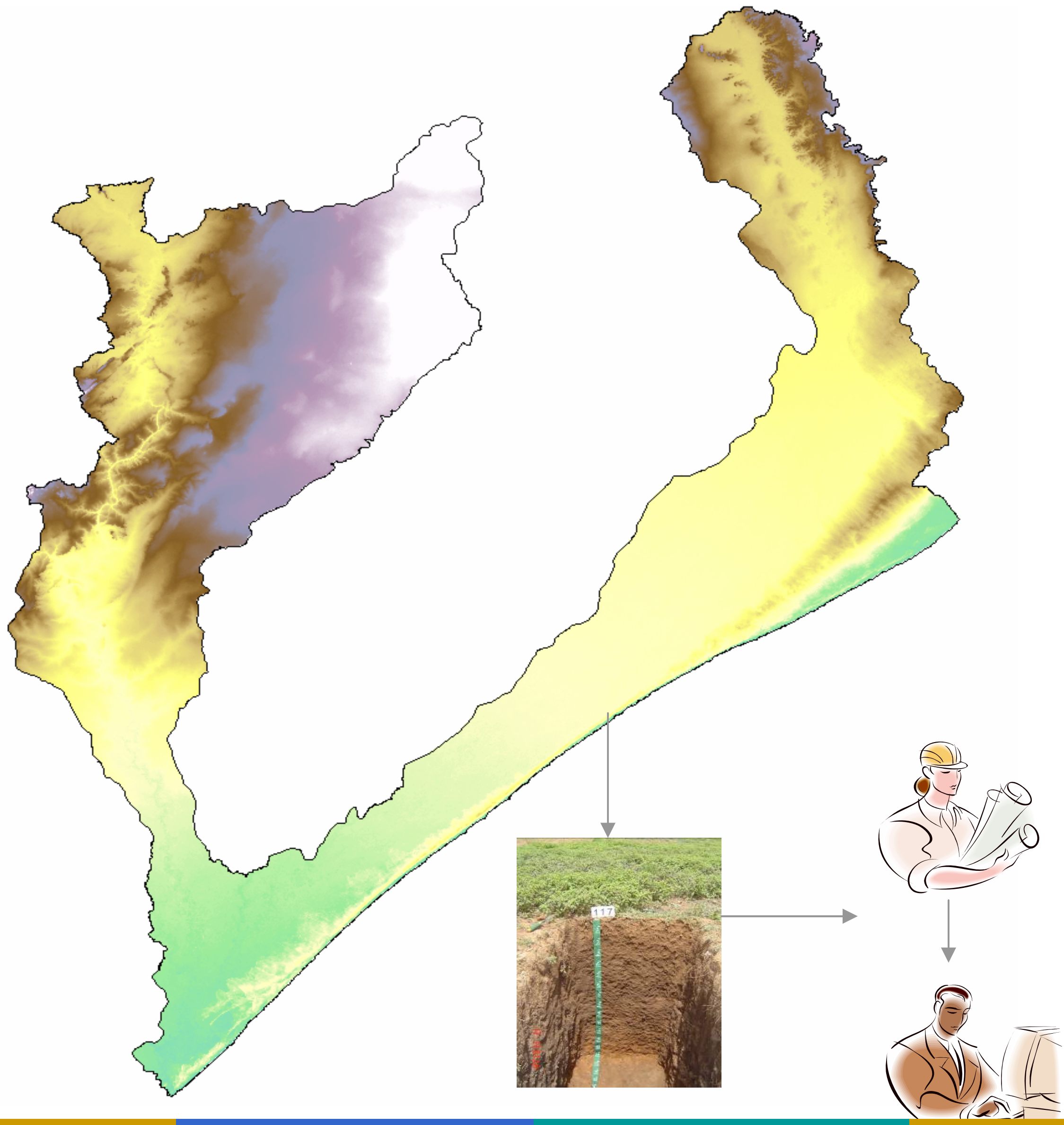
SWALIM

Soil Survey of the Juba and Shabelle Riverine Areas in Southern Somalia



Project Report No. L-08
July 2007

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Funded by the European Union and implemented by the Food and Agriculture Organization of the United Nations

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This document should be cited as follows:

Vargas, R. R., Omuto, C., and Alim, M. S. 2007. Soil survey of the Juba and Shabelle riverine areas in Southern Somalia. FA0-SWALIM. Project Report L-08. Nairobi, Kenya.

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List of acronyms

AOI	Area of Interest
CMSV	Continuous Model of Spatial Variation
DEM	Digital Elevation Model
DSM	Digital Soil Mapping
DMSV	Discrete Model of Spatial Variation
FAO	Food and Agriculture Organization
GP	Geopedological Approach
GIS	Geographical Information System
ILWIS	Integrated Land and Water Information System
LCCS	Land Cover Classification System
NSM	Newhall Simulation Model
SIHLMA	Somalia Integrated Hierarchical Landform Mapping Approach
SoLIM	Soil Land Inference Model
SRTM	Shuttle Radar Topography Mission
SWALIM	Somalia Water and Land Information Management

ACKNOWLEDGMENTS

The authors wish to acknowledge the considerable support given by the Project Task Force. Dr. Freddy Nachtergaele is thanked for his overall contribution to the present work.

We are grateful to the field surveyors Musse Shaie Alim, Mohammed Farah Omar and Mohamed Farah Ali for carrying out the field data collection. Our special appreciation goes to SAGRA (Somalia Agriculturalist Association) for their support during the field survey in Southern Somalia.

Special thanks to the European Commission Delegation – Rural Development Somalia Operations, for providing us with many Soil Reports from project studies carried out in Somalia.

The FSAU (Food Security Analysis Unit) of the FAO is acknowledged for its significant contributions and support during the field survey in Southern Somalia.

The Regional Centre for Mapping of Resources for Development (RCMRD) is gratefully acknowledged for access to facilities for scanning the analogue maps.

Finally, we want to express our thanks to all technical and administrative SWALIM staff for their valuable help during this stage of the project. We are indebted to Christine Kenyao and Alex Koton for their contributions of bibliographic research and data retrieval. Antony O. Ndubi is acknowledged for his tremendous efforts in data inputs and map editing.

1 INTRODUCTION

1.1 Background of soil surveying

Soil information in form of mapping is a key element for natural resources management and specifically for land use planning. In developing countries like Somalia where there is no national spatial data infrastructure, soil data and information are very scarce. Conventional soil surveys were, and still are the most widely used method of acquiring soil data at different scales for different purposes. This is a highly cost- and time-consuming activity, which limit the broad application of soil mapping.

According to McKenzie *et al.* (2000), technological advances during the last few decades have created a tremendous potential for improvement in the way that soil maps are produced. Remote sensing and photogrammetric techniques provide spatially explicit digital data of the Earth's surface and have lent considerable improvement in mapping land resources. However, in the case of soil resources they are not particularly effective due to limitations in accessing information apart from soil cover. In soil mapping, the soil depth where soil development takes place is a fundamental requirement. Although these tools can improve soil inventory activities, we cannot avoid soil surveys because they are the most reliable and accurate way of acquiring and understanding the type(s) and properties of soil present in a specific area. This technical report details the combined application of soil surveying and remote sensing in developing a soil map and related information in a selected study area in southern Somalia

1.2 Soil surveying in Somalia

Soil surveys in Somalia were mostly undertaken between 1961 and 1988, and information on previous national-level soil surveying and mapping initiatives are very scarce. The most important reconnaissance soil surveys at the regional level were done in the Juba and Shabelle region (FAO-Lockwood, 1967), and in the north-west area of the country (Sogreah, 1981). However, some other studies made at the reconnaissance level may still be found as illustrated in Table 1.

Table 1: Soil surveys carried out in the study area

SURVEY	LOCATION	AREA (km^2)	SCALE
ICA (1961)	Lower Juba Valley	4500	1:650,000
Selchozpromexport (1965)	Lower and Middle Juba Valley	16000	1:200,000
FAO/Lockwood (1967)	Project Area	208500	1:60,000
Technital	Juba Valley	50000	1:200,000
HTS (1977)	Project Area	200000	1:500,000
Sogreah (1983)	North-west of Somalia	33500	1:100,000

The severe drought that affected the Sahel region of Africa in 1973 and 1974 had a particularly serious impact on northern Somalia. Livestock and crop losses were heavy and an estimated 600000 to one million people were affected. The Somali government took appropriate emergency measures and established relief camps where 245000 people were fed and housed. Recognizing the need for a more permanent solution to the hazardous subsistence economy of the dominantly nomadic people and the largely untapped agricultural potential of southern Somalia, a decision was taken early in 1975 to relocate up to 120000 displaced nomads on a voluntary basis (Fanoole Settlement Project, 1978; Hunting Technical Services Ltd, 1978).

Because of that situation, the Juba and Shabelle catchment in the southern part of Somalia was where most of the soil survey projects at semi-detailed and detailed scales were carried out. With international cooperation, the government contracted companies to perform land evaluation and feasibility studies with the aim of finding suitable land for establishing irrigated farms. Soil surveys were part of these projects that generated soil data and information in the form of reports and maps.

Since the start of the war in 1991, soil survey activities ceased and in most cases, available soil data has been lost.

In view of the foregoing and with a view to future planning activities in the country, there is a need to generate baseline data able to provide a proper picture of the current natural resources situation. As part of SWALIM objective in information generation and management in Somalia, a soil map is necessary to capture the information on soil resources. It is in this view that the Land Team in SWALIM undertook to develop a soil map of Somalia to support future activities such as land suitability and land degradation assessments. This technical report documents the soil mapping activities that were undertaken with an attempt to integrate all historical soil data and available information, new soil surveys, and the application of predictive soil mapping.

The objective of this study was to map the soil resources of the Juba and Shabelle catchment areas at 1:100000 scale using all available resources such as historical soil data, field survey and advanced digital soil mapping techniques as a tool for handling scarce data environments.

2 STUDY AREA

2.1 Location and delineation

The study area lies between the longitudes 41°53' and 46°09' East and between the latitudes 0°16' South and 5°04' North, thus covering about 88 000 square kilometres. It covers the whole of the Juba River and a greater part of the Shabelle River basin within Somalia (Figure 1).

The most important towns found in the area are Luuq, Garbahaarrey, Baardheere, Bu'aale, Jilib, Jamaame and Kismaayo in the Juba valley; and Beledweyne, Buulobarde, Mahadday Weyn, Jawhar, Balcad, Mogadishu, Afgooye, Marka, Baraawe, and Haaway in the Shabelle valley.

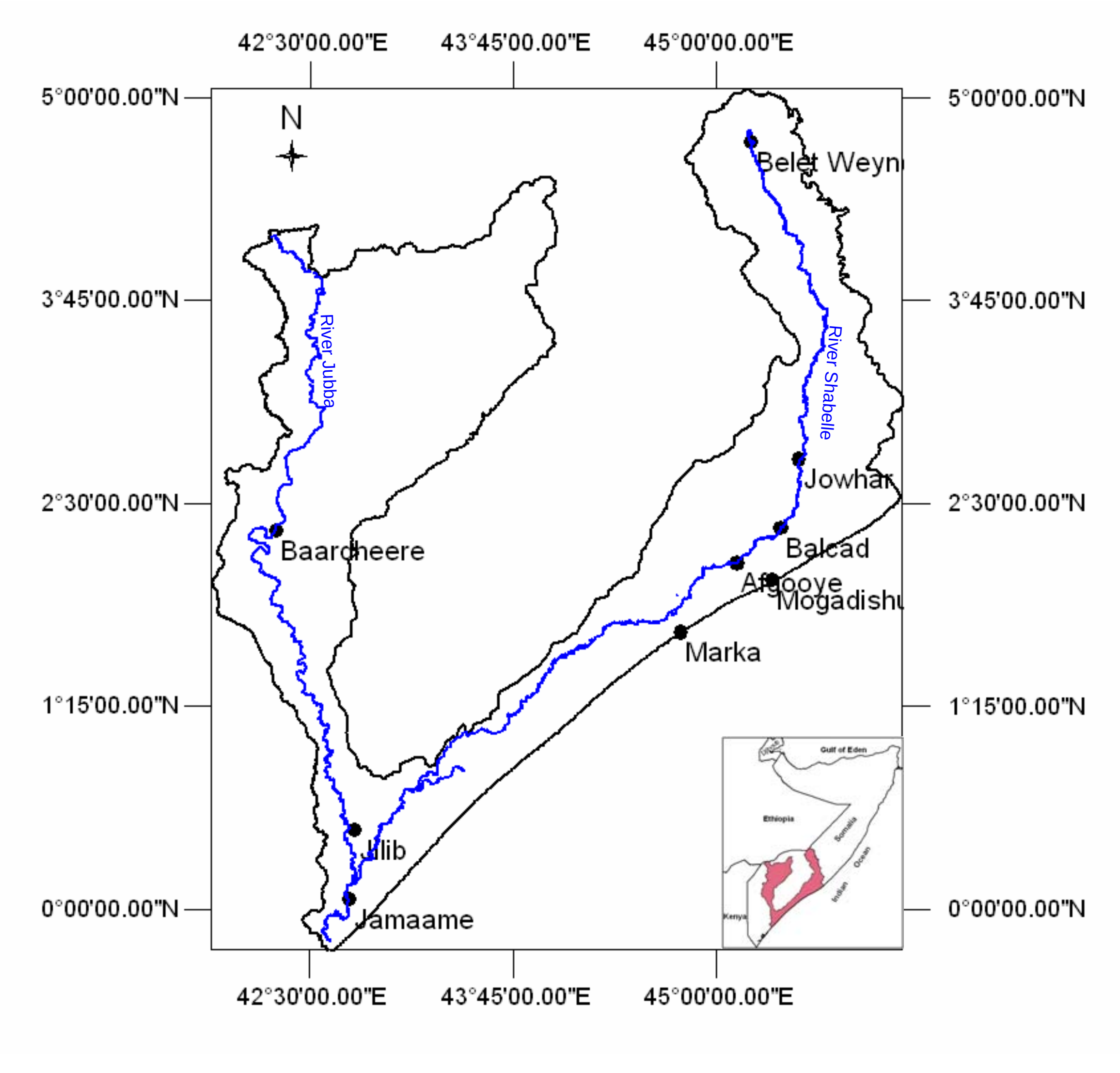


Figure 1: Study Area

2.2 Climate

The climate of the river basin areas of southern Somalia is tropical arid to dry and sub-humid, and is influenced by the north-easterly and south-easterly air flows of the Intertropical Convergence Zone (ITCZ). North-easterly and south-easterly air masses meet in the Intertropical Front (ITF) and raise air upwards to produce rain. The annual movements of the ITCZ from north to south across Africa and back again, give rise to four different seasons in Somalia, comprising two distinguishable rainy seasons alternating with two marked dry seasons, as follows:

- *Gu*: April to June, the main rainy season for all over the country
- *Xagaa*: July to September, littoral showers, but dry and cool in the hinterland
- *Deyr*: October to December, second rainy season for all over the country
- *Jilaal*: January to March, longer dry season for all over the country

Rainfall in the study area is erratic, with a bimodal pattern except in the southern catchment areas close to the coast where some showers may occur even during the *Xagaa*. (See Figure 1 and Figure 2). Rainfall varies considerably, with the *Gu* delivering about 60% of the total mean annual rainfall, which ranges from 200 - 400 mm in areas bordering Ethiopia in Hiiraan, Gedo and Bakool regions, to 400 - 500 mm in the central Bay area and northern parts of the Middle and Lower Shabelle regions. Higher rainfall areas receiving more than 600 mm occur in the Middle Juba region, around Jilib in the southern catchment areas. Rainfall is characterised by intense, short rainstorms. The study area has a high inter-annual rainfall variation and is subject to recurrent drought every three to four years, and more severe dry periods every seven to nine years.

Air temperatures are influenced by altitude and by the strengths of seasonal winds. In the first dry season (*Xagaa*) days are often cool and cloudy all over the region, with light showers in areas close to the coast. In the second dry season (*Jilaal*) days are hot, or very hot and dry. The hottest period coincides with the months of March and April.

Temperatures vary seasonally, with mean annual temperatures ranging between 23°-30°C, with a maximum temperature of 41°C in March (Baardheere) and a minimum temperature of 24°C in July. In areas near major rivers relative humidity is high, ranging from about 70-80%, but further inland away from the rivers the air is much drier. Relative humidity is higher in the coastal areas, where it usually exceeds 87%. The high relative humidity is normally compounded by higher temperatures.

The major winds are in response to the north and south seasonal movement of the Intertropical Convergence Zone, and in particular the Intertropical front. In the study area the winds blow persistently from the northeast during *Jilaal* (December to February), when the weather is hot or very hot, and from the southwest during *Xagaa*, (June to August), when the weather is cool and cloudy. The south-west monsoon winds prevail during June, July and August. The north-east monsoon winds prevail during December, January and February.

The weather is hot and calm between the monsoons (part or all of April and part or all of September). In the *Jilaal* periods, prevailing winds are strong and blow in heavy dust storms from the Arabian Peninsula. Weaker winds generally occur during the inter-monsoonal periods of April/May and October/November. Average wind speeds vary between 2-6m per second.

Evapotranspiration is consistently high throughout the study area. The highest potential evapotranspiration occurs in the northern areas of Gedo, Bakool and Hiraan regions, where it exceeds > 2 000 mm/yr; in the rest of the area it is between 1 500 – 2 000 mm/yr. Annual rainfall (P) is everywhere far below potential evapotranspiration (PET) and there is a significant moisture deficit for most of the year.

Three broad climatic zones may be recognized, characterized by differences in patterns of rainfall:

- The coastal zone - with significant rainfall occurring from July -August (*Hagi* rains) that lengthen the *Gu* season.
- The semi-arid zone – with two strongly defined rainy seasons and an additional light rainy season that may occur during July-August.
- The arid zone – with a lower annual rainfall and a dry period between July-August. The monsoon winds are the most important factor affecting the climate and the timing of the rainy periods.

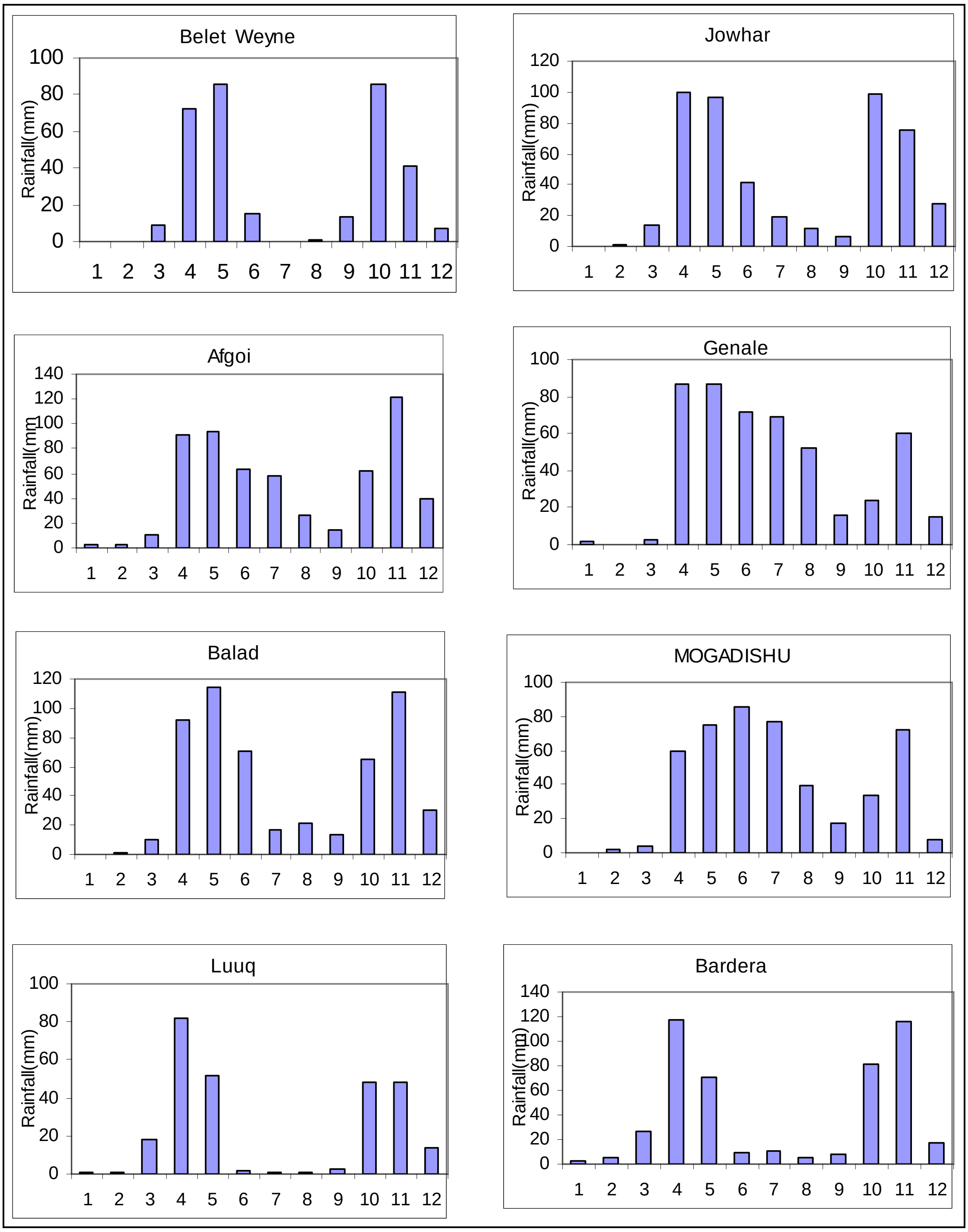


Figure 2: Mean monthly rainfall patterns in the study area (1963-2001)

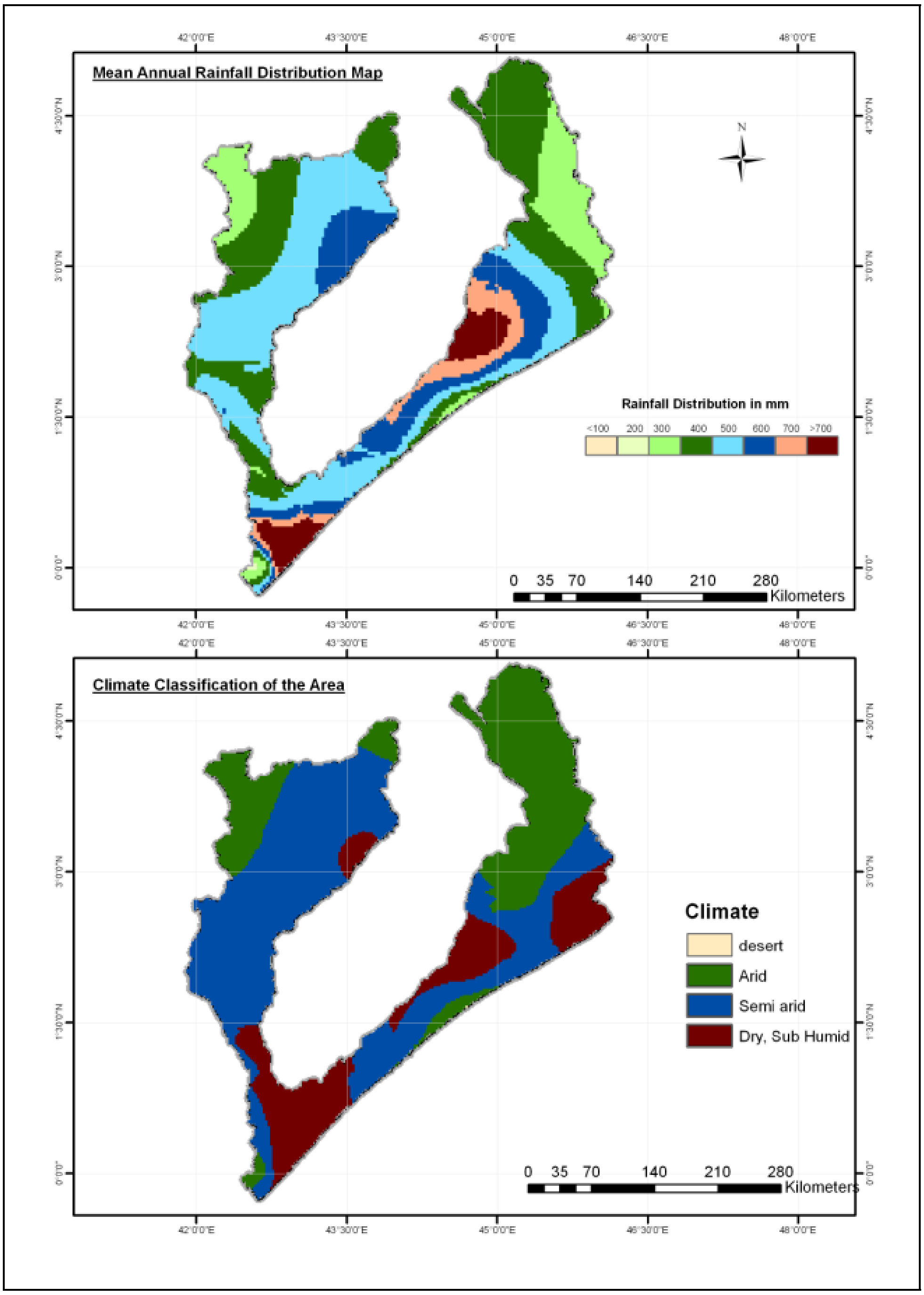


Figure 3: Mean annual rainfall distribution map and climate of study area

2.3 Geology

The Study Area is characterized by the outcropping of the metamorphic basement complex, made up of migmatites and granites. Sedimentary rocks such as limestones, sandstones, and gypsiferous limestones are present, as well as an extensive, wide system of coastal sand dunes. Basaltic flows are present in the north-western part of the study area. From a tectonic point of view, the study area is characterized by a fault system lying parallel to the coast in the alluvial part of the AOI, and by a system of northwest-southeast oriented faults in the metamorphic basement complex.

Some late Tertiary fluvio-lagunal deposits occur on the Lower Juba plain and part of the southern Shabelle, consisting of clay, sandy clay, sand, silt and gravel. Recent fluvial deposits are common alongside the two major rivers, the Juba and Shabelle, consisting of sand, gravel, clay and sandy clay. Other Recent alluvial deposits occur in small valleys in Gedo and Bakool Regions and in the Buur area, consisting of gravely sand or red sandy loam materials. A wide coastal dune system occurs along the coast.

2.4 Landform / Soils

According to the bibliography, the study area is characterized by the following land features:

1. The two main river valleys (Juba and Shabelle Rivers) that traverse the generally level, undulating morphology of the area;
2. hilly topography in the middle of the study area cut by wadis, and gently undulating wide plains toward the coast; and
3. a coastal dune complex known as the Merka red dunes, which fringes the coast from beyond the Kenyan border, separating the narrow coastal belt from the Webi Shebeli alluvial plain (Carbone & Accordi, 2000).

The study area is dominated by the presence of the distal portion of the two main perennial rivers of the Horn of Africa, flowing from the highlands of Ethiopia towards the Indian Ocean: the Juba River (700 km of which is within Somalia, out of its 2 000 km total length) and the Shabelle River (1 560 km of which is within Somalia, out of its almost 1 800 km total length). The Juba flows into the Indian Ocean close to Kismaayo city, while the Shabelle impounds itself a few kilometres before reaching the lower tract of the Juba.

According to the bibliography (Land Resources Development Centre, 1985; Lockwood Survey Corporation Limited, 1968), a brief description of the soils found (period 1961-1980) in the area is given: Along the upper reaches of both the Juba and Shabelle there are extensive limestone outcrops, with more localised sandstones, marls and gypsum. Here the soils tend to be shallow. The Juba and Shabelle floodplains mostly comprise deep, seasonally poorly drained, medium to heavy textured calcareous alluvial Fluvisols, Cambisols and Vertisols. Haplic Vertisols (Chromic) predominate in the Shabelle valley, with increasing salinity and alkalinity as the alluvium of the lower Shabelle valley impinges upon the alkaline ‘Marine or Alluvial Plain’, a feature which extends across from the lower

Shabelle, trans-Juba to beyond the Tana River in Kenya. The Shabelle swamps comprise clays and silty clays with surface organic accumulation, but little salinity build-up despite the high level of surface evaporation. Nevertheless, given irrigation without drainage but with a high watertable, there is evidence for steady soil salinisation, as at the Jawhar Sugar Estate and on the Soblaale Settlement scheme.

On the marine or alluvial plain there is evidence of greater degrees of soil alkalinity. Much of the recent alluvium in the narrower Juba floodplain can be regarded as Haplic Fluvisol (Calcaric), with sandy river levees and lower-lying clay loam to clay in seasonally flooded dhesheegs. And in the Shabelle, these clays show an increasing tendency to alkalinity in the lower river reaches, more particularly on the western edge of the floodplain receiving runoff from the Marine or alluvial plain. Towards the coast, several sub-plains join the Juba Valley from the west; these are floored with saline and alkaline clay as at Goob Weyn. Farther south and west, in the area designated ‘Trans-Juba’, there are in effect three basic groups of soils running broadly parallel with the coast. The coastal sandunes and loamy sands fringe the immediate coast. Behind these coastal sand hills are extensive fossil coral and limestone sheets with an average 50 cm cover of reddish or yellow-brown sandy loam and sandy clay loam.

Because of the predominance of alluvium, many soils comprise layers of deposited materials which, because of the semi-arid climate, have been little affected by normal soil-forming processes. Despite their variability, most soils share characteristics of heavy texture and low permeability, with a tendency to poor drainage.

2.5 Land Cover

Land cover in the study area consists mainly of natural vegetation. Other cover types include Crop fields (both rainfed and irrigated), Urban and Associated Areas (Settlement/Towns and Airport), Dunes and Bare lands and Natural Water bodies. The natural vegetation consists of riparian forest, bush lands and grasslands. Woody and herbaceous species include *Acacia bussei, A. seyal, A. nilotica, A. tortilis, A. senegal, Chrysopogon auchieri* var. *quinqueplumis, Suaeda fruticosa* and *Salsola foetida*.

2.6 Land Use

Land use in the study area consists mainly of grazing and wood collection for fuel and building material. Rangelands in the Juba and Shabelle catchments support livestock such as goats, sheep, cattle and camels. Livestock ownership is private but grazing lands are communal, making it very difficult to regulate range use. Rangelands are utilised by herders using transhumance strategies (Shaie, 1977). Land covers associated with this land use include forest, bushlands and grasslands (GTZ, 1990).

Farmers in these two river valleys are sedentary, practicing animal husbandry in conjunction with crop production. They tend to keep lactating cattle and a few sheep and goats near their homes, while non-lactating animals are herded further away in the manner of herding nomadic stock. However, rainfed and irrigation farmers keep relatively small numbers of livestock, mainly cattle and small ruminants.

Animal feed is obtained primarily from natural vegetation and crop residues, while dry season watering of animals is from rivers. Crop residues provide forage for non-browsers such as cattle and sheep. Numerous water reservoirs in the area between the two rivers provide water during the wet season and also serve as alternative water sources to the rivers. Groundwater is also an important source of water for livestock, and other sources including hand-dug wells, swamps, creeks and boreholes.

Other land uses include rainfed agriculture, which includes agriculture that is entirely dependent upon rainfall. Crops under this category of land use include sorghum, millet, maize, groundnuts, cowpeas, mung beans, cassava and other minor crops, and are grown twice a year in the *Gu* and *Deyr* seasons.

Small-scale irrigated fields are also found along the Shabelle and Juba river valleys, growing maize, sesame, fruit trees and vegetables while large-scale plantations include sugar cane, bananas, guava, lemon, mango and papaya.

Flood recession cultivation in *desheks* (natural depressions) on the Juba River floodplain is common, crops including sesame, maize and vegetables. Major crops in the *desheks* are maize, sesame, tobacco, beans, peas and vegetables, watermelon and (rarely) groundnuts. Cropping is either single or mixed.

3 MATERIALS AND METHODS

The basic materials used in this work can be found in Table 2.

Table 2: Materials

TYPE	MATERIAL
Hardware	Project reports Soil and land classification maps Profile descriptions CDs and DVDs regarding soil data. WRB 2006 Digital maps and reports from internet. Professional Scanner FSC 5010 DSP
Software	ArcGIS 9.2 SDBmPlus 2.01 GeoVis 2.3.0 Microsoft Excel 2000 Dynamic Atlas 2.1 (Somalia) Ilwis 3.1 S-PLUS CART

3.1 Bibliographic research

A complete bibliographic search for all soil survey activities carried out in the study area was performed. All soil survey projects undertaken in the study area were listed, following which all data sources were traced through the internet, grey literature, scientific articles and so on. The most fruitful strategy of obtaining data was visiting various Somali project libraries, where many projects reports were available.

After obtaining an overview through reviews of available data, a collection process was performed following the compiled list of references. Reports and maps (hard copies) were the primary targets in this process.

3.2 Soil data retrieval

3.2.1 GIS building

A GIS project was created for including all soil maps retrieved for the study area. This project had to be multi-scale (as all previous maps had been produced to different scales) and multi-thematic (because different soil classification systems had been used).

The first step was to convert all available analogue maps into digital versions, so all maps were scanned using the facilities of the Regional Centre for Mapping of Resources for Development (RCMRD), where a professional map scanner is available.

All maps were then georeferenced using the system in Table 3. This task was difficult due to most maps not having included coordinates. The topographic maps were the base for georeferencing the soil maps. Some projects had included topographic surveys, so the benchmarks were used as the cartographic reference. Some existing maps from the Dynamic Atlas (FAO, 2005) were also used for some georeferencing adjustments into the GIS project.

Table 3: Geodesic System

GEODESIC SYSTEM	PARAMETERS
Projection	Universal Transversal Mercator (UTM)
Datum	WGS 1984
Ellipsoid	WGS 1984
Zone	38

Following the same procedure, soil pits or soil profiles were also georeferenced. A few soil profile descriptions contained coordinates, but the majority did not. Point maps containing soil profiles were created.

The georeferenced maps containing the polygon soil classes were then digitised using both ArcGIS and GeoVis software, which included labelling polygons according to their original soil class or mapping unit code.

Once all maps were included in the GIS project, all their soil-landscape data such as map codes, soil series, landforms or geomorphology, topography, soil descriptions, soil drainage classes, FAO-UNESCO classes, USDA-Soil taxonomy classes and WRB 2006 soil classes (which was not yet available) were included.

3.2.2 Updating soil classification into WRB 2006

Almost all the soil maps contained soil mapping units using the soil-landscape (discrete model of spatial variation) approach. The thematic description includes a soil class name that in most of the cases was derived using the FAO-UNESCO 1974 Soil Map legend and the USDA Soil Taxonomy from 1975.

Soil classes were converted into a standard actual soil classification system to give more clues and information to the users. The World Reference Base for soil resources 2006 (WRB, 2006), was the soil classification system used to reclassify each given soil class mapping unit, and specifically each existing soil profile. The classification of soils in this system is based on soil properties defined in terms of diagnostic horizons, properties and materials, which to the greatest extent possible should be measurable and observable in the field.

This step was not merely a direct conversion of existing soil classes into WRB; rather, each available soil profile description was studied and assessed using site descriptions, profile descriptions and physical-chemical analytical data. Where no soil profiles were available apart from a soil map including soil mapping units, we reclassified the soil class given in the legend and converted it into WRB 2006, trying to portray the specific characteristics of that soil class.

All soil profiles were stored in an Excel spreadsheet containing the original profile ID, the new coordinates, location of the profile, and landform of the site, FAO-UNESCO legend if available, USDA Soil taxonomy if available and the WRB 2006.

3.2.3 Data input and storage

To have all profiles georeferenced and classified into WRB (2006), it was important to store the data in a database. The Multilingual Soil Profile Database (SDBm Plus 2.01 - De la Rosa, 2003)) was used for this purpose, although this software is not a soil geographic database *per se*. However, the option ‘Export data into ASCII format’ was used, then opened and converted into a soil geographic database using Microsoft Access. Data entered into SDBmPlus was related to General information, Horizon description, Standard analysis and in some cases, if data was available, we also entered Chemical determinations and Physical data.

3.3 Soil survey

Conventional soil surveys, including mapping activities, should follow standards for scale and sampling intensity. According to Avery and Dent (Avery, 1987; Dent and Young, 1981) if the objective is to produce a map at scales of 1:50 000 and 1:100 000, the following rules should apply:

At 1:100 000 scale

Low semi-detailed soil survey, resource inventory
Inspection density according to Avery and Dent: 1 km^2 (100 ha) to 4 km^2 (400 ha)
Area of study: 12.936 km^2

Considering the optimum and the area characteristics:

$$\begin{array}{l} 1 \text{ sample} - 1\ km^2 \\ X \quad - \quad 88\ 000\ km^2 \end{array}$$

X = 88 000 samples

Considering the minimum and the area characteristics:

1 sample - 4 km^2
X - 88 000 km^2
X = 22 000 samples

As can be seen, a high level of soil sampling is required in order to follow a conventional survey based on determination of relationships between soils and landscapes.

Constraints in this area of interest included poor accessibility (few roads), the extent of the study area (88 000 km^2), flooding during December 2006 and February 2007, security restrictions due to the current socio-political situation and the presence of unmapped landmines and roadblocks, hence it was neither technically nor practically feasible to perform a conventional soil survey. Instead, alternatives had to be considered in order to perform the primary objective of soil mapping. Project constraints demanded the use of rapid automated techniques combined with relatively time-intensive techniques such as Soil Inference Systems, historical soil data, limited field observation and sampling.

As mentioned by Scull (Scull, 2003), there are many new methods that aim to improve soil mapping activities in areas with low spatial data infrastructure. These methods are known as DSM (digital soil mapping techniques) (Pedometrics, 2005). One tool is Predictive Soil Mapping, which infers soil classes based on low soil samples using an inference system relying on expert knowledge.

For the purpose of this study, the SCORPAN Predictive Soil Mapping was adopted (McBratney et al, 2003); this is part of the Pedometrics tools and considers the initial Jenny equation, including time and space, and the soil attributes for predicting locations of specific soil classes or attributes under specific environmental conditions. This contends that soils are predictable when local environmental conditions and soil relationships to these environmental conditions are known.

3.3.1 Landscape stratification (Geopedological approach)

The core of the overall approach was the identification and understanding of the soil-landscape model concept. Landscape stratification was performed through adapting the Geopedological (GP) approach (Zinck, 1988) to Somalian conditions. The GP approach is an hierarchical system which stratifies terrain from a geomorphological perspective, but with the objective of determining soil formations. This approach utilises six different categorical levels; however, only Landscape, Relief, Lithology and Landform levels were used in this study. The present exercise was initiated from an integrated and modified GP approach. The primary difference lay in, instead of aiming at producing a soil map using aerial photography (as in a conventional soil survey), the aim was a landform map obtained using satellite imagery. Spatial and spectral information extracted from aerial photographs or satellite images are quite different, even though they can be complementary. In addition, visual image interpretation was integrated with Digital Terrain Analysis, giving rise to integrated landform maps at 1:100 000 and 1:50 000 scales, which were verified in the field.

The present approach has been called the Somalia Integrated Hierarchical Landform Mapping Approach – SIHLMA. For a detailed explanation of the procedure and results, please refer to the Landform of selected areas in Somaliland and Southern Somalia Report (Paron, 2006) which is part of the land resources inventory of the SWALIM project carried out in the study area.

3.3.2 Soil sampling strategy

Considering the aforementioned constraints and the proposed approach for the soil mapping activity, a soil sampling scheme was designed considering representative sites that would reveal the spectrum of soil spatial variability, and especially areas with scarce historical soil data.

Using the landscape map, variability of different landscapes and relief types were analysed as well as their relation to soil formation, thereby assessing spatial variability and composition of the terrain component.

Referring to the representative landscapes and relief types, land cover variability, the accessibility map, security measures and scarce soil data areas, a random soil sampling Scheme (Figure 4) was designed. The sampling scheme took into consideration the accessibility and insecurity problems in much of the southern parts of the study area. Luckily, for these difficult areas existing soil profile (176 old profile locations in Figure 4) complemented the new survey locations (82 new profile locations) so that in total there were 358 soil profile locations for soil mapping in the study area.

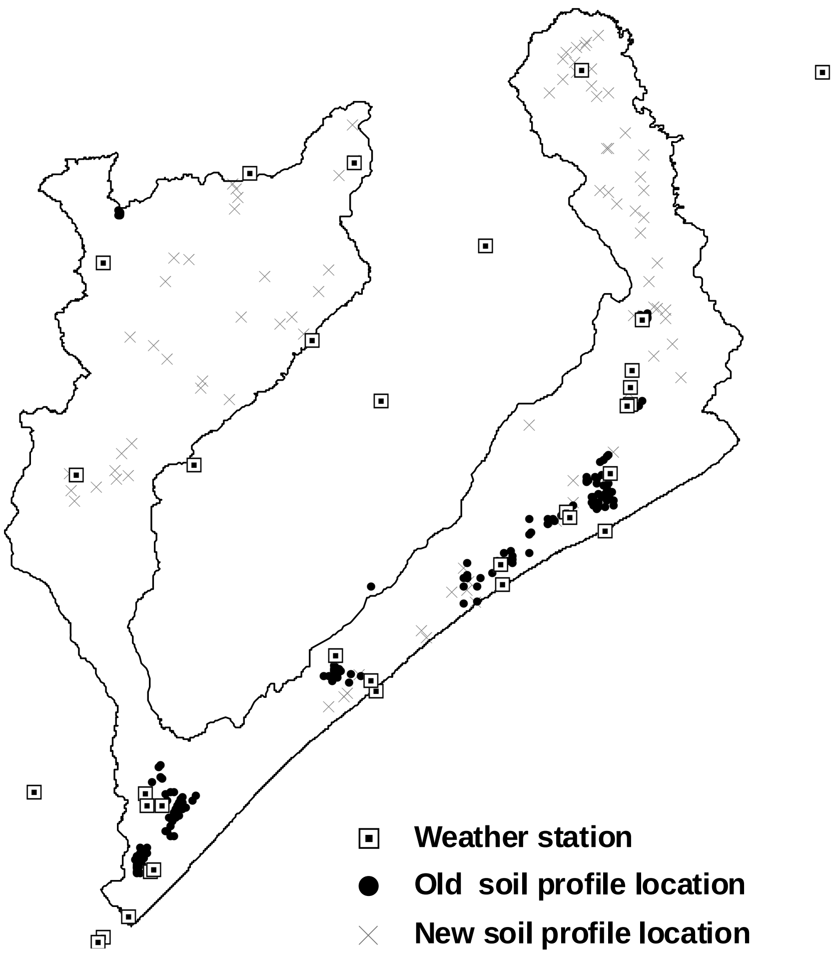


Figure 4: Old and new soil profile pits for soil mapping

3.3.3 Soil field data collection

A field-based natural resources inventorying was carried out by SWALIM during March 2007 for the fulfilment of the main objective of land suitability assessment of the Juba and Shabelle catchment areas, which included a specific soil survey aimed at collecting soil data.

Due to security restrictions, SWALIM contracted local land resources surveyors to perform the field data collection (16 Local surveyors, three of whom out of six were soil scientists). The soil scientists were distributed among three main areas of interest according to physical and security-related accessibility.

Before the field survey, one week of training for the Somali surveyors was devoted to refreshing their knowledge in terms of general surveying and soil surveying for soil scientists (Figure 5). This was a fundamental step in refreshing and upgrading their knowledge of GPS devices, map reading, and new methods for soil sampling. To support and guide this training and the field activities, the SWALIM land team produced a Field Survey Manual (FAO-SWALIM PROJECT, 2006) which was used throughout.

Conventional soil profile descriptions were carried out along the sampling points located in different relief types. Not all planned soil sites were visited, either due to impeded accessibility or presence of floods.

Lecture on soil surveying and mapping

Training on the use of GPS

Field training on soil properties

Field training on soil profile description

Figure 5: Appraisal of the field data collection team

At each site, a standard soil pit was dug. A soil collection form was designed to collect site information, soil attributes and pedogenetic indicators (see Appendix 1). Physical and chemical soil properties were described for each soil profile and soil samples were taken for laboratory analysis in Nairobi, Kenya. A preliminary soil classification was performed using the WRB 2006 soil classification system (WRB, 1998). Auguring was performed in areas where there was a need to define boundaries between different soil classes.

Sites with rocky or stony soils were not described in detail, but preliminary classifications were still made.

3.3.4 Soil laboratory analysis

Soil samples were analysed in the ICRAF (World Agroforestry Centre) Soil Laboratory following standard soil analysis procedures. Parameters analysed included soil particle distribution, pH, EC, CEC, Exchangeable cations (Ca, Mg, K, Na), CEC, Extractable Phosphorus, Nitrogen total, Organic Carbon, Calcium Carbonate and Gypsum. Table 4 shows the results of these analyses.

Table 4: Soil properties from profile pits in the study area

	Old soil profiles				New soil profile			
	Topsoil (≤ 50 cm)		Subsoil (> 50 cm)		Topsoil (≤ 50 cm)		Subsoil (> 50 cm)	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
pH	7.99	0.34	8.02	0.32	8.45	0.36	8.33	0.39
EC (mS/cm)	1.61	1.56	4.45	4.06	0.31	0.69	0.48	0.85
Ca (me/100g)	33.38	17.87	36.99	22.49	23.84	14.61	24.87	19.80
Mg (me/100g)	6.93	3.26	8.89	4.38	5.14	3.07	7.04	3.55
Na (me/100g)	0.96	1.98	2.34	3.65	0.78	1.43	3.43	4.57
K (me/100g)	1.56	1.23	1.14	1.59	0.42	0.33	0.24	0.20
CEC (me/100g)	31.49	22.22	29.63	10.80	21.86	21.72	32.17	27.07
P (me/100g)	2.45	3.01	1.33	1.63	4.25	8.13	2.14	3.08
Sand (%)	28.79	15.90	26.71	16.21	41.04	19.53	40.95	20.03
Silt (%)	29.02	11.96	28.89	13.70	30.49	11.62	27.65	12.24
Clay (%)	42.51	15.30	44.32	15.14	28.48	12.74	31.40	16.29
N (%)	0.08	0.05	0.05	0.02	0.07	0.04	0.05	0.03
SOC (%)	0.94	0.57	0.56	0.30	2.80	1.53	2.64	1.19
$CaC0_3$ (%)	16.68	7.19	17.71	6.74	15.29	7.69	16.45	6.68
$CaS0_4$ (%)	0.39	2.91	1.41	4.45	0.11	0.35	0.28	0.59
PBS (%)	32.34	35.36	24.67	33.41				
ESP (%)	3.01	6.80	8.25	15.31				

3.3.5 Soil classification

All soil profiles were preliminarily classified in the field using the WRB 2006 system. Once soil laboratory results were available, soil profiles were re-classified. Soils were classified at two levels: at reference group, and prefix and suffix levels.

3.3.6 Data input

Once the soil survey was completed, the soil data forms were sent to Nairobi. All soil forms were entered into the soil profile database software SDBmPlus 2.1, a specialised program for storing soil profile data. Once all soil profiles were entered, use was made of the program's capabilities to display the different soil profiles, the results of which may be seen in Appendix 2. The software also allowed the export of all data into a point-based soil geographic database designed in Microsoft Access for historical soil data.

3.4 Determination and acquisition of necessary environmental variables

The SWALIM land team have generated different thematic layers, mainly as landscape, relief, land cover and land use maps. All are considered important soil-forming factors which later were used in the soil modelling process. Some other layers such as Soil Moisture Regime and Slope maps were generated using different approaches. All maps used the same geodesic system that can be found in Table 4.

3.5 Predictive soil mapping

Predictive mapping of soil involved the use of hierarchical tree modelling of the soil forming factors, soil properties, and soil profile descriptions. The soil classes (according to the WRB classification system 2006) at the profile sample-points were taken as the dependent variable and modelled with other soil forming factors as follows (McBratney et al., 2003):

$$S_{class} = f(s, c, o, r, p, a, n) \quad (1)$$

where S_{class} is the soil class at the sampled location, *s* is the soil property (chemical and physical), *o* is the organism (land cover/use type), *r* is the topography (DTM variables), *p* is the parent material (landform), *a* is time factor (which was assumed unity), and *n* is the spatial co-ordinates (which was inherent in the spatial layers of the input variables). The functional form of *f* in Equation (1) was established using a tree model and implemented in CART® V6.1 (Salford Systems, 2007). Two-thirds of the available data were used to develop the model and one-third held out for validation. The procedures reported in Breiman et al. (1984) were used in the model development and validation.

In order to extrapolate Equation (1) to the entire study area, the independent variables were spatially interpolated for the un-sampled locations using the Inverse Waited Distance method (IWD). The GIS layers of these variables formed the independent variables in a spatial domain in a GIS environment. The resultant model as developed using CART was then transformed back with these GIS layers to produce a soil map of the study area.

4 RESULTS

4.1 Bibliographic research and data collection

Bibliographic research was a fruitful activity, as many useful project reports were collected that contained valuable soil data, even though some were produced a number of years ago. Table 5 shows all soil data sources that were collected and used in this study. It also shows details such as the scale at which studies were produced, soil classification systems used, the presence of soil profiles, and finally activities performed on each data source.

Table 5: Soil data sources

SOIL DATA SOURCE	MAP AVAILABILITY	REPORT	SOIL PROFILES	TASKS PERFORMED
Lockwood Survey Corporation Limited. 1968. Landforms and Soils. Volume III. Agricultural and Water Surveys Somalia. Food and Agriculture Organization of the United Nations. Rome, Italy. Mogadishu, Somalia.236 (Lockwood Survey Corporation Limited, 1968)	No. However, the improved map version carried out by Hunting Technical Services is available. 1:60.000 and 1:500000	Available	Available, but without coordinates. Soil classification system: British. No precise data about it.	The soil classes were converted into WRB2006.
Hunting Technical Services Ltd. 1977. Inter-catchment agricultural development study. Settlement Development Agency. Somalia. (Hunting Technical Services Ltd, 1977)	Yes. Soil map in TIFF Format at approx. scale 1:500.000 available through the EuDASM.	No	No. Soil classification system: British. No precise data about it.	The map was georeferenced, and polygons were digitized. The soil classes were converted into WRB2006 and this attribute was included in the map.
Selvaradjou, S-K., L. Montanarella, O. Spaargaren and D. Dent.2005.European Digital Archive of Soil Maps (EuDASM): Soil Maps of Africa.E. 21657.Luxemburg.(Selvaradjou, 2005)	Inter-catchment Soil map in TIFF Format at scale 1:100.000 available.	No	No	Georeferenced and available in shp. format. The soil classes were converted into WRB2006.
Food and Agriculture Organization of the United Nations, UNESCO.2003.Digital Soil Map of the World and Derived Soil Properties.1.Land and Water Digital Media Series. Rome, Italy. (Food and Agriculture Organization of the	Yes. 1:5.000.000 scale. Digital version	Available	No	

United Nations, 2003)				
Food and Agriculture Organization of the United Nations.1998.The Soil and Terrain Database for Northeastern Africa. Crop Production System Zones of the IGAD Subregion.2.Land and Water Digital Media Series. Rome, Italy. (Food and Agriculture Organization of the United Nations, 1998)	Yes. 1:1.000.000 scale based of FAO/Lockwood study. Digital format.	Available	Not as a point map. Soil classification system: FAO-UNESCO. 1990	The soil classes were converted into WRB2006.
FAO, SWALIM and FSAU. 2005. Dynamic Atlas of Somalia. (FAO, 2005)	Different soil maps from small to big scales. Digital format.	Only the description of the used legends.	No.	All the map classes were converted into WRB 2006. The complete soil-landscape attributes were added into the maps.
Hunting Technical Services Ltd., and Sir MacDonald & Partners Consulting Engineers. 1969. Project for the Water Control and Management of the Shabelle River. Volume V. Soils and Agriculture. United Nations Development Program. Somalia. (Hunting Technical Services Ltd., 1969)	Digital maps of the Balad and Afgoi Regions coming from the Dynamic atlas. 1:20.000	Available	Yes, a theoretical description with repetitive geographic coordinates for The Balad and Afgoi Regions. Soil classification systems: USDA Soil Taxonomy 7th Approximation 1975.	All the profiles were georeferenced and stored in SDBmPlus. Soil classes were converted into WRB2006 soil classification system. The complete soil-landscape attributes were added into the map.
Alim, Musse Shaiye, Soil Classification and Land Suitability Studies in the Lower Shabelle Region, Somalia, in Department of Soil Science. 1987, Swedish University of Agricultural Sciences: Uppsala, Sweden. P. 78. (Musse Shaiye Alim, 1987).	Yes, hard copy map. Approx. scale 1:80.000	Available	Profile description in a hard copy and without coordinates. Soil classification systems: USDA Soil Taxonomy 1960.	The map was georeferenced and digitized including its attributes. All the profiles were georeferenced and stored in SDBmPlus. Soil classes were converted into WRB2006 soil classification system.
Hunting Technical Services Ltd. 1978. Fanoole Settlement Project. Somali Democratic Republic. Settlement Development Agency. UK-Somalia. (Hunting Technical Services Ltd, 1978)	Digital map coming from the Dynamic atlas. Scale 1:50.000	Description of the used legends. Complete Report	Soil profile description without coordinates. Soil classes according to FAO-UNESCO 1974 and compared to FAO-Lockwood	All the profiles were georeferenced and stored in SDBmPlus. Soil classes were converted into WRB2006 soil classification system. The complete soil-landscape attributes were added into the map.

Agnoloni, M., Il terreni dei evista ión irrigui di Genale e Bulo Mesesta (Somalia), in Rel. Mon. Agrarie Subtrop. E Trop. . 1968, Istituto Agronomico per L'oltremare. P. 46. (Agnoloni, 1968)	Digital map coming from the Dynamic atlas.	Description of the used legends. There is a Report with some general explanation.	No detailed soil profile description, no coordinates. No soil classification system was used. Textural classification only.	No improvements
Ferrari, G.A., Lulli, L., Moggi, G., Shaie, M., Elmi, M., Moghe, M. H.,. 1983. Carta delle unita di territorio alla foce del Giuba in Somalia e la loro capacita d'uso'. Instituto Sper. Studio e Difesa del Suolo. Firenze, Italia. (Ferrari, 1983)	Digital map coming from the Dynamic atlas.	Description of the used legends. No Report available.	No	No improvements
Ferrari, G.A., Alim, M.S., Karama, A.S., Mohamud, J.M.,.1985.Esempi di cartografia tematica nell'area di Afgooye.Rivista Subtropicale e Tropicale. .LXXIX 3 Firenze. (Ferrari, 1985)	Digital map coming from the Dynamic atlas.	Description of the used legends. No Report Available.	No profiles available. Soil classes according to FAO-UNESCO 1971-1974 are available.	Soil classification was converted into WRB 2006. The complete soil-landscape attributes were added into the map.
Sir MacDonald & Partners Limited. 1976. Jowhar Sugar Estate. Drainage and reclamation study. Somali Democratic Republic. Ministry of Industry. Cambridge, UK-Somalia. (Sir MacDonald & Partners Limited, 1976)	Digital map coming from the Dynamic atlas.	Description of the used legends. No Specific Soil Report. General description.	General soil profile description. Soil classes according to FAO-UNESCO 1974 are available.	All the profiles were georeferenced and stored in SDBmPlus Soil classification was converted into WRB 2006. The complete soil-landscape attributes were added into the map.
Sir MacDonald & Partners Limited. 1978. Genale-Bulo Marerta Project. Annex I. Soils. Somali Democratic Republic, Ministry of Agriculture. Cambridge, UK-Somalia.210. (Sir MacDonald & Partners Limited, 1978)	Digital maps coming from the Dynamic atlas. 1:50000 and Qoryyooley Project 1:25.000	Description of the used legends. Complete Report Available.	Complete georeferenced list of profiles are available. They were classified using the FAO-UNESCO Soil Legend 1971-1974.	All the profiles were georeferenced and stored in SDBmPlus. Soil classes were converted into WRB2006 soil classification system. The complete soil-landscape attributes were added into the map.
Sir MacDonald & Partners Limited. 1985. Farjano Settlement Project. Land Evaluation. Somali Democratic	Digital map coming from the Dynamic atlas. 1:25.000	Report available but without the hardcopy of the map	Soil profile description without coordinates. Soils were	All the profiles were georeferenced and stored in SDBmPlus. Soil classes were converted into WRB2006 soil

Republic. National Refugee Commission. United Nations High Commissioner for Refugees. Cambridge, UK. Somalia. (Sir MacDonald & Partners Limited, 1985)			classified using the FAO-UNESCO Soil Legend 1974 and the Soil Taxonomy of USDA 1975.	classification system. The complete soil-landscape attributes were added into the map.
Hunting Technical Services Ltd. 1979. Homboy Irrigated Settlement Project. Volume I Soils. Somali Democratic Republic. Settlement Development Agency. Mogadishu, Somalia. (Hunting Technical Services Ltd, 1979)	Digital map coming from the Dynamic atlas. 1:20000	Report available	Soil profile description but without coordinates. Soils were classified using the FAO-UNESCO Soil Legend 1974.	All the profiles were georeferenced and stored in SDBmPlus. Soil classes were converted into WRB2006 soil classification system. The complete soil-landscape attributes were added into the map.
Unpublished Thesis, University of Florence: Florence, Italy. (Unpublished Thesis)	Digital map coming from the Dynamic atlas. Edition scale 1:200.000	Report available	Soil profile description but without coordinates. Soil classification system: USDA Soil Taxonomy 1975.	Soil classification was converted into WRB 2006. The complete soil-landscape attributes were added into the map.
Land Resources Development Centre. 1985. Land Use in Tsetse-Affected Areas of Southern Somalia. Somali Democratic Republic. National Tsetse and Trypanosomiasis Control Project. Land Use Survey. Surbiton, UK-Mogadishu, Somalia.289 (Land Resources Development Centre, 1985)	Digital maps from EuRASM. Land Capability maps. 1:500000	Report Available with general soil information.	Incomplete soil profile description.	No improvements
Sir MacDonald & Partners Limited. 1980. Reconnaissance and Pre-Feasibility Studies in Jalalagsie & Jowhar Districts and Gedo Region. Pre-Feasibility Report for Jalalagsie & Jowhar Districts. Somali Democratic Republic. National Refugee Commission. Cambridge, UK. Mogadishu, Somalia. (Sir MacDonald & Partners Limited, 1980b)	Hard copy Soil map included in the report. 1:30.000	Complete report available.	Complete description of the soil profiles. No georeferenced. Soils were classified using the FAO-UNESCO Soil Legend 1974.	The map was georeferenced and digitized including its attributes. All the profiles were georeferenced and stored in SDBmPlus. Soil classes were converted into WRB2006 soil classification system.
Sir MacDonald & Partners Limited.	Hard copy Soil map without	Complete report	Georeferenced soil profiles	The map was georeferenced and

1980. Reconnaissance and Pre-Feasibility Studies in Jalalagsie & Jowhar Districts and Gedo Region. Pre-Feasibility Report for Gedo Region. Somali Democratic Republic. National Refugee Commission. Cambridge, UK. Mogadishu, Somalia. (Sir MacDonald & Partners Limited, 1980a)	coordinates. 1:30.000	available	available. Soils were classified using the FAO-UNESCO Soil Legend 1974.	digitized including its attributes. All the profiles were georeferenced and stored in SDBmPlus. Soil classes were converted into WRB2006 soil classification system.
Sir MacDonald & Partners Limited. 1988. Dara Salaam Busley Agricultural Development Project. Annex 1 Soils. Annex 2 Water Resources. Somali Democratic Republic. Ministry of Agriculture. Cambridge, UK-Mogadishu, Somalia. (Sir MacDonald & Partners Limited, 1988)	Hard copy Soil map without coordinates. 1:30.000	Complete report available	Georeferenced soil profiles available. Soils were classified using the FAO-UNESCO Soil Legend 1974 and USDA Soil Taxonomy 1975.	The map was georeferenced and digitized including its attributes. All the profiles were georeferenced and stored in SDBmPlus. Soil classes were converted into WRB2006 soil classification system.
Sir MacDonald & Partners Limited. 1979. Mogambo Irrigation Project. Feasibility Study. Main Report and Soils. Somali Democratic Republic. State Planning Commission. Cambridge, UK-Mogadishu, Somalia. (Sir MacDonald & Partners Limited, 1979)	Hard copy Soil map without coordinates. 1:10.000	Complete report available	Complete un-georeferenced soil profiles description. No soil classification was used.	The map was georeferenced and digitized including its attributes. All the profiles were georeferenced and stored in SDBmPlus. Soil classes were converted into WRB2006 soil classification system.

4.2 Soil maps of the irrigation projects

A total of 176 soil profiles (see Annex 1 for the details of these profiles) were retrieved from different sources. Soil profile data, including 16 soil maps, were organized into GIS format and made available to different applications and users. Soil profiles were specifically used for the predictive soil mapping exercise (below).

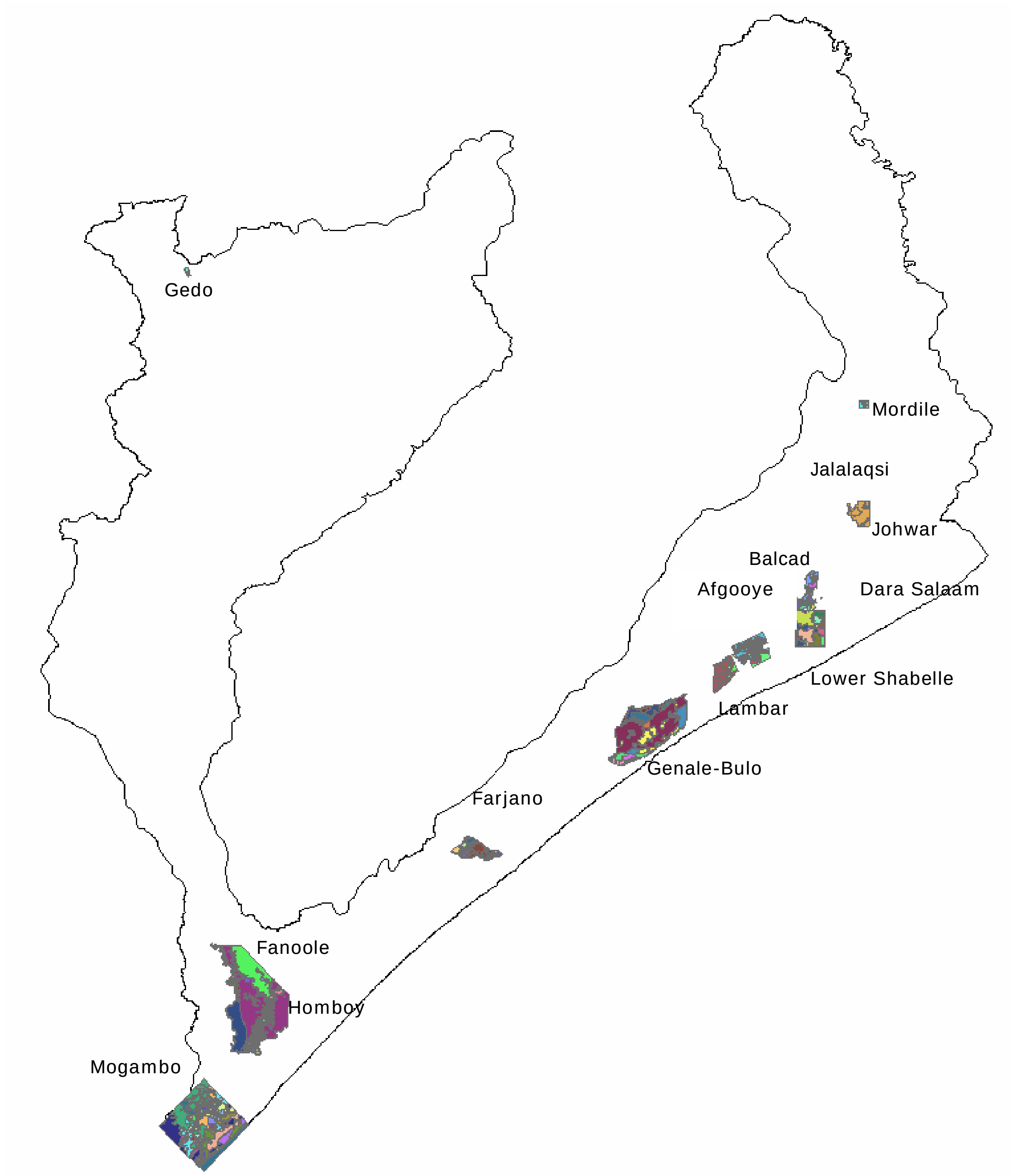
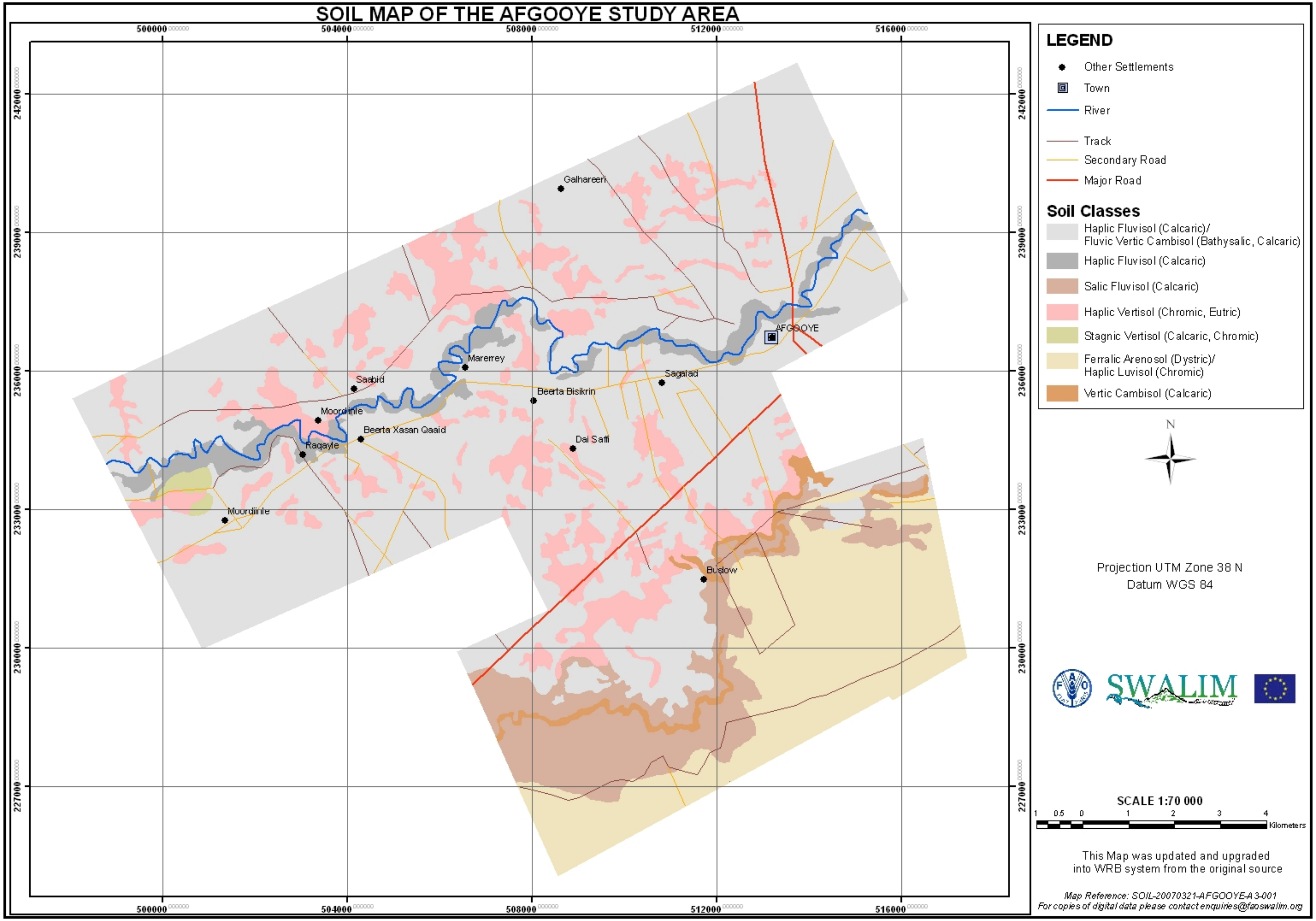
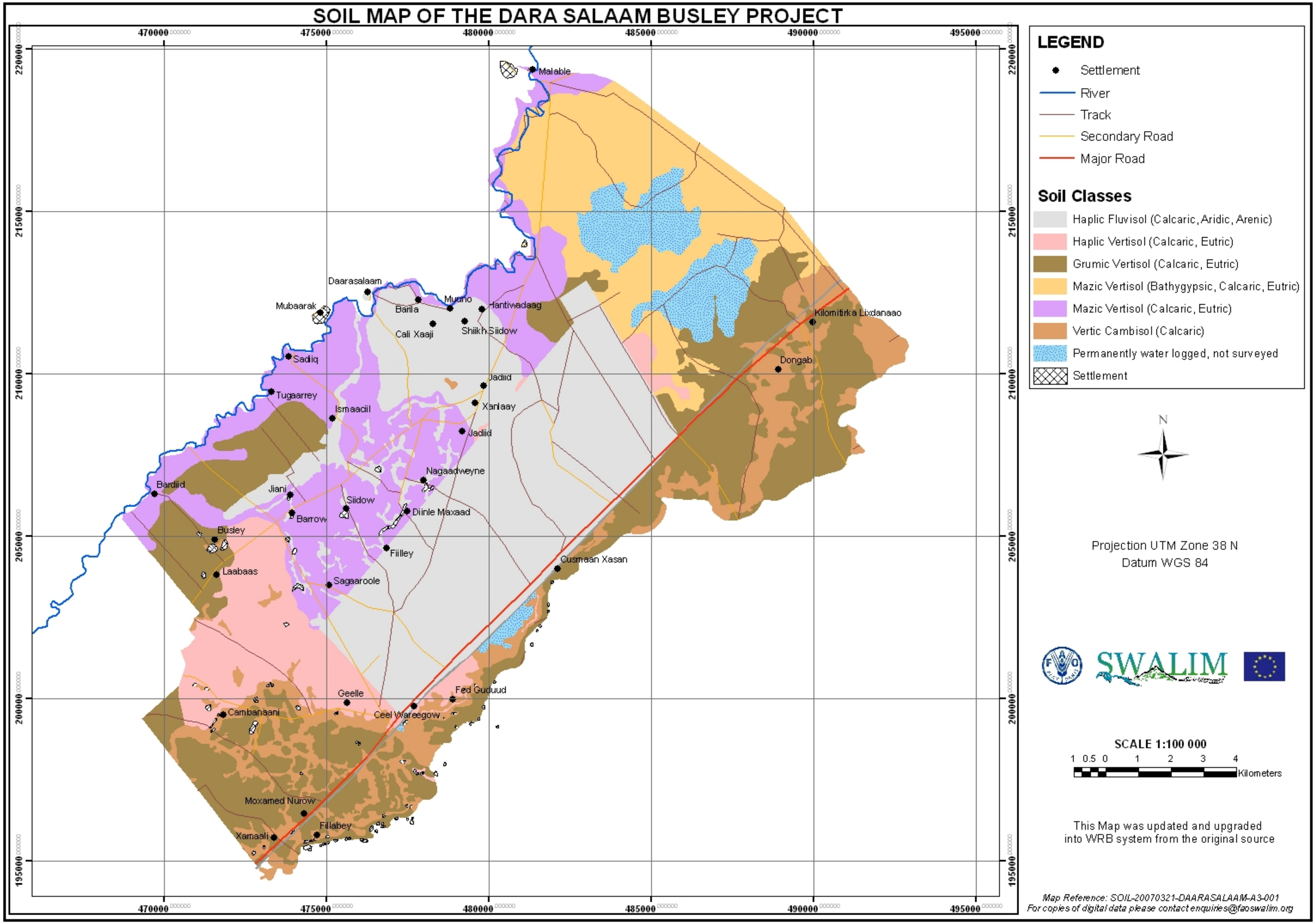
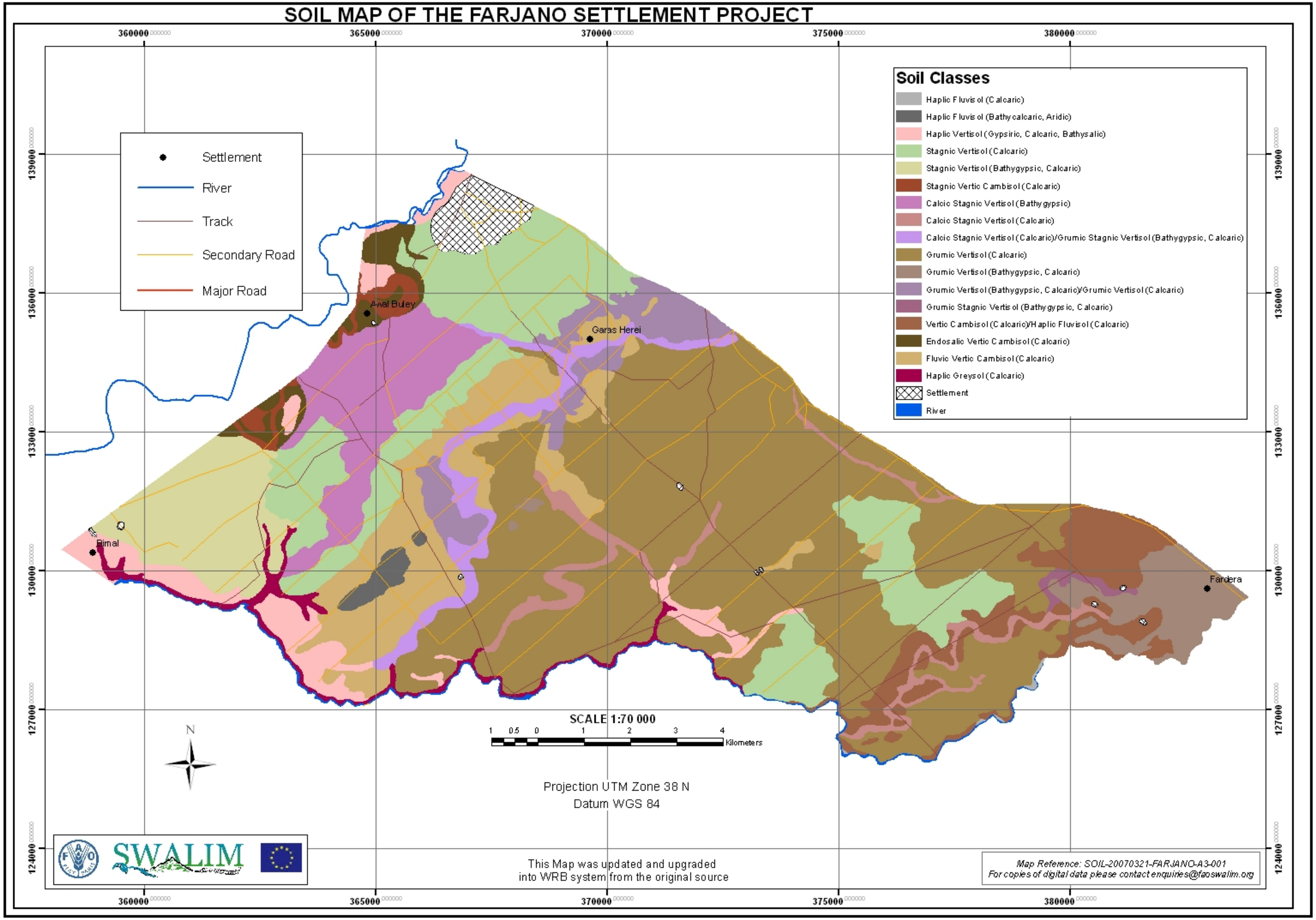
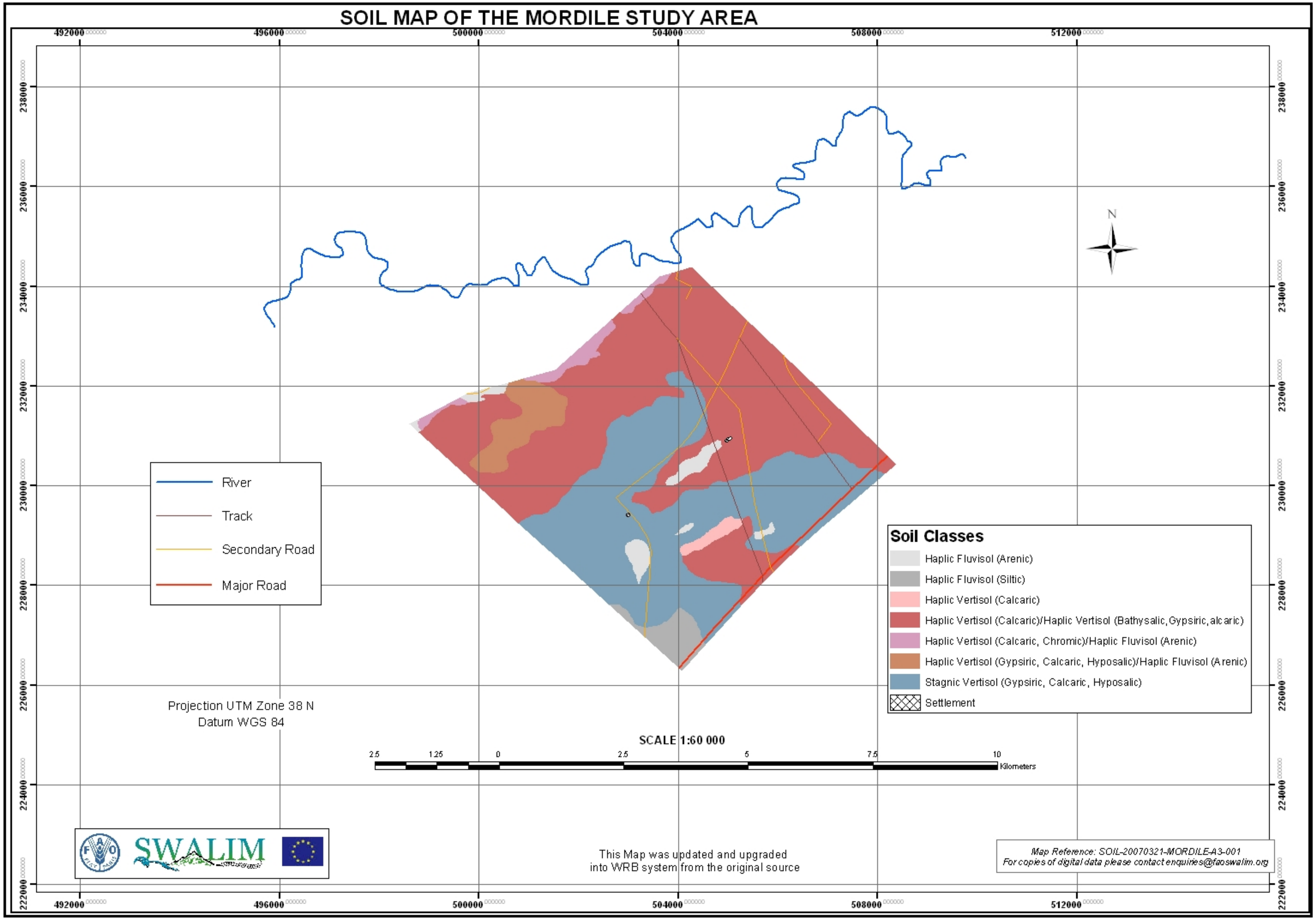


Figure 6: Individual historical soil maps of the irrigation projects

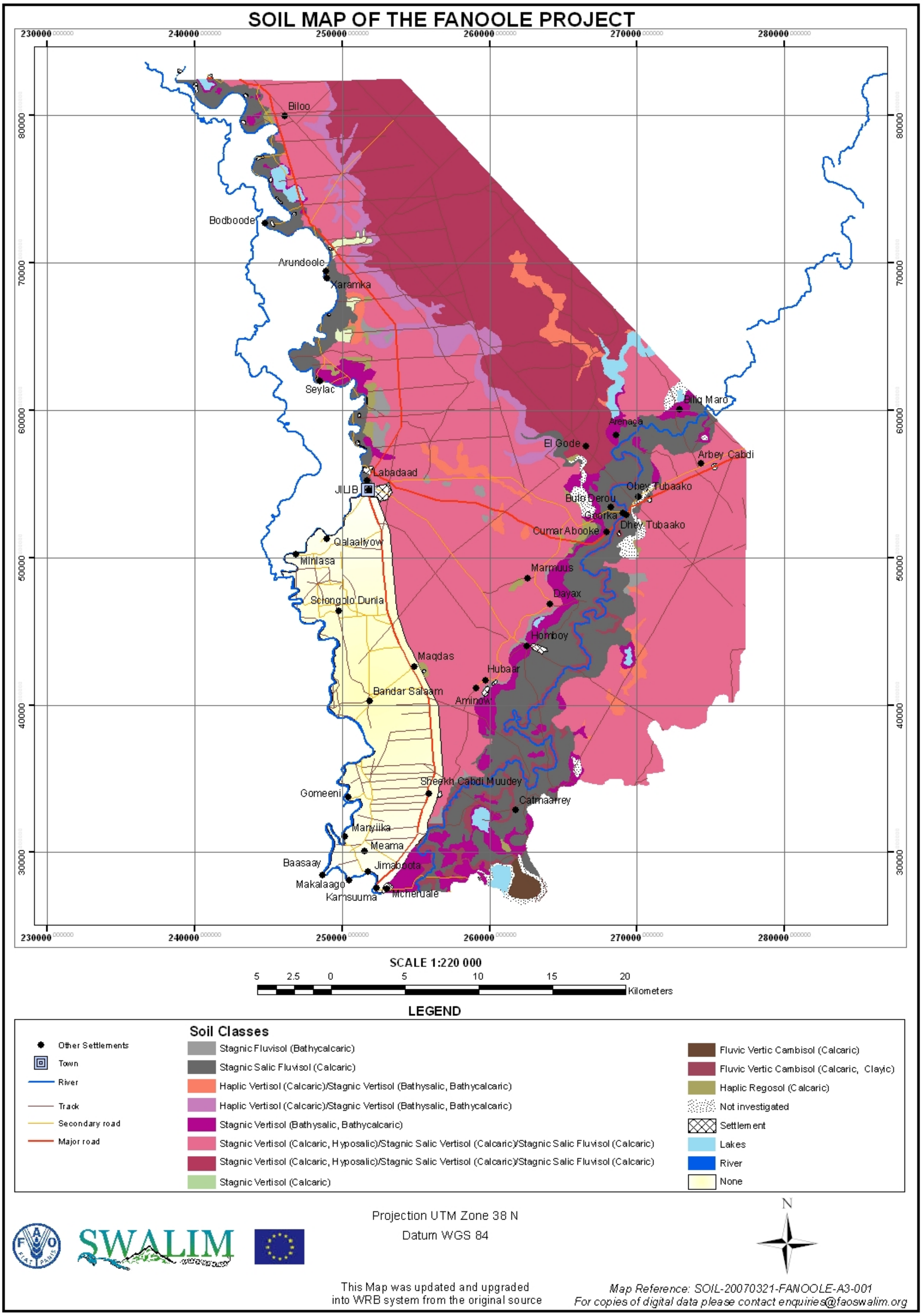

SOIL MAP OF THE AFGOOYE STUDY AREA
500000
504000
508000
512000
516000
242000
239000
236000
233000
230000
227000
Galhareeri
AFGOOYE
Marerrey
Saabid
Sagalad
Beerta Bisikrin
Moordiinle
Beerta Xasan Qaaid
Raqayle
Dai Saffi
Moordiinle
Buslow
LEGEND
Other Settlements
Town
River
Track
Secondary Road
Major Road
Soil Classes
Haplic Fluvisol (Calcaric)/ Fluvic Vertic Cambisol (Bathysalic, Calcaric)
Haplic Fluvisol (Calcaric)
Salic Fluvisol (Calcaric)
Haplic Vertisol (Chromic, Eutric)
Stagnic Vertisol (Calcaric, Chromic)
Ferralic Arenosol (Dystric)/ Haplic Luvisol (Chromic)
Vertic Cambisol (Calcaric)
N
Projection UTM Zone 38 N
Datum WGS 84
SWALIM
SCALE 1:70 000
1 0.5 0 1 2 3 4
Kilometers
This Map was updated and upgraded into WRB system from the original source
Map Reference: SOIL-20070321-AFGOOYE-A3-001
For copies of digital data please contact enquiries@faoswalim.org

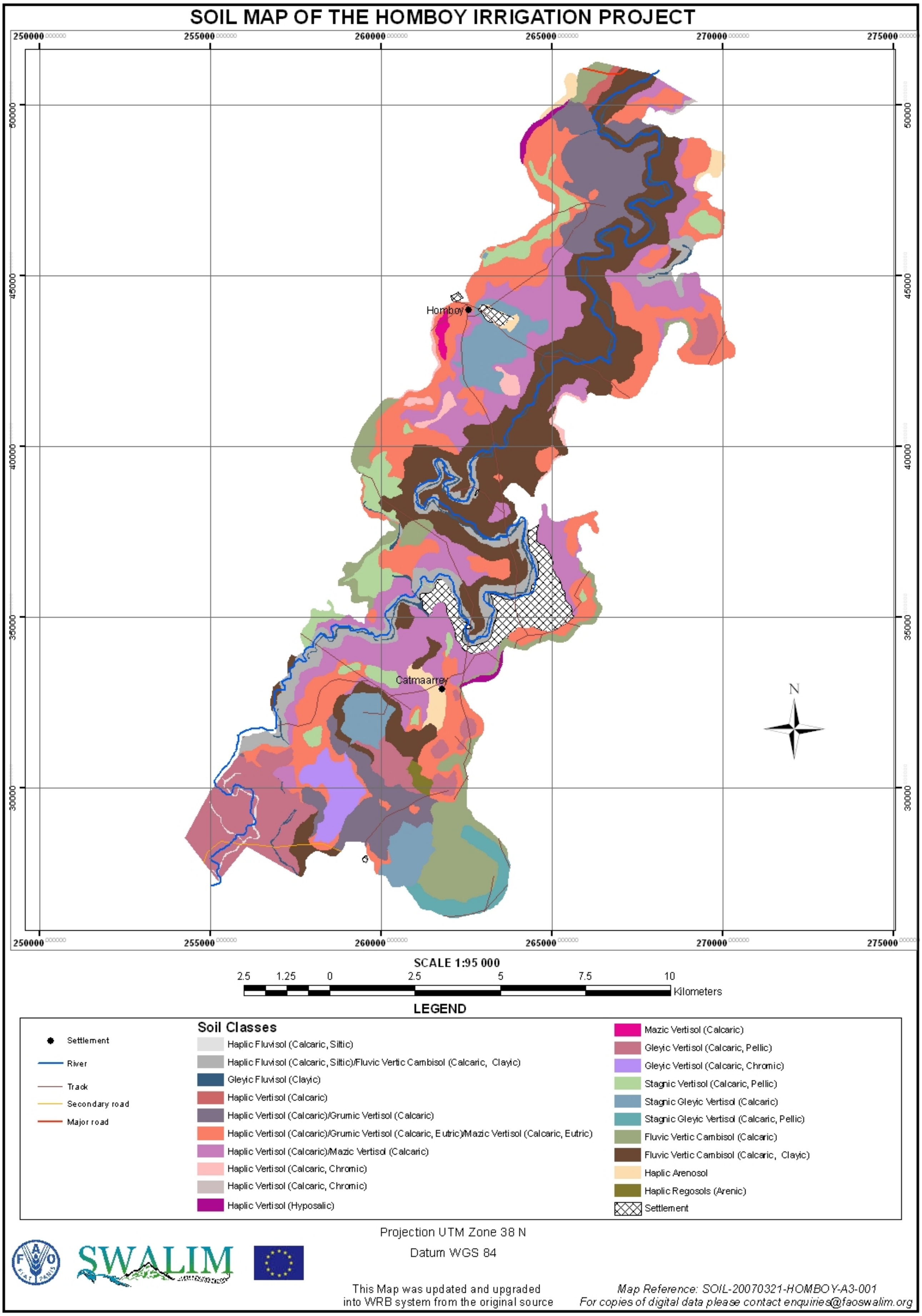

SOIL MAP OF THE DARA SALAAM BUSLEY PROJECT
470000
475000
480000
485000
490000
495000
195000
200000
205000
210000
215000
220000
Malable
Daarasalaam
Mubaarak
Barila
Mudno
Hantiwadaag
Cali Xaaji
Shiikh Siidow
Sadiq
Jadiid
Tugaarrey
Ismaacill
Xanlaay
Jadiid
Nagaadweyne
Bardiid
Jiani
Siidow
Barrow
Diinle Maxaad
Busley
Fiilley
Laabaas
Sagaaroole
Cusmaan Xasan
Kilomitirka Lixdanaao
Dongab
Geelle
Fed Guduud
Cambanaani
Ceel Wareegow
Moxamed Nurow
Fillabey
Xamaali
LEGEND
Settlement
River
Track
Secondary Road
Major Road
Soil Classes
Haplic Fluvisol (Calcaric, Aridic, Arenic)
Haplic Vertisol (Calcaric, Eutric)
Grumic Vertisol (Calcaric, Eutric)
Mazic Vertisol (Bathygypsic, Calcaric, Eutric)
Mazic Vertisol (Calcaric, Eutric)
Vertic Cambisol (Calcaric)
Permanently water logged, not surveyed
Settlement
N
Projection UTM Zone 38 N
Datum WGS 84
SWALIM
SCALE 1:100 000
1 0.5 0 1 2 3 4
Kilometers
This Map was updated and upgraded
into WRB system from the original source
Map Reference: SOIL-20070321-DAARASALAAM-A3-001
For copies of digital data please contact enquiries@faoswalim.org


SOIL MAP OF THE FARJANO SETTLEMENT PROJECT
Soil Classes
Haplic Fluvisol (Calcaric)
Haplic Fluvisol (Bathycalcaric, Aridic)
Haplic Vertisol (Gypsiric, Calcaric, Bathysalic)
Stagnic Vertisol (Calcaric)
Stagnic Vertisol (Bathygypsic, Calcaric)
Stagnic Vertic Cambisol (Calcaric)
Calcic Stagnic Vertisol (Bathygypsic)
Calcic Stagnic Vertisol (Calcaric)
Calcic Stagnic Vertisol (Calcaric)/Grumic Stagnic Vertisol (Bathygypsic, Calcaric)
Grumic Vertisol (Calcaric)
Grumic Vertisol (Bathygypsic, Calcaric)
Grumic Vertisol (Bathygypsic, Calcaric)/Grumic Vertisol (Calcaric)
Grumic Stagnic Vertisol (Bathygypsic, Calcaric)
Vertic Cambisol (Calcaric)/Haplic Fluvisol (Calcaric)
Endosalic Vertic Cambisol (Calcaric)
Fluvic Vertic Cambisol (Calcaric)
Haplic Greysol (Calcaric)
Settlement
River
Settlement
River
Track
Secondary Road
Major Road
Awal Buley
Garas Herei
Bimal
Fardera
360000
365000
370000
375000
380000
139000
136000
133000
130000
127000
124000
SCALE 1:70 000
1 0.5 0 1 2 3 4
Kilometers
N
Projection UTM Zone 38 N
Datum WGS 84
SWALIM
This Map was updated and upgraded
into WRB system from the original source
Map Reference: SOIL-20070321-FARJANO-A3-001
For copies of digital data please contact enquiries@faoswalim.org

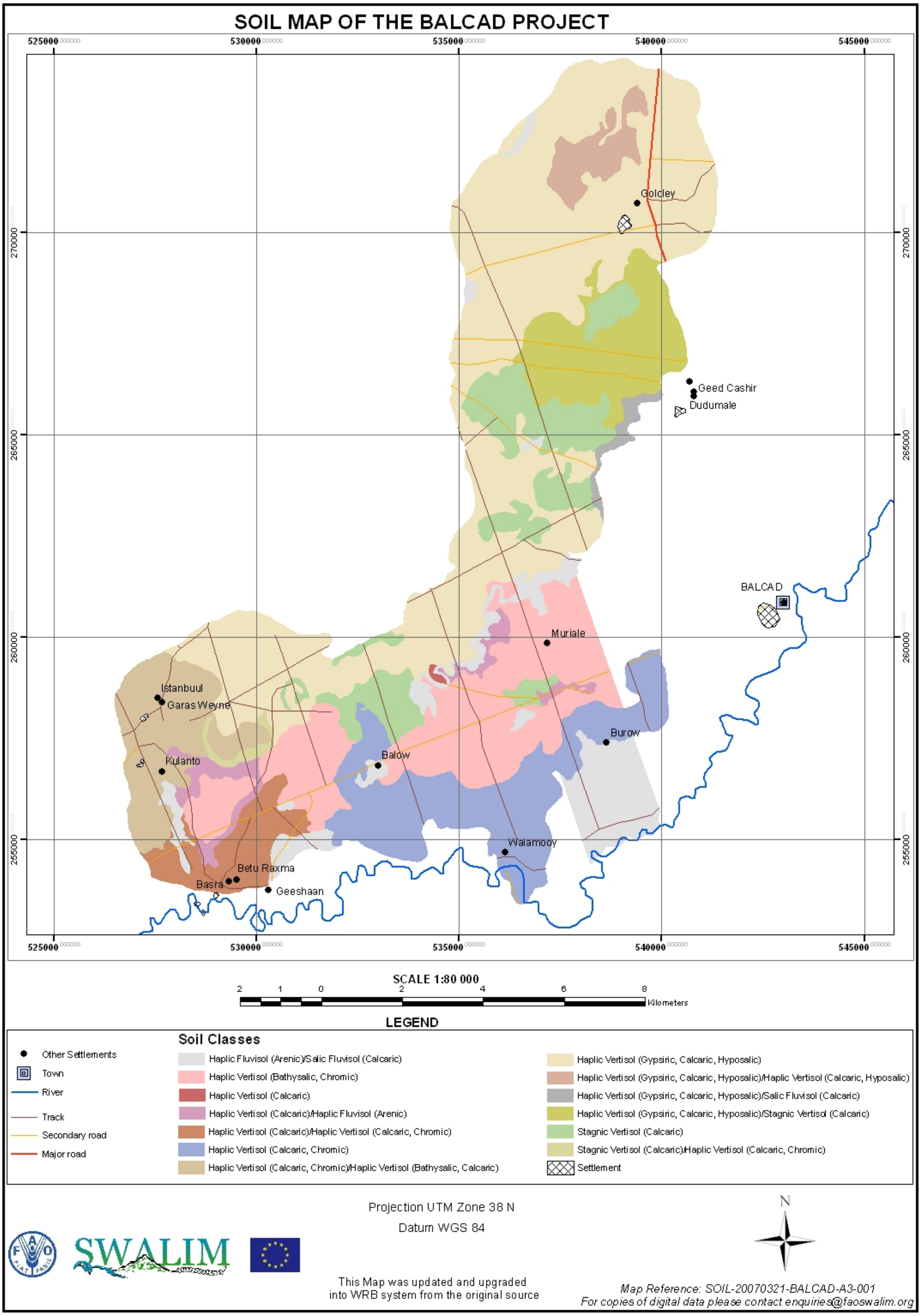


SOIL MAP OF THE MORDILE STUDY AREA
River
Track
Secondary Road
Major Road
Soil Classes
Haplic Fluvisol (Arenic)
Haplic Fluvisol (Siltic)
Haplic Vertisol (Calcaric)
Haplic Vertisol (Calcaric)/Haplic Vertisol (Bathysalic,Gypsiric,alcaric)
Haplic Vertisol (Calcaric, Chromic)/Haplic Fluvisol (Arenic)
Haplic Vertisol (Gypsiric, Calcaric, Hyposalic)/Haplic Fluvisol (Arenic)
Stagnic Vertisol (Gypsiric, Calcaric, Hyposalic)
Settlement
N
Projection UTM Zone 38 N
Datum WGS 84
SCALE 1:60 000
2.5 1.25 0 2.5 5 7.5 10
Kilometers
SWALIM
This Map was updated and upgraded
into WRB system from the original source
Map Reference: SOIL-20070321-MORDILE-A3-001
For copies of digital data please contact enquiries@faoswalim.org


SOIL MAP OF THE FANOOLE PROJECT
Biloo
Bodboode
Arundoole
Xaramka
Seylac
Bilig Maro
Arenaga
El Gode
Arbey Cabdi
Labadaad
JILIB
Ohey Tubaako
Bulo Derou
Georka
Dhey Tubaako
Cumar Abooke
Qalaaliyow
Minlasa
Marmuus
Dayax
Sciongolo Dunia
Homboy
Maqdas
Hubaar
Bandar Salaam
Aminow
Sheekh Cabdi Muudey
Gomeeni
Catmaarrey
Manyiika
Meama
Baasaay
Jimaboota
Makalaago
Mcherdale
Kamsuuma
SCALE 1:220 000
Kilometers
LEGEND
Other Settlements
Town
River
Track
Secondary road
Major road
Soil Classes
Stagnic Fluvisol (Bathycalcaric)
Stagnic Salic Fluvisol (Calcaric)
Haplic Vertisol (Calcaric)/Stagnic Vertisol (Bathysalic, Bathycalcaric)
Haplic Vertisol (Calcaric)/Stagnic Vertisol (Bathysalic, Bathycalcaric)
Stagnic Vertisol (Bathysalic, Bathycalcaric)
Stagnic Vertisol (Calcaric, Hyposalic)/Stagnic Salic Vertisol (Calcaric)/Stagnic Salic Fluvisol (Calcaric)
Stagnic Vertisol (Calcaric, Hyposalic)/Stagnic Salic Vertisol (Calcaric)/Stagnic Salic Fluvisol (Calcaric)
Stagnic Vertisol (Calcaric)
Fluvic Vertic Cambisol (Calcaric)
Fluvic Vertic Cambisol (Calcaric, Clayic)
Haplic Regosol (Calcaric)
Not investigated
Settlement
Lakes
River
None
Projection UTM Zone 38 N
Datum WGS 84
N
This Map was updated and upgraded
into WRB system from the original source
Map Reference: SOIL-20070321-FANOOLE-A3-001
For copies of digital data please contact enquiries@faoswalim.org



SOIL MAP OF THE HOMBOY IRRIGATION PROJECT
250000
255000
260000
265000
270000
275000
50000
45000
40000
35000
30000
Homboy
Catmaarrey
N
SCALE 1:95 000
2.5 1.25 0 2.5 5 7.5 10
Kilometers
LEGEND
Settlement
River
Track
Secondary road
Major road
Soil Classes
Haplic Fluvisol (Calcaric, Siltic)
Haplic Fluvisol (Calcaric, Siltic)/Fluvic Vertic Cambisol (Calcaric, Clayic)
Gleyic Fluvisol (Clayic)
Haplic Vertisol (Calcaric)
Haplic Vertisol (Calcaric)/Grumic Vertisol (Calcaric)
Haplic Vertisol (Calcaric)/Grumic Vertisol (Calcaric, Eutric)/Mazic Vertisol (Calcaric, Eutric)
Haplic Vertisol (Calcaric)/Mazic Vertisol (Calcaric)
Haplic Vertisol (Calcaric, Chromic)
Haplic Vertisol (Calcaric, Chromic)
Haplic Vertisol (Hyposalic)
Mazic Vertisol (Calcaric)
Gleyic Vertisol (Calcaric, Pellic)
Gleyic Vertisol (Calcaric, Chromic)
Stagnic Vertisol (Calcaric, Pellic)
Stagnic Gleyic Vertisol (Calcaric)
Stagnic Gleyic Vertisol (Calcaric, Pellic)
Fluvic Vertic Cambisol (Calcaric)
Fluvic Vertic Cambisol (Calcaric, Clayic)
Haplic Arenosol
Haplic Regosols (Arenic)
Settlement
Projection UTM Zone 38 N
Datum WGS 84
SWALIM
This Map was updated and upgraded
into WRB system from the original source
Map Reference: SOIL-20070321-HOMBOY-A3-001
For copies of digital data please contact enquiries@faoswalim.org


SOIL MAP OF THE BALCAD PROJECT
525000
530000
535000
540000
545000
270000
265000
260000
255000
Goldley
Geed Cashir
Dudumale
BALCAD
Muriale
Istanbuul
Garas Weyne
Burow
Kulanto
Balow
Walamooy
Betu Raxma
Basra
Geeshaan
SCALE 1:80 000
2 1 0 2 4 6 8
Kilometers
LEGEND
Other Settlements
Town
River
Track
Secondary road
Major road
Soil Classes
Haplic Fluvisol (Arenic)/Salic Fluvisol (Calcaric)
Haplic Vertisol (Bathysalic, Chromic)
Haplic Vertisol (Calcaric)
Haplic Vertisol (Calcaric)/Haplic Fluvisol (Arenic)
Haplic Vertisol (Calcaric)/Haplic Vertisol (Calcaric, Chromic)
Haplic Vertisol (Calcaric, Chromic)
Haplic Vertisol (Calcaric, Chromic)/Haplic Vertisol (Bathysalic, Calcaric)
Haplic Vertisol (Gypsiric, Calcaric, Hyposalic)
Haplic Vertisol (Gypsiric, Calcaric, Hyposalic)/Haplic Vertisol (Calcaric, Hyposalic)
Haplic Vertisol (Gypsiric, Calcaric, Hyposalic)/Salic Fluvisol (Calcaric)
Haplic Vertisol (Gypsiric, Calcaric, Hyposalic)/Stagnic Vertisol (Calcaric)
Stagnic Vertisol (Calcaric)
Stagnic Vertisol (Calcaric)/Haplic Vertisol (Calcaric, Chromic)
Settlement
Projection UTM Zone 38 N
Datum WGS 84
N
This Map was updated and upgraded
into WRB system from the original source
Map Reference: SOIL-20070321-BALCAD-A3-001
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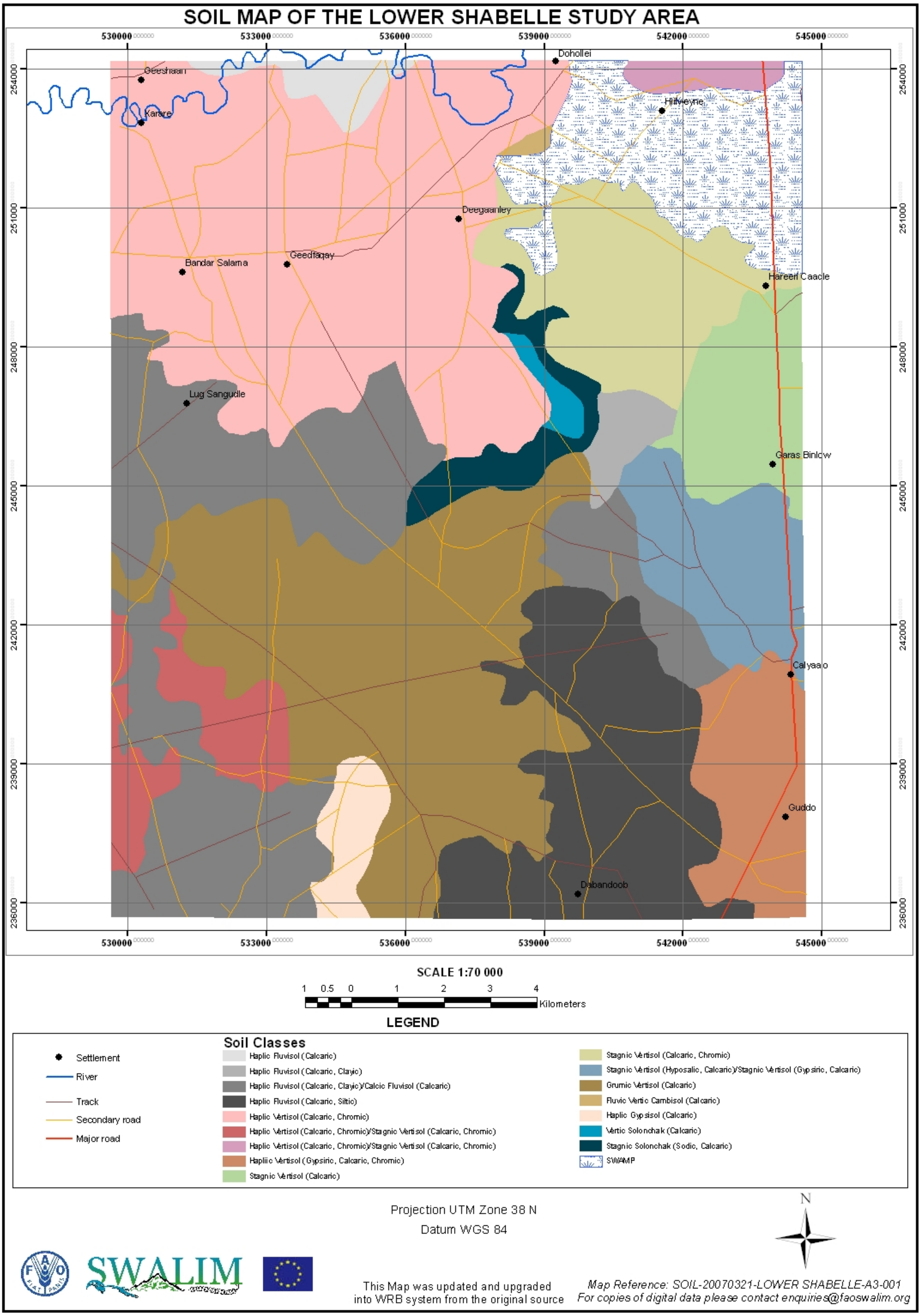
SOIL MAP OF THE LOWER SHABELLE STUDY AREA
530000
533000
536000
539000
542000
545000
254000
251000
248000
245000
242000
239000
236000
Dohollei
Geeshaan
Karare
Hilfeyne
Deegaanley
Geedfaqay
Bandar Salama
Hareeri Caacle
Lug Sangudle
Garas Binlow
Calyaalo
Guddo
Dabandoob
SCALE 1:70 000
1 0.5 0 1 2 3 4
Kilometers
LEGEND
Settlement
River
Track
Secondary road
Major road
Soil Classes
Haplic Fluvisol (Calcaric)
Haplic Fluvisol (Calcaric, Clayic)
Haplic Fluvisol (Calcaric, Clayic)/Calcic Fluvisol (Calcaric)
Haplic Fluvisol (Calcaric, Siltic)
Haplic Vertisol (Calcaric, Chromic)
Haplic Vertisol (Calcaric, Chromic)/Stagnic Vertisol (Calcaric, Chromic)
Haplic Vertisol (Calcaric, Chromic)/Stagnic Vertisol (Calcaric, Chromic)
Hapliic Vertisol (Gypsiric, Calcaric, Chromic)
Stagnic Vertisol (Calcaric)
Stagnic Vertisol (Calcaric, Chromic)
Stagnic Vertisol (Hyposalic, Calcaric)/Stagnic Vertisol (Gypsiric, Calcaric)
Grumic Vertisol (Calcaric)
Fluvic Vertic Cambisol (Calcaric)
Haplic Gypsisol (Calcaric)
Vertic Solonchak (Calcaric)
Stagnic Solonchak (Sodic, Calcaric)
SWAMP
Projection UTM Zone 38 N
Datum WGS 84
N
SWALIM
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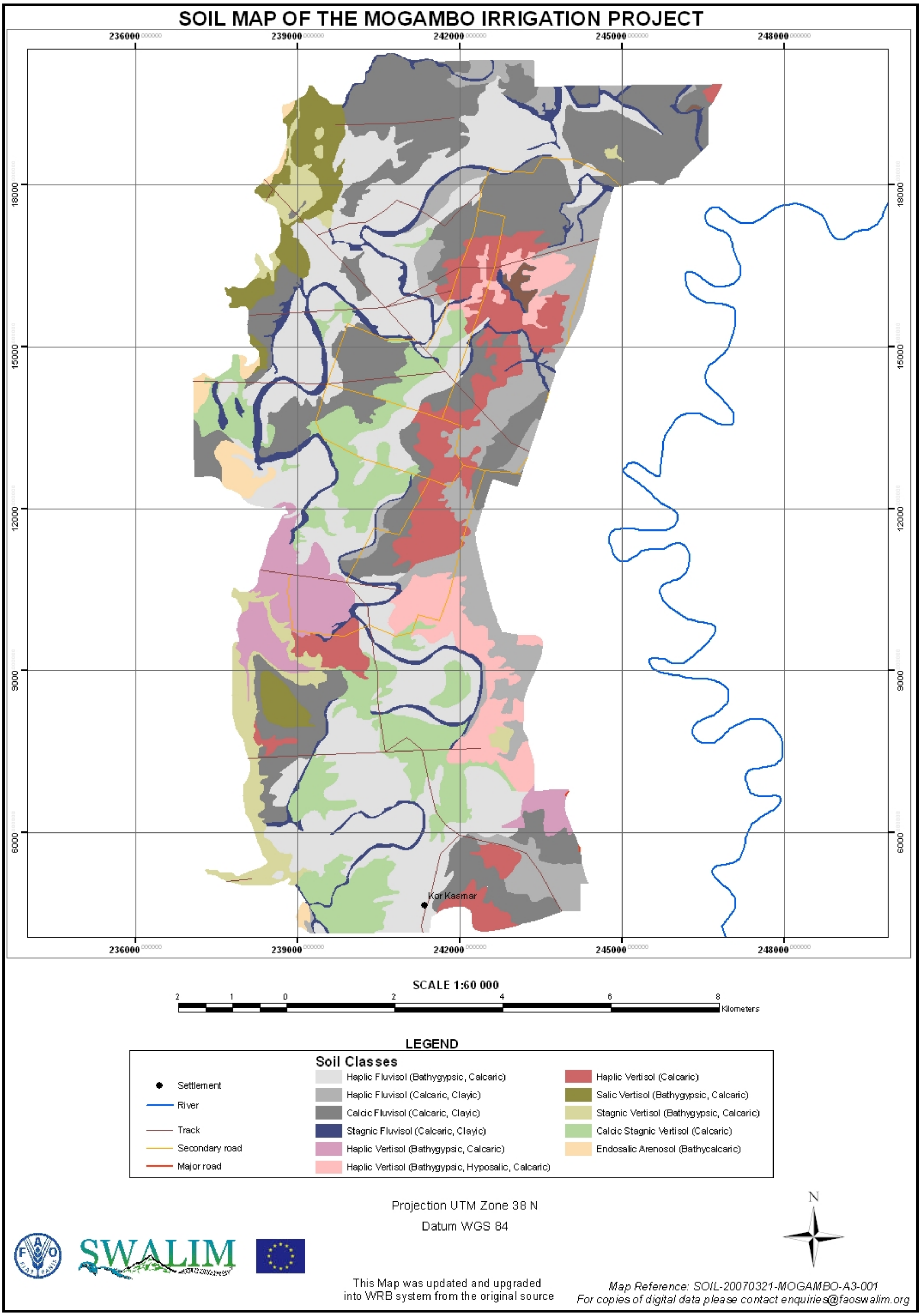
SOIL MAP OF THE MOGAMBO IRRIGATION PROJECT
236000
239000
242000
245000
248000
18000
15000
12000
9000
6000
Kor Kasmar
SCALE 1:60 000
2 1 0 2 4 6 8
Kilometers
LEGEND
Settlement
River
Track
Secondary road
Major road
Soil Classes
Haplic Fluvisol (Bathygypsic, Calcaric)
Haplic Fluvisol (Calcaric, Clayic)
Calcic Fluvisol (Calcaric, Clayic)
Stagnic Fluvisol (Calcaric, Clayic)
Haplic Vertisol (Bathygypsic, Calcaric)
Haplic Vertisol (Bathygypsic, Hyposalic, Calcaric)
Haplic Vertisol (Calcaric)
Salic Vertisol (Bathygypsic, Calcaric)
Stagnic Vertisol (Bathygypsic, Calcaric)
Calcic Stagnic Vertisol (Calcaric)
Endosalic Arenosol (Bathycalcaric)
Projection UTM Zone 38 N
Datum WGS 84
N
SWALIM
This Map was updated and upgraded
into WRB system from the original source
Map Reference: SOIL-20070321-MOGAMBO-A3-001
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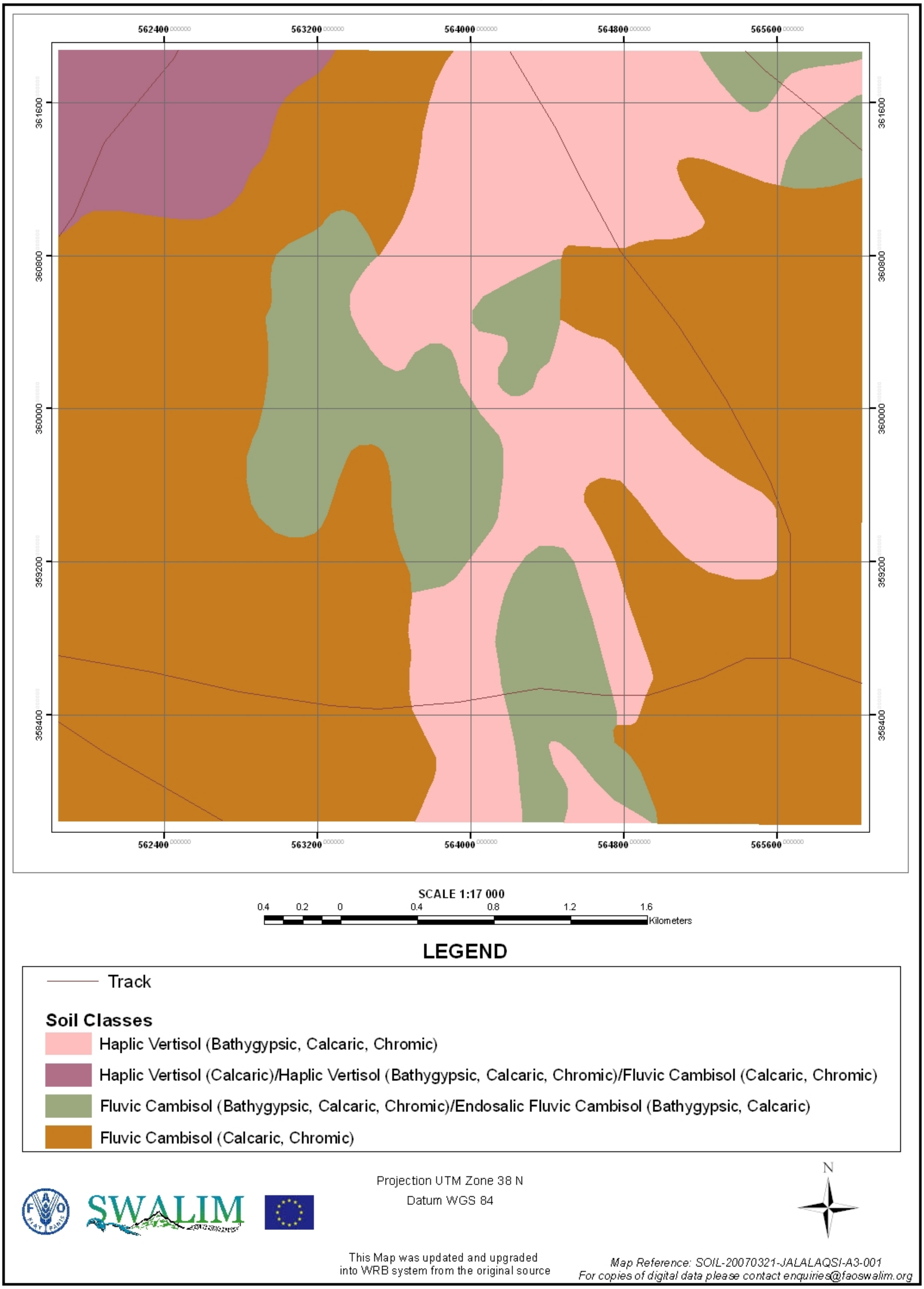
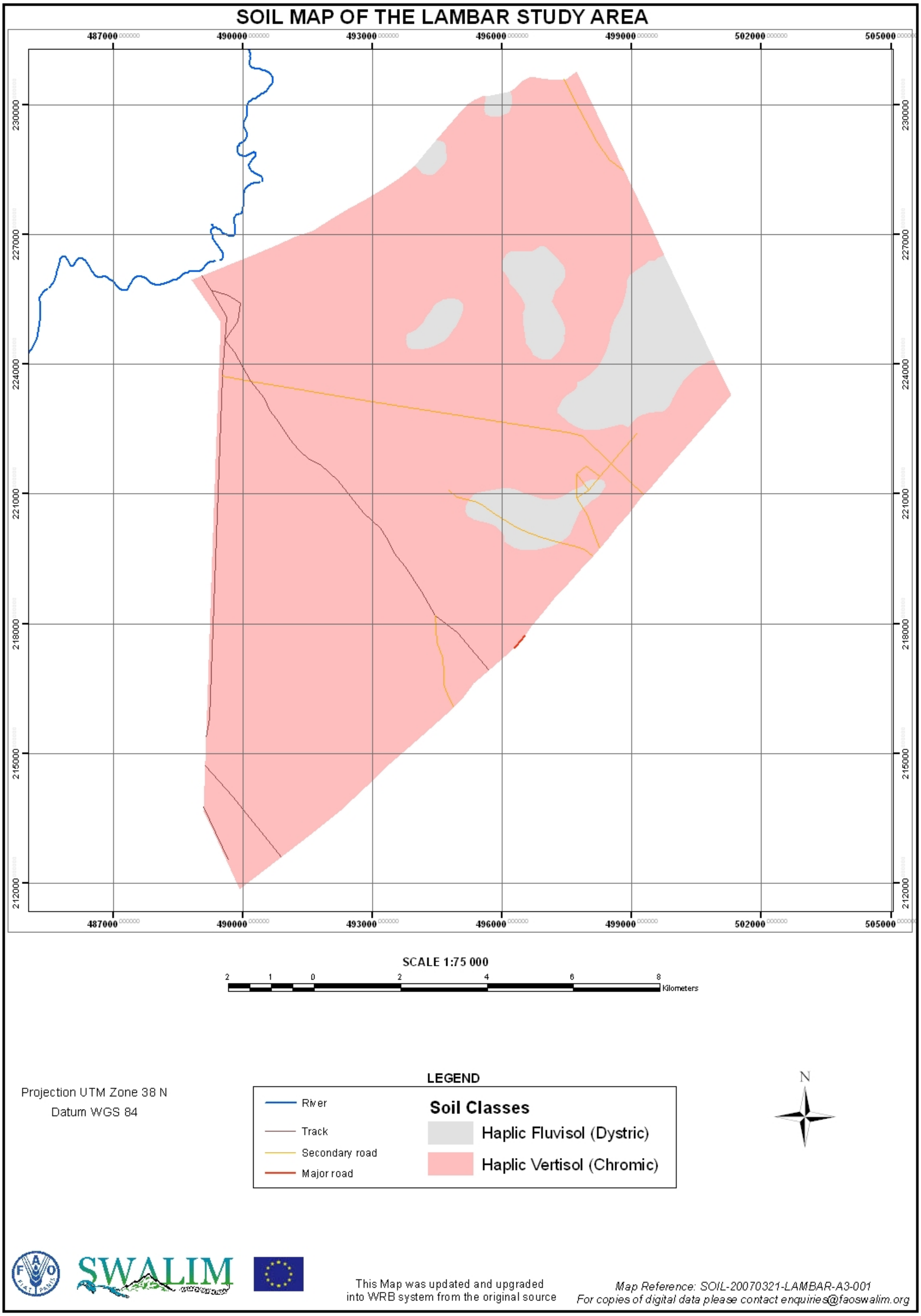
SOIL MAP OF THE JALALAQSI PROJECT





SOIL MAP OF THE LAMBAR STUDY AREA
487000
490000
493000
496000
499000
502000
505000
230000
227000
224000
221000
218000
215000
212000
SCALE 1:75 000
Kilometers
Projection UTM Zone 38 N
Datum WGS 84
LEGEND
River
Track
Secondary road
Major road
Soil Classes
Haplic Fluvisol (Dystric)
Haplic Vertisol (Chromic)
N
SWALIM
This Map was updated and upgraded
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Map Reference: SOIL-20070321-LAMBAR-A3-001
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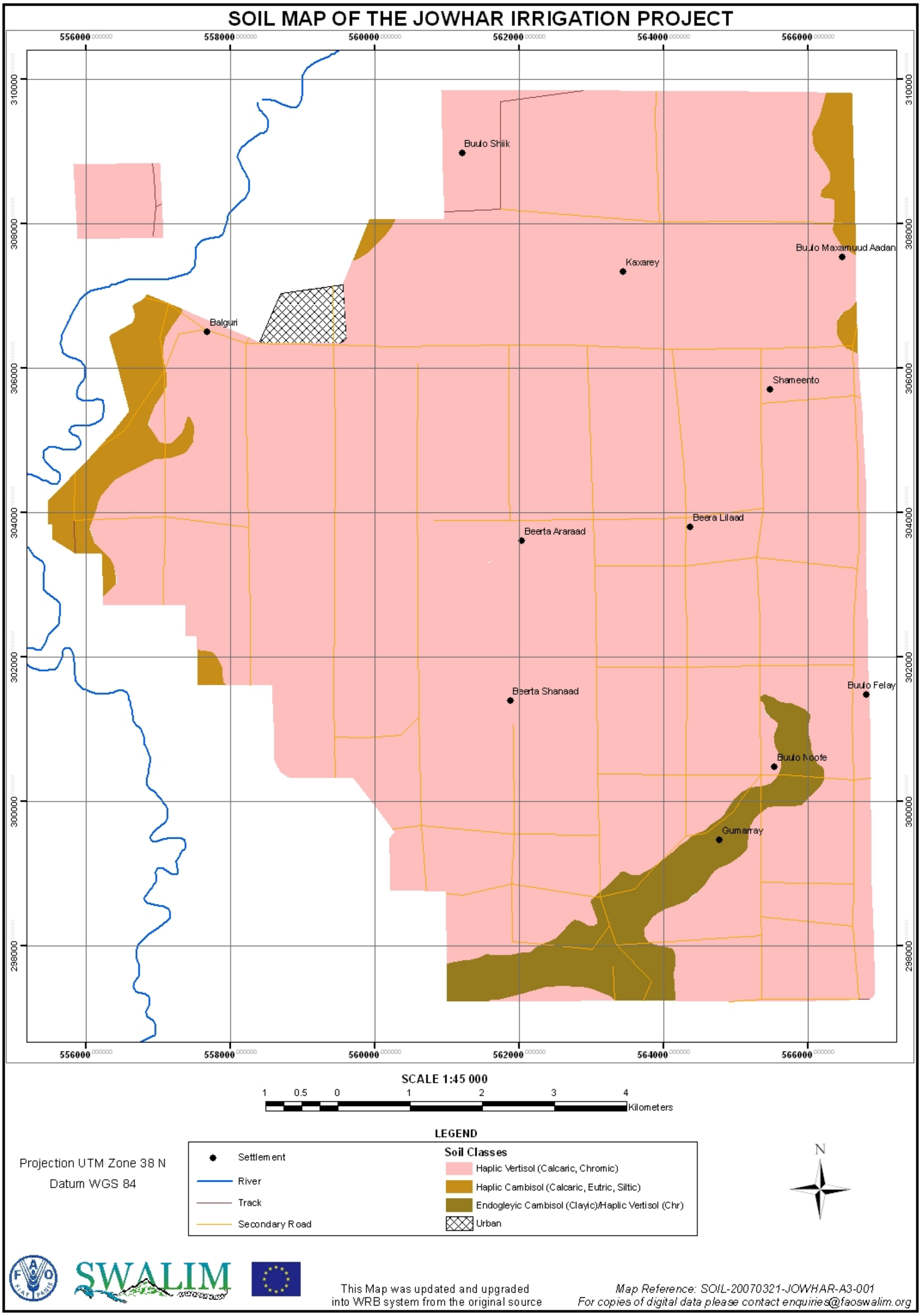
SOIL MAP OF THE JOWHAR IRRIGATION PROJECT
556000
558000
560000
562000
564000
566000
310000
308000
306000
304000
302000
300000
298000
Buulo Shiik
Kaxarey
Buulo Maxamuud Aadan
Balguri
Shameento
Beera Lilaad
Beerta Araraad
Beerta Shanaad
Buulo Felay
Buulo Noofe
Gumarray
SCALE 1:45 000
1 0.5 0 1 2 3 4
Kilometers
LEGEND
Projection UTM Zone 38 N
Datum WGS 84
Settlement
River
Track
Secondary Road
Soil Classes
Haplic Vertisol (Calcaric, Chromic)
Haplic Cambisol (Calcaric, Eutric, Siltic)
Endogleyic Cambisol (Clayic)/Haplic Vertisol (Chr)
Urban
N
This Map was updated and upgraded
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Map Reference: SOIL-20070321-JOWHAR-A3-001
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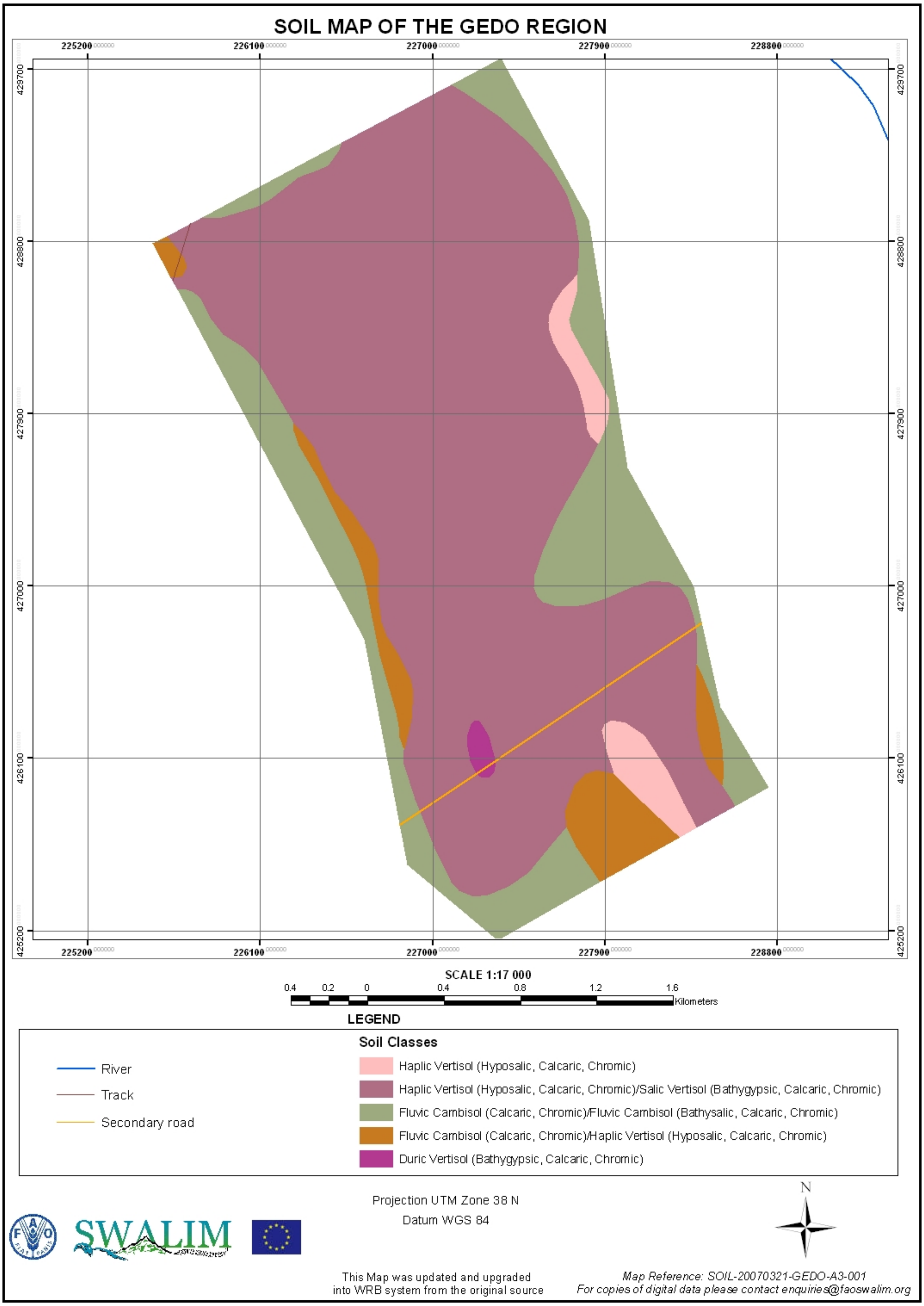
SOIL MAP OF THE GEDO REGION
225200
226100
227000
227900
228800
429700
428800
427900
427000
426100
425200
SCALE 1:17 000
0.4 0.2 0 0.4 0.8 1.2 1.6
Kilometers
LEGEND
River
Track
Secondary road
Soil Classes
Haplic Vertisol (Hyposalic, Calcaric, Chromic)
Haplic Vertisol (Hyposalic, Calcaric, Chromic)/Salic Vertisol (Bathygypsic, Calcaric, Chromic)
Fluvic Cambisol (Calcaric, Chromic)/Fluvic Cambisol (Bathysalic, Calcaric, Chromic)
Fluvic Cambisol (Calcaric, Chromic)/Haplic Vertisol (Hyposalic, Calcaric, Chromic)
Duric Vertisol (Bathygypsic, Calcaric, Chromic)
Projection UTM Zone 38 N
Datum WGS 84
N
SWALIM
This Map was updated and upgraded
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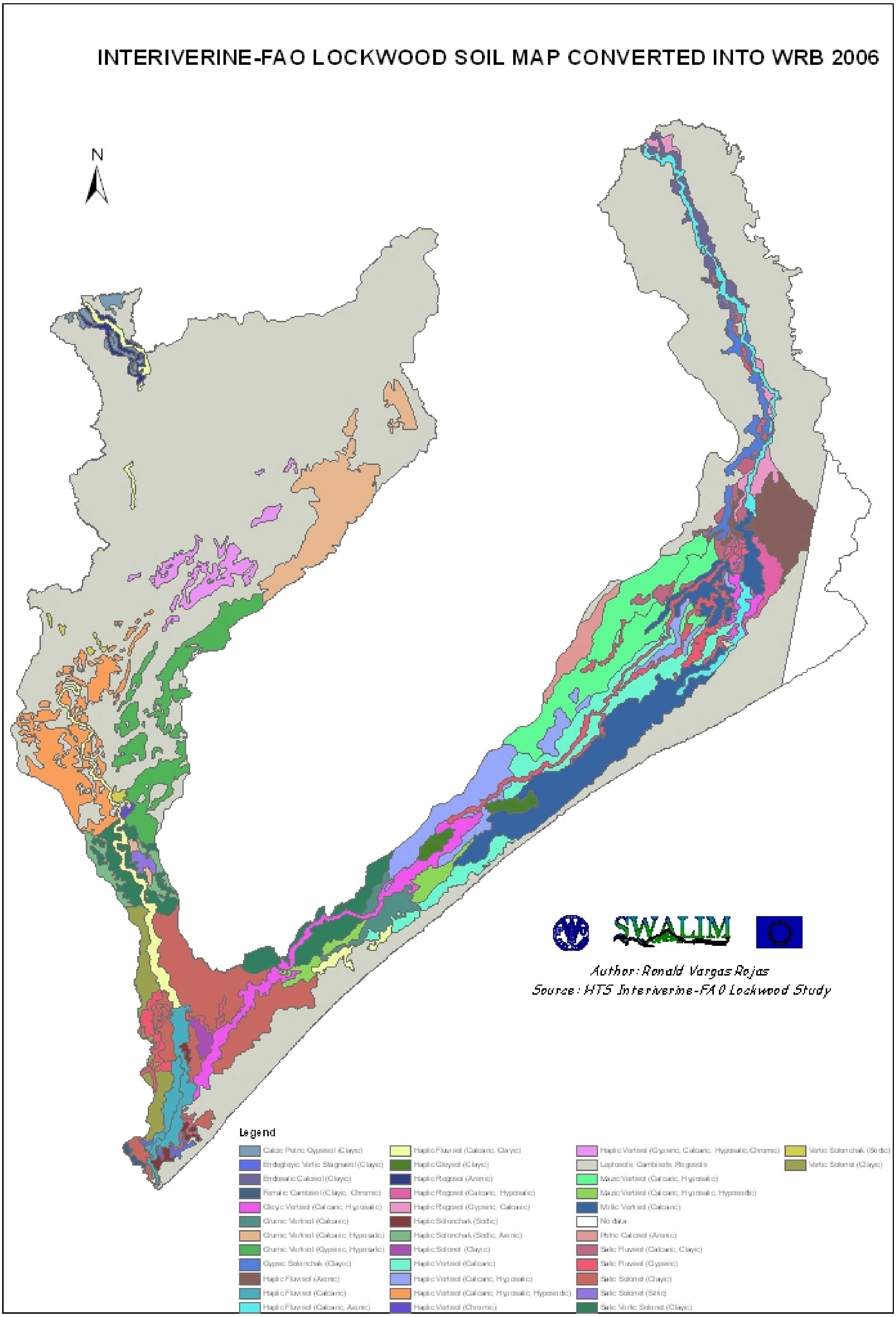

INTERIVERINE-FAO LOCKWOOD SOIL MAP CONVERTED INTO WRB 2006
N
SWALIM
Author: Ronald Vargas Rojas
Source: HTS Interiverine-FAO Lockwood Study
Legend
Calcic Petric Gypsisol (Clayic)
Endogleyic Vertic Stagnosol (Clayic)
Endosalic Calcisol (Clayic)
Ferralic Cambisol (Clayic, Chromic)
Gleyic Vertisol (Calcaric, Hyposalic)
Grumic Vertisol (Calcaric)
Grumic Vertisol (Calcaric, Hyposalic)
Grumic Vertisol (Gypsiric, Hyposalic)
Gypsic Solonchak (Clayic)
Haplic Fluvisol (Arenic)
Haplic Fluvisol (Calcaric)
Haplic Fluvisol (Calcaric, Arenic)
Haplic Fluvisol (Calcaric, Clayic)
Haplic Gleysol (Clayic)
Haplic Regosol (Arenic)
Haplic Regosol (Calcaric, Hyposalic)
Haplic Regosol (Gypsiric, Calcaric)
Haplic Solonchak (Sodic)
Haplic Solonchak (Sodic, Arenic)
Haplic Solonetz (Clayic)
Haplic Vertisol (Calcaric)
Haplic Vertisol (Calcaric, Hyposalic)
Haplic Vertisol (Calcaric, Hyposalic, Hyposodic)
Haplic Vertisol (Chromic)
Haplic Vertisol (Gypsiric, Calcaric, Hyposalic, Chromic)
Leptosols, Cambisols, Regosols
Mazic Vertisol (Calcaric, Hyposalic)
Mazic Vertisol (Calcaric, Hyposalic, Hyposodic)
Mollic Vertisol (Calcaric)
No data
Petric Calcisol (Arenic)
Salic Fluvisol (Calcaric, Clayic)
Salic Fluvisol (Gypsiric)
Salic Solonetz (Clayic)
Salic Solonetz (Siltic)
Salic Vertic Solonetz (Clayic)
Vertic Solonchak (Sodic)
Vertic Solonetz (Clayic)

4.3 Soil maps for the study area at Reference Group and at Suffix and Prefix levels 1:100 000

Twelve different Reference Soil Groups are present in the study area. These are: Leptosols, Regosols, Arenosols, Cambisols, Fluvisols, Calcisols, Solonetz, Solonchaks, Gypsisols, Luvisols, Vertisols, and Technosols. The occurrence of each reference group as dominant class and also the associations between reference groups are presented in the next table:

Table 6: Areas of soil reference groups in the study area

REFERENCE GROUP	Area (km^2)	%
Vertisols	15667.17	17.82
Calcisols	9209.08	10.47
Regosols	6708.78	7.63
Leptosols	5427.92	6.17
Arenosols	4716.99	5.36
Fluvisols	2936.68	3.34
Solonetz	2861.93	3.26
Solonchaks	1150.82	1.31
Cambisols	527.03	0.60
Luvisols	228.14	0.26
Technosols	92.51	0.11
Water bodies	42.90	0.05
Associations at Reference Group		
Leptosols/Regosols/Calcisols	8984.86	10.22
Vertisols/Fluvisols	8322.40	9.47
Arenosols/Cambisols	7020.35	7.98
Leptosols/Regosols	6020.90	6.85
Leptosols/Calcisols	2884.78	3.28
Vertisols/Solonetz	1855.94	2.11
Solonetz/Fluvisols	1059.92	1.21
Fluvisols/Calcisols	858.13	0.98
Regosols/Gypsisols	569.95	0.65
Fluvisols/Regosols	337.04	0.38
Fluvisols/Vertisols	328.26	0.37
Vertisols/Luvisols	110.57	0.13
TOTAL	**87923.03**	**100.00**

At the second categorical level, many different prefix and suffix qualifiers were encountered. A general description of the soils occurring in the area is given below using the WRB Key (WRB, 2006):

<u>Leptosols</u>

These soils are very shallow, over continuous rock and soils that are extremely gravelly and/or stony. The study area is covered with this soil, especially in inselbergs, hill complex areas and various slopes. The prefix and suffix found under this soil group were:

Prefix qualifiers

Lithic: Having continuous rock starting within 10 cm of the soil surface.

Haplic: Having a typical expression of certain features (typical in the sense that there is no further or meaningful characterization) and only used if none of the preceding qualifiers applies.

Suffix qualifiers

Calcaric: Having calcaric material between 20 - 50 cm from the soil surface or between 20 cm and continuous rock or a cemented or indurated layer, whichever is shallower.

Eutric: Having a base saturation (by 1 M NH4OAc) of 50% or more in the major part between 20 - 100 cm from the soil surface or between 20 cm and continuous rock or a cemented or indurated layer.

Regosols

Regosols form a taxonomic remnant group containing all soils that could not be accommodated in any of the other RSGs. Weakly developed mineral soils in unconsolidated materials that do not have a mollic or umbric horizon, are not very shallow or very rich in gravels.

Prefix qualifiers

Haplic: Having a typical expression of certain features (typical in the sense that there is no further or meaningful characterization) and only used if none of the preceding qualifiers applies.

Suffix qualifiers

Calcaric: Having calcaric material between 20 - 50 cm from the soil surface or between 20 cm and continuous rock or a cemented or indurated layer, whichever is shallower.

Arenosols

Arenosols comprise sandy soils, including both soils developed in residual sands after in situ weathering of usually quartz-rich sediments or rock, and soils developed in recently deposited sands such as dunes in deserts and beach lands.

Prefix qualifiers

Endosalic: Having a salic horizon (horizon containing soluble salts) between 50 - 100 cm from the soil surface.

Ferralic: Having a ferralic horizon (iron content) starting within 200 cm of the soil surface or ferralic properties in at least some layer starting within 100 cm of the soil surface.

Haplic: Having a typical expression of certain features (typical in the sense that there is no further or meaningful characterization) and only used if none of the preceding qualifiers applies.

Suffix qualifiers

Calcaric: Having calcaric material between 20 and 50 cm from the soil surface or between 20 cm and continuous rock or a cemented or indurated layer, whichever is shallower.

Hyposalic: Having an ECe of 4 dS/m or more at 25°C in some layer within 100 cm of the soil surface.

Dystric: Having a base saturation (by 1 M NH4OA) of less than 50% in the major part between 20 - 100 cm from the soil surface of between 20 cm and continuous rock or a cemented or indurated layer.

Cambisols

Cambisols combine soils with at least an incipient subsurface soil formation. Transformation of parent material is evident from structure formation and mostly brownish discoloration, increasing clay percentage, and/or carbonate removal.

Prefix qualifiers

Vertic: Having a vertic horizon (clayey subsurface horizon with shrinking and swelling properties) or vertic properties (slickensides, cracks) within 100 cm of the soil surface.

Fluvic: Having fluvic material in a layer, 25 cm or more thick, within 100 cm of the soil surface.

Endogleyic: Having between 50 - 100 cm from the mineral soil surface in some parts reducing conditions and in 25% or more of the soil volume a gleyic colour pattern (saturated with groundwater).

Suffix qualifiers

Calcaric: Having calcaric material between 20 - 50 cm from the soil surface or between 20 cm and continuous rock or a cemented or indurated layer, whichever is shallower.

Clayic: Having a texture of clay in a layer, 30 cm or more thick, within 100 cm of the soil surface.

Chromic: Having within 150 cm of the soil surface a subsurface layer, 30 cm or more thick, that has a Munsell hue redder than 7.5 YR or that has both, a hue of 7.5 YR and a chroma, moist, of more than 4.

Eutric: Having a base saturation (by 1 M NH_4OAc) of 50% or more in the major part between 20 - 100 cm from the soil surface or between 20 cm and continuous rock or a cemented or indurated layer.

Fluvisols

Fluvisols accommodate genetically young, azonal soils in alluvial deposits of the Juba and Shabelle rivers, and also in lateral river valleys, lacustrine and marine deposits.

Prefix qualifiers
Salic: Having a salic horizon (horizon containing soluble salts) starting within 100 cm of the soil surface.

Haplic: Having a typical expression of certain features (typical in the sense that there is no further or meaningful characterization) and only used if none of the preceding qualifiers applies.

Suffix qualifiers
Gypsiric: Having a gypsiric material between 20 - 50 cm from the soil surface.

Calcaric: Having calcaric material between 20 - 50 cm from the soil surface or between 20 cm and continuous rock or a cemented or indurated layer, whichever is shallower.

Arenic: Having a texture of loamy fine sand or coarser in a layer, 30 cm or more thick, within 100 cm of the soil surface.

Siltic: Having a texture of silt, silt loam, silty clay loam or silty clay in a layer, 30 cm or more thick, within 100 cm of the soil surface.

Clayic: Having a texture of clay in a layer, 30 cm or more thick, within 100 cm of the soil

Calcisols

Calcisols accommodate soils in which there is substantial secondary accumulation of lime.

Prefix qualifiers
Petric: Having a strongly cemented or indurated layer starting within 100 cm of the soil surface.

Endosalic: Having a salic horizon (horizon containing soluble salts) between 50 and 100 cm form the soil surface.

Suffix qualifiers
Arenic: Having a texture of loamy fine sand or coarser in a layer, 30 cm or more thick, within 100 cm of the soil surface.

Clayic: Having a texture of clay in a layer, 30 cm or more thick, within 100 cm of the soil surface.

Solonetz

These are soils with a dense, strongly structured, clayey subsurface horizon that has a high proportion of adsorbed Na and/or Mg ions.

Prefix qualifiers
Vertic: Having a vertic horizon (clayey subsurface horizon with shrinking and swelling properties) or vertic properties (slickensides, cracks) within 100 cm of the soil surface.

Salic: Having a salic horizon (horizon containing soluble salts) starting within 100 cm of the soil surface.

Haplic: Having a typical expression of certain features (typical in the sense that there is no further or meaningful characterization) and only used if none of the preceding qualifiers applies.

Suffix qualifiers

Siltic: Having a texture of silt, silt loam, silty clay loam or silty clay in a layer, 30 cm or more thick, within 100 cm of the soil surface.

Clayic: Having a texture of clay in a layer, 30 cm or more thick, within 100 cm of the soil surface.

Solonchaks

Solonchaks are soils that have a high concentration of soluble salts at some time in the year.

Prefix qualifiers

Vertic: Having a vertic horizon (clayey subsurface horizon with shrinking and swelling properties) or vertic properties (slickensides, cracks) within 100 cm of the soil surface.

Gypsic: Having a gypsic horizon (non cemented horizon containing secondary accumulations of gypsum) starting within 100 cm of the soil surface.

Haplic: Having a typical expression of certain features (typical in the sense that there is no further or meaningful characterization) and only used if none of the preceding qualifiers applies.

Suffix qualifiers

Sodic: Having 15% or more exchangeable Na plus Mg on the exchange complex within 50 cm of the soil surface throughout.

Arenic: Having a texture of loamy fine sand or coarser in a layer, 30 cm or more thick, within 100 cm of the soil surface.

Clayic: Having a texture of clay in a layer, 30 cm or more thick, within 100 cm of the soil surface.

Gypsisols

Gypsisols are soils with substantial secondary accumulation of gypsum ($CaSO_4$.2H2O).

Prefix qualifiers

Petric: Having a strongly cemented or indurated layer starting within 100 cm of the soil surface.

Calcic: Having a calcic horizon (accumulation of secondary $CaCO^{3}$) or concentrations of secondary carbonates starting within 100 cm of the soil surface.

Suffix qualifiers
Clayic: Having a texture of clay in a layer, 30 cm or more thick, within 100 cm of the soil surface.

Luvisols

Luvisols are soils that have a higher clay content in the subsoil than in the topsoil as a result of pedogenetic processes (especially clay migration) leading to an *argic* subsoil horizon. Luvisols have high-activity clays throughout the *argic* horizon and a high base saturation at certain depths.

Prefix qualifiers
Haplic: Having a typical expression of certain features (typical in the sense that there is no further or meaningful characterization) and only used if none of the preceding qualifiers applies.

Calcic: Having a calcic horizon (accumulation of secondary $CaCO^{3}$) or concentrations of secondary carbonates starting within 100 cm of the soil surface.

Suffix qualifiers
Chromic: Having within 150 cm of the soil surface a subsurface layer, 30 cm or more thick, that has a Munsell hue redder than 7.5 YR or that has both, a hue of 7.5 YR and a chroma, moist, of more than 4.

Rhodic: Having within 150 cm of the soil surface a subsurface layer, 30 cm or more thick, with a Munsell hue redder than 5 YR (3.5 YR or redder), a value, moist, of less than 3.5 and a value, dry, no more than one unit higher than the moist value.

Vertisols

These soils are churning, heavy clay soils with a high proportion of swelling clays. These soils form deep wide cracks from the surface downward when they dry out, which happens in most years.

Prefix qualifiers
Grumic: Having a soil surface layer with a thickness of 3 cm or more with a strong structure finer than very coarse granular.

Mazic: Massive and hard to very hard in the upper 20 cm of the soil.

Salic: Having a salic horizon (horizon containing soluble salts) starting within 100 cm of the soil surface.

Gleyic: Having within 100 cm of the mineral soil surface in some parts reducing conditions and in 25% or more of the soil volume a gleyic colour pattern (saturated with groundwater).

Stagnic: Having within 100 cm of the mineral soil surface in some parts reducing conditions for some time during the year and in 25% or more of the soil volume, single or in combination, a stagnic colours (saturated with surface water) pattern or an albic horizon.
Calcic: Having a calcic horizon (accumulation of secondary CaCO3) or concentrations of secondary carbonates starting within 100 cm of the soil surface.
Haplic: Having a typical expression of certain features (typical in the sense that there is no further or meaningful characterization) and only used if none of the preceding qualifiers applies.

Suffix qualifiers
Bathysalic: Salic horizon (horizon containing soluble salts) starting between 100 - 200 cm from the soil surface.
Bathygypsic: Gypsic horizon (horizon containing gypsum) starting between 100 - 200 cm from the soil surface.
Bathycalcaric: Calcaric material starting between 100 - 200 cm from the soil surface.
Gypsiric: Having a gypsiric material between 20 - 50 cm from the soil surface.
Calcaric: Having calcaric material between 20 - 50 cm from the soil surface or between 20 cm and continuous rock or a cemented or indurated layer, whichever is shallower.
Hyposalic: Having an ECe of 4 dS/m or more at 25°C in some layer within 100 cm of the soil surface.
Hyposodic: Having a 6% or more exchangeable Na on the exchange complex in a layer, 20 cm or more thick, within 100 cm of the soil surface.

Technosols

Technosols combine soils whose properties and pedogenesis are dominated by their *technical* origin. They contain a significant amount of artefacts (something in the soil recognizably made or extracted from the earth by humans), or are sealed by *technic hard rock* (material created by humans, having properties unlike natural rock). Technosols are often referred to as urban or mine soils.

Because of the scale of mapping, the only Technosols that were found expansive enough to be mapped were those around Mogadishu. The other urban centres were small and could not be mapped on their own.

4.4 Soil attributes in the study area

Soil properties in the study area vary highly along the different landscapes. Figure 7 summarizes the ranges (min, mean and max) of the main soil attributes per Soil Reference Group found in the study area. These are also compared with standard values from the bibliography in order to determine the status of soil properties.

Some of the important distinguishable features from this summary include the delineation of Arenosols as having the highest sand content (with the mean of over 90%), Solonchaks as having the highest EC (mean ~ 18 mS/cm), and Vertisols as having the highest clay content (mean ~50%). According to WRB (2006), the relationships such as shown in Figure 7 are exploited in mapping soils. This fact was utilized in this study by first extrapolating a map of the soil properties over the study area and subsequently implementing the relationship between the soil properties and reference groups on the entire maps of the soil properties. However, in order to include the suffixes and prefixes of soil mapping criteria, other factors in Equation (1) were also included.

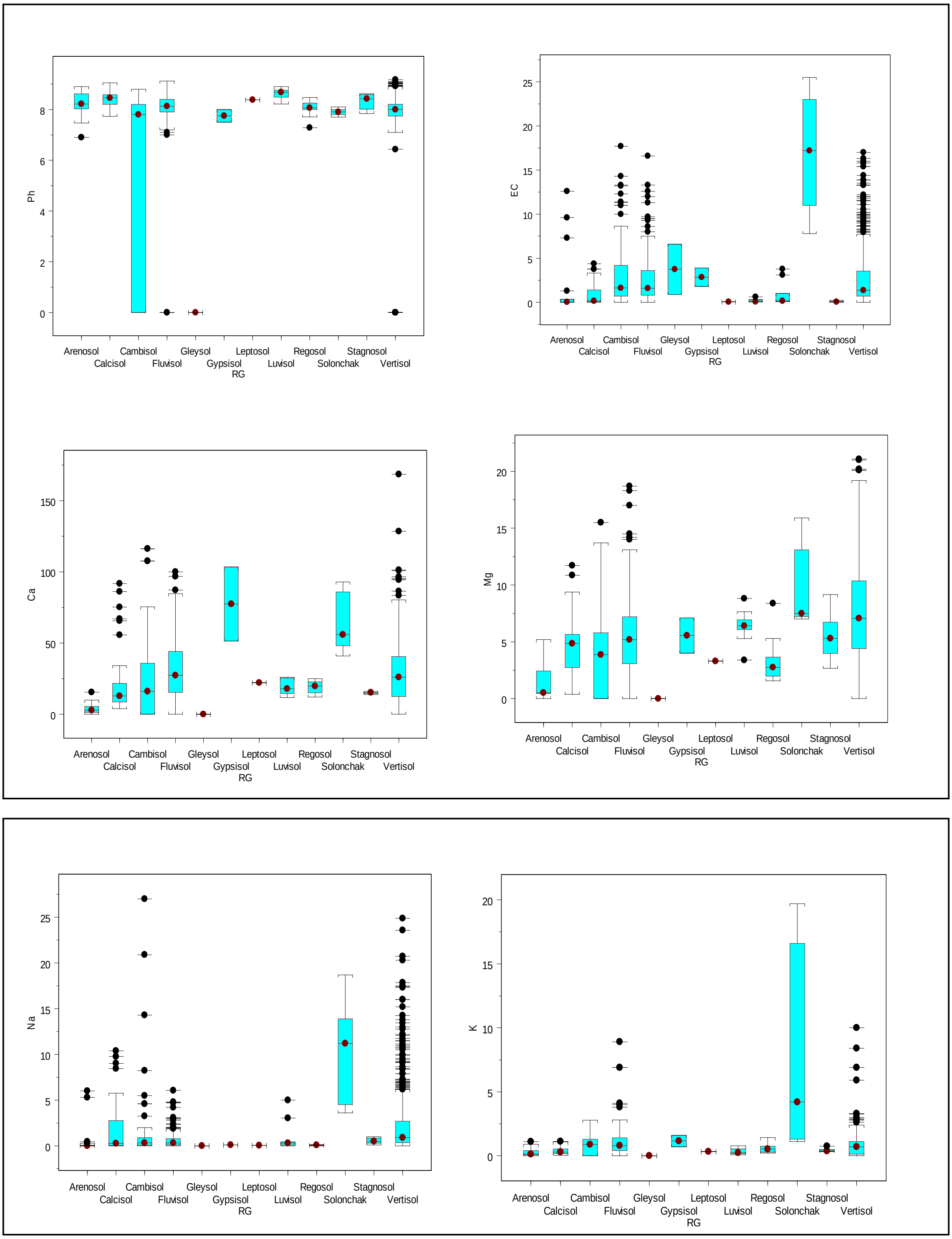


Figure 7: Summary of soil properties by WRB (2006) reference groups

Figure 7: Cont.

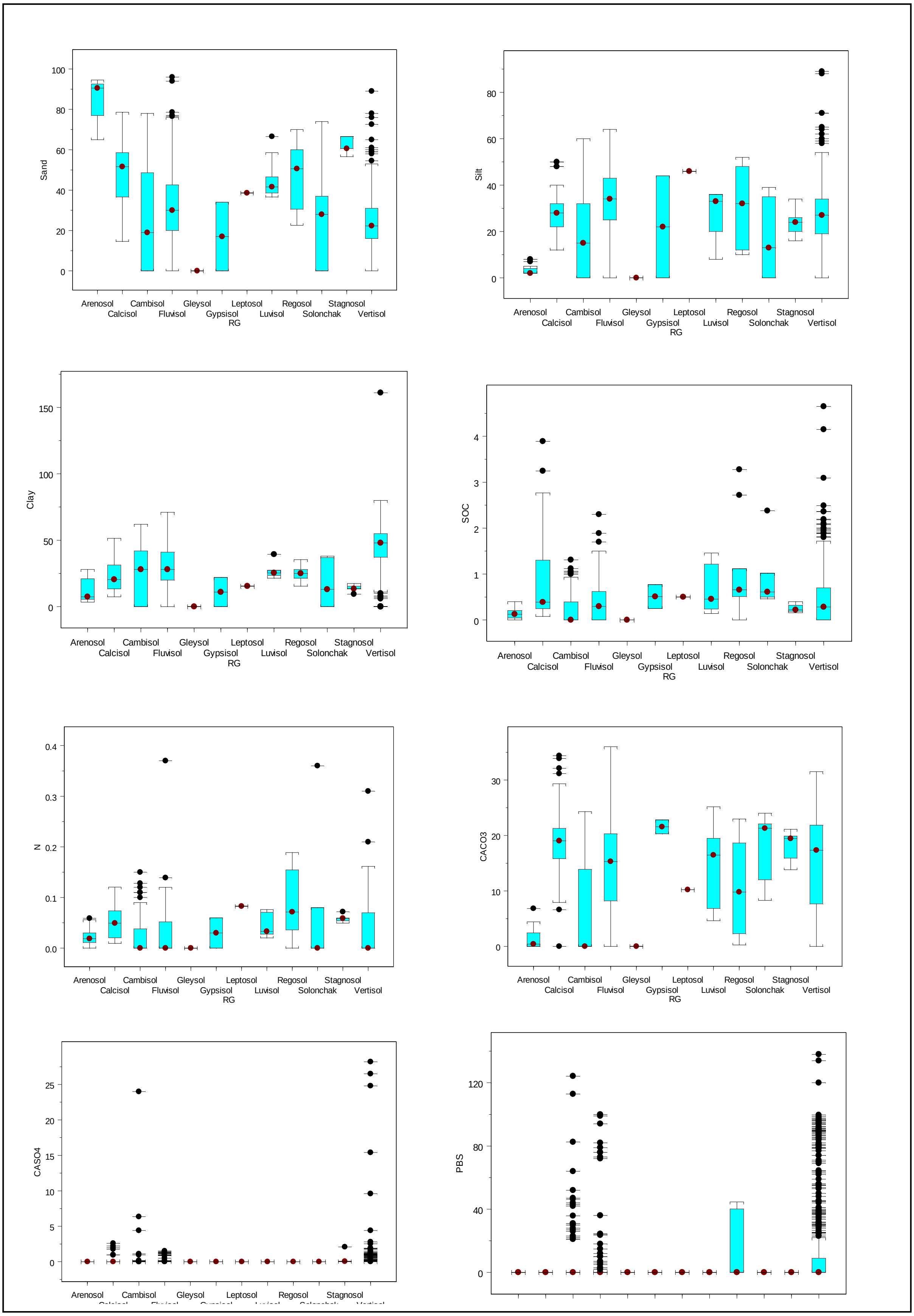
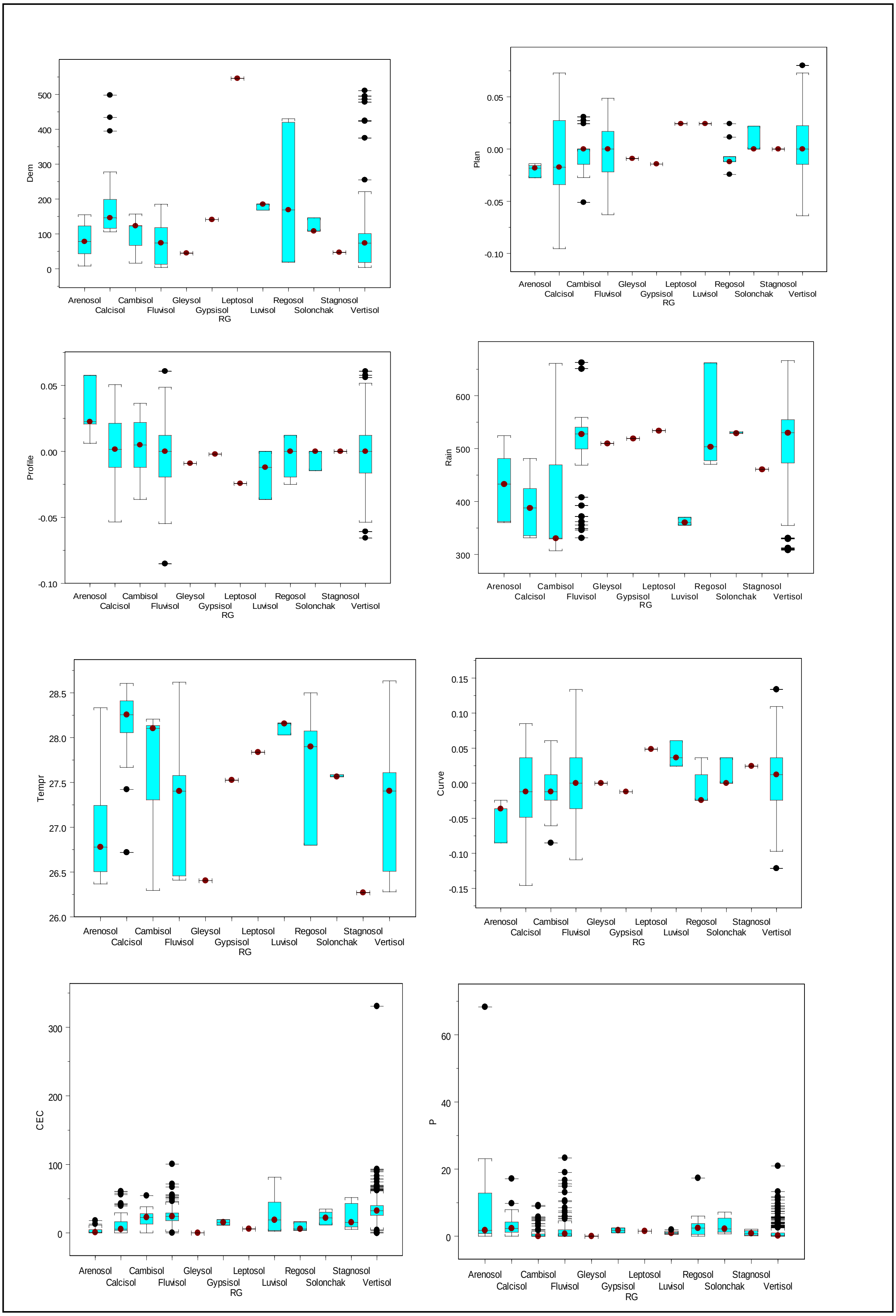


Figure 7: Cont.



4.5 Technical assessment of the soil resources of the study area

Figure 8 shows some of the Jenny's input factors for predictive soil mapping. The co-ordinates of the profile pits with the above soil classes were overlaid on these input factors and the values of the input factors extracted accordingly into the database of soil classes. The final database contained soil classes and Jenny's input factors for the development of a statistical relationship between these two groups.

Further analysis of these input factors showed some patterns of soil properties, relief, and topographic characteristics. In the southern parts (along the coastline), soil properties were dominated by high sand content while the uplands of river Juba had higher proportions of silt. The uplands of river Shabelle and much of its entire river valley had higher proportions of clay content. Where rivers Juba and Shabelle meet in the south-eastern parts of the study area had relatively high clay content accompanied with high EC. This could be the result of deposition from both rivers. These regions also had a characteristic below sea level altitude with gentle to almost flat slope. These characteristics could posit a possibility of Stagnosols or salty soils as they may be frequently below the ocean level. The uplands of both the rivers had remarkable extent of stoniness with associated ridges in the landform map. Thus, possibilities of finding Leptosols or Regosols were eminent in these areas. All these characteristics were explored using tree models and further exploited in developing a classification algorithm for the predictive soil mapping.

A hierarchical tree model was developed between observed soil classes and the Jenny's factors. About 80% overall predictive accuracy was achieved on one-quarter holdout data. Figure 9 shows the model developed with the reference group alone. The X and Y values in this figure were the spatial co-ordinates that were obtained from the map of the study area. Since the tree model was developed outside a GIS environment, the inclusion of X and Y values were important to portray the spatial extent of the input variables.

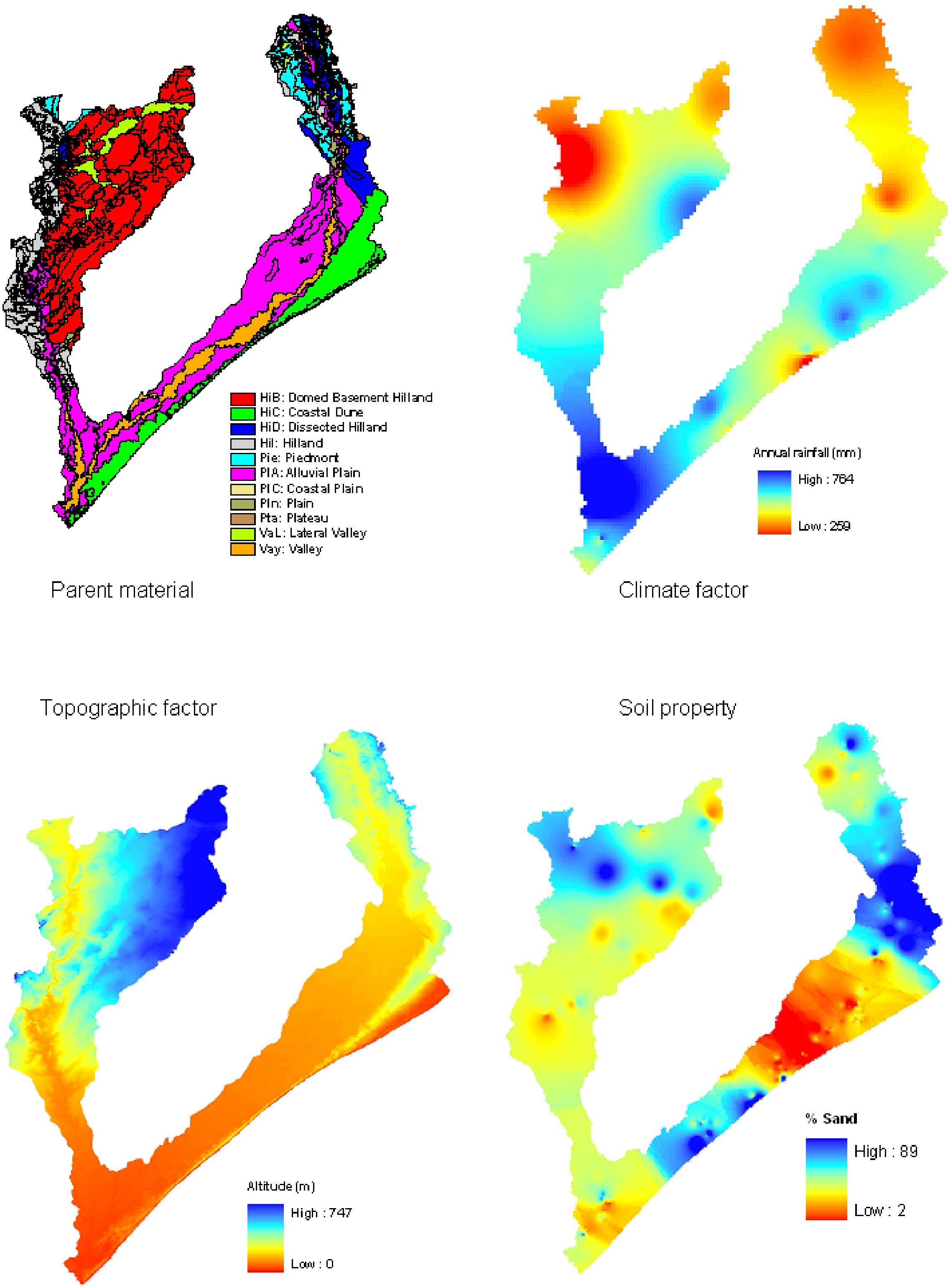


Figure 8: Some of the Jenny's factors for digital mapping

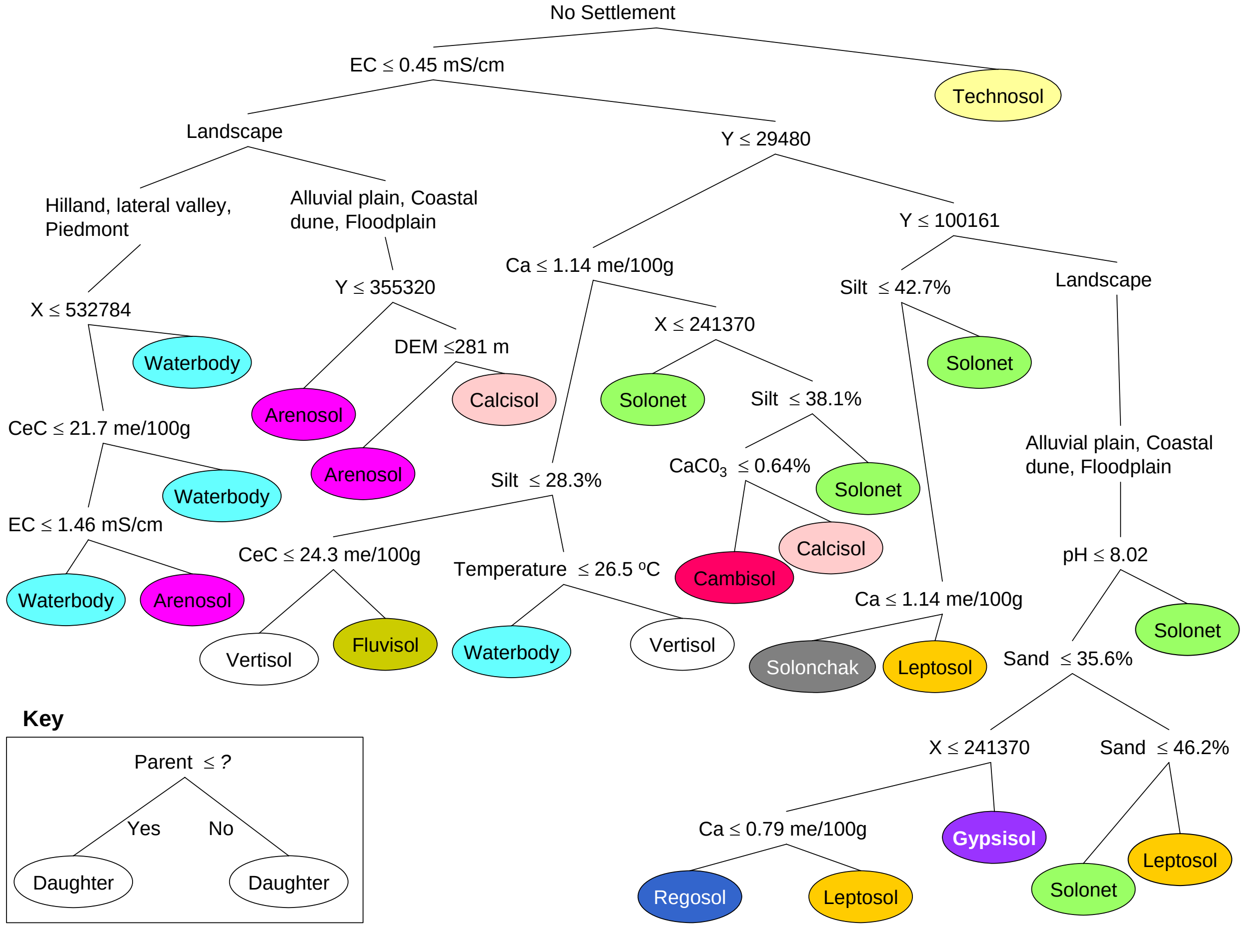


Figure 9: Classification model for digital soil mapping

The model in Figure 9 identified settlements, electrical conductivity, landscape features, and spatial characteristics as the most important (with variable importance of over 50%) variables in diagnosing soil classes. It successfully separated Cambisols from Calcisols using calcium carbonate, Fluvisols from Vertisols using cation exchange capacity, and Regosols from Leptosols using calcium content (Figure 9). Although Arenosols are easily distinguished by the sand content and presence of sand dunes, the apparent concentration of these characteristics in the low-lying parts of the watershed made the model to prefer the use of DEM in identifying them (Figure 9). The misclassification error rate for this model was 5% on holdout samples. This low figure was deemed accurate for an area of over 80,000 km^2. Figure 10 shows a final map output of the soil reference groups that was re-sampled to a scale of 1:100000. Another tree model was also developed on the same principles as for the Figure 9 albeit with 40 tree nodes to include the prefix and suffixes of WRB classification system. This second model had an error rate of 3.7% with holdout classification accuracy of 92%.

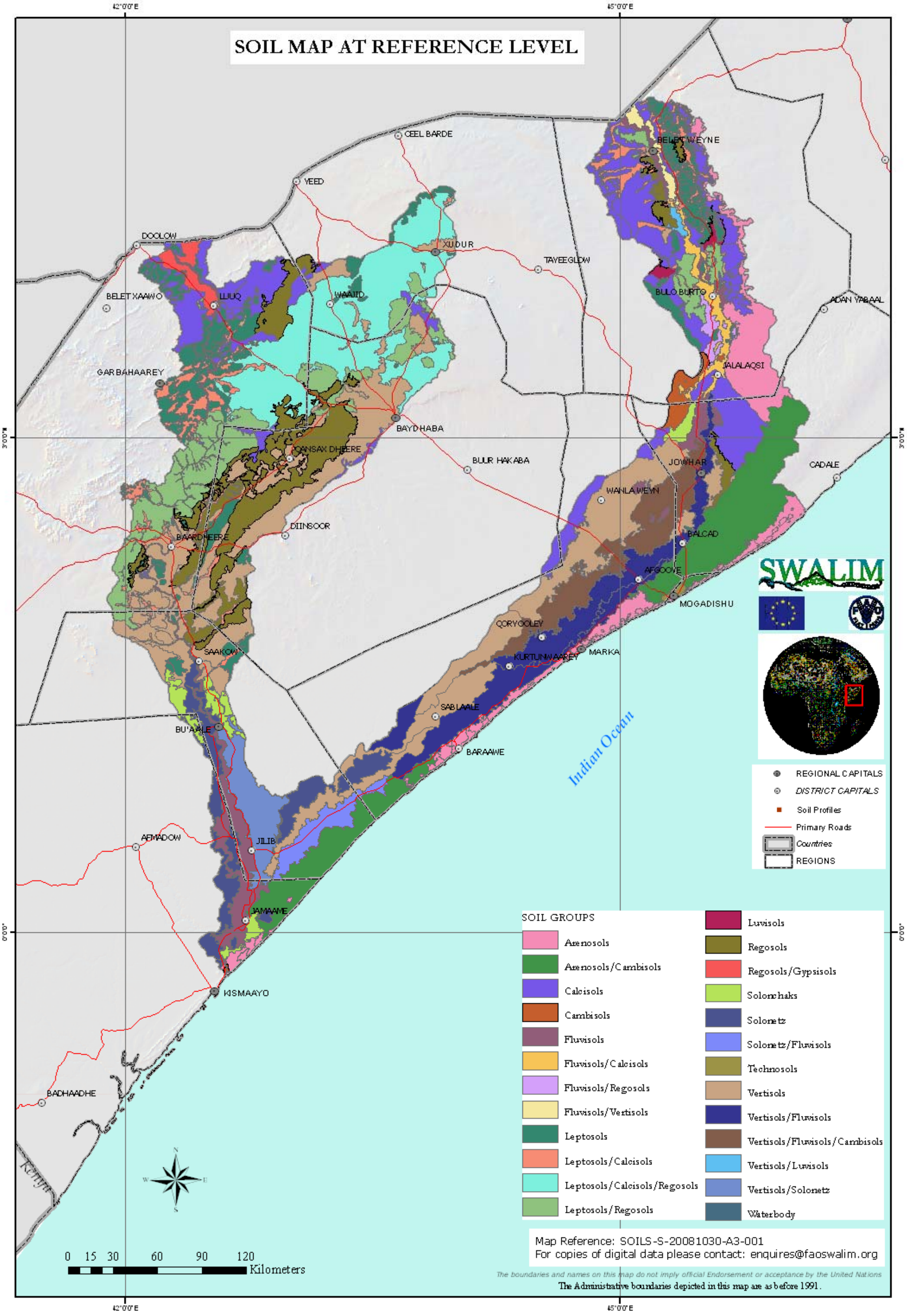
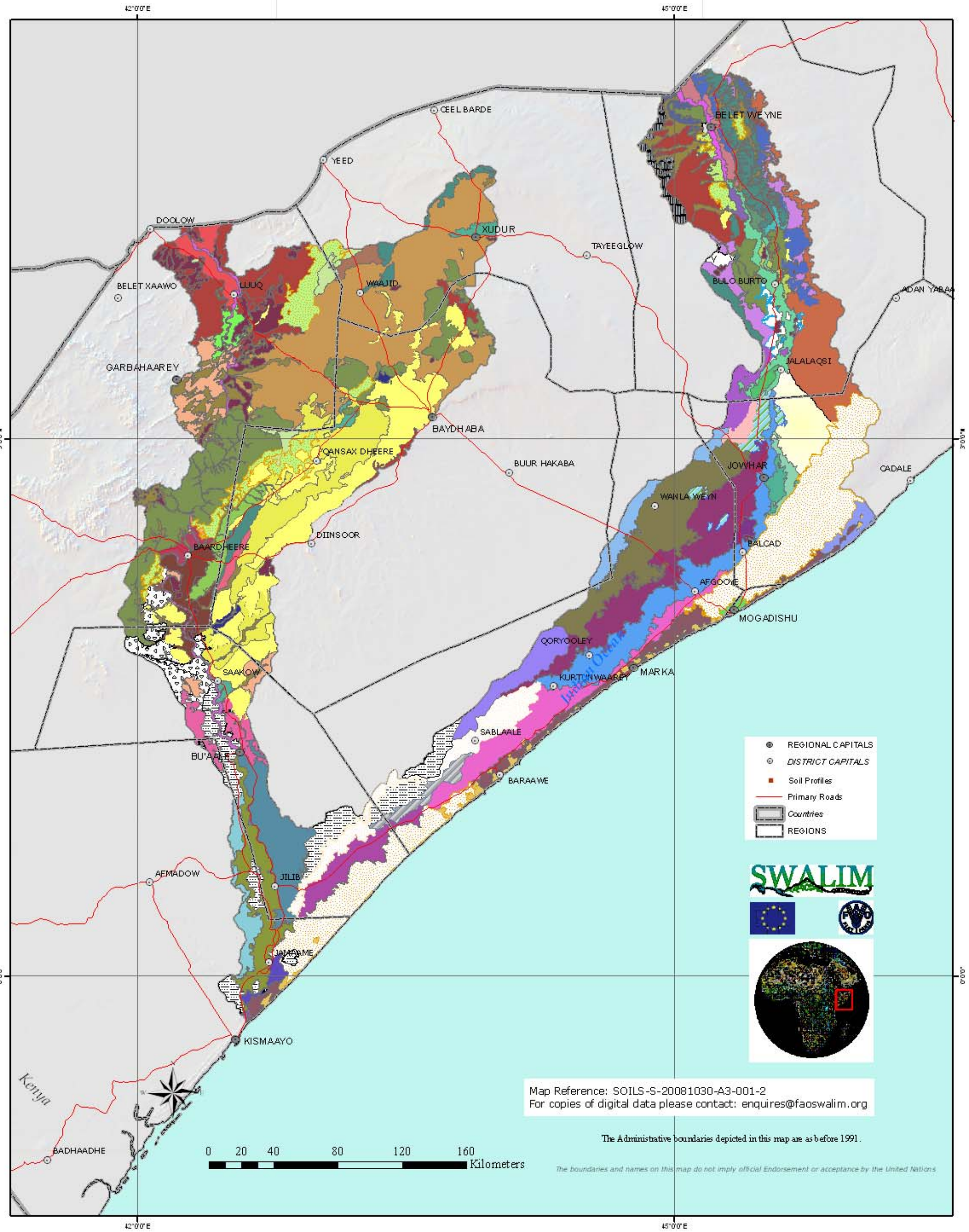


Figure 10: Soil map at the reference group level in the study area

From Figure 10, Vertisols cover the largest percentage of the study area and especially on the middle and lower reaches of both river Juba and Shabelle. These soils coincidentally are located in the main areas for agriculture both rainfed and irrigated. The Calcisols are located in the upper parts of both rivers while the Regosols are present in small pockets around the study area showing evidence of insignificant development. Leptosols which are the most undeveloped type of soils present mainly in the hilly/rocky landscapes of the study area. The sand dunes along the front shore line have the Arenosols as the unique type of soil. Fluvisols are soils found mainly in the river and floodplains of both Juba and Shabelle rivers. Solonetz and Solonchacks are soils with high content of salts and sodium located in the lower Shabelle and Juba areas, water stagnation is a common process there. Cambisols are located in few sites of the study area in which evidence of soil properties change can be seen. Luvisols are clayey soils that can be found in some sites around the depositional area of the Shabelle river. The Technosols are soils located in urban areas and in this case the only mappable was the Mogadishu region.

SOIL MAP AT PREFIX AND SUFFIX LEVEL



SOIL GROUPS

Soils

- Calcic Endoleptic Vertisol (Calcaric, Chromic)
- Calcic Endoleptic/Grumic Vertisol (Humic, Chromic)
- Calcic Fluvisol (Arenic)/Haplic Calcisol (Aridic, Arenic)
- Calcic Fluvisol (Aridic, Clayic)
- Calcic Fluvisol (Aridic, Clayic)/Haplic Regosol (Gypsiric, Calcaric)
- Calcic Fluvisol (Aridic, Clayic)/Vertic Hypocalcic Calcisol (Aridic, Clayic)
- Calcic Fluvisol (Siltic)/Calcic Mazic Vertisol (Calcaric)
- Calcic Grumic Vertisol (Calcaric, Pellic)/Haplic Fluvisol (Calcaric)
- Calcic Grumic Vertisol (Pellic)
- Calcic Luvisol (Rhodic)
- Calcic Mazic Vertisol (Chromic)
- Calcic Mazic Vertisol (Pellic)
- Calcic Stagnic Mazic Vertisol (Chromic)/Calcic Fluvisol (Clayic)
- Calcic Vertisol (Calcaric)/Calcic Luvisol (Rhodic)
- Calcic Vertisol (Calcaric, Hyposalic)/Salic Fluvisol (Gypsiric)/Vertic Cambisol (Calcaric, Chromic)
- Calcic Vertisol (Calcaric, Pellic)/Grumic Gleyic Vertisol (Calcaric, Hyposalic)
- Endoleptic Calcisol (Arenic)
- Endoleptic Grumic Vertisol (Chromic)
- Endopetric Calcisol (Arenic, Aridic)
- Endosalic Calcisol (Clayic)
- Epileptic Calcisol (Arenic)
- Epileptic Calcisol (Siltic, Chromic)
- Epileptic Regosol (Aridic, Calcaric)
- Epileptic Regosol (Aridic, Calcaric)/Lithic Leptosol (Calcaric)
- Epileptic Regosol (Calcaric, Skeletic)
- Ferralic Arenosol (Aridic)
- Ferralic Arenosol (Aridic)/Ferralic Cambisol (Aridic, Rhodic)
- Grumic Calcic Vertisol (Calcaric)
- Grumic Vertisol (Calcaric)
- Gypsic Solonchak (Clayic)
- Haplic Arenosol (Calcaric)
- Haplic Calcisol (Siltic, Chromic)
- Haplic Cambisol (Calcaric, Aridic)
- Haplic Fluvisol (Calcaric, Clayic)
- Haplic Fluvisol (Calcaric, Clayic)/Stagnic Fluvisol (Clayic)
- Haplic Luvisol (Chromic)
- Haplic Regosol (Arenic)/Calcic Petric Gypsisol (Clayic)
- Haplic Regosol (Calcaric, Hyposalic)
- Haplic Regosol (Skeletic, Calcaric)
- Haplic Solonchak (Sodic, Arenic)
- Haplic Solonchak (Sodic)
- Haplic Vertisol (Calcaric, Chromic)
- Haplic Vertisol (Calcaric, Hyposalic)
- Haplic Vertisol (Calcaric, Hyposalic, Hyposodic)
- Hyperskeletic Leptosol (Aridic)/Haplic Regosol (Skeletic)
- Hyperskeletic Leptosol (Aridic)/Nudilithic Leptosol (Calcaric)
- Hyperskeletic Leptosol (Calcaric)
- Lithic Leptosol (Aridic)/Epileptic Calcisol (Aridic, Siltic)
- Lithic Leptosol (Calcaric)
- Lithic Leptosol (Calcaric)/Epileptic Calcisol (Arenic, Chromic)/Haplic Regosol (Skeletic)
- Luvic Calcisol (Chromic)
- Nudilithic Leptosol (Calcaric)
- Petric Calcisol (Arenic)
- Protic Arenosol (Aridic)
- Rubic Arenosol (Aridic)
- Salic Fluvisol (Calcaric, Clayic)
- Salic Vertic Solonet (Clayic)
- Salic Vertic Solonet (Clayic)/Haplic Fluvisol (Calcaric, Clayic)
- Stagnic Vertisol (Bathygypsic, Calcaric)
- Stagnic Vertisol (Calcaric)/Salic Solonet (Clayic)
- Technosols
- Vertic Calcisol (Chromic)
- Vertic Solonet (Clayic)
- Waterbody

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The study area is highly heterogeneous in terms of soils, giving opportunities in terms of land use for the population. This study revealed that the upper Juba and Shabelle areas are quite similar in terms of soil formation; they both have Calcisols, Leptosols, and Regosols in the sloping areas of the watershed. As the rivers progress downstream they are both distinguishable with the presence of Fluvisols and Vertisols. In addition to the river valleys, the study area has small inselbergs and hilly areas having Leptosols and Regosols. These late soils have physical limitations for agriculture purposes.

The middle part of the Shabelle river valley is characterized with wide river path having more developed soils such as Vertisols, Luvisols, Cmabisols. The gently sloping areas that contribute to the river are composed by Regosols, Cambisols and Calcisols. For the Juba river valley, the middle part of is composed of very productive Vertisols and Calcisols. This explains why this region is famous as the sorghum belt in the country. These Vertisols are red and constitute the best soils in terms of agriculture due to their good chemical and physical properties. However, at some places they are combined with patches of Leptosols and Regosols with physical limitations, especially in terms of depth.

The Lower Shabelle river valley have a mixture of soils, but are mainly composed by Vertisols, Calcisols, Solonetz, Arenosols, Cambisols and Fluvisols. The soils in this area are quite variable and have the characteristics of moderately well to poorly drained soils. Although some of the Vertisols, Cambisols, Fluvisols and Calcisols have good soil properties for agriculture purposes, the floods frequency may influence their exploitation. In this region, most of the previous irrigation projects were based some time ago. This is in line with the variability and characteristics of the aforementioned soils.

The Lower Juba is an area prone to floods mainly due to their geomorphological context. The soils formed in this region are largely due to the landscape charcateristics. Consequently, most of the soils in this region are grey Vertisols, Stagnosols, Fluvisols, Solonchacks, Solonetz and Arenosols. Small patches of Leptosols can also be found mainly in small hilly areas. The soils of this region are prone to annual flooding, which contributes to its formation and status. Poor internal drainage and salinity are the most difficult processes to take into account. The soils in this area have strong limitations for agricultural activities.

The southern area of the study area is surrounded by the coastal dune which is composed of Arenosols. The soils close to the coast are pure sand while the soils facing the Shabelle river valley are more developed, but are also still Arenosols. These soils are not useful for agricultural purposes.

This study is unique in regards to the soil resource inventory in Somalia. It constitutes a rich geographic data resource that includes some of the data archived from the brink of disposal. These data sources are now available as individual soil map projects as well as a general map that can provide a useful guide for future research, other application, and for guiding future soil surveys in the country.

This study has clearly shown that a) there is a need to study soil distributions along the northern areas of both the Juba and Shabelle basement areas. This is important, as this area is prone to soil erosion processes; b) the Juba and Shabelle flood- and alluvial plains, where most previous soil surveys have been concentrated, require only a few site-specific soil surveys to study specific soil processes affecting and promoting changes in attributes such as soil deposition, salt content, $CaCO_3$ content, gypsum content and redomorphic properties.

5.2 Recommendations

This study should be clearly understood to be a preliminary compiled soil map and soil data collection for the Juba and Shabelle catchment areas. More bibliographic research and soil data update is recommended.

The present study was carried out under a difficult socio-political situation that largely influenced the methodology for carrying out the study. The soil profiles in the lower Juba river valley were not adequately updated due to uneven socio-political conflicts, and frequent flooding at the time of fieldwork. This prompted the over-reliance on old soil data. It is recommended that further work be done at appropriate times to update the current map. More sampling density work is especially recommended to augment the existing database

Data input into SDBmPlus will continue until a complete list of 188 soil profiles is made. Once this is done, a final soil point geographic database will be created that will be available for a future variety of applications.

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APPENDICES

Appendix 1: Description of current soil profiles

Appendix 2: Historical soil profile data

Appendix 3: Soil analytical data for historical

Appendix 1: The description of soil profile characteristics and classification

SOIL PROFILE DESCRIPTION FOR PROFILE No. S100	
Profile code : S100	Date : 2007-05-03
Location : XUDUR	Coordinates : -04º10'43" / - 43º53'46"
Authors : Musse Alim Shaie	Elevation : 509
WRB 2006 classification : Haplic Vertisol (Calcaric, Chromic)	Soil climate : Aridic aridic isohyperthermic
Land use : Fallow system	Topography : Almost flat
Vegetation : Deciduous shrub	Land form : Alluvial plain
Parent material : Alluvium (Pleistocene) in situ weathered	Land element : Flood plain
Effective soil depth: 50-100cm	Slope : 0.3 - 0.7% straight
Rock outcrops : Nil	Micro topography : Level
Surface stoniness : Nil	Drainage : Moderately well
Erosion : Sheet erosion slight	Flood : Annually
Moisture conditions : Dry	UTM coordinates: 377499 - 461961
Remarks :	There is self-mulching and deep medium wide cracks on soil surface. Soft Gypsum crystals layer lies below soil horizons. Soil erosion is occurring along sloping road sides. Flash flooding occurs during high rainfalls and stands for several days.

Horizon	Depth cm	Description
A1	0-20	Yellowish red (5YR 4/6) (dry); moderate fine and very fine granular structure; soft to slightly in dry and firm in moist, sticky and plastic in wet; ; very high porosity, common Voids fine and very fine in interstitial pores; moderately calcareous; few earthworms; common fine-medium roots; clear wavy boundary.
Bt1	20-45	Yellowish red (5YR 4/6) (dry); clay; weak coarse prismatic structure; hard in dry and firm in moist, sticky and plastic in wet; common prominent slickenside on pedfaces Cutans; ; high porosity, common Voids fine and very fine in interstitial pores; moderately calcareous; few earthworms; few fine roots; clear smooth boundary
Bt2	45-90	Red (2.5YR 4/6) (dry); clay; weak to moderate fine to coarse subangular prismatic structure; hard in dry and firm in moist, sticky and plastic in wet; common prominent slickenside on pedfaces Cutans; ; low porosity, few Voids very fine in interstitial pores; moderately calcareous; few fine and very fine roots; abrupt smooth boundary.
R	90-160	Soft to slightly in dry and friable in moist, non sticky and non plastic

		in wet; .

HORIZON	A1	Bt1	Bt2
LOWER	20cm	45cm	90cm
SAND %	34.6	14.6	28.6
SILT %	36	44	32.0
CLAY %	29.4	41.4	39.6
TEXTURE CLASS	CL	SiC	CL
C (%)	4.75	4.39	4.40
N (%)	0.08	0.07	0.06
P (ppm)	1.41	6.73	1.26
pH	8.5	8.0	8.1
EC (mS/cm)	0.6	0.2	0.2
CEC (me/100g)	7.4	7.6	8.0
Ca^{++}	26.91	30.70	28.67
Mg^{++}	4.63	5.84	5.30
K^{+}	0.65	0.33	0.27
Na^{+}	0.04	0.38	0.5
CaCO3 (%)	21.2	21.2	22.9

SOIL PROFILE DESCRIPTION FOR PROFILE No. S102

Profile code : S102	Date : 2007-05-03

Location : Waney -Xudur	Coordinates : - 4º05'17" / - 43º49'03"
Authors : Musse Alim Shaie	Elevation : 469
WRB 2006 classification : Epileptic Calcisol (Chromic)	Soil climate : Isohyperthermic aridic isohyperthermic
Land use :	Topography : Almost flat
Vegetation : Deciduous shrub	Land form : Plain
Parent material : Colluvium in situ weathered	Land element : Alluvial fan
Effective soil depth: 0 -25cm	Slope : 0.3 - 0.7% straight
Rock outcrops :	Micro topography : Even
Surface stoniness : Very few	Drainage : Well
Erosion :	Flood :
Moisture conditions : Dry	UTM coordinates: 368752 - 451956

Remarks :	The parent material is limestone and the soil is very shallow. The major land use is pastoralism.

Horizon	Depth cm	Description
A	0-15	Strong brown (7.5YR 4/6) (dry); siltloam; strong fine granular structure; soft to slightly in dry and friable in moist, non sticky and non plastic in wet; ; medium porosity, common Voids fine in interstitial pores; very few limestone fine subrounded fresh-slightly weathered rocks; moderately calcareous; very few fine-medium roots; abrupt wavy boundary.
Ac	15-25	Strong brown (7.5YR 4/6) (dry); siltloam; strong fine granular structure;

HORIZON	A	Ac
LOWER	15	25
SAND %	36.6	38.6
SILT %	32.0	30.0
CLAY %	31.4	31.4
TEXTURE CLASS	CL	CL
C (%)	4.20	3.57
N (%)	0.05	0.07
P (ppm)	7.91	4.82
pH	8.7	8.7
EC (mS/cm)	0.1	0.1
CEC (me/100g)	6.9	3.7
Ca^{++}	19.33	21.81
Mg^{++}	2.74	2.72
K^{+}	1.03	0.95
Na^{+}	0.04	0.04
CaCO3 (%)	27.2	21.3

		soft to slightly in dry; ; medium porosity, common Voids fine in interstitial pores; common limestone medium subrounded fresh-slightly weathered rocks; strongly calcareous; very few fine-medium roots; clear smooth boundary.
R	25-	; dominant limestone stones and boulders subrounded fresh-slightly weathered rocks.

SOIL PROFILE DESCRIPTION FOR PROFILE No. S108	
Profile code : S 108	Date : 2007-10-03
Location : Dheriow- Saydheelow-Baidoa	Coordinates : - 3º24'56" / - 43º41'47"
Authors : Musse Alim Shaie	Elevation : 438
WRB 2006 classification : Haplic Leptosol (Skeletic, Aridic)	Soil climate : Isohyperthermic aridic isohyperthermic
Land use : Animal husbandry	Topography : Almost flat
Vegetation : Deciduous shrub	Land form : Alluvial plain
Parent material : Fluvial deposits in situ weathered	Land element : Flood plain
Effective soil depth: 0 -25cm	Slope : 0.3 - 0.7%
Rock outcrops :	Micro topography : Even
Surface stoniness : Very few	Drainage : Moderately well
Sealing/crusts : Slight sealing	Flood :
Moisture conditions : Dry	UTM coordinates: 355181 - 377639
Remarks :	

Horizon	Depth cm	Description
A	0-15	Red (2.5YR 4/6) (dry); siltloam; strong fine and medium granular structure; soft to slightly in dry and friable in moist, non sticky and non plastic in wet; ; medium porosity, common Voids fine and very fine in interstitial pores; common fine-medium roots; abrupt wavy boundary.
R	15-	Dominant limestone stones and boulders subrounded fresh-slightly weathered rocks.

HORIZON	A			
LOWER	15			
SAND %	38.6			
SILT %	46.0			
CLAY %	15.4			
TEXTURE CLASS	L			
C (%)	1.78			
N (%)	0.08			
P (ppm)	1.52			
pH	8.4			
EC (mS/cm)	0.1			
CEC (me/100g)	6.1			
Ca^{++}	22.13			
Mg^{++}	3.30			
K^{+}	0.32			
Na^{+}	0.05			
CaCO3 (%)	10.2			

SOIL PROFILE DESCRIPTION FOR PROFILE No. S118

Profile code : S 118	Date : 2007-03-16

Location : North Qansahdere	Coordinates : - 2º53'53" / - 43º01'44"
Authors : Musse Alim Shaie	Elevation : 423
WRB 98 classification : Epileptic Regosol (Aridic, Siltic)	Soil climate : Aridic aridic isohyperthermic
Land use : Animal husbandry	Topography : Almost flat
Vegetation : Deciduous shrub	Land form : Alluvial plain
Parent material : In situ weathered	Land element :
Effective soil depth: 50-100cm	Slope : 0.3 - 0.7%
Rock outcrops :	Micro topography : Level
Surface stoniness : Few	Drainage : Moderately well
Erosion :	Flood :
Moisture conditions : Dry	UTM coordinates: 280905 - 320505

Remarks :

Horizon	Depth cm	Description
A	0-10	Clark yellowish brown (10YR 3/6) (dry); siltloam; moderate fine and very fine granular structure; soft in dry; ; high porosity, many Voids fine and very fine in interstitial pores; common limestone medium and coarse subrounded fresh-slightly weathered rocks; few fine roots; abrupt smooth boundary.
Btir	10-30	Clark yellowish brown (10YR 3/6) (dry); siltloam; strong fine and very fine granular structure; few distinct clay-sesquioxides cutans on pedfaces Cutans; ; very high porosity, many Voids fine and very fine in interstitial pores; common limestone medium subrounded fresh-slightly weathered rocks; few fine roots; gradual wavy boundary.
R	30-	; abundant limestone extremely coarse subrounded fresh-slightly weathered rocks; very few very fine roots.

HORIZON	A	Btir		
LOWER	10	30		
SAND %	30.6	50.6		
SILT %	48.0	34.0		
CLAY %	21.4	15.4		
TEXTURE CLASS	L	L		
C (%)	0.75	0.56		
N (%)	0.08	0.07		
P (ppm)	17.34	3.79		
pH	7.28	7.71		
EC (mS/cm)	0.16	0.11		
CEC (me/100g)	3.67	3.90		
Ca^{++}	12.06	13.26		
Mg^{++}	2.76	2.88		
K^{+}	0.97	1.42		
Na^{+}	0.08	0.09		
CaCO3 (%)	0.7	0.3		

SOIL PROFILE DESCRIPTION FOR PROFILE No. S127

Profile code : S 127	Date : 2007-03-22

Location : River bank -North Bardera	Coordinates : - 2º20'52" / - 42º17'05"
Authors : Musse Alim Shaie	Elevation : 93 m
WRB 2006 classification : Haplic Fluvisol (Calcaric, Siltic)	Soil climate : Aridic aridic isohyperthermic
Land use : Annual field cropping	Topography : Gently undulating
Vegetation :	Land form : Alluvial plain
Parent material : Fluvial deposits	Land element : Flood plain
Effective soil depth: 100-150cm	Slope : 0.3 - 0.7%
Rock outcrops :	Micro topography : Low hummocks
Surface stoniness :	Drainage : Imperfect
Sealing/crusts : Strong sealing	Flood :
Moisture conditions : Dry	UTM coordinates: 197989 - 259808

Remarks :	This area has seasonal flooding problem and very common deposition of new material.

Horizon	Depth cm	Description
Ap	15-	Weak red (7.5R 5/4) (dry); sandy loam; single grain fine and very fine structure; soft in dry; .

HORIZON	Ap			

LOWER				
SAND %				
SILT %				
CLAY %				
TEXTURE CLASS				
C (%)				
N (%)				
P (ppm)				
pH				
EC (mS/cm)				
CEC (me/100g)				
Ca^{++}				
Mg^{++}				
K^{+}				
Na^{+}				
CaCO3 (%)				

SOIL PROFILE DESCRIPTION FOR PROFILE No. S201

Profile code : S 201	Date : 2007-03-04

Location : Dabanley near Libiga - Jowhar district	Coordinates : - 2º49'48" / - 45º29'21"
Authors : Mohhamed Farah Omar	Elevation : 105
WRB 2006 classification : Vertic Cambisol (Calcaric, Chromic)	Soil climate :
Land use : Agriculture	Topography : Almost flat
Vegetation : Herbaceous	Land form : Alluvial plain
Parent material : Alluvium	Land element :
Effective soil depth: 100-150cm	Slope : 0.7 - 2%
Rock outcrops :	Micro topography : Gilgai
Sealing/crusts : Slight sealing	Drainage : Moderately well
Moisture conditions : Dry	UTM coordinates: 554389 - 312815

Remarks :	There are fine cracks, low and fine salt cover and annual flooding risk on the surface of this soil.

Horizon	Depth cm	Description
Ap	0-30	Very dark grayish brown (10YR 3/2) (dry) and Dark brown (10YR 3/3) (moist); clayloam; moderate medium granular structure; common faint clay-sesquioxides cutans on pedfaces Cutans; ; low porosity, few Voids fine; common fine rounded rocks; few calcareous fine and siliceous; strongly calcareous; common fine roots; abrupt smooth boundary.
B1	30-70	Very dusky red (7.5R 2.5/3) (moist); clayloam; moderate fine subangular blocky structure; ; low porosity, common Voids fine-medium; common fine rounded rocks; strongly calcareous; common fine roots; clear smooth boundary.
B2	70-110	Very dusky red (7.5R 2.5/3) (moist); clayloam; moderate medium angular blocky structure; common faint clay-sesquioxides cutans on pedfaces Cutans; ; low porosity, few Voids fine in interstitial pores; common fine rounded rocks; dominant concretions calcareous fine; strongly calcareous; very few fine roots; clear smooth boundary.

BC	110-	Dusky red (7.5R 3/3) (moist); clay; moderate fine angular blocky structure; ; low porosity, few Voids fine in interstitial pores; common fine rounded rocks; dominant nodules calcareous; strongly calcareous.

HORIZON	Ap	B1	B2	Bc
LOWER	30	70	110	>110
SAND %	58.6	54.6	56.6	50.6
SILT %	26.0	32.0	24.0	28.0
CLAY %	15.4	13.4	19.4	21.4
TEXTURE CLASS	SL	SL	SL	L
C (%)	2.77	2.88	2.92	2.69
N (%)	0.09	0.07	0.06	0.06
P (ppm)	3.75	1.42	1.33	0.96
pH	8.69	8.68	8.53	8.29
EC (mS/cm)	1.63	1.63	0.47	0.01
CEC (me/100g)	6.96	6.72	31.15	54.46
Ca^{++}	14.60	16.10	15.41	16.20
Mg^{++}	3.13	3.14	3.87	5.11
K^{+}	0.47	0.28	0.21	0.16
Na^{+}	0.23	0.23	0.28	0.42
CaCO3 (%)	17.2	19.5	13.7	14.4

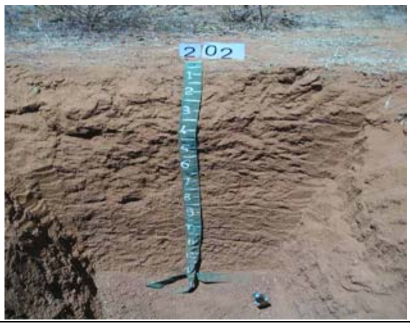
SOIL PROFILE DESCRIPTION FOR PROFILE No. S202

Profile code : S 202	Date : 2007-03-05
Location : Ali Fooldheere -Jowhar district	Coordinates : - 3º02'33" / - 45º38'01"
Authors : Mohhamed Farah Omar	Elevation : 131
WRB 2006 classification : Haplic Calcisol (Aridic, Arenic, Chromic)	Soil climate : Ustic ustic hyperthermic
Land use : Agriculture	Topography : Almost flat
Vegetation : Herbaceous	Land form : Alluvial plain
Parent material : Alluvium	Land element : Flood plain
Effective soil depth: 100-150cm	Slope : 2 - 8%
Rock outcrops :	Micro topography : Animal tracks
Erosion : Sheet erosion slight	Drainage : Moderately well
Sealing/crusts : Slight sealing	Flood :
Moisture conditions : Dry	UTM coordinates: 570422 - 336304.
Remarks : There are fine cracks on th soil surface.	

Horizon	Depth cm	Description
Ap	0-30	Dark reddish brown (5YR 3/4) (dry) and Reddish brown (5YR 4/4) (moist); clay; weak medium angular blocky structure; ; few Voids fine; abundant fine rounded rocks; common nodules calcareous fine; strongly calcareous; common very fine roots; clear smooth boundary.

A2	30-65	Dark reddish brown (5YR 3/3) (dry) and Reddish brown (5YR 4/4) (moist); clayloam; moderate fine subangular blocky structure; ; few Voids fine; common fine rounded rocks; common nodules calcareous fine; strongly calcareous; common very fine roots; clear smooth boundary.
B1	65-85	Dark reddish brown (5YR 3/3) (dry) and Dark reddish brown (5YR 3/4) (moist); clayloam; moderate fine subangular blocky structure; ; very few Voids fine; abundant fine rounded rocks; common nodules calcareous fine; extremely calcareous; common very fine roots; clear boundary.
B2	85-100	Dark reddish brown (5YR 3/3) (dry) and Dark reddish brown (5YR 3/4) (moist); clayloam; moderate fine subangular blocky structure; ; few Voids fine; many fine rounded rocks; common nodules calcareous fine; extremely calcareous; few very fine roots; clear smooth boundary.
C	100-135	Dark reddish brown (5YR 3/3) (dry) and Yellowish red (5YR 4/6) (moist); clayloam; moderate fine subangular blocky structure; ; few Voids fine; abundant fine rounded rocks; common nodules calcareous fine; extremely calcareous; few very fine roots.

HORIZON	Ap	A2	B1	B2	C
LOWER	30	65	85	100	>100
SAND %	58.6	56.6	54.6	60.6	58.6
SILT %	20.0	32.0	26.0	22.0	24.0
CLAY %	21.4	11.4	19.4	17.4	17.4
TEXTURE CLASS	SCL	SL	SL	SL	SL
C (%)	1.52	1.14	1.85	2.22	2.83
N (%)	0.09	0.08	0.07	0.07	0.06
P (ppm)	5.68	1.94	2.68	4.93	4.24
pH	8.40	8.45	8.44	8.44	8.41
EC (mS/cm)	0.02	0.02	0.06	0.07	0.08
CEC (me/100g)	3.69	4.53	4.75	9.90	5.20
Ca^{++}	12.47	10.68	15.61	15.85	14.49
Mg^{++}	2.92	3.63	5.25	5.19	5.27
K^{+}	0.42	0.30	0.31	0.12	0.04
Na^{+}	0.14	0.11	0.88	1.55	3.09
CaCO3 (%)	7.9	6.6	12.9	15.9	21.1



Appendix 2: Historical soil profile data

ID	STUDY	X	Y	DATE	GEOMORPHOLOGY	ORIGINAL_CLASS	WRB2006
H19	AFGOI_MORDILE	527333.13	255174.6	24/01/1968	Flat and level	Udic Chromustert	Haplic Vertisol (Calcaric, Chromic)
H22	AFGOI_MORDILE	533324.52	256711	24/01/1968	Flat and level	Udic Chromustert	Haplic Vertisol (Bathysalic, Chromic)
H24	AFGOI_MORDILE	527945.03	255924.6	31/01/1968	Uneven, eroded levee	Typic Ustorthent	Salic Fluvisol (Calcaric)
H25	AFGOI_MORDILE	527703.51	256495	31/01/1968	Flat and level	Udorthentic Chromustert	Haplic Vertisol (Bathysalic, Calcaric)
H26	AFGOI_MORDILE	527332.66	257876.6	31/01/1968	Slight depression	Udic Chromustert	Haplic Vertisol (Calcaric, Chromic)
H27	AFGOI_MORDILE	490732.69	221061.2	03/02/1968	Flat and level	Udorthentic Pellustert	Stagnic Vertisol (Gypsiric, Calcaric, Hyposalic)
H29	AFGOI_MORDILE	490887	230947	03/02/1968	Flat and level	Udic Chromustert	Haplic Vertisol (Calcaric, Chromic)
H31	AFGOI_MORDILE	491868	222193.4	05/02/068	Flat and level to slightly depressional	Udic Chromustert	Haplic Vertisol (Calcaric, Chromic)
H60	AFGOI_MORDILE	502409.4	228276.3	27/02/1968	Flat and level in slight depression	Udorthentic Chromustert	Stagnic Vertisol (Gypsiric, Calcaric, Hyposalic)
H61	AFGOI_MORDILE	502872.76	227508.7	27/02/1968	Flat and gently sloping on old river levee	Typic Ustorthent	Haplic Fluvisol (Siltic)
H91	AFGOI_MORDILE	533262.75	256711	05/03/1968	Flat and level on eroded levee	Typic Ustorthent	Haplic Fluvisol (Arenic)
H98	AFGOI_MORDILE	532737.39	258215.3	05/03/1968	Flat and very gently sloping	Udic Chromustert	Haplic Vertisol (Calcaric, Chromic)
H148	AFGOI_MORDILE	536690.45	258953.1	16/03/1968	slight depression	Udorthentic Pellustert	Stagnic Vertisol (Calcaric)
H183	AFGOI_MORDILE	540547.65	271634.8	25/03/1968	Flat and level	Udorthentic Chromustert	Haplic Vertisol (Gypsiric, Calcaric, Hyposalic)
H186	AFGOI_MORDILE	540887.03	272801.6	25/03/1968	Flat and level in slight depression	Udic Chromustert	Haplic Vertisol (Gypsiric, Calcaric, Hyposalic)
H192	AFGOI_MORDILE	538355.59	269423.5	26/03/1968	Flat and level	Udorthentic Chromustert	Haplic Vertisol (Gypsiric, Calcaric, Hyposalic)
H195	AFGOI_MORDILE	535761.67	268563.2	26/03/1968	Flat and very gently sloping	Udorthentic Chromustert	Haplic Vertisol (Gypsiric, Calcaric, Hyposalic)
H251	AFGOI_MORDILE	506795.66	230609.8	20/04/1968	Flat and level	Udic Chromustert	Haplic Vertisol (Calcaric)
H255	AFGOI_MORDILE	506085.18	231408.1	20/04/1968	Slightly uneven	Udic Chromustert	Haplic Vertisol (Bathysalic, Gypsiric, Calcaric)
H268	AFGOI_MORDILE	511446	232912	07/05/1968	Flat and level	Udic Chromustert	Haplic Vertisol (Calcaric)
H270	AFGOI_MORDILE	502162.25	231223.8	07/05/1968	Flat and very gently sloping	Udic Chromustert	Haplic Vertisol (Gypsiric, Calcaric)
H347	AFGOI_MORDILE	518934	239944	09/06/1968	Flat and level	Udic Chromustert	Haplic Vertisol (Calcaric, Chromic)
1	MUSSE_THESIS	537587.5	253119.6	16/07/1985	Recent alluvial floodplain	Entic Chromustert	Haplic Vertisol (Calcaric, Chromic)
2	MUSSE_THESIS	538853.96	252536.5	16/07/1985	Recent alluvial floodplain	Udic Chromustert	Fluvic Vertic Cambisol (Calcaric)
3	MUSSE_THESIS	533881.08	253763.5	18/07/1985	Levee of old alluvial plain	Typic Ustifluvents	Haplic Fluvisol (Calcaric)
4	MUSSE_THESIS	534870.66	248022.2	18/07/1985	Recent alluvial floodplain	Entic Chromustert	Haplic Vertisol (Calcaric, Chromic)
5	MUSSE_THESIS	530516.12	245534.3	21/07/1985	Recent alluvial floodplain	Typic Ustifluvents	Haplic Fluvisol (Calcaric, Clayic)
6	MUSSE_THESIS	539133.25	247071.3	21/07/1985	Recent alluvial floodplain	Typic Salorthids	Vertic Solonchaks (Calcaric)
7	MUSSE_THESIS	531906.15	244920.5	22/07/1985	Recent alluvial floodplain	Typic Ustifluvents	Haplic Fluvisol (Calcaric, Clayic)
8	MUSSE_THESIS	535057.34	241605.1	24/07/1985	Older alluvial flood plain	Udic Chromustert	Grumic Vertisol (Calcaric)
9	MUSSE_THESIS	532864.13	242495.1	24/07/1985	Older alluvial flood plain	Udic Chromustert	Grumic Vertisol (Calcaric)
10	MUSSE_THESIS	537064.32	244921.6	30/07/1985	Recent alluvial floodplain	Aquollic Salorthids	Stagnic Solonchaks (Sodic, Calcaric)

11	MUSSE_THESIS	544138	243142.5	31/07/1985	Recent alluvial floodplain	Udic Chromustert	Stagnic Vertisol (Hyposalic, Calcaric)
12	MUSSE_THESIS	544107.92	240072.1	01/08/1985	Recent alluvial floodplain	Udic Chromustert	Haplic Vertisol (Gypsiric, Calcaric, Chromic)
13	MUSSE_THESIS	540493.12	243632.8	01/08/1985	Recent alluvial floodplain	Typic Ustifluvents	Calcic Fluvisol (Calcaric)
14	MUSSE_THESIS	533297.55	237490.5	05/08/1985	Levee of old alluvial plain	Typic Ustifluvents	Calcic Fluvisol (Calcaric)
15	MUSSE_THESIS	535027.13	238350.5	05/05/1985	Older alluvial flood plain	Typic Gysiorthid	Haplic Gypsisol (Calcaric)
16	MUSSE_THESIS	539629.49	238505	07/08/1985	Levee of older alluvial floodplain	Typic Ustifluvents	Haplic Fluvisol (Calcaric, Siltic)
17	MUSSE_THESIS	531907.13	239793	05/08/1985	Older alluvial flood plain	Entic Chromustert	Haplic Vertisol (Calcaric, Chromic)
18	MUSSE_THESIS	530362.38	241727	05/08/1985	Recent alluvial floodplain	Typic Ustifluvents	Haplic Fluvisol (Calcaric, Clayic)
19	MUSSE_THESIS	541357.38	246027.9	08/08/1985	Levee of older alluvial floodplain	Typic Ustifluvents	Haplic Fluvisol (Calcaric, Clayic)
20	MUSSE_THESIS	542160.89	244278	08/08/1985	Recent alluvial floodplain	Udic Chromustert	Stagnic Vertisol (Gypsiric, Calcaric)
21	MUSSE_THESIS	543117.4	248116.2	08/08/1985	Recent alluvial floodplain	Udic Chromustert	Stagnic Vertisol (Calcaric)
22	MUSSE_THESIS	540461.5	246641.8	13/08/1985	Recent alluvial floodplain	Typic Ustifluvents	Haplic Fluvisol (Calcaric)
23	MUSSE_THESIS	540367.91	250356.9	13/08/1985	Recent alluvial floodplain	Udic Chromustert	Stagnic Vertisol (Calcaric, Chromic)
24	MUSSE_THESIS	539874.03	249128.6	13/08/1985	Recent alluvial floodplain	Entic Chromustert	Stagnic Vertisol (Calcaric, Chromic)
25	MUSSE_THESIS	540183.22	247839.2	13/08/1985	Recent alluvial floodplain	Udic Chromustert	Stagnic Vertisol (Calcaric, Chromic)
26	MUSSE_THESIS	541170.03	253980.2	15/08/1985	Flat depression	Entic Chromustert	Stagnic Vertisol (Calcaric, Chromic)
R10	GENALE_BULO	449951	202645	14/071977	Old flood plain	Chromic Vertisol	Haplic Vertisol (Bathygypsic, Calcaric)
R20	GENALE_BULO	457361	178694	18/07/1977	Meander flood plain	Vertic Cambisol	Haplic Fluvisol (Calcaric, Clayic)
R22	GENALE_BULO	388768	187930	18/07/1985	Levee of old alluvial plain	Chromic Vertisol	Salic Vertisol (Bathygypsic, Calcaric, Chromic)
R37	GENALE_BULO	448095	193434	18/08/1977	Flood plain	Vertic Cambisol	Endosalic Vertic Cambisol (Calcaric)
R18	GENALE_BULO	448093	187907	13/07/1977	Channel remnant	Vertic Cambisol	Vertic Cambisol (Bathygypsic, Calcaric)
R63	GENALE_BULO	449949	195276	31/10/1977	Flood plain	Chromic Vertisol	Haplic Vertisol (Calcaric, Chromic)
R17	GENALE_BULO	449948	193434	13/07/1977	Recent flood plain	Chromic Vertisol	Stagnic Vertisol (Calcaric, Chromic)
R14	GENALE_BULO	457362	187905	12/07/1977	Flood plain	Chromic Vertisol	Haplic Vertisol (Calcaric, Chromic)
R33	GENALE_BULO	459217	193432	14/08/1977	Recent flood plain	Chromic Vertisol	Haplic Vertisol (Calcaric, Chromic)
R28	GENALE_BULO	448091	176854	01/08/1977	Levee of channel remnant	Eutric Cambisol	Haplic Fluvisol (Calcaric, Siltic)
R40	GENALE_BULO	449948	193434	24/08/1977	Levee of channel remnant	Eutric Cambisol	Haplic Fluvisol (Calcaric, Clayic)
R47	GENALE_BULO	466633	197115	21/09/1977	Meander flood plain	Vertic Cambisol	Stagnic Fluvisol (Bathygypsic, Calcaric, Clayic)
PG01	DARA_SALAAM	478127.89	210500.4	26/031987	Main floodplain	Chromic Vertisol	Haplic Vertisol (Calcaric, Eutric, Chromic)
PG02	DARA_SALAAM	470311.05	204575.6	27/03/1987	Main floodplain	Chromic Vertisol	Mazic Vertisol (Bathygypsic, Calcaric, Eutric)
PG03	DARA_SALAAM	472937.03	204452.5	27/03/1987	Main floodplain	Chromic Vertisol	Mazic Vertisol (Bathygypsic, Calcaric, Eutric)
PG04	DARA_SALAAM	479301.45	207092.2	27/03/1987	Main floodplain	Chromic Vertisol	Mazic Vertisol (Calcaric, Eutric)
PG05	DARA_SALAAM	476150.03	204759.1	28/03/1987	Broad low convex ridge-levee	Calcaric Fluvisol	Haplic Fluvisol (Calcaric, Aridic, Arenic)
PG06	DARA_SALAAM	480011.64	203499.8	28/03/1987	Main floodplain	Chromic Vertisol	Haplic Vertisol (Calcaric, Eutric)

PG07	DARA_SALAAM	474667.7	209149.8	29/03/1987	Main floodplain	Chromic Vertisol	Haplic Vertisol (Calcaric, Eutric)
PG08	DARA_SALAAM	474759.32	200921.3	29/03/1987	Main floodplain	Chromic Vertisol	Haplic Vertisol (Bathygypsic, Calcaric, Eutric)
PG09	DARA_SALAAM	479177.68	205188.6	30/03/1987	Main floodplain	Chromic Vertisol	Haplic Vertisol (Calcaric, Eutric)
PG10	DARA_SALAAM	490392.31	209639.7	30/03/1987	Main floodplain near costal dunes	Chromic Vertisol	Grumic Vertisol (Calcaric, Eutric)
PM3	Gedo	227690.78	426676.1	01/08/1980	Clayey channel fill of former Juba Floodplain	Chromic Vertisol	Salic Vertisol (Bathygypsic, Calcaric, Chromic)
PM4	Gedo	226977.79	425633.2	01/08/1980	Medium textured alluvium of sand bar/levee	Calcic Cambisol	Fluvic Cambisol (Bathysalic, Calcaric, Chromic)
PM5	Gedo	227692.47	427260	03/08/1980	Medium textured alluvium of sand bar/levee	Calcic Cambisol	Fluvic Cambisol (Calcaric, Chromic)
PM6	Gedo	226462.46	428892.4	09/08/1980	Clayey channel fill of former Juba Floodplain	Chromic Vertisol	Salic Vertisol (Bathygypsic, Calcaric, Chromic)
M6	Gedo	227226.16	426124.2	03/08/1980	Clayey channel fill of old Juba Floodplain	Chromic Vertisol	Gypsic Duric Vertisol (Calcaric, Chromic)
M19	Gedo	227139.24	428091.4	05/08/1980	Clayey channel fill of old Juba Floodplain	Chromic Vertisol	Haplic Vertisol (Hyposalic, Calcaric, Chromic)
M20	Gedo	227354.07	427660.5	05/08/1980	Clayey channel fill of old Juba Floodplain	Chromic Vertisol	Haplic Vertisol (Hyposalic, Calcaric, Chromic)
PM2	Jalalagsie_Jowhar	565240.17	358754.2	01/08/1980	Alluvium of old Shabelle cover plain	Calcic Cambisol	Fluvic Cambisol (Calcaric, Chromic)
PM8	Jalalagsie_Jowhar	565825.61	360351.2	21/08/1980	Alluvium of old Shabelle cover plain	Calcic Cambisol	Fluvic Cambisol (Calcaric, Chromic)
PM15	Jalalagsie_Jowhar	562740.03	359305.5	24/08/1980	Alluvium of former Shabelle cover plain	Calcic Cambisol	Fluvic Cambisol (Calcaric, Chromic)
M4	Jalalagsie_Jowhar	565179.01	357771.6	01/07/1980	Old cover plain Alluvium	Calcic Cambisol	Fluvic Cambisol (Calcaric, Chromic)
PM11	Jalalagsie_Jowhar	565424.82	359644.7	25/08/1980	Alluvium of old Shabelle cover plain	Calcic Cambisol	Fluvic Cambisol (Calcaric, Chromic)
PM1	Jalalagsie_Jowhar	565978.19	363268.3	01/08/1980	Old cover plain Alluvium of Shabelle	Calcic Cambisol	Fluvic Cambisol (Bathygypsic, Calcaric, Chromic)
PM7	Jalalagsie_Jowhar	565825.01	361364.5	21/08/1980	Alluvium of old Shabelle cover plain	Calcic Cambisol	Fluvic Cambisol (Bathygypsic, Calcaric, Chromic)
PM12	Jalalagsie_Jowhar	564067.06	359367.6	25/08/1980	Old Alluvium of Shabelle coverplain	Calcic Cambisol	Endosalic Fluvic Cambisol (Bathygypsic, Calcaric)
M45	Jalalagsie_Jowhar	563140.56	360503.2	18/08/1980	Old Alluvium of Shabelle coverplain	Calcic Cambisol	Fluvic Cambisol (Bathygypsic, Calcaric, Chromic)
PM16	Jalalagsie_Jowhar	564899.26	361210.4	24/08/1980	Old Alluvium of Shabelle coverplain	Chromic Vertisol	Haplic Vertisol (Bathygypsic, Calcaric, Chromic)
M76	Jalalagsie_Jowhar	562152.28	361792.3	20/08/1980	Clayey coverplain	Pellic Vertisol	Haplic Vertisol (Calcaric)
A301	HOMBOY	260056	34288	10/02/1979	Crest of levee	Calcaric Fluvisol	Haplic Fluvisol (Calcaric, Siltic)
C239	HOMBOY	262903	39603	16/02/1979	Low levee	Calcaric Fluvisol	Fluvic Vertic Cambisol (Calcaric, Clayic)
A364	HOMBOY	262749	42675	21/02/1979	Flat cover floodplain	Calcaric Fluvisol	Stagnic Gleyic Vertisol (Calcaric)
C038	HOMBOY	266183	45931	21/01/1979	Almost flat on cover floodplain near levee	Calcaric Fluvisol	Calcic Vertisol (Calcaric)
A379	HOMBOY	266339	50355	27/02/1979	Flat cover floodplain	Chromic Vertisol	Haplic Vertisol (Calcaric)
A300	HOMBOY	265843	47375	06/02/1979	Cover floodplain to western depression	Chromic Vertisol	Haplic Vertisol (Calcaric)
A377	HOMBOY	257797	30878	27/02/1979	Shallow depression	Chromic Vertisol	Mazic Vertisol (Calcaric, Eutric)
C009	HOMBOY	263430	45195	15/01/1979	Western depression on Shabelle floodplain	Chromic Vertisol	Grumic Vertisol (Calcaric, Eutric)

C238	HOMBOY	259469	39358	10/021979	Broad flat floored depression	Pellic Vertisol	Stagnic Vertisol (Calcaric, Pellic)
C178	HOMBOY	269492	46453	04/02/1979	Flat in large depression	Pellic Vertisol	Gleyic Vertisol (Calcaric, Pellic)
C263	HOMBOY	260580	28082	22/02/1979	Large flat depression	Pellic Vertisol	Stagnic Gleyic Vertisol (Calcaric, Pellic)
C287	HOMBOY	256962	31401	27/02/1979	Broad flat levee	Calcaric Fluvisol	Fluvic Vertic Cambisol (Calcaric, Clayic)
A302	HOMBOY	261046	38405	10/02/1979	On crest of levee	Calcaric Fluvisol	Fluvic Vertic Cambisol (Calcaric, Clayic)
C035	HOMBOY	267203	45409	21/01/1979	Flat cover floodplain, near margin of low levee	Calcaric Fluvisol	Fluvic Vertic Cambisol (Calcaric, Clayic)
A337	HOMBOY	262377	41170	16/02/1979	Flat cover floodplain	Chromite Vertisol	Haplic Vertisol (Calcaric)
A416	HOMBOY	265813	49434	06/03/1979	Cover floodplain	Chromic Vertisol	Grumic Vertisol (Calcaric)
C288	HOMBOY	267174	49925	27/02/1979	Small depressions	Chromic Vertisol	Haplic Vertisol (Calcaric)
A299	HOMBOY	264884	47775	05/02/1979	Broad depression along west side of floodplain	Pellic Vertisol	Stagnic Vertisol (Calcaric, Pellic)
A378	HOMBOY	261821	43198	27/02/1979	Lower slope site in western depression area	Pellic Vertisol	Mazic Vertisol (Calcaric)
C237	HOMBOY	260984	37361	10/02/1979	Raised terrace area	Calcaric Regosol	Fluvic Vertic Cambisol (Calcaric)
C286	HOMBOY	262251	28297	27/02/1979	Old meander complex	Calcaric Regosol	Fluvic Vertic Cambisol (Calcaric)
C240	HOMBOY	264975	41384	16/02/17979	Shallow depression	Calcaric Fluvisol	Fluvic Vertic Cambisol (Calcaric, Clayic)
G5	JOWHAR	555388.74	305291.8	06/09/1975	Near crest of main levee of Shabelle river	Eutric Cambisol	Haplic Cambisol (Eutric, Siltic)
G4	JOWHAR	562458.27	307260.1	03/09/1975	Level floodplain of Shabelle River	Chromic Vertisol	Haplic Vertisol (Calcaric, Chromic)
G7	JOWHAR	560977.87	303789.7	12/09/1975	Level floodplain of Shabelle River	Chromic Vertisol	Haplic Vertisol (Calcaric, Chromic)
G1	JOWHAR	558600.92	302683.3	29/08/1975	Floodplain of Shabelle River	Gleyic Cambisol/Chromic Vertisol	Endogleyic Cambisol (Clayic)/Haplic Vertisol (Calcaric, Chromic)
PM11	FARJANO	375576.32	131832.5	19/01/1985	Lower coverplain	Chromic Vertisol	Grumic Vertisol (Calcaric)
M227	FARJANO	358606.19	130457.9	03/02/1985	Lower coverplain	Chromic Vertisol	Haplic Vertisol (Gypsiric, Calcaric, Bathysalic)
PM2	FARJANO	366797.94	131590.6	06/02/1985	Old channel	Chromic Vertisol	Calcic Stagnic Vertisol (Calcaric)
PM5	FARJANO	366951.86	130116.4	09/01/1985	Old channel	Chromic Vertisol	Grumic Stagnic Vertisol (Bathygypsic, Calcaric)
PM32	FARJANO	365687.07	135829	04/02/1985	Old channel	Vertic Cambisol	Stagnic Vertic Cambisol (Calcaric)
PM25	FARJANO	368376.04	135490	29/01/1985	Lower coverplain	Pellic Vertisol	Stagnic Vertisol (Calcaric)
PM19	FARJANO	364944.82	134908	24/01/1985	Lower coverplain	Chromic Vertisol	Calcic Stagnic Vertisol (Bathygypsic)
PM34	FARJANO	361450.28	131132.3	12/02/1985	Lower coverplain	Chromic Vertisol	Stagnic Vertisol (Bathygypsic, Calcaric)
PM21	FARJANO	381881.26	130693.8	26/01/1985	Upper coverplain	Calcic Cambisol	Vertic Cambisol (Calcaric)
M257	FARJANO	375203.15	126151.6	05/02/1985	Levee/Upper coverplain	Calcaric Fluvisol	Haplic Fluvisol (Calcaric)
M258	FARJANO	365316.84	137333.9	09/02/1985	Upper coverplain	Vertic Cambisol	Endosalic Vertic Cambisol (Calcaric)
PM8	FARJANO	365437.37	130362.8	12/01/1985	Sandy terrace	Calcic Luvisol	Haplic Fluvisol (Bathycalcaric, Aridic)
M45	FARJANO	363735.99	127323.2	09/01/1985	Active swamp	Gleyic Fluvisol	Haplic Greysol (Calcaric)
PM10	FARJANO	369642.73	133626.3	14/021985	Upper coverplain	Vertic Cambisol	Fluvic Vertic Cambisol (Calcaric)

PM20	FARJANO	365173.79	134352.6	24/01/1984	Lower coverplain	Chromic Vertisol	Calcic Stagnic Vertisol (Calcaric)
A031	FANOOLE	252729.82	72495.24	14/08/1978	Marine plain (MP)	Chromic Vertisol	Stagnic Vertisol (Calcaric, Hyposalic)
A032	FANOOLE	253245.76	72997.95	15/08/1978	Marine plain (MP)	Chromic Vertisol	Stagnic Vertisol (Calcaric, Hyposalic)
A058	FANOOLE	264427.25	43227.09	21/081978	Shabelle backslope and cover floodplain (Sb)	Calcaric Fluvisol	Stagnic Salic Fluvisol (Calcaric)
A059	FANOOLE	262215.15	55654.48	25/08/1978	Marine plain (MP)	Chromic Vertisol	Stagnic Vertisol (Hyposalic)
A076	FANOOLE	259860.35	55601.56	27/08/1978	Marine plain depression (MPd)	Pellic and Chromic Vertisol	Haplic Vertisol (Calcaric)
A077	FANOOLE	266937.97	52241.35	27/08/1978	Beach remnant (BR)	Eutric Regosols	Haplic Regosol (Calcaric)
A078	FANOOLE	267189.33	52598.53	27/08/1978	Shabelle depressions and backswamps (Sd1)	Pellic and Chromic Vertisol	Stagnic Vertisol (Calcaric)
A103	FANOOLE	274055.28	50402.49	14/09/1978	Marine plain (MP)	Chromic Vertisol	Salic Vertisol (Calcaric)
A104	FANOOLE	276158.72	53365.83	14/09/1978	Marine plain (MP)	Chromic Vertisol	Haplic Vertisol (Calcaric)
A105	FANOOLE	256976.39	55032.71	14/09/1978	Beach remnant/Marine plain transitional (BM)	Eutric Regosols/Chromic Vertisol	Stagnic Fluvisol (Bathycalcaric)
B157	FANOOLE	257442.26	50262.32	15/09/1978	Marine plain (MP)	Chromic Vertisol	Stagnic Salic Vertisol (Calcaric)
B158	FANOOLE	254171.8	65166.27	15/09/1978	Marine plain (MP)	Chromic Vertisol	Stagnic Vertisol (Calcaric)
B159	FANOOLE	248628.77	62295.53	15/09/1978	Juba depressions and backswamp (Jd)	Chromic and Pellic Vertisols	Stagnic Vertisol (Bathysalic, Bathycalcaric)
B160	FANOOLE	254013.05	65602.83	15/09/1978	Marine plain depression (MPd)	Pellic and Chromic Vertisol	Stagnic Vertisol (Bathysalic, Bathycalcaric)
D008	MOGAMBO	242514.6	18774.81		Levee area in meander complex	Calcaric Fluvisols	Calcic Fluvisol (Clayic)
D012	MOGAMBO	245175.11	19819.23		Slightly undulating plain	Chromic and Pellic Vertisols	Stagnic Vertisol (Bathygypsic, Calcaric)
G052	MOGAMBO	243009.14	14810.85		Broad flat plain between levee courses	Chromic and Pellic Vertisols	Stagnic Vertisol (Bathygypsic, Calcaric)
G059	MOGAMBO	237966.14	7559.31		Shallow depression alongside marine plain	Chromic and Pellic Vertisols	Calcic Stagnic Vertisol (Calcaric)
G137	MOGAMBO	239791.26	5346.766		Broad flat depression in meander complex	Chromic Vertisols	Calcic Stagnic Vertisol (Calcaric)
G138	MOGAMBO	238244.47	5254.633		Depressional area	Chromic and Pellic Vertisols	Stagnic Vertisol (Calcaric, Pellic)
G140	MOGAMBO	240904.91	4486.334		Flat level plain	Chromic and Pellic Vertisols	Calcic Vertisol (Calcaric)
G141	MOGAMBO	241400.66	16285.96		Flat plain	Chromic and Pellic Vertisols	Calcic Stagnic Vertisol (Bathygypsic, Calcaric)
T008	MOGAMBO	240875.18	19911.95		Flat plain	Chromic and Pellic Vertisols	Calcic Stagnic Vertisol (Calcaric)
T009	MOGAMBO	243628.37	19665.78		Old levee slightly undulating	Calcaric Fluvisols	Haplic Fluvisol (Calcaric, Clayic)
T020	MOGAMBO	244308.77	18313.68		Flat level plain	Chromic and Pellic Vertisols	Haplic Vertisol (Calcaric, Hyposalic)
T021	MOGAMBO	241679.24	17791.61		Lower slope of levee into basin unit	Calcaric Fluvisols	Stagnic Fluvisol (Calcaric, Clayic)
T024	MOGAMBO	240410.8	16962.09		Site between levees of old meander complex	Calcaric Fluvisols	Haplic Fluvisol (Episalic, Calcaric)

TO27	MOGAMBO	242916.23	13673.93		Very low levee formation	Calcaric Fluvisols	Haplic Fluvisol (Bathysalic, Calcaric, Clayic)
T028	MOGAMBO	238121.33	14596.21		Terrace on marine plain	Pellic and Chromic Vertisol	Haplic Vertisol (Bathygypsic, Hyposalic, Calcaric)
T029	MOGAMBO	240565.26	14749.63		Flat plain	Chromic and Pellic Vertisols	Calcic Vertisol (Bathygypsic, Bathysalic, Manganesic)
T031	MOGAMBO	241338.72	15609.94		Depressional site in meander complex	Calcaric Fluvisols	Salic Fluvisol (Bathygypsic, Calcaric)
T032	MOGAMBO	237564.3	12568.15		Weakly undulating degraded aeolian dune field	Eutric Regosols	Endosalic Arenosol (Bathycalcaric)
T075	MOGAMBO	238306.54	9464.481		Flat depression in meander complex	Chromic and Pellic Vertisols	Stagnic Vertisol (Bathygypsic, Calcaric)
T076	MOGAMBO	239358.36	9464.416		Very weakly undulating, depressional site	Chromic and Pellic Vertisols	Calcic Vertisol (Bathygypsic, Calcaric)
T077	MOGAMBO	240317.36	9495.086		Levee on western edge of meander complex	Calcaric Fluvisols	Haplic Fluvisol (Bathygypsic, Calcaric)
T078	MOGAMBO	241245.42	9464.301		Low levee area, nearly flat, sloping to north	Calcaric Fluvisols	Haplic Fluvisol (Bathysalic, Calcaric)
T079	MOGAMBO	239543.92	8573.276		Flat level plain	Chromic and Pellic Vertisols	Haplic Vertisol (Calcaric)
T080	MOGAMBO	239543.92	8511.861		Alluvial terrace on marine plain outlier	Chromic Vertisols	Salic Vertisol (Bathygypsic, Calcaric)
T81	MOGAMBO	237935.26	8542.636		Broad flat depression at foot of marine plain	Chromic and Pellic Vertisols	Stagnic Vertisol (Bathygypsic, Calcaric)
T135	MOGAMBO	240441.19	10754.94		Levee site within meander complex	Calcaric Fluvisols	Haplic Fluvisol (Calcaric)
T136	MOGAMBO	239389.44	11553.96		Depressional area in meander complex	Chromic Vertisols	Haplic Vertisol (Calcaric)
T137	MOGAMBO	238244.81	11523.32		Levee terrace between	Chromic and Pellic Vertisols	Haplic Vertisol (Bathygypsic, Calcaric)
T139	MOGAMBO	243720.82	16592.99		Flat level plain	Chromic and Pellic Vertisols	Haplic Vertisol (Bathygypsic, Calcaric)
T191	MOGAMBO	238863.16	4363.479		Levee adjacent to marine plain	Calcaric Fluvisols	Calcic Fluvisol (Calcaric, Clayic)
T252	MOGAMBO	244401.42	16992.38		Recent levee formation	Calcaric Fluvisols	Calcic Fluvisol (Thaptoclayic, Calcaric)
T255	MOGAMBO	242235.66	13643.26		Upper part of old levee slope	Calcaric Fluvisols	Stagnic Fluvisol (Thaptoclayic)

Appendix 3: Soil analytical data for historical and current soil profiles

PROFILE	HORIZON	DEPTH	PH	EC mS/cm	Ca++	Mg++	Na+	K+	CECmeq/100g	P_ppm	SAND%	SILT%	CLAY%	TEXTURE	N_%	C_%	CaCO3_%	GYPSUM_%	ESP	Ca/Mg
100	A1	0-20	8.5	0.6	26.91	4.63	0.04	0.65	7.4	1.41	34.6	36.0	29.4	CL	0.08	1.81	21.2	0	0.59	5.82
100	BT1	20-45	8.0	0.2	30.70	5.84	0.38	0.33	7.6	6.73	14.6	44.0	41.4	SiC	0.07	1.52	21.2	0	4.95	5.26
100	BT2	90	8.1	0.2	28.67	5.30	0.50	0.27	8.0	1.26	28.6	32.0	39.4	CL	0.06	1.35	22.9	0	6.26	5.41
102	A	15	8.7	0.1	19.33	2.74	0.04	1.03	6.9	7.91	36.6	32.0	31.4	CL	0.05	0.74	27.2	0	0.60	7.07
102	AC	25	8.6	0.1	21.81	2.72	0.04	0.95	3.7	4.82	38.6	30.0	31.4	CL	0.07	0.83	21.3	0	1.20	8.02
104	A	10	8.5	0.1	18.47	2.53	0.00	0.52	6.5	4.73	38.6	36.0	25.4	L	0.12	1.92	24.1	0	0.00	7.31
105	AP	15	8.6	0.1	37.27	6.20	0.99	0.46	5.4	3.32	26.6	50.0	23.4	SiL	0.07	0.42	18.3	0	18.33	6.02
105	A1	35	8.8	0.1	30.15	8.11	1.71	0.30	9.9	1.90	18.6	40.0	41.4	C	0.06	0.39	18.4	0.07	17.28	3.72
105	A2	60	9.1	0.1	21.89	5.94	3.96	0.26	10.8	2.48	26.6	32.0	41.4	C	0.05	0.36	16.8	0.07	36.61	3.68
105	BTK	95	9.1	0.1	24.22	6.99	5.07	0.23	8.7	2.45	20.6	34.0	45.4	C	0.06	0.39	16.9	0	58.61	3.46
108	A	15	8.4	0.1	22.13	3.30	0.05	0.32	6.1	1.52	38.6	46.0	15.4	L	0.08	0.50	10.2	0	0.76	6.71
109	A	10	8.6	0.1	11.19	1.57	0.05	0.66	2.2	3.45	48.6	30.0	21.4	L	0.11	1.86	33.9	0	2.38	7.13
110	A1	bt	8.9	0.1	37.16	10.56	2.80	0.18	53.9	0.87	32.6	26.0	41.4	C	0.07	0.47	13.0	0.09	5.19	3.52
110	AP	10	8.7	0.1	37.59	9.44	0.91	0.27	10.6	0.99	38.6	34.0	27.4	CL	0.07	0.51	9.0	0.03	8.58	3.98
110	C	>90	8.8	0.2	29.29	11.38	9.26	0.13	53.3	0.47	18.6	40.0	41.4	C	0.07	0.42	11.3	0.16	17.39	2.57
110	BT	90	9.0	0.1	29.51	11.38	6.89	0.11	58.3	0.48	24.6	22.0	53.4	C	0.07	0.46	8.0	0.20	11.82	2.59
112	A	5	8.5	0.1	19.74	3.66	0.00	0.63	4.3	3.78	22.6	48.0	29.4	CL	0.15	2.72	18.6	0	0.00	5.39
113	AP	5	8.6	0.1	37.63	7.61	0.77	0.39	10.8	1.56	30.6	34.0	35.4	CL	0.09	0.52	14.0	0	7.11	4.95
113	A1	15	8.9	0.1	34.71	10.25	2.39	0.27	48.0	0.97	28.6	26.0	45.4	C	0.08	0.50	13.2	0.08	4.98	3.39
113	A2	45	9.1	0.1	32.51	10.69	4.67	0.28	28.2	0.61	24.6	26.0	49.4	C	0.08	0.47	16.7	0.09	16.56	3.04
113	BT	80	9.0	0.2	31.55	11.41	7.88	0.17	54.8	2.75	18.6	24.0	57.4	C	0.08	0.45	16.3	0.14	14.38	2.76
113	CK	>80	8.2	1.1	47.61	12.07	9.10	0.21	20.6	0.68	24.6	28.0	47.4	C	0.06	0.39	13.2	0	44.19	3.94
114	A1	10	8.9	0.1	47.09	13.08	3.18	0.18	22.0	0.89	30.6	30.0	39.4	CL	0.09	0.73	1.2	0.05	14.47	3.60
114	A2	25	9.2	0.1	43.82	13.43	6.18	0.11	21.2	0.69	18.6	24.0	57.4	C	0.09	0.67	2.2	0.07	29.15	3.26
114	BT	110	8.8	0.3	43.73	13.29	10.98	0.11	24.3	0.43	22.6	22.0	55.4	C	0.06	0.56	2.7	0.11	45.08	3.29
115	A1	20	8.6	0.1	32.00	5.02	0.05	0.58	19.8	0.98	18.6	50.0	31.4	SiCL	0.11	0.83	15.8	0	0.24	6.37
115	A2	35	8.6	0.1	34.16	5.46	0.20	0.06	12.1	0.78	38.6	40.0	21.4	L	0.08	0.51	11.6	0	1.63	6.26
116	A1	25	9.0	0.1	46.06	12.23	2.71	0.30	32.5	0.74	26.6	32.0	41.4	C	0.10	0.60	8.4	0.07	8.32	3.77
116	BT1	50	9.0	0.1	45.02	12.65	4.88	0.32	48.3	0.79	24.6	30.0	45.4	C	0.09	0.55	10.9	0.11	10.10	3.56
116	BT2	>80	8.2	0.9	62.01	12.76	12.06	0.19	42.6	0.40	32.6	30.0	37.4	CL	0.06	0.44	7.4	1.13	28.29	4.86
116	AP	10	8.5	0.2	47.30	12.46	1.50	0.44	41.5	1.82	20.6	36.0	43.4	C	0.11	0.60	9.2	0.04	3.62	3.79

117	AP	10	8.5	0.1	35.50	7.19	0.25	0.38	23.3	2.59	34.6	36.0	29.4	CL	0.09	0.55	12.9	0	1.06	4.94
117	A1	25	8.6	0.1	33.91	6.97	0.62	0.23	67.0	1.40	30.6	36.0	33.4	CL	0.09	0.51	11.5	0	0.92	4.86
117	BT1	60	9.0	0.2	41.40	12.03	6.14	0.17	69.7	0.77	26.6	28.0	45.4	C	0.09	0.49	12.9	0.07	8.80	3.44
117	CGY	>110	8.2	2.1	69.69	14.22	13.80	0.14	91.3	0.21	30.6	58.0	11.4	SiL	0.05	0.29	9.2	1.76	15.12	4.90
117	BT GY2	110	8.2	1.2	41.58	13.01	11.73	0.12	89.3	0.15	28.6	46.0	25.4	L	0.07	0.43	10.8	1.14	13.14	3.20
118	A	10	7.28	0.16	12.06	2.76	0.08	0.97	3.67	17.34	30.6	48.0	21.4	L	0.08	0.66	0.7	0	2.28	4.38
118	BT1	30	7.71	0.11	13.26	2.88	0.09	1.42	3.90	3.79	50.6	34.0	15.4	L	0.07	0.53	0.3	0	2.38	4.60
119	A	10	8.06	0.11	22.86	5.30	0.10	0.53	5.80	0.57	32.6	32.0	35.4	CL	0.19	1.12	14.6	0	1.66	4.31
120	AP	5	8.18	0.05	48.72	6.95	0.13	0.32	20.61	0.80	18.6	50.0	31.4	SiCL	0.07	0.43	0.7	0	0.65	7.01
120	A1	25	8.28	0.05	46.88	6.76	0.19	0.23	58.69	0.29	28.6	36.0	35.4	CL	0.06	0.41	0.6	0	0.32	6.94
120	A2	67	8.25	0.05	42.33	7.18	0.26	0.17	74.60	0.11	30.6	34.0	35.4	CL	0.06	0.42	0.3	0	0.35	5.90
124	A	10	8.36	.0.10	15.06	1.99	0.00	0.28	4.09	6.04	26.6	52.0	21.4	SiL	0.18	3.28	19.2	0	0.00	7.58
125	A1	15	8.58	0.21	31.79	6.74	1.57	0.12	49.01	1.85	28.6	38.0	33.4	CL	0.09	1.72	24.8	0	3.21	4.72
125	A2	35	8.94	0.03	24.64	6.41	3.81	0.06	52.78	1.01	12.6	26.0	61.4	C	0.05	2.36	16.0	0	7.22	3.85
125	BT1	65	7.88	1.94	45.11	6.65	5.14	0.07	50.83	0.28	24.6	34.0	41.4	C	0.05	1.88	18.5	0	10.11	6.78
125	BTGYZ	100	7.96	3.25	39.95	7.35	12.76	0.10	89.56	0.24	20.6	30.0	49.4	C	0.03	1.55	20.5	0.91	14.25	5.43
125	CGY	>100	7.97	2.67	35.49	7.69	15.98	0.08	60.87	0.21	28.6	30.0	41.4	C	0.02	1.05	22.7	0.83	26.25	4.61
126	A1	35	8.43	0.15	22.04	2.71	0.09	0.44	68.83	5.74	24.6	46.0	29.4	CL	0.15	2.19	24.0	0	0.13	8.13
126	A2	85	8.59	0.10	32.29	3.74	0.33	0.07	53.78	1.52	32.6	38.0	29.4	CL	0.06	2.08	20.2	0	0.62	8.62
128	AP	5	7.94	0.34	37.33	3.33	0.00	0.13	50.58	2.20	28.6	30.0	41.4	C	0.03	0.61	22.1	0	0.00	11.22
128	AGY	30	7.90	0.53	38.48	4.65	0.00	0.10	12.05	0.68	28.6	30.0	41.4	C	0.06	0.27	23.2	0.61	0.00	8.27
128	BTGYZ	105	7.81	0.78	36.87	8.56	0.28	0.21	34.22	0.40	26.6	22.0	51.4	C	0.03	0.25	22.7	0.65	0.82	4.31
129	A1	5	8.40	0.09	34.02	4.56	0.00	0.38	20.87	20.93	30.6	40.0	29.4	CL	0.16	1.15	13.7	0	0.00	7.46
129	A2	30	8.57	0.07	33.29	6.93	0.19	0.02	9.13	2.35	40.6	34.0	25.4	L	0.11	0.61	16.1	0	2.09	4.81
129	BT	85	8.62	0.10	26.40	8.68	0.47	0.03	14.64	0.49	42.6	30.0	27.4	CL	0.09	0.44	15.8	0	3.21	3.04
132	A1	10	8.20	3.32	7.66	2.47	0.03	0.63	1.51	17.15	58.6	26.0	15.4	SL	0.09	2.77	24.0	0	2.01	3.10
132	A2	30	8.63	0.16	5.43	1.67	0.00	0.46	1.52	3.77	54.6	26.0	19.4	SL	0.06	2.66	22.8	0	0.10	3.24
132	AC	45	8.63	0.11	4.71	1.80	0.06	0.15	11.96	2.32	50.6	28.0	21.4	L	0.05	3.25	19.0	0	0.52	2.62
201	AP	30	8.69	1.63	14.60	3.13	0.23	0.47	6.96	3.75	58.6	26.0	15.4	SL	0.09	0.60	17.2	0	3.27	4.67
201	B1	70	8.68	1.63	16.10	3.14	0.23	0.28	6.72	1.42	54.6	32.0	13.4	SL	0.07	0.45	19.5	0	3.48	5.13
201	B2	110	8.53	0.47	15.41	3.87	0.28	0.21	31.15	1.33	56.6	24.0	19.4	SL	0.06	1.12	13.7	0	0.90	3.99
201	BC	>110	8.29	0.01	16.20	5.11	0.42	0.16	54.46	0.96	50.6	28.0	21.4	L	0.06	0.84	14.4	0	0.77	3.17
202	AP	30	8.40	0.02	12.47	2.92	0.14	0.42	3.69	5.68	58.6	20.0	21.4	SCL	0.09	0.52	7.9	0	3.76	4.27
202	A2	65	8.45	0.02	10.68	3.63	0.11	0.30	4.53	1.94	56.6	32.0	11.4	SL	0.08	0.33	6.6	0	2.48	2.95

202	B1	85	8.44	0.06	15.61	5.25	0.88	0.31	4.75	2.68	54.6	26.0	19.4	SL	0.07	0.27	12.9	0	18.58	2.97
202	B2	100	8.44	0.07	15.85	5.19	1.55	0.12	9.90	4.93	60.6	22.0	17.4	SL	0.07	0.27	15.9	0	15.70	3.06
202	C	>100	8.41	0.08	14.49	5.27	3.09	0.04	5.20	4.24	58.6	24.0	17.4	SL	0.06	0.25	21.1	0	59.45	2.75
203	A1	25	8.69	0.14	13.19	4.98	0.02	0.44	4.77	2.14	58.6	20.0	21.4	SCL	0.11	0.59	18.0	0	0.44	2.65
203	A2	55	8.79	0.15	11.74	6.84	0.02	0.19	4.12	0.90	58.6	28.0	13.4	SL	0.07	1.21	15.3	0	0.54	1.72
203	B1	85	8.57	0.26	10.68	7.89	0.11	0.20	3.89	2.30	56.6	28.0	15.4	SL	0.07	1.11	19.2	0	2.92	1.35
203	B2	115	8.50	0.69	9.10	9.38	0.34	0.17	4.30	1.02	58.6	28.0	13.4	SL	0.06	1.11	20.7	0	7.90	0.97
203	C	>115	8.48	0.21	8.28	8.67	1.63	0.13	4.75	1.18	54.6	24.0	21.4	SCL	0.06	0.33	32.1	0	34.43	0.96
204	A1	40	8.56	0.08	11.99	2.75	0.02	0.36	7.59	3.30	60.6	20.0	19.4	SL	0.09	0.27	8.2	0	0.27	4.35
204	B1	60	8.33	0.11	10.06	4.64	0.16	0.53	6.90	1.67	54.6	30.0	15.4	SL	0.07	0.32	10.5	0	2.32	2.17
204	B2	100	8.77	0.01	8.06	5.96	3.82	0.62	41.43	2.33	50.6	30.0	19.4	L	0.12	0.11	31.2	0	9.23	1.35
204	BC	>100	9.05	0.02	8.58	4.93	1.49	0.76	9.11	1.90	40.6	24.0	35.4	CL	0.05	0.16	16.6	0	16.37	1.74
205	A1	25	8.42	0.11	24.20	7.61	0.64	0.19	40.77	1.12	26.6	32.0	41.4	C	0.13	1.20	19.6	0	1.57	3.18
205	A2	55	8.01	0.64	20.19	11.10	3.70	0.06	50.53	0.50	18.6	28.0	53.4	C	0.10	0.91	21.5	0.11	7.32	1.82
205	B1	85	8.05	0.06	15.26	10.89	5.05	0.05	78.74	0.43	18.6	26.0	55.4	C	0.10	0.67	23.6	0.10	6.41	1.40
205	B2	>85	8.56	0.12	15.14	12.86	3.38	0.14	92.38	0.47	16.6	30.0	53.4	C	0.08	0.60	24.1	0	3.66	1.18
206	AP	35	8.65	0.08	25.26	6.45	0.78	0.60	55.73	5.14	18.6	26.0	55.4	C	0.14	1.28	14.6	0	1.39	3.92
206	B1	85	8.55	0.02	23.16	5.92	0.73	0.64	100.55	2.34	20.7	34.0	45.4	C	0.09	0.51	18.8	0	0.72	3.91
206	C1	100	8.62	0.03	19.60	4.77	0.67	0.40	33.23	3.54	32.6	46.0	21.4	L	0.07	0.33	19.0	0	2.00	4.11
206	C2	110	8.38	0.04	29.48	7.15	0.95	0.38	71.38	3.92	18.6	26.0	55.4	C	0.09	0.72	18.3	0	1.34	4.12
206	C3	125	8.65	0.016	24.92	6.04	0.86	0.36	49.75	7.55	14.6	40.0	45.4	SiC	0.08	0.42	22.7	0	1.73	4.13
207	A	30	8.67	0.017	26.10	5.74	0.42	0.32	22.50	1.99	20.6	38.0	41.4	C	0.09	0.61	19.0	0	1.86	4.55
207	B1	55	8.68	0.08	24.04	6.06	1.33	0.16	17.74	1.23	18.6	36.0	45.4	C	0.08	0.57	19.7	0	7.52	3.96
207	B2	80	8.13	0.01	19.04	5.92	2.85	0.12	36.86	1.32	18.6	40.0	41.4	C	0.06	0.83	22.7	0	7.73	3.22
207	C1	125	7.57	0.01	15.95	4.86	2.89	0.12	4.52	1.88	40.6	38.0	21.4	L	0.05	0.34	24.3	0	63.87	3.29
208	A1	30	7.68	0.01	17.72	4.92	0.15	1.80	4.96	9.10	36.6	38.0	25.4	L	0.10	1.10	22.1	0	3.10	3.60
208	A2	55	8.02	0.18	17.15	9.73	1.46	0.11	7.98	2.33	24.6	60.0	15.4	SiL	0.07	1.30	18.3	0	18.34	1.76
208	B1	115	8.51	0.02	14.41	10.16	3.14	0.12	16.40	0.57	42.6	6.0	51.4	C	0.07	0.55	24.6	0	19.15	1.42
208	B2	>115	8.82	0.01	14.74	10.04	3.16	0.15	37.98	0.61	18.6	24.0	57.4	C	0.06	0.85	20.1	0	8.33	1.47
209	A1	20	8.21	0.01	13.11	4.46	0.98	0.26	10.87	0.89	38.6	34.0	27.4	CL	0.08	0.58	19.3	0	9.03	2.94
209	A2	50	8.78	0.03	17.96	8.71	2.15	0.13	41.32	0.54	26.6	28.0	45.4	C	0.08	0.27	22.6	0.15	5.20	2.06
209	B1	90	8.92	0.02	15.22	10.52	10.68	0.11	62.24	0.19	18.6	26.0	55.4	C	0.07	0.54	20.3	0	17.17	1.45
209	B2	110	8.12	0.02	32.78	10.97	11.46	0.13	93.23	0.27	24.6	30.0	45.4	C	0.07	0.45	19.9	0.46	12.30	2.99
209	B3	110-150	8.48	0.03	33.31	11.58	8.38	0.14	32.83	0.48	40.6	48.0	11.4	L	0.06	0.22	16.0	1.06	25.52	2.88

210	A1	25	8.62	0.02	13.85	2.67	0.10	0.76	5.43	1.69	66.6	20.0	13.4	SL	0.07	0.40	13.8	2.09	1.86	5.19
210	A2	40	8.42	0.02	15.37	3.98	0.28	0.47	8.82	2.13	60.6	24.0	15.4	SL	0.06	0.32	19.5	0.07	3.19	3.86
210	B1	65	8.01	0.06	16.16	5.30	1.01	0.37	15.54	0.83	60.6	26.0	13.4	SL	0.05	0.22	19.9	0.05	6.49	3.05
210	B2	95	7.84	0.12	14.57	6.73	0.50	0.34	43.05	0.30	66.6	16.0	17.4	SL	0.06	0.16	21.1	0	1.17	2.17
210	B3	120	8.59	0.23	15.28	9.16	0.85	0.32	51.57	0.14	56.6	34.0	9.4	SL	0.05	0.19	15.9	0	1.66	1.67
211	A1	30	8.57	0.08	16.57	5.67	0.70	0.59	6.51	0.50	54.6	24.0	21.4	SCL	0.07	0.30	12.1	0	10.78	2.92
211	A2	50	8.68	0.01	14.92	8.76	1.75	0.24	6.71	0.31	48.6	22.0	29.4	SCL	0.05	0.24	14.3	0.05	26.11	1.70
211	B1	85	8.67	0.24	14.48	10.47	3.47	0.25	12.61	0.20	38.6	20.0	41.4	C	0.05	0.29	10.3	0.03	27.52	1.38
211	B2	130	8.71	0.03	18.63	13.13	6.36	0.24	38.70	0.25	38.6	20.0	41.4	C	0.05	0.23	11.8	0	16.45	1.42
212	A1	25	8.32	0.04	4.58	1.78	0.06	0.65	1.30	1.63	78.6	8.0	13.4	SL	0.05	0.30	0.0	0	4.45	2.57
212	B1	50	8.21	0.02	5.47	2.44	0.06	0.70	1.09	1.12	78.6	4.0	17.4	SL	0.06	0.21	0.2	0	5.67	2.25
212	B2	90	8.09	0.03	7.45	4.10	0.29	0.41	5.20	0.70	70.6	8.0	21.4	SCL	0.06	0.17	0.2	0	5.58	1.82
212	B3	130	8.01	0.02	9.99	4.93	0.45	0.34	3.48	1.02	68.6	4.0	27.4	SCL	0.05	0.13	0.2	0	13.01	2.03
213	A1	30	8.46	0.01	22.78	7.67	0.40	0.34	61.09	1.14	38.6	26.0	35.4	CL	0.10	0.59	17.3	0	0.65	2.97
213	B1	60	8.31	0.02	16.78	9.64	1.98	0.13	44.56	0.78	34.6	18.0	47.4	C	0.07	0.30	17.8	0.15	4.43	1.74
213	B2	120	8.23	0.03	35.82	13.08	13.45	0.09	49.20	0.26	32.6	22.0	45.4	C	0.06	0.22	16.2	0.95	27.33	2.74
214	A1	25	8.65	0.04	15.75	6.02	0.96	0.39	58.26	0.00	40.6	30.0	29.4	CL	0.09	0.51	18.2	0.09	1.65	2.62
214	A2	75	8.02	0.05	8.28	10.46	7.31	0.08	65.70	0.78	34.6	12.0	53.4	C	0.05	0.34	19.8	0.18	11.13	0.79
214	B1	105	7.75	0.06	28.31	10.88	17.42	0.16	50.18	0.46	32.6	16.0	51.4	C	0.05	0.19	19.4	0	34.71	2.60
214	B2	130	7.76	0.32	10.77	11.74	16.00	0.10	48.45	0.28	30.6	12.0	57.4	C	0.04	0.18	21.5	0	33.02	0.92
215	A1	25	8.59	0.28	30.18	5.85	0.26	0.13	39.70	1.56	32.6	34.0	33.4	CL	0.09	0.68	18.3	0	0.66	5.16
215	A2	55	8.38	0.65	28.85	6.04	0.71	0.07	35.91	1.03	34.6	30.0	35.4	CL	0.07	0.55	19.0	0	1.97	4.78
215	B1	95	8.01	0.22	29.78	6.99	0.82	0.19	41.42	1.25	24.6	24.0	51.4	C	0.07	0.54	18.7	0	1.98	4.26
215	B2	>95	7.82	0.22	31.58	8.91	1.17	0.08	29.63	1.59	32.6	26.0	41.4	C	0.06	0.45	18.5	0	3.95	3.55
216	A	40	8.43	0.34	3.05	0.45	0.00	0.13	0.43	23.12	94.6	2.0	3.4	S	0.02	0.13	1.6	0	0.00	6.76
216	C1	70	8.57	0.28	2.82	0.47	0.00	0.07	0.65	15.37	92.6	2.0	5.4	S	0.02	0.07	2.4	0	0.00	6.00
216	C2	100	8.62	0.02	2.89	0.49	0.00	0.08	0.43	20.85	92.6	2.0	5.4	S	0.02	0.05	3.7	0	0.00	5.90
216	C3	140	8.65	0.03	2.57	0.52	0.00	0.06	0.00	12.85	92.6	2.0	5.4	S	0.02	0.06	4.4	0	0.00	4.97
216	C4	>140	8.67	0.03	2.33	0.50	0.00	0.07	0.00	7.31	94.6	2.0	3.4	S	0.01	0.03	6.8	0	0.00	4.63
217	AP	25	8.30	0.04	15.62	3.55	0.04	1.79	22.50	11.82	36.6	14.0	49.4	C	0.13	0.89	16.9	0	0.20	4.40
217	A	55	6.43	0.05	28.36	7.27	0.37	0.39	37.30	8.38	18.6	40.0	41.4	C	0.09	0.68	16.9	0	0.99	3.90
217	C1	95	7.70	0.07	17.14	4.60	0.31	0.10	4.34	5.33	12.6	64.0	23.4	SiL	0.05	0.47	22.4	0	7.14	3.72
217	C2	135	7.73	0.02	29.07	8.23	0.70	0.14	43.80	3.23	14.6	44.0	41.4	SiC	0.09	0.56	17.0	0	1.59	3.53
218	AP	25	8.01	0.01	20.07	5.03	0.43	0.49	43.48	4.05	38.6	42.0	19.4	L	0.10	1.00	21.6	0	0.99	3.99

218	A	40	8.65	0.02	20.64	6.65	0.52	0.26	20.87	1.52	30.6	30.0	39.4	CL	0.07	1.04	21.0	0	2.48	3.11
218	B1	75	8.28	0.03	17.81	9.57	0.70	0.15	34.22	1.23	20.6	34.0	45.4	C	0.06	1.32	19.5	0	2.05	1.86
218	B2	110	8.30	0.08	14.10	11.54	2.63	0.14	48.33	0.71	20.6	30.0	49.4	C	0.05	1.24	19.0	0	5.44	1.22
219	AP	25	8.47	0.09	34.47	3.96	0.28	0.75	53.04	10.82	24.6	32.0	43.4	C	0.21	1.97	13.1	0	0.52	8.71
219	A	35	8.02	0.01	75.49	5.15	0.26	0.35	60.48	2.73	20.6	38.0	41.4	C	0.11	0.93	15.0	1.92	0.42	14.65
219	B1	65	8.07	0.02	68.41	8.26	0.55	0.28	52.43	1.54	26.6	16.0	57.4	C	0.08	0.66	15.6	0.99	1.05	8.28
219	B2	100	7.82	0.04	65.07	13.30	1.13	0.23	48.24	1.07	38.6	24.0	37.4	CL	0.07	0.59	15.3	2.52	2.35	4.89
219	B3	>100	7.72	0.02	86.42	11.49	1.33	0.30	78.72	1.66	28.6	44.0	27.4	CL	0.13	1.89	20.6	1.03	1.70	7.52
220	AP	15	8.13	0.32	28.34	6.74	0.27	0.91	59.27	5.84	22.6	30.0	47.4	C	0.11	1.24	18.3	0	0.46	4.20
220	A	30	8.14	0.08	28.09	7.48	0.64	0.56	64.35	2.89	20.6	28.0	51.4	C	0.09	0.82	20.4	0	0.99	3.76
220	B1	65	8.48	0.02	26.36	9.57	0.89	0.36	24.81	1.64	18.6	24.0	57.4	C	0.08	0.70	20.2	0	3.59	2.75
220	B2	125	8.19	0.08	36.60	14.35	2.82	0.33	83.29	0.74	20.6	26.0	53.4	C	0.06	0.57	18.9	0.82	3.39	2.55
220	B3	>123	8.86	0.07	31.57	14.75	4.26	0.27	21.74	1.10	28.6	26.0	45.4	C	0.05	0.47	19.7	0.65	19.58	2.14
221	AC	20	8.05	0.09	2.85	0.62	0.00	0.07	0.86	68.30	90.6	2.0	7.4	S	0.03	0.20	0.0	0	0.00	4.56
221	C1	80	8.22	0.02	1.35	0.42	0.00	0.16	1.72	5.05	88.6	2.0	9.4	LS	0.02	0.06	0.0	0	0.00	3.20
221	C2	120	7.94	0.32	0.81	0.24	0.00	0.14	0.22	2.45	88.6	2.0	9.4	LS	0.01	0.03	0.0	0	0.00	3.32
221	C3	>120	8.32	0.04	1.43	0.53	0.00	0.11	0.10	1.08	90.6	2.0	7.4	S	0.01	0.36	0.0	0	1.17	2.71
301	A	0-20	8.3	0.46	15.11	5.93	0.95	0.76	4.07	2.70	44.6	34.0	21.4	L	0.04	0.46	17.7	0	23.26	2.55
301	B1	20-40	8.0	1.64	17.80	10.85	5.76	0.29	28.56	1.87	42.6	48.0	9.4	L	0.04	0.37	19.12	0	20.16	1.64
301	B2	40-80	8.1	2.43	14.48	11.71	9.76	0.19	43.07	1.56	40.6	50.0	9.4	L	0.04	0.32	20.57	0	22.66	1.24
301	C	80-150	8.2	3.29	86.12	8.57	9.02	0.16	41.06	0.21	56.6	36.0	7.4	SL	0.02	0.08	18.81	2.23	21.96	10.05
302	A	0-30	7.5	0.07	1.94	0.22	0.00	0.05	0.00	1.76	92.6	2.0	5.4	S	0.02	0.24	0.42	0	######	9.03
302	B	30-40	8.0	0.01	0.86	0.48	0.00	0.04	0.00	0.60	92.6	2.0	5.4	S	0.00	0.04	0.00	0	######	1.79
303	A	0-20	8.5	0.06	11.22	3.10	0.08	0.71	6.09	3.73	58.6	20.0	21.4	SCL	0.05	0.40	10.61	0.04	1.32	3.62
303	B1	20-70	8.6	0.06	15.79	4.08	0.08	0.51	3.18	5.10	52.6	26.0	21.4	SCL	0.04	0.34	10.49	0.03	2.66	3.87
303	B2	70-120	8.4	0.11	14.70	4.14	0.31	0.45	5.18	3.08	50.6	24.0	25.4	SCL	0.03	0.24	8.40	0	6.00	3.55
303	C	120-150	8.3	0.15	15.65	4.47	0.39	0.47	4.98	4.61	48.6	26.0	25.4	SCL	0.04	0.24	11.15	0	7.78	3.50
304	A	0-30	8.6	0.07	5.15	1.01	0.00	0.29	0.68	9.78	78.6	12.0	9.4	SL	0.03	0.17	8.11	0	0.18	5.08
304	B	30-70	8.3	0.64	7.98	4.77	3.29	1.12	2.26	2.35	58.6	24.0	17.4	SL	0.02	0.13	18.82	0.96	145.30	1.67
304	C	70-130	8.5	2.18	67.02	5.65	2.78	1.08	2.95	0.51	58.6	30.0	11.4	SL	0.02	0.09	17.18	0.95	94.24	11.86
305	A	0-20	8.6	0.22	19.78	4.55	0.00	0.68	5.6	3.71	34.6	38.0	27.4	CL	0.04	0.40	21.1	0	0.00	4.34
305	A2	20-70	8.6	0.06	19.65	5.79	0.00	0.50	16.4	2.65	32.6	30.0	37.4	CL	0.04	0.34	20.5	0	0.00	3.39
305	B	70-130	8.6	0.06	9.91	3.24	0.00	0.28	3.0	1.98	52.6	14.0	33.4	SCL	0.02	0.15	22.9	0	0.00	3.06
307	A	0-30	8.9	0.05	26.04	6.51	0.38	0.55	45.0	1.52	42.6	36.0	21.4	L	0.08	0.44	15.1	0	0.85	4.00

307	B	30-70	8.6	0.32	25.56	7.65	3.04	0.12	52.8	1.20	38.6	36.0	25.4	L	0.07	0.42	17.8	0	5.75	3.34
307	C	70-100	8.4	0.63	25.47	8.81	5.00	0.07	81.3	0.92	36.6	36.0	27.4	CL	0.08	0.47	12.7	0	6.15	2.89
308	A	0-30	8.6	0.12	16.64	6.19	0.17	0.64	32.6	1.41	38.6	38.0	23.4	L	0.06	0.65	26.2	0	0.53	2.69
308	B	30-70	8.6	0.13	18.39	8.74	0.56	0.14	52.6	0.53	34.6	36.0	29.4	CL	0.03	0.24	24.8	0	1.07	2.10
308	C	70-150	8.2	0.88	87.24	7.83	2.95	0.21	54.8	0.22	54.6	34.0	11.4	SL	0.02	0.13	16.2	0	5.38	11.14
309	A1	0-50	8.3	0.21	7.54	1.23	0.00	0.24	0.2	7.05	64.6	20.0	15.4	SL	0.02	0.23	12.3	0	0.00	6.15
309	A2	50-70	8.6	0.09	8.23	1.41	0.00	0.29	3.2	4.22	58.6	22.0	19.4	SL	0.01	0.13	13.4	0	0.00	5.82
309	B	110	8.6	0.07	12.52	3.08	0.09	0.23	4.1	1.94	40.6	38.0	21.4	L	0.02	0.17	15.2	0	2.27	4.07
313	A	0-30	8.8	0.04	11.80	3.39	0.00	0.56	4.3	0.96	58.6	18.0	23.4	SCL	0.02	0.14	4.6	0	0.00	3.48
313	B	30-80	8.5	0.10	17.31	6.31	0.27	0.31	33.7	0.89	66.6	8.0	25.4	SCL	0.03	0.23	6.8	0	0.80	2.74
313	C	80-130	8.2	0.27	18.43	6.08	0.44	0.23	37.9	0.71	40.6	20.0	39.4	CL	0.03	0.24	5.9	0	1.16	3.03
314	A	0-30	8.7	0.07	14.58	5.28	0.00	0.78	2.8	1.98	46.6	32.0	21.4	L	0.04	1.46	19.5	0	0.00	2.76
314	B1	30-50	8.8	0.05	19.63	6.94	0.08	0.24	2.6	0.83	44.6	32.0	23.4	L	0.03	1.31	19.5	0	3.17	2.83
314	B2	50-80	8.6	0.06	15.48	6.86	0.17	0.20	3.5	0.64	38.6	34.0	27.4	CL	0.03	0.53	25.2	0	5.00	2.26
314	C	80-130	8.7	0.07	14.34	6.20	0.34	0.17	4.1	0.55	38.6	34.0	27.4	CL	0.03	1.22	20.4	0	8.35	2.31
315	A1	20	8.86	1.97	21.80	6.75	6.12	0.10	52.69	0.82	18.6	40.0	41.4	C	0.03	0.81	13.6	0	11.62	3.23
315	A2	60	8.07	0.15	23.91	9.24	20.30	0.09	47.78	1.69	18.6	28.0	53.4	C	0.02	0.32	17.1	0	42.48	2.59
315	B	110	7.91	0.21	29.54	9.16	17.32	0.08	32.93	1.28	16.6	28.0	55.4	C	0.03	0.31	17.0	0	52.60	3.22
318	A	110	7.73	4.38	65.64	1.24	0.17	0.35	5.62	3.99	14.6	40.0	45.4	SiC	0.10	1.68	29.3	2.59	3.11	52.84
318	B	30	7.84	1.83	75.27	0.38	0.14	0.20	0.22	0.08	74.6	18.0	7.4	SL	0.01	0.08	12.5	0.97	64.10	195.78
319	A	20	8.11	1.90	31.07	5.37	0.27	0.09	53.94	0.50	20.6	46.0	33.4	CL	0.03	0.35	23.0	0	0.50	5.79
319	A2	50	7.85	0.27	41.58	6.15	0.78	0.15	24.88	0.23	26.6	32.0	41.4	C	0.02	0.29	21.8	0.99	3.12	6.76
319	B	100	7.95	1.32	43.48	8.76	5.61	0.46	9.71	0.27	32.6	40.0	27.4	CL	0.01	0.24	19.4	1.84	57.75	4.96
319	C	150	8.48	2.40	6.07	3.16	8.45	0.08	3.02	3.04	72.6	6.0	21.4	SCL	0.01	0.05	12.2	0	279.84	1.92
321	A	25	8.84	1.75	10.79	1.88	0.19	0.11	1.95	4.36	26.6	48.0	25.4	L	0.02	1.30	34.4	0	9.92	5.74
321	B	80	8.01	0.33	9.52	4.85	4.90	0.04	5.41	3.97	36.6	22.0	41.4	C	0.01	3.89	14.2	0	90.70	1.96
321	C	160	8.07	1.41	7.64	4.34	3.32	0.04	29.42	3.99	28.6	20.0	51.4	C	0.01	1.76	22.0	0	11.28	1.76
323	A	30	8.89	3.77	5.59	2.69	4.87	0.40	1.52	7.13	68.6	18.0	13.4	SL	0.01	1.48	17.6	0	320.85	2.08
323	B	70	7.79	2.92	7.65	7.11	10.39	0.22	1.73	4.35	66.6	20.0	13.4	SL	0.04	2.18	17.0	0	600.49	1.08
323	C	130	8.13	3.77	3.89	5.51	8.45	0.13	5.85	5.42	58.6	22.0	19.4	SL	0.03	2.52	17.8	0	144.31	0.71
325	A	20	8.06	2.66	21.80	4.70	0.22	0.19	6.51	1.40	38.6	38.0	23.4	L	0.03	0.75	22.4	0	3.41	4.64
325	B1	50	8.07	0.12	27.19	4.20	0.35	0.10	58.12	0.18	32.6	34.0	33.4	CL	0.02	1.00	19.4	0.36	0.61	6.48
325	B2	70	8.07	0.10	47.37	4.54	0.23	0.20	60.85	0.27	32.6	32.0	35.4	CL	0.02	0.48	25.4	1.34	0.38	10.43
325	C	130	8.19	1.92	61.10	5.74	0.28	0.21	27.77	0.36	34.6	28.0	37.4	CL	0.01	0.62	22.2	1.82	1.01	10.65

327	A	0-10	7.90	0.10	26.26	4.85	0.48	0.19	60.63	1.67	32.6	28.0	39.4	CL	0.03	0.31	19.7	0	0.79	5.41
327	B1	10-60.	8.40	0.60	23.03	4.71	0.47	0.11	57.97	0.75	32.6	22.0	45.4	C	0.02	0.23	20.1	0	0.81	4.89
327	B2	60-100	8.23	0.16	25.32	4.91	0.38	0.08	60.57	0.11	22.6	32.0	45.4	C	0.02	0.24	19.6	0	0.63	5.16
327	C1	100-120	7.82	0.21	55.70	4.78	0.40	0.19	55.96	0.54	24.6	30.0	45.4	C	0.02	0.13	20.1	1.76	0.71	11.66
327	C2	120-160	7.77	0.66	91.73	5.33	0.46	0.22	39.37	0.00	50.6	40.0	9.4	L	0.01	0.38	0.0	1.96	1.18	17.19
329	A	30	8.16	0.01	12.61	3.01	0.04	0.77	9.73	2.01	44.6	34.0	21.4	L	0.09	0.35	17.1	0	0.43	4.20
329	B	70	8.30	0.01	11.88	4.13	0.66	0.43	39.25	0.94	42.6	32.0	25.4	L	0.08	0.30	18.1	0	1.68	2.88
329	C	130	8.53	0.11	10.71	6.91	6.06	0.61	46.41	2.45	30.6	24.0	45.4	C	0.05	0.29	21.3	0	13.07	1.55
330	A	40	8.40	0.12	4.86	0.78	0.04	0.21	2.82	3.87	78.6	10.0	11.4	SL	0.08	0.34	6.5	0	1.39	6.20
330	B1	60	7.96	1.66	4.01	1.49	0.04	0.68	2.58	1.27	70.6	16.0	13.4	SL	0.05	0.22	15.7	0	1.51	2.68
330	B2	90	8.50	0.13	2.62	1.84	2.34	0.47	1.72	1.16	68.6	24.0	7.4	SL	0.05	0.54	17.0	0	135.69	1.42
330	C	130	8.61	0.12	3.72	3.97	4.21	0.49	9.73	1.49	56.6	28.0	15.4	SL	0.03	1.89	19.4	0	43.25	0.94
331	A	40	8.67	0.02	6.52	1.16	0.00	0.36	1.73	23.33	76.6	12.0	11.4	SL	0.05	0.19	9.8	0	0.00	5.63
331	B	90	9.07	1.07	6.53	1.56	0.00	0.53	2.17	5.91	68.6	20.0	11.4	SL	0.05	0.14	15.2	0	0.00	4.18
331	C	130	8.47	0.06	7.95	1.62	0.30	0.99	3.46	14.92	62.6	24.0	13.4	SL	0.05	0.14	20.6	0	8.57	4.90
333	A	20	8.69	0.12	42.43	3.36	0.12	0.24	29.35	2.18	38.6	46.0	15.4	L	0.08	0.37	22.6	0.98	0.41	12.63
333	B1	40	8.75	0.17	44.13	5.12	0.17	0.23	52.22	1.05	36.6	42.0	21.4	L	0.05	0.43	22.3	1.10	0.32	8.63
333	B2	40-90	9.12	0.17	53.56	6.78	0.25	0.24	51.87	0.78	34.6	56.0	9.4	SiL	0.05	0.44	21.6	1.41	0.49	7.89
333	C	130	8.42	0.13	54.74	7.59	0.33	0.22	67.06	0.56	32.6	60.0	7.4	SiL	0.09	0.44	20.8	1.52	0.49	7.22
A301	1	10	7.8	1.6	17.9	3.9	0.4	2.2	23.1	2.8	41	39	20		0.12	1.4	15		1.732	4.59
A301	2	25	7.9	1.5	10.3	2.6	0.7	1.2	20.4	2.5	57	21	22		0.07	0.8	18		3.431	3.96
A301	3	75	7.6	3.6	17.8	4.8	0.6	1	24.1	\N	27	46	27		\N	\N	25		2.490	3.71
A301	4	160	7.9	4.2	33.8	1.3	0	0.9	16.5	\N	29	53	18		\N	\N	36		0.000	26.00
A301	5	200	7.9	5.2	16.6	5.1	0.5	1.4	23.8	\N	24	43	33		\N	\N	27		2.101	3.25
A364	1	10	8.1	1.1	24.8	8.5	0.5	1.5	31.5	\N	18	39	42		\N	\N	23		1.587	2.92
A364	2	45	8.2	0.8	7.2	4.1	0.4	0.8	330.7	1.4	19	32	49		0.06	0.7	18		0.121	1.76
A364	3	90	8.2	0.8	12.4	6.5	1.9	1	30.6	\N	19	19	62		\N	\N	23		6.209	1.91
A364	4	145	8	1.8	17.4	10.2	1.4	1	33	\N	16	22	62		\N	\N	21		4.242	1.71
A364	5	190	7.8	5.5	10.2	5.4	0.9	1.3	32.3	\N	26	17	57		\N	\N	21		2.786	1.89
A377	1	25	7.8	1	15.7	4.1	0.4	1.8	27.3	1.9	36	22	42		0.09	0.8	20		1.465	3.83
A377	2	75	7.8	2.8	19.5	10.4	0.9	1.1	27.3	0.5	31	22	47		0.04	0.5	2.2		3.297	1.88
A377	3	125	8	2.1	15.2	11.8	1.5	1	27	\N	31	22	47		\N	\N	21		5.556	1.29
A377	4	200	7.8	8.7	16.6	6.9	2.4	0.7	25.8	\N	31	27	42		\N	\N	22		9.302	2.41
A379	1	20	7.9	1.6	24.4	12.2	0.7	1.2	29.5	1.3	20	36	42		\N	0.8	23		2.373	2.00

A379	2	80	8	1.7	15.2	8.1	1.3	0.6	29.9	0.9	25	21	53		0.05	0.7	19		4.348	1.88
A379	3	170	7.6	6	17.5	6	0	0.8	30.6	\N	23	25	52		\N	\N	22		0.000	2.92
C009	1	15	7.6	1	26.8	8.4	0.5	1.5	34.6	1.2	15	33	53		0.07	0.8	23		1.445	3.19
C009	2	38	7.9	1.2	22.7	10.1	0.9	0.8	33.6	0.7	10	27	63		0.06	0.7	30		2.679	2.25
C009	3	92	8.1	0.9	20	8.9	0.8	0.7	34	\N	11	26	63		\N	\N	23		2.353	2.25
C009	4	180	7.8	\N	13.5	5	1.1	1.1	35.1	\N	8	31	61		\N	\N	19		3.134	2.70
C009	5	275	7.8	4.2	38.8	14.8	0.6	1	35.6	\N	8	31	61		\N	\N	23		1.685	2.62
C038	1	25	7.8	2.2	20.8	9	0.5	1.6	29.8	1.3	3	13	42		0.07	0.7	24		1.678	2.31
C038	2	50	7.7	4.7	10.6	5.4	0	0.8	29.8	0.8	21	27	52		0.07	0.6	22		0.000	1.96
C038	3	110	7.9	8.3	33.1	7.2	0	0.8	31	\N	16	42	42		\N	\N	22		0.000	4.60
C038	4	180	8	10.2	50.7	13.2	4	1.1	27.8	\N	25	43	31		\N	\N	24		14.388	3.84
C038	5	200	7.8	5.1	28.7	7.8	1.2	1.7	13.3	\N	19	41	40		\N	\N	23		9.023	3.68
C178	1	15	7.7	0.7	34.2	9.8	0.3	1.2	30	1.9	17	35	48		0.07	0.7	24		1.000	3.49
C178	2	36	7.9	0.7	19.9	7.3	0.8	0.9	30	1.6	19	31	50		0.07	0.6	24		2.667	2.73
C178	3	75	8	1.2	16.6	6.9	0.9	0.8	30.6	\N	17	30	53		\N	\N	27		2.941	2.41
C178	4	130	7.9	3.5	20.2	9.4	0.8	1	30.7	\N	17	28	55		\N	\N	25		2.606	2.15
C178	5	200	7.7	7.3	70.5	7.4	1.5	0.9	30.1	\N	19	33	48		\N	\N	23		4.983	9.53
C238	1	15	7.6	4.3	25.6	8.4	0.4	2.1	33.4	3.2	21	26	53		0.15	1.7	19		1.198	3.05
C238	2	38	7.7	3.2	21.9	10	0.2	1.4	32.4	0.8	21	18	161		0.08	0.7	21		0.617	2.19
C238	3	74	7.9	3.4	26.4	19	1.5	1.1	34.6	\N	16	21	63		\N	\N	21		4.335	1.39
C238	4	115	7.8	7.2	27.3	20.1	5	1.2	34.2	\N	16	21	63		\N	\N	20		14.620	1.36
C238	5	190	8	6.3	50.6	11.6	1.1	1.2	31.9	\N	14	31	55		\N	\N	18		3.448	4.36
C239	1	20	7.8	4.2	107.6	2.3	2	1	27.3	1.8	19	48	33		0.11	1	20		7.326	46.78
C239	2	50	7.7	2.8	116.2	5.6	0.5	1.9	28	1.4	17	43	40		0.09	0.9	22		1.786	20.75
C239	3	80	7.8	3.9	75.5	5.7	0.1	1.2	27.9	\N	14	41	45		\N	\N	21		0.358	13.25
C239	4	110	7.8	0.7	39.4	5.2	0.4	1.3	30.4	\N	17	48	35		\N	\N	20		1.316	7.58
C239	5	200	7.7	5.7	27.5	7.1	0	1.2	27.9	\N	17	45	38		\N	\N	19		0.000	3.87
C263	1	15	7.7	1.1	26.8	8.4	0.4	1.9	29.2	2.95	18	29	53		0.08	1.6	28		1.370	3.19
C263	2	40	8.1	0.6	26.2	8.1	0.7	1.5	28.2	2.05	18	27	55		0.06	1	30		2.482	3.23
C263	3	90	8.2	0.7	16.5	6.5	0.8	1.6	27.9	\N	23	22	55		\N	\N	2.5		2.867	2.54
C263	4	200	7.7	2.4	11.8	4.6	0	0.6	30.8	\N	33	16	51		\N	\N	27		0.000	2.57
R20	1	25	8.3	2.4	24.6	4.1	0.4	1.5	24.9	1	12	52	36		0.08	1.1	\N		1.606	6.00
R20	2	45	8.1	3.5	75.6	2.7	0.2	0.8	25.6	\N	9	45	36		\N	\N	\N		0.781	28.00
R20	3	65	8	4	75	2.2	0.2	0.8	3.2	\N	37	50	13		\N	\N	\N		6.250	34.09

R20	4	125	8.1	5.6	71.3	7.6	0.4	1.2	10.7	\N	37	22	41		\N	\N	\N		3.738	9.38
R20	5	150	8.1	7	84.7	18.3	0.9	1.6	14	\N	42	20	38		\N	\N	\N		6.429	4.63
R37	1	20	8.3	3.1	21.6	5.1	0.4	1.6	28.8	5.8	20	40	40		0.09	1.31	\N		1.389	4.24
R37	2	70	8.2	6.1	60.6	5.4	1.5	1.3	33.7	\N	15	40	45		\N	\N	\N		4.451	11.22
R37	3	150	8.5	7.5	22.5	5.5	1.5	0.8	29.8	\N	15	60	25		\N	\N	\N		5.034	4.09
R37	4	165	8.3	2.9	21	5.4	0.3	0.7	29.4	\N	10	45	45		\N	\N	\N		1.020	3.89
R22	1	20	8.1	4	32	7.5	0.8	3	32.5	2	12	42	46		0.09	0.86	\N		2.462	4.27
R22	2	55	8.1	5.2	24.8	8.5	1.6	1.6	29	\N	12	35	53		\N	\N	\N		5.517	2.92
R22	3	90	8.2	6	46.3	6.7	1.5	0.9	31.9	\N	17	32	51		\N	\N	\N		4.702	6.91
R22	4	140	8.3	8	61.3	11.8	2.8	0.9	36.8	\N	12	32	56		\N	\N	\N		7.609	5.19
R18	5	180	8.1	8	59.4	8	5.5	1.8	31.8	\N	22	42	46		\N	\N	\N		17.296	7.43
R18	1	15	8.5	2.1	19.6	3.7	0.4	2.4	21.8	9.2	10	54	26		0.09	0.9	\N		1.835	5.30
R18	2	65	8.6	3	10.7	4.5	1.2	1.8	22.8	\N	15	44	41		\N	\N	\N		5.263	2.38
R18	3	115	8.4	5	21.9	6.1	4.6	2	28.5	\N	12	39	49		\N	\N	\N		16.140	3.59
R18	4	150	8.4	5	62.5	8.7	4.6	1.7	28.5	\N	17	45	38		\N	\N	\N		16.140	7.18
R63	3	105	8	3.2	30.9	6.4	0.4	1	38	\N	1	26	73		\N	\N	\N		1.053	4.83
R63	4	160	8.1	3.2	50	5.7	0.3	1.1	34.8	\N	10	10	80		\N	\N	\N		0.862	8.77
R63	1	25	8.1	1.9	31.4	6.2	0.4	1.7	36.8	3.2	18	29	53		0.07	0.83	\N		1.087	5.06
R63	2	75	8.1	2	29	7	0.3	1	36.3	\N	8	29	73		\N	\N	\N		0.826	4.14
R17	1	25	8.2	1.4	28.2	6	0.3	2.1	29.3	5.7	6	36	58		0.1	1	\N		1.024	4.70
R17	2	105	8.1	1.7	37.8	7.1	0.5	0.8	41.3	\N	9	23	68		\N	\N	\N		1.211	5.32
R17	3	125	8.1	1.9	27.4	4.6	0.4	0.8	28.5	\N	17	32	51		\N	\N	\N		1.404	5.96
R17	4	165	8.1	2.6	19.2	4.2	0.4	0.9	34.3	\N	19	33	48		\N	\N	\N		1.166	4.57
R14	1	15	8.3	2.1	28.8	4.7	0.2	2.1	32.5	3.9	9	38	53		0.09	0.9	\N		0.615	6.13
R14	2	55	8.3	1.6	23.4	4.8	0.3	1.5	33.3	\N	11	33	56		\N	\N	\N		0.901	4.88
R14	3	95	8.3	1.5	24.8	5.5	0.5	1.1	41.8	\N	11	21	68		\N	\N	\N		1.196	4.51
R14	4	160	7.9	1.9	23.1	4.4	0.4	0.9	31.8	\N	21	23	56		\N	\N	\N		1.258	5.25
R33	1	30	8.2	2.2	23.8	5.8	0.3	1.4	25.1	2.6	22	45	33		0.1	1.05	\N		1.195	4.10
R33	2	50	8.1	2.9	19.1	5	0.1	0.5	21.3	\N	27	48	25		\N	\N	\N		0.469	3.82
R33	3	65	8.1	2.3	21.6	4.8	0.3	0.5	25.3	\N	10	65	25		\N	\N	\N		1.186	4.50
R33	4	105	8.1	1.8	30.8	6	0.1	0.8	35.1	\N	15	30	55		\N	\N	\N		0.285	5.13
R33	5	130	8.2	1.2	26	6.3	0.3	0.8	36.5	\N	10	28	62		\N	\N	\N		0.822	4.13
R28	1	25	8.6	2.3	18	3	0.3	1.5	14.3	\N	17	45	38		\N	\N	\N		2.098	6.00
R28	2	55	8.4	2	21.5	4.4	0.2	4.1	23	1	17	60	23		0.03	0.4	\N		0.870	4.89

R28	3	90	8	4.4	30.5	5.7	0.9	0.7	27.8	\N	12	40	48		\N	\N	\N		3.237	5.35
R28	4	110	8.2	7.5	17.8	3.3	0.4	0.3	17.8	\N	30	54	16		\N	\N	\N		2.247	5.39
R40	1	20	8.1	3.3	15.6	1.6	0	0.8	19.3	4.6	30	47	13		0.09	1.05	\N		0.000	9.75
R40	2	60	8.2	3.7	38.8	4.3	0.2	0.5	22.8	\N	27	55	18		\N	\N	\N		0.877	9.02
R40	3	100	8.3	4.3	56.9	5.1	0.2	0.6	27.6	\N	22	50	28		\N	\N	\N		0.725	11.16
R40	4	160	8.2	4.4	66.3	9.2	0.1	0.9	33.8	\N	15	20	65		\N	\N	\N		0.296	7.21
R47	1	35	8.1	3.7	19.1	5.6	0.2	0.8	28.8	2.6	13	47	40		0.09	0.92	\N		0.694	3.41
R47	2	65	7.9	3.8	12.9	2.3	0.1	0.3	15.5	\N	47	43	10		\N	\N	\N		0.645	5.61
R47	3	80	8.1	3.6	16.6	3.6	0.1	0.4	19.3	\N	11	64	25		\N	\N	\N		0.518	4.61
R47	4	150	8.1	3.7	15.4	3.6	0.2	0.4	18.5	\N	16	61	23		\N	\N	\N		1.081	4.28
H148	1	50	7.6	0.8	\N	\N	0.6	\N	22	0.5	34	16	50		0.09	0.57	17.57		2.727	0.00
H148	2	70	7.5	4.9	\N	\N	0.95	\N	22	\N	27	20	53		\N	\N	17.37		4.318	0.00
H148	3	140	7.5	4.4	\N	\N	1.12	\N	27	\N	26	21	53		\N	\N	16.14		4.148	0.00
H148	4	200	7.6	5.9	\N	\N	0.93	\N	23	\N	26	19	55		\N	\N	15.73		4.043	0.00
H183	1	50	8.1	0.9	\N	\N	0.93	\N	40	0.5	23	20	57		0.08	0.81	22.9		2.325	0.00
H183	2	100	8	2	\N	\N	1.92	\N	43	\N	25	21	54		\N	\N	22.5		4.465	0.00
H183	4	200	7.7	6	\N	\N	4.1	\N	40	\N	23	19	58		\N	\N	20.7		10.250	0.00
H186	1	50	7.8	1.5	\N	\N	0.46	\N	38	1	28	19	53		0.08	0.79	27.2		1.211	0.00
H186	2	100	7.9	5	\N	\N	0.79	\N	39	\N	28	16	56		\N	\N	25.4		2.026	0.00
H186	3	150	7.9	3	\N	\N	0.34	\N	40	\N	28	16	56		\N	\N	23.1		0.850	0.00
H186	4	200	7.9	6.5	\N	\N	2.22	\N	47	\N	30	16	54		\N	\N	23.3		4.723	0.00
H19	1	40	8	1	\N	\N	2.68	\N	44	2.7	25	41	34		0.1	0.79	15.79		6.091	0.00
H19	2	70	8.1	1.5	\N	\N	5.34	\N	47	\N	22	39	39		\N	\N	16.8		11.362	0.00
H19	3	90	8.2	1.2	\N	\N	6.22	\N	47	\N	15	36	49		\N	\N	18.45		13.234	0.00
H19	4	110	8.2	1.8	\N	\N	3.52	\N	14	\N	40	44	16		\N	\N	10.04		25.143	0.00
H19	5	200	8.1	3.5	\N	\N	1.27	\N	9	\N	60	34	6		\N	\N	6.15		14.111	0.00
H192	1	30	7.8	3	\N	\N	0.73	\N	28	0.5	27	41	34		0.09	0.74	22.3		2.607	0.00
H192	2	80	7.9	4.5	\N	\N	0.65	\N	33	\N	30	26	44		\N	\N	24.5		1.970	0.00
H192	3	130	7.8	5	\N	\N	2.89	\N	32	\N	30	19	41		\N	\N	25.7		9.031	0.00
H192	4	190	7.9	8.2	\N	\N	3.25	\N	33	\N	37	17	46		\N	\N	27.8		9.852	0.00
H196	1	35	8	2.8	\N	\N	0.33	\N	27	1.5	34	25	41		0.07	0.76	29.6		1.222	0.00
H196	2	90	8	5	\N	\N	0.76	\N	38	\N	28	24	48		\N	\N	29.4		2.000	0.00
H196	3	140	7.8	7.5	\N	\N	0.25	\N	36	\N	26	23	51		\N	\N	27.8		0.694	0.00
H196	4	200	7.9	8.5	\N	\N	2.6	\N	39	\N	26	23	51		\N	\N	28.6		6.667	0.00

H22	1	55	8.2	1.2	\N	\N	1.43	\N	45	5	15	48	36		0.08	0.74	18.66		3.178	0.00
H22	2	70	8.2	3.2	\N	\N	4.37	\N	39	\N	17	62	21		\N	\N	16.4		11.205	0.00
H22	3	100	7.8	6	\N	\N	8.66	\N	52	\N	10	29	61		\N	\N	17.89		16.654	0.00
H22	4	120	7.8	11.8	\N	\N	6.2	\N	44	\N	10	41	49		\N	\N	16.61		14.091	0.00
H22	5	135	7.9	15.8	\N	\N	5.44	\N	36	\N	17	39	44		\N	\N	15.99		15.111	0.00
H22	6	180	8.1	14.4	\N	\N	6.52	\N	36	\N	12	37	51		\N	\N	12.15		18.111	0.00
H24	1	40	7.8	1.4	\N	\N	0.52	\N	33	\N	32	47	21		0.1	1.06	15.37		1.576	0.00
H24	2	40	7.8	5.8	\N	\N	2.03	\N	29	\N	32	47	21		\N	\N	13.53		7.000	0.00
H24	3	165	7.9	16.6	\N	\N	4.74	\N	27	\N	32	47	21		\N	\N	14.97		17.556	0.00
H24	4	200	7.8	9.3	\N	\N	1.81	\N	15	\N	0	42	11		\N	\N	\N		12.067	0.00
H25	1	40	7.9	0.8	\N	\N	1.6	\N	40	7.3	7	47	46		0.11	0.77	18.86		4.000	0.00
H25	2	100	8	0.6	\N	\N	3.27	\N	45	\N	5	36	59		\N	\N	19.07		7.267	0.00
H25	3	135	7.7	3.8	\N	\N	3.08	\N	42	\N	5	29	66		\N	\N	22.55		7.333	0.00
H25	4	170	7.6	6.3	\N	\N	3.37	\N	50	\N	2	24	74		\N	\N	18.66		6.740	0.00
H25	5	200	7.6	7.7	\N	\N	2.29	\N	44	\N	2	27	71		\N	\N	19.89		5.205	0.00
H251	1	50	7.9	1.2	\N	\N	0.98	\N	37	\N	28	31	41		0.08	0.83	19.2		2.649	0.00
H251	2	95	7.9	4.2	\N	\N	1.67	\N	34	\N	26	38	36		\N	\N	25.3		4.912	0.00
H251	3	130	7.7	6.5	\N	\N	1.21	\N	25	\N	31	45	24		\N	\N	21.9		4.840	0.00
H251	4	180	7.7	7.2	\N	\N	1.21	\N	25	\N	21	43	36		\N	\N	22.3		4.840	0.00
H255	1	45	8	2	\N	\N	0.22	\N	39	13.3	59	33	41		0.11	1.06	21.3		0.564	0.00
H255	2	97	7.9	3.9	\N	\N	0.64	\N	43	\N	15	31	54		\N	\N	\N		1.488	0.00
H255	3	130	7.7	9.2	\N	\N	5.85	\N	39	\N	23	41	36		\N	\N	\N		15.000	0.00
H255	4	180	7.7	12	\N	\N	6.43	\N	43	\N	11	28	61		\N	\N	24.22		14.953	0.00
H26	1	60	7.8	1.3	\N	\N	0.54	\N	47	1.5	12	37	51		0.08	0.72	18.25		1.149	0.00
H26	2	120	7.8	1.7	\N	\N	2.36	\N	50	\N	5	24	71		\N	\N	19.27		4.720	0.00
H26	3	140	7.6	5.4	\N	\N	1.43	\N	40	\N	16	32	51		\N	\N	16.4		3.575	0.00
H26	4	200	7.5	6.7	\N	\N	1.91	\N	29	\N	17	42	41		\N	\N	30.96		6.586	0.00
H268	1	50	8	0.9	\N	\N	0.42	\N	39	\N	18	30	52		0.07	0.82	18.7		1.077	0.00
H268	2	110	7.7	3.5	\N	\N	2.01	\N	40	\N	18	40	42		\N	\N	22.4		5.025	0.00
H268	3	155	7.7	4.5	\N	\N	1.54	\N	39	\N	23	30	49		\N	\N	23.3		3.949	0.00
H268	4	200	7.7	5	\N	\N	2.83	\N	42	\N	33	33	34		\N	\N	19.4		6.738	0.00
H27	1	65	7.6	0.8	\N	\N	1.49	\N	45	2.7	25	17	58		0.09	0.85	21.5		3.311	0.00
H27	2	115	7.8	6	\N	\N	4.84	\N	40	\N	36	11	53		\N	\N	20.8		12.100	0.00
H27	3	165	7.9	9.6	\N	\N	9.89	\N	40	\N	23	27	50		\N	\N	27.25		24.725	0.00

H27	4	190	8	9.7	\N	\N	9.17	\N	40	\N	30	13	57		\N	\N	25.43		22.925	0.00
H270	2	105	7.7	3.8	\N	\N	2.75	\N	47	\N	20	37	43		\N	\N	19.6		5.851	0.00
H270	3	140	7.9	5.5	\N	\N	3.83	\N	36	\N	18	22	55		\N	\N	20.9		10.639	0.00
H270	4	200	7.9	6.8	\N	\N	1.78	\N	35	\N	30	17	53		\N	\N	22.1		5.086	0.00
H29	1	60	7.8	1.4	\N	\N	0.77	\N	40	1	12	44	44		0.08	0.76	17.84		1.925	0.00
H29	2	80	7.7	4.1	\N	\N	2.48	\N	42	1.5	7	49	44		0.08	0.76	18.45		5.905	0.00
H29	3	10	7.8	4.1	\N	\N	4.44	\N	42	\N	2	27	71		\N	\N	3.19		10.571	0.00
H29	4	135	7.6	5.5	\N	\N	4.21	\N	45	\N	2	44	54		\N	\N	0.24		9.356	0.00
H29	5	180	7.6	6	\N	\N	2.72	\N	40	\N	5	46	49		\N	\N	22.35		6.800	0.00
H31	1	50	7.8	0.8	\N	\N	0.55	\N	48	3.7	17	24	59		0.1	0.78	15.99		1.146	0.00
H31	2	85	7.8	1.2	\N	\N	1.83	\N	44	\N	15	19	66		\N	\N	16.61		4.159	0.00
H31	3	125	7.9	1.1	\N	\N	3.97	\N	45	\N	15	19	66		\N	\N	16.2		8.822	0.00
H31	4	200	7.7	4	\N	\N	2.73	\N	48	\N	12	17	71		\N	\N	16.81		5.688	0.00
H347	1	30	7.8	1.2	\N	\N	1.5	\N	41	0.5	11	24	65		0.09	0.7	17.16		3.659	0.00
H347	2	60	7.8	1.4	\N	\N	0.93	\N	31	\N	14	18	68		\N	\N	15.94		3.000	0.00
H347	3	70	7.8	0.8	\N	\N	0.95	\N	23	\N	31	24	45		\N	\N	13.08		4.130	0.00
H347	4	85	7.7	0.7	\N	\N	0.61	\N	11	\N	59	31	10		\N	\N	10.83		5.545	0.00
H347	5	145	7.6	3.2	\N	\N	0.58	\N	20	\N	24	53	23		\N	\N	14.1		2.900	0.00
H347	6	175	7.6	3.2	\N	\N	0.6	\N	23	\N	31	54	15		\N	\N	12.46		2.609	0.00
H347	7	200	7.6	3	\N	\N	0.17	\N	12	\N	76	16	8		\N	\N	8.17		1.417	0.00
H60	1	40	7.7	1	\N	\N	0.48	\N	47	1	15	21	64		0.06	0.59	\N		1.021	0.00
H60	2	90	7.6	3.1	\N	\N	1.07	\N	45	\N	12	27	61		\N	\N	18.39		2.378	0.00
H60	3	140	7.8	7.4	\N	\N	9.52	\N	47	\N	10	31	59		\N	\N	9.76		20.255	0.00
H60	4	200	7.9	10	\N	\N	11.1	\N	48	\N	10	31	59		\N	\N	10.33		23.208	0.00
H61	1	40	7.7	1.3	\N	\N	0.56	\N	31	19	12	59	29		0.07	0.59	18.8		1.806	0.00
H61	2	70	7.7	2.9	\N	\N	0.61	\N	29	\N	15	59	26		\N	\N	\N		2.103	0.00
H61	3	95	7.6	2.9	\N	\N	0.63	\N	21	\N	27	52	21		\N	\N	\N		3.000	0.00
H61	4	130	7.6	3.6	\N	\N	2	\N	25	\N	22	49	29		\N	\N	13.52		8.000	0.00
H61	5	200	7.8	3	\N	\N	3	\N	29	\N	8	37	55		\N	\N	17.37		10.345	0.00
H91	1	55	7.7	0.8	\N	\N	1.56	\N	31	5.4	20	49	31		0.07	0.46	17.37		5.032	0.00
H91	2	120	7.8	2.9	\N	\N	0.99	\N	31	\N	77	14	9		\N	\N	10.42		3.194	0.00
H91	3	200	7.6	4.1	\N	\N	2.8	\N	45	\N	2	27	71		\N	\N	13.28		6.222	0.00
H98	1	45	7.8	1.2	\N	\N	0.9	\N	40	4	10	41	49		0.08	0.53	17.16		2.250	0.00
H98	2	95	7.9	0.7	\N	\N	2.68	\N	33	\N	10	34	56		\N	\N	17.52		8.121	0.00

H98	3	135	7.8	0.9	\N	\N	2.63	\N	27	\N	19	21	60		\N	\N	15.94		9.741	0.00
H98	4	160	7.8	1.9	\N	\N	3.24	\N	27	\N	22	20	58		\N	\N	17.16		12.000	0.00
H98	5	200	7.6	4.8	\N	\N	2.02	\N	27	\N	29	16	55		\N	\N	16.75		7.481	0.00
M19	1	25	\N	1.3	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M19	2	50	\N	0.8	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M19	3	80	\N	1.2	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M19	4	100	\N	1.1	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M20	1	25	\N	1.3	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M20	2	50	\N	0.8	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M20	3	80	\N	1.2	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M20	4	100	\N	1.1	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M4	2	100	7.7	11	\N	\N	0.69	\N	23	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M4	3	150	7.9	11.4	\N	\N	2	\N	23.5	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M4	4	200	7.9	11	\N	\N	2	\N	20	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M4	1	30	7.8	1.2	\N	\N	0.13	\N	11.5	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M45	1	50	\N	0.9	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M45	2	100	\N	6.6	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M6	1	30	\N	2.3	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M6	2	100	\N	5.6	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M6	3	130	\N	13.3	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M6	4	160	\N	16	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M76	1	30	\N	2.4	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M76	2	70	\N	3.3	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
M76	3	120	\N	7.2	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
11	1	5	8.7	1.2	48.7	7.5	0.3	1.7	34.2	0.8	36	36	37		0.15	4.65	12		0.877	6.49
11	2	15	8.3	1.3	47.6	8.2	0	1.5	28.1	1.4	31	33	36			0.94	31.5		0.000	5.80
11	3	40	8.4	1.2	58.6	9	0.5	0.9	26.5	0.8	25	40	35			1.07	24.9		1.887	6.51
11	4	150	7.9	3.9			7.2	1.1	31.3		17	27	56				25.8		23.003	0.00
12	1	35	8.5	1	52.5	12.1		1.1	34.6	0.8	19	46	35		0.05	1.09	23		0.000	4.34
12	2	80	8.4	2.8	52.5	8.5	1	1	33.3	0.8	16	26	58			1.1	22.1		3.003	6.18
12	3	100	8.3	4	76.4	19.2	1.5	0.8	12.8	1.6						1.18	19.4		11.719	3.98
12	4	150	7.9	5.5	67	5.9	6.6	0.7	46.6	0.2	40	33	27			0.41	23		14.163	11.36
15	1	25	7.5	1.8	51.4	4	0.1	1.6	19.5	1	34	44	22		0.06	0.77	20.3		0.513	12.85
15	2	145	8	3.9	103.4	7.1	0.1	0.7	11.4	2.5						0.25	22.8		0.877	14.56

16	1	15	8.6	0.7	51.4	4.4	0.6	1.2	12.8	1.5	15	48	37		0.07	0.62	24		4.688	11.68
16	2	43	8.1	1.4	52	5.9	0.1	1.2	38.1	1	19	38	43			0.72	1		0.262	8.81
16	3	150	8.1	8	58.6	8.4		1.1	35.6	1	19	31	50			0.63	28.6		0.000	6.98
17	1	40	7.3	3.4	49.8	6	0.2	10	30.4	0.5	36	36	28		0.12	1.24	25.5		0.658	8.30
17	2	63	7.5	0.8	49.8	5.8	0.3	2	31.6	1	30	29	41			0.72	23		0.949	8.59
17	3	95	7.8	0.6	51.4	6.3	0.3	1	31.5	1	31	29	40			0.57	25		0.952	8.16
17	4	145	7.5	1.2	49.8	5.6	0.6	0.6	32.7	1	38	29	33			0.28	22.2		1.835	8.89
17	5	15	7.1	1.9	51.2	6	0.5	0.6	33.9	1	16	41	43			0.35	22.1		1.475	8.53
18	1	10	8.3	2.3	47	6.4		6.9	27.7	1.5	31	22	27		0.1	1.32			0.000	7.34
18	2	45	7.9	4.2	48.2	9.9	1.9	2.1	33.9	1	26	39	35			0.61	23.2		5.605	4.87
18	3	90	7.9	4.8	42.3	7.7	0.5	0.6	21	1	43	33	24			0.25	22.1		2.381	5.49
18	4	135	7.6	7.5	48.2	8.4	0.6	0.6	28.1	1	24	29	47			0.35	22.55		2.135	5.74
19	1	10	8.3	1.3	53.2	7.2	1.9	0.7	28.1	1	41	44	15		0.37	1.42	20.3		6.762	7.39
19	2	48	8.2	0.7	42.3	5.9	1	0.6	27.7	0.5	29	33	38			0.69	24.9		3.610	7.17
19	3	70	8.4	1.1	42.3	5.5	0.8	8.9	26.7	3	33	36	31			0.98	22.1		2.996	7.69
19	4	85	8.2	1.3	44.1	6.6	0.5	1.1	22.2	1	42	34	24			0.41	23.3		2.252	6.68
19	5	100	8.2	1.1	43.2	6.7	0.4	0.8	12.1	1	74	12	14			0.28	19.4		3.306	6.45
19	6	110	8.2	2.2	40.4	5.6		0.6	31.4	1	29	35	36			0.48	22.75		0.000	7.21
19	4	120	8.1	1.2	36.8	4.2		0.5	23.4	1	35	44	21			0.21	24.9		0.000	8.76
20	1	10	7.8	1.2	41.8	5.9	0.1	5.9	32.7	1.2	26	43	31		0.13	1.33	21.2		0.306	7.08
20	2	55	7.6	1	45.9	9	0.4	1	33.9	1	25	27	48			0.61	20.4		1.180	5.10
20	3	105	7.4	3.2	50.4	9.3	0.1	0.9	30.4	0.5	17	32	51			0.56	23.2		0.329	5.42
20	4	150	8	4.4	59.1	11.4	2.8	0.9	26.4	0.5	18	25	57			0.55	21.3		10.606	5.18
21	1	15	8.4	1.2	53.6	6.8	0.3	6.9	47.5	1	21	29	50			2.49	11.1		0.632	7.88
21	2	50	8.2	1	49.1	9.3	0.2	1.1	40.3	1	19	27	54			0.86	20.7		0.496	5.28
21	3	145	8	3	48.2	12.1	0.6	1.1	35	0.5	23	19	58			0.75	21.8		1.714	3.98
22	1	15	8.1	1.7	40	4.6	0.1	1.4	25.9	1.5	56	30	14		0.08	0.63	19.4		0.386	8.70
22	2	37	8	3.4	48.2	6.6	0.2	0.9	34.5	1	21	37	42			0.83	23		0.580	7.30
22	3	45	8	2.6	46.3	7.2	2	0.7	25.3	0.5	44	29	26			0.58	15.7		7.905	6.43
22	4	145	8	3	47.3	8.4	0.2	0.9	7	1	25	28	47			0.67	22.1		2.857	5.63
23	1	10	8.5	0.5	48.6	5.6	0.2	8.4	38.4	4	22	42	36		0.12	3.09	17.1		0.521	8.68
23	2	22	8.3	0.7	52.7	6.6	0.6	0.9	22.2	1	42	37	21			0.56	22.1		2.703	7.98
23	3	52	8	1.3	47.3	3.5	0.2	0.4	47	0.5	18	29	53			2.08	18.6		0.426	13.51
23	4	150	7.9	1.7	46.3	9.7	0.3	1	32.7	0.5	17	34	49			0.54	25		0.917	4.77

24	1	8	7.6	0.8	45.4	4.4	0.3	1.8	31.3	1	32	42	26		0.09	0.85	20.3		0.958	10.32
24	2	75	8.6	1.4	52.7	7.4	0.5	1.1	33.8	0.5	29	14	57			1.36	17.6		1.479	7.12
24	3	150	7.4	2.9	48.6	9.5	0.3	1.1	29.1	0.5	16	34	50			0.56	21.2		1.031	5.12
25	1	20	8.7	0.8	44.1	5.1	0.5	0.7	24.4		27	42	31		0.11	1.14	17.5		2.049	8.65
25	2	65	8.2	0.9	44.1	5.3	0.5	0.7	35.7	0.5	17	30	53			0.97	20.4		1.401	8.32
25	3	150	8.2	0.9	48.2	6.8	0.2	1.2	35	1.02						1.02	19.6		0.571	7.09
26	1	5	7.5	0.9	53.6	7.2	0.2	0.7	34.7	0.6	78	9	13		0.31	4.15	12.1		0.576	7.44
26	2	36	7.9	1.2	45	7.8	0.3	1.5	34.4	0.6	22	36	42			0.47	21.3		0.872	5.77
26	3	63	7.7	3.2	47.3	8.5	1.2	0.8	32	1.9	17	42	41			0.53	25		3.750	5.56
5	1	40	7.7	1.4	31	5	0.2	2.6	32.7	2.1	27	36	37		0.03	0.81	21.2		0.612	6.20
5	2	70	8.2	1.8	31.3	6	0.2	1.5	29.2	1.6	25	34	41			0.38	23.2		0.685	5.22
5	3	90	7.5	1.2	50.3	6.7	0.5	1.3	28.1	0.6	22	34	44			0.47	24.9		1.779	7.51
5	4	120	8.3	1	42	3.7	0.2	0.7	16.4	0.8	71	17	12			0.25	17.9		1.220	11.35
5	5	150	8.2	2	54.8	8.6	1	1.5	43.7	0.7	17	25	58			0.42	22.1		2.288	6.37
6	1	55	7.8	25.5	48.1	7.3	11.2	19.7	30.3	5.4	23	39	38		0.08	0.46	21.3		36.964	6.59
6	2	90	8	11	85.9	13.1	3.6	16.6	11.8	2.7	28					0.61	21.3		30.508	6.56
6	3	150	7.7	12.5	72	15.9	13.9	9.7	11.7	1.6						0.5	24		0.000	4.53
7	1	25	7.7	1.3	46	5.6	0.3	1.8	43.3	3.6	47	25	28		0.03	1.13	19.5		0.693	8.21
7	2	45	7.2	1.7	48.1	7.9	0.3	1.5	25.3	1	32	26	42			0.52	18.5		1.186	6.09
7	3	50	7.1	2.2	47.9	2.3	0.1	1.1	12.1	0.1	52	24	51			0.35	21.3		0.826	20.83
7	4	100	7.6	3.3	49.6	4.2	0.2	1.4	24.6	1	31	34	35			0.27	24.9		0.813	11.81
7	5	150	7.6	3	48.1	0.9	0.3	0.7	10.6	0.1	76	15	9			0.27	15.7		2.830	53.44
8	1	10	8.7	1	53.1	4.6	0.2	1.6	31.6	1.6	31	34	35		0.02	0.57	15.7		0.633	11.54
8	2	32	8.3	1.6	52.5	9.5	0.3	1.3	33.8	1	25	32	43			0.73	21.2		0.888	5.53
8	3	85	8.1	1.2	54.2	6.1	0.6	1	18.9	1.2	30	26	44			1.09	9.2		3.175	8.89
8	4	105	7.9	6.5	57.5	5	0.4	1	33.9	1.5	17	32	51			0.43	22.9		1.180	11.50
8	5	125	8.1	4.8	63.2	7.5	7	1.2	23.7	0.6	17	47	36			0.39	28.3		29.536	8.43
9	1	10	8.1	0.8	54.8	2.9	0.2	1.7	35	0.8	18	44	38		0.07	0.81	25.1		0.571	18.90
9	2	67	8.4	1	54.2	5.8	0.3	1.4	36.2	0.7	22	30	47			0.72	23		0.829	9.34
9	3	120	8.4	2.1	52.5	6.1	0	0.9	40.9	1	16	29	55			0.5	22.1		0.000	8.61
1	1	20	8.4	0.5	48.4	6.3	0.1	1.1	36.1	1.6	33	26	41		0.02	0.54	18.9		0.277	7.68
1	2	35	8.4	0.6	68.8	6.8	0.2	0.8	28.1	0.4	30	30	40			0.44	19.4		0.712	10.12
1	3	50	8.2	0.9	55.8	9.5	0.2	0.7	34.8	1	28	15	57			0.44	22		0.575	5.87
1	4	85	8.3	0.6	51.8	9.8	0.4	0.8	34.9	0.7	25	20	55			0.56	19.5		1.146	5.29

1	5	125	8.2	1	53.5	9.8	0.3	0.7	33.9	0.5	29	21	50			0.71	16.6		0.885	5.46
1	6	150	8	3.9	94.4	6.5	0.2	0.7	21.3	0.6	35	18	47			0.51	22.8		0.939	14.52
10	1	15	7.9	7.8	49.8	7	4.5	4.2	34.9	7.2	37	30	33		0.36	2.38	20.4		12.894	7.11
10	2	53	7.9	23	55.9	8.2	13.6	4.2	16.6	2.2	28	35	37			0.94	22.1		81.928	6.82
10	3	72	8	19.2	40.9	7.2	8.4	1.1	23.5	0.7	74	13	13			0.5	12		35.745	5.68
10	4	150	8.1	17.2	92.9	7.5	18.7	1.3	21.9	1.2						1.02	8.3		85.388	12.39
13	1	27	8.5	0.8	39.8	6.7	0	1.4	8.4	3.4	70	15	15		0.05	0.72	14.7		0.000	5.94
13	2	65	8.4	0.5	43.1	12.4	0	1.5	22.2	6	45	23	32			0.46	20.3		0.000	3.48
13	3	80	8.4	0.5	32	9.3	0	0.4	9.3	2	96	2	2			0.31	12		0.000	3.44
13	4	97	8.4	1	45.3	10	0.8	2.1	41.5	8.5	38	30	32			0.44	19.4		1.928	4.53
13	5	110	8.4	1.7	45.3	3.9	0.8	1.2	30.4	1.5	20	56	24			0.25	34.1		2.632	11.62
13	6	150	8.3	2.4	48.1	5	0.6	0.9	9.4	1.4	24	62	14			0.31	24.9		6.383	9.62
14	1	20	8.2	1.2	48.1	4.5	0.8	6.9	30.3	1	32	39	29		0.1	1	20.3		2.640	10.69
14	2	60	8.1	3.2	48.7	6	0.4	1.7	31.6	1	22	39	39			0.83	22.8		1.266	8.12
14	3	100	7.9	3.1	51.4	6.5	0.1	1	32.4	0.5	18	41	41			0.73	24		0.309	7.91
14	4	145	7.8	7.5	54.8	5.8	3.1	0.8	25.7	1	39	35	26			0.48	15.7		12.062	9.45
2	1	50	8.4	1	53.5	5.7	0.1	1.1	24.3	0.9	27	37	36		0.05	0.62	24.1		0.412	9.39
2	2	100	8.2	0.8	29.5	3.3	0.1	0.4	15.2	0.3	78	9	13			0.35	16.7		0.658	8.94
2	3	150	8	1	46.7	5.8	0.1	0.6	28	1.3	52	20	28			0.32	22.3		0.357	8.05
3	1	30	8.3	1.1	60.3	5.8	0.2	1.3	5.8	1.1	47	33	20			1.18	18.6		3.448	10.40
3	2	70	8.1	5.4	43.2	9.8	0.7	0.5	33.8	0.6	34	33	33			0.8	19.9		2.071	4.41
3	3	100	8.5	9.5	34.7	7.2	0.2	0.5	21.1	0.5	57	23	20			0.24	24.1		0.948	4.82
3	4	135	8.1	9.5	39.8	12.7	0.5	0.4	31.3	0.1	27	39	34			0.38	23		1.597	3.13
4	1	60	8.4	1	51.8	5.8	0.5	0.8	28.3	1.4	39	30	31		0.06	0.75	19.5		1.767	8.93
4	2	100	8.2	3	51.8	5	0.4	1.3	27.6	2	19	33	48			0.76	22.1		1.449	10.36
4	3	125	8.2	3.1	101.3	6.8	0.3	0.7	43.7	2.5	25	29	46			0.93	21.2		0.686	14.90
4	4	140	8.1	4	45	4.8	0.2	0.4	22.2	0.1	52	26	22			0.26	20.4		0.901	9.38
PG01	2	66	7.7	1.05	28.55	13	2	0.94	48.8	\N	15	34	51		\N	\N	23.3		4.098	2.20
PG01	4	137	7.6	3.7	34.6	15	3.33	0.9	55.08	\N	1	30	69		\N	\N	26.5		6.046	2.31
PG01	1	26	7.8	1.26	31.17	11.7	2.38	0.71	49.63	5.6	7	28	65		0.045	0.67	28.6		4.795	2.67
PG01	3	105	7.7	2.4	32.05	14.2	3.16	0.18	55.66	\N	4	33	63		\N	\N	24.4		5.677	2.26
PG02	1	40	7.6	1.8	35.82	11.4	2.89	3.25	55.25	11.5	3	37	60		0.093	2	23.3		5.231	3.15
PG02	2	63	7.6	2.7	38.51	11.3	2.64	2.63	58.75	\N	2	35	63		\N	\N	23.3		4.494	3.40
PG02	3	140	7.7	4.5	69.18	17.2	3.69	0.88	39.99	\N	2	54	44		\N	\N	25.4		9.227	4.02

PG02	4	180	7.9	5.7	51.6	18.3	4.5	0.71	44.3	\N	11	71	18		\N	\N	25.4		10.158	2.82
PG03	1	20	7.6	1.81	31.89	8.88	2.13	2.08	50	8.1	13	33	54		0.092	2.18	18.1		4.260	3.59
PG03	2	71	7.8	3.05	95.34	12.8	1.9	0.71	50	\N	4	89	7		\N	\N	23.3		3.800	7.48
PG03	3	100	7.8	3.3	128.5	14.1	1.63	0.76	37.5	\N	4	88	8		\N	\N	20.1		4.347	9.10
PG03	4	140	7.8	3.78	100.9	17.2	1.67	0.63	37.5	\N	18	36	46		\N	\N	23.3		4.453	5.88
PG04	1	15	7.6	1.26	37.65	11.6	2.3	2.08	56.3	9.8	3	44	53		0.06	1.2	24.3		4.085	3.26
PG04	2	50	7.8	1.58	54.85	9.1	3.8	0.95	56.3	\N	4	24	72		\N	\N	15		6.750	6.03
PG04	3	76	7.8	2.88	16.82	5.14	2.4	0.25	27.5	\N	18	36	46		\N	\N	16.9		8.727	3.27
PG04	4	120	7.9	2.9	10.16	5.12	1.15	0.13	16.8	\N	89	0	11		\N	\N	12.8		6.845	1.98
PG05	1	30	7.7	1.89	19.4	6.46	1.45	0.63	25	2.3	59	13	28		0.03	0.4	15		5.800	3.00
PG05	2	87	7.7	1.45	27.31	7.78	2	1.7	27.5	\N	22	57	21		\N	\N	15		7.273	3.51
PG05	3	140	7.9	1.78	10.32	5.18	2	0.38	23.5	\N	69	7	24		\N	\N	20.1		8.511	1.99
PG05	4	161	7.6	5.78	14.92	5.07	1.37	0.31	23.02	\N	69	10	21		\N	\N	13.8		5.951	2.94
PG06	1	15	7.7	0.63	40.4	9.08	1.66	1.15	61.25	4.3	19	18	63		0.082	1.33	16.9		2.710	4.45
PG06	2	43	7.8	0.35	37.88	7.8	1.71	1	61.25	\N	15	33	52		\N	\N	19.1		2.792	4.86
PG06	3	80	7.6	1.31	38.75	8.94	1.82	0.95	56.25	\N	16	30	54		\N	\N	18.1		3.236	4.33
PG06	4	150	7.6	2.84	49.41	12.5	2.26	0.86	49.31	\N	17	34	49		\N	\N	19.1		4.583	3.96
PG07	1	38	7.7	0.63	31.9	10.4	2.09	2.25	59.4	7.5	5	28	67		0.06	0.94	25.4		3.519	3.08
PG07	2	77	7.7	1.1	35.74	11.6	2.47	1.25	63.47	\N	1	29	70		\N	\N	24.3		3.892	3.09
PG07	3	115	7.6	3.8	47.4	14.9	3.5	1.08	62.75	\N	1	20	79		\N	\N	25.4		5.578	3.17
PG07	4	140	7.7	3.68	32.4	11.1	4.89	0.83	56.77	\N	2	38	60		\N	\N	25.4		8.614	2.92
PG08	1	32	7.6	0.74	37.76	9.06	1.91	1.2	56.25	5.5	8	41	51		0.064	1.07	21.2		3.396	4.17
PG08	2	63	7.6	2.84	48.15	10.1	2.29	0.95	55.79	\N	7	38	55		\N	\N	20.1		4.105	4.79
PG08	3	100	7.6	4.1	50.67	16.2	3	1	55.27	\N	9	38	53		\N	\N	20.1		5.428	3.12
PG08	4	169	7.7	4.73	45.32	17.3	4.11	1	48.36	\N	9	39	52		\N	\N	24.3		8.499	2.62
PG09	1	20	7.8	0.63	42.98	9.06	1.73	1.63	62.25	4	1	38	61		0.058	1.94	23.3		2.779	4.74
PG09	2	70	7.8	0.42	40.45	10.3	2.07	1.35	62.25	\N	1	37	62		\N	\N	23.3		3.325	3.93
PG09	3	145	7.6	3.4	31.81	12.3	2.37	1.1	68.12	\N	1	41	58		\N	\N	23.3		3.479	2.58
PG09	4	168	7.7	4	58.81	4.45	3.09	1	67.59	\N	1	33	66		\N	\N	25.4		4.572	13.22
PG10	1	10	7.6	1.34	42.81	9	1.97	1.19	62.5	4.9	4	40	56		0.06	1.2	18.1		3.152	4.76
PG10	2	40	7.8	0.42	42	10.4	2.17	0.95	64.8	\N	4	38	58		\N	\N	18.1		3.349	4.04
PG10	3	103	7.6	4.8	66.12	14.9	3.95	1.13	63	\N	2	39	60		\N	\N	20.1		6.270	4.44
PG10	4	149	7.6	4.8	47.68	13.5	1.4	0.83	59.35	\N	1	39	60		\N	\N	24.3		2.359	3.54
PM1	1	10	7.7	0.7	10.1	0.68	0.06	1.36	13	\N	54	20	26		\N	\N	15.1	0.04	0.462	14.85

PM1	2	40	7.8	0.4	10.15	0.94	0.06	0.88	14	\N	55	15	30		\N	\N	15.5	0.04	0.429	10.80
PM1	3	60	7.9	0.5	8.73	2.72	0.21	0.95	18.8	\N	47	16	37		\N	\N	23.5	0.02	1.117	3.21
PM1	4	150	7.6	2.6	48.75	1.25	0.09	1.19	16.5	\N	36	27	37		\N	\N	24.3	6.36	0.545	39.00
PM1	5	200	7.7	2.8	51.88	2.43	0.1	1.14	13.5	\N	52	24	24		\N	\N	18	24	0.741	21.35
PM11	1	38	\N	0.7	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM11	2	100	\N	0.8	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM11	3	170	\N	2.7	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM11	4	200	\N	3.5	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM12	1	35	\N	1.3	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM12	2	100	\N	13.2	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM12	3	170	\N	14.3	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM12	4	200	\N	12.3	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM15	1	32	\N	0.6	\N	\N	0.08	\N	16.3	\N	\N	\N	\N		\N	\N	\N		0.491	0.00
PM15	2	82	\N	0.7	\N	\N	0.24	\N	21.8	\N	\N	\N	\N		\N	\N	\N		1.101	0.00
PM15	3	120	\N	1.8	\N	\N	0.24	\N	26	\N	\N	\N	\N		\N	\N	\N		0.923	0.00
PM15	4	180	\N	2.3	\N	\N	0.33	\N	20.8	\N	\N	\N	\N		\N	\N	\N		1.587	0.00
PM16	1	35	7.6	0.5	11.95	1.84	0.06	1.28	18.3	\N	47	17	36		\N	\N	\N	26.5	0.328	6.49
PM16	2	80	7.8	0.5	10.78	3.63	0.06	1.51	19.8	\N	43	14	43		\N	\N	\N	28.2	0.303	2.97
PM16	3	150	8.4	0.5	10.23	5.78	0.71	0.95	20	\N	37	17	46		\N	\N	\N	24.8	3.550	1.77
PM16	4	200	7.8	4.8	49.38	4.01	0.55	0.5	28.3	\N	45	18	37		\N	\N	\N	15.4	1.943	12.31
PM2	1	10	7.9	0.9	9.36	1.11	0.06	1.29	12.8	5.4	65	8	27		0.06	0.6	10.9	0.03	0.469	8.43
PM2	2	47	7.9	0.6	10.2	2.95	0.08	1.97	17	1.2	52	13	35		0.044	0.5	13.9	0.03	0.471	3.46
PM2	3	115	7.7	2.5	10.8	3.87	0.39	2.4	23.3	\N	42	16	42		\N	\N	19.3	0.01	1.674	2.79
PM2	4	200	7.8	10	38.13	5.13	0.88	1.04	21.5	\N	38	25	37		\N	\N	23	4.4	4.093	7.43
PM3	1	10	7.6	1.9	30.94	2.24	0.05	1.18	35.8	0.52	28	27	45		0.028	0.298	13.5	0.4	0.140	13.81
PM3	2	35	7.7	1.9	34.69	2.8	0.02	0.98	36	0.26	26	26	48		0.021	0.266	12.6	1.5	0.056	12.39
PM3	3	80	7.7	2.7	43.75	5.32	0.26	0.94	30.8	\N	28	24	48		\N	\N	11.3	2.8	0.844	8.22
PM3	4	110	7.8	4.2	56.25	7.04	0.25	0.82	25.5	\N	26	39	35		\N	\N	11.4	9.6	0.980	7.99
PM4	1	15	7.7	0.6	13.3	1.82	0.06	1.44	17.3	4.82	58	14	28		0.045	0.6	8.8	0.05	0.347	7.31
PM4	2	42	7.8	1	10.93	2.29	0.16	0.56	15	0.67	68	7	25		0.028	0.33	8.4	0.03	1.067	4.77
PM4	3	70	7.6	7.5	10.66	2.67	0.5	0.28	18.3	\N	68	7	25		\N	\N	13.1	0.02	2.732	3.99
PM4	4	110	7.6	7.5	8.94	4.34	1.66	0.34	20.8	\N	58	14	28		\N	\N	19.4	0.01	7.981	2.06
PM5	1	30	\N	1	\N	\N	0.03	\N	9	\N	\N	\N	\N		\N	\N	\N		0.333	0.00
PM5	2	65	\N	0.4	\N	\N	0.06	\N	9.3	\N	\N	\N	\N		\N	\N	\N		0.645	0.00

PM5	3	100	\N	1	\N	\N	0.06	\N	16	\N	\N	\N	\N		\N	\N	\N		0.375	0.00
PM5	4	180	\N	1.7	\N	\N	0.13	\N	17.8	\N	\N	\N	\N		\N	\N	\N		0.730	0.00
PM6	1	30	\N	2.3	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM6	2	100	\N	5.6	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM6	3	130	\N	13.3	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM6	4	160	\N	15.4	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM7	1	25	\N	1.2	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM7	2	50	\N	0.8	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM7	3	130	\N	1.9	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM7	4	180	\N	8.3	\N	\N	\N	\N	\N	\N	\N	\N	\N		\N	\N	\N		0.000	0.00
PM8	1	50	\N	1.6	\N	\N	0.14	\N	14.5	\N	\N	\N	\N		\N	\N	\N		0.966	0.00
PM8	2	100	\N	8.6	\N	\N	0.55	\N	19.3	\N	\N	\N	\N		\N	\N	\N		2.850	0.00
PM8	3	150	\N	13.3	\N	\N	1.01	\N	22.5	\N	\N	\N	\N		\N	\N	\N		4.489	0.00
PM8	4	200	\N	11.3	\N	\N	1.29	\N	22.3	\N	\N	\N	\N		\N	\N	\N		5.785	0.00
A301	1	10	7.8	1.6	17.9	3.9	0.4	2.2	23.1	2.8	41	39	20		0.12	1.4	15	0.04	1.732	4.59
A301	2	25	7.9	1.5	10.3	2.6	0.7	1.2	20.4	2.5	57	21	22		0.07	0.8	18	0.04	3.431	3.96
A301	3	75	7.6	3.6	17.8	4.8	0.6	1	24.1		27	46	27				25	0.17	2.490	3.71
A301	4	160	7.9	4.2	33.8	1.3	0	0.9	16.5		29	53	18				36	1.31	0.000	26.00
A301	5	200	7.9	5.2	16.6	5.1	0.5	1.4	23.8		24	43	33				27	1.36	2.101	3.25
C239	1	20	7.8	4.2	107.6	2.3	1	2	27.3	1.8	19	48	33		0.11	1	20	0.17	3.663	46.78
C239	2	50	7.7	2.8	116.2	5.6	0.5	1.9	28	1.4	17	43	40		0.09	0.9	22	0.11	1.786	20.75
C239	3	85	7.8	3.9	75.5	5.7	0.1	1.2	27.9		14	41	45				21	0.09	0.358	13.25
C239	4	110	7.8	0.7	39.4	5.2	0.4	1.3	30.4		17	48	35				20	0.96	1.316	7.58
C239	5	200	7.7	5.7	27.5	7.1	0	1.2	27.9		17	45	38				19	1.12	0.000	3.87
A364	1	10	8.1	1.1	24.8	8.5	0.5	1.5	31.5	1.6	19	39	42		0.07	0.8	23	0	1.587	2.92
A364	2	45	8.2	0.8	7.2	4.1	0.4	0.8	30.7	1.4	19	32	49		0.06	0.7	18	0	1.303	1.76
A364	3	90	8.2	0.8	12.4	6.5	1.9	1	30.6		19	19	62				23	0.01	6.209	1.91
A364	4	145	8	1.8	17.4	10.2	1.4	1	33		16	22	62				21	0	4.242	1.71
A364	5	190	7.8	5.5	10.6	5.4	0.9	1.3	32.3		26	17	57				21	1.05	2.786	1.96
C038	1	25	7.8	2.2	20.8	9	0.5	1.6	29.8	1.3	16	42	42		0.07	0.7	24	0.04	1.678	2.31
C038	2	50	7.7	4.7	10.6	5.4	0	0.8	29.8	0.8	21	27	52		0.07	0.6	22	0.17	0.000	1.96
C038	3	110	7.9	8.3	33.1	7.2	0	0.8	31		16	42	42				22	1.09	0.000	4.60
C038	4	180	8	10.2	50.7	13.2	4	1.1	27.8		26	43	31				24	0.88	14.388	3.84
C038	5	200	7.8	5.1	28.7	7.8	1.2	1.7	13.3		19	41	40				23	1.05	9.023	3.68

A379	1	6	7.9	1.6	24.4	12.2	0.7	1.2	29.5	1.3	20	36	42		0.07	0.8	23	0.03	2.373	2.00
A379	2	20	8	1.7	15.2	8.1	1.3	0.6	29.9	0.9	25	21	53		0.05	0.7	19	0.02	4.348	1.88
A379	3	80	7.6	6	17.5	6	0	0.8	30.6		23	25	52				22	0.55	0.000	2.92
A300	1	15	7.7	1.2	20.9	4.9	0.6	1	30	2	29	28	43		0.08	0.8	19	0	2.000	4.27
A300	2	90	7.9	0.9	19.8	8.4	0.7	0.8	28.4	0.8	37	20	43		0.05	0.6	22	0.01	2.465	2.36
A300	3	120	7.9	1.2	15.2	6.4	0.8	0.4	22.1		32	38	30				24	0.01	3.620	2.38
A300	4	153	8	1.1	13.5	6.5	0.4	0.4	17.9		49	31	20				20	0	2.235	2.08
A300	5	200	7.9	0.8	15.4	5.5	0.3	0.4	13.8		61	21	18				18	0.01	2.174	2.80
A377	1	25	7.8	1	15.7	4.1	0.4	1.8	27.3	1.9	36	22	42		0.09	0.8	20	0.03	1.465	3.83
A377	2	75	7.8	2.8	19.5	10.4	0.9	1.1	27.3	0.5	31	22	47		0.04	0.5	2.2	0.06	3.297	1.88
A377	3	125	8	2.1	15.2	11.8	1.5	1	27		31	22	47				21	0.09	5.556	1.29
A377	4	200	7.8	8.7	16.6	6.9	2.4	0.7	25.8		31	27	42				22	0.98	9.302	2.41
C009	1	15	7.6	1	26.8	8.4	0.5	1.5	34.6	1.2	14	33	53		0.07	0.8	23	0.04	1.445	3.19
C009	2	38	7.9	1.2	22.7	10.1	0.9	0.8	33.6	0.7	10	27	63		0.06	0.7	30	0.01	2.679	2.25
C009	3	92	8.1	0.9	20	8.9	0.8	0.7	34		11	26	63				23	0.01	2.353	2.25
C009	4	180	7.8	3.6	13.5	5	1.1	1.1	35.1		8	31	61				19	0.35	3.134	2.70
C238	1	15	7.6	4.3	25.6	8.4	0.4	2.1	33.4	3.2	21	26	53		0.15	1.7	19	0.22	1.198	3.05
C238	2	38	7.7	3.2	21.9	10	0.2	1.4	32.4	0.8	21	18	61		0.08	0.7	21	0	0.617	2.19
C238	3	74	7.9	3.4	26.4	19	1.5	1.1	34.6		16	21	63				21	0.05	4.335	1.39
C238	4	115	7.8	7.2	27.3	20.1	5	1.2	34.2		16	21	63				20	0.1	14.620	1.36
C238	5	190	8	6.3	5	11.6	1.1	1.2	31.9		14	31	55				18	1.06	3.448	0.43
C178	1	15	7.7	0.7	34.2	9.8	0.3	1.2	30	1.9	17	35	48		0.07	0.7	24	0.03	1.000	3.49
C178	2	36	7.9	0.7	19.9	7.3	0.8	0.9	30	1.6	19	31	50		0.07	0.6	24	0.02	2.667	2.73
C178	3	75	8	1.2	16.6	6.9	0.9	0.8	30.6		17	30	53				27	0.01	2.941	2.41
C178	4	130	7.9	3.5	20.2	9.4	0.8	1	30.7		17	28	55				25	0.05	2.606	2.15
C178	5	200	7.7	7.3	70.5	7.4	1.5	0.9	30.1		19	33	48				23	1.14	4.983	9.53
C263	1	15	7.7	1.1	26.8	8.4	0.4	1.9	29.2	2.95	18	29	53		0.08	1.6	28	0.03	1.370	3.19
C263	2	40	8.1	0.6	26.2	8.1	0.7	1.5	28.2	2.05	18	27	55		0.06	1	30	0.02	2.482	3.23
C263	3	90	8.2	0.7	16.5	6.5	0.8	1.6	27.9		23	22	55				2.5	0.01	2.867	2.54
C263	4	145	7.7	0.4	11.8	4.6	0	0.6	30.8		33	16	51				27	0.17	0.000	2.57
G5	1	15	7.8	0.7	21	6	0.2	1.3	28.2		12	35	53						0.709	3.50
G5	2	35	7.7	0.7	16.9	5.5	0.3	1.2	25.6		17	38	45						1.172	3.07
G5	3	75	7.7	2	12.9	5	0.4	0.9	20.7		32	38	30						1.932	2.58
G5	4	140	7.7	2.3	20.8	7.7	0.5	1.1	30.1		12	33	55						1.661	2.70

G4	1	12	7.8	1.2	21	6.6	0.3	1.2	28.5		22	15	63						1.053	3.18
G4	2	30	7.7	2.1	20.5	7.5	0.6	0.9	27.7		24	11	65						2.166	2.73
G4	3	65	7.8	2	17.8	8.7	0.9	0.7	27.5		27	13	60						3.273	2.05
G4	4	140	7.8	1.7	15.5	9.8	0.5	0.7	27.4		30	10	60						1.825	1.58
G7	1	15	7.7	1.6	23	8	0.3	1.1	31.9		11	24	65						0.940	2.88
G7	2	35	7.6	1.5	17.1	6	0.3	1.1	26.3		24	26	50						1.141	2.85
G7	3	60	7.7	1.5	12.8	6.2	0.4	0.6	24.4		27	23	50						1.639	2.06
G7	4	120	7.7	3	12.9	6.8	0.2	0.5	27.5		35	17	48						0.727	1.90
G1	1	12	7.7	6.6	18	10	2.3	1.6	31.6		27	20	53						7.278	1.80
G1	2	30	7.4	11.1	23.4	6.6	0.7	1.8	32.5		17	25	58						2.154	3.55
G1	3	70	7.9	9.9	16.9	10	3.4	0.9	31.2		30	10	60						10.897	1.69
G1	4	120	8.1	9.1	32.5	13.5	2.8	0.6	49.4		27	13	60						5.668	2.41
PM11	1	14	7.6	0.47	35.8	6.2	0.65	2.63	24.9	8.9	53	12	35		0.15	1.04			2.610	5.77
PM11	2	70	7.7	0.66	33.3	6.2	0.85	2.01	27.6	0	46	12	42		0.0588	0.61			3.080	5.37
PM11	3	92	7.8	0.73	35.8	11.3	1.56	0.98	32.2		43	10	47						4.845	3.17
PM11	4	135	8.2	1.66	35.5	13.7	3.26	1.11	33.5		40	10	50						9.731	2.59
M227	1	20	7.9	0.77	39.7	7.5	1	2.19	39.2	3.4	32	29	39		0.1093	0.74			2.551	5.29
M227	2	45	8.3	0.87	37.8	15.1	1.77	1.28	36.6	1.8	28	18	54		0.0616	0.65			4.836	2.50
M227	3	75	8.4	1.29	38.4	15	3.61	1.41	40		25	21	54						9.025	2.56
M227	4	120	8.3	6.2	51.6	17.8	1.25	1.39	39.3		23	26	51						3.181	2.90
PM2	1	4	7.9	0.52	43.3	4.3	0.65	2.78	38.3	1.2	24	24	52		0.12	0.93			1.697	10.07
PM2	2	25	8.1	0.82	43.4	10	1.13	1.13	34.6	0	21	18	61		0.0056	0.49			3.266	4.34
PM2	3	100	8.1	1.58	41.3	12	1.29	1.29	35		21	18	61						3.686	3.44
PM2	4	125	8.2	1.51	45.8	13	1.34	1.34	33.9		23	15	62						3.953	3.52
PM25	1	2	7.6	0.81	36.9	3.7	0.66	1.58	32.9	3.1	44	19	37		0.15	2.36			2.006	9.97
PM25	2	20	7.9	0.81	33.8	6.2	0.87	2.24	26.1	0	40	10	50		0.0532	0.53			3.333	5.45
PM25	3	50	8	1.98	35.8	8.3	1.18	1.35	23.8		42	8	50						4.958	4.31
PM25	4	110	8	0.45	37.8	8.5	1.19	2.84	30.9		39	9	52						3.851	4.45
PM19	1	15	7.7	0.63	41.2	4.7	0.7	2.29	29.5	2.5	39	18	43		0.12	0.76			2.373	8.77
PM19	2	45	8	1.39	41.8	6.3	1	1.19	31.3	0	38	12	50		0.05	0.51			3.195	6.63
PM19	3	75	8	0.42	35.7	4.7	0.73	2.9	24		48	12	50						3.042	7.60
PM19	4	120	8	2.7	65.1	15.2	3.13	1	32.1		31	17	52						9.751	4.28
PM20	1	20	7.9	0.39	39.4	4.7	0.83	1.83	30.6	5.3	47	14	39		0.11	0.7			2.712	8.38
PM20	2	40	8	0.82	38.2	9.3	1.03	1.01	31.7	0.3	38	12	50		0	0.47			3.249	4.11

PM20	3	80	8	1.73	39.7	13.3	1.45	1.02	34.7		38	10	53						4.179	2.98
PM20	4	120	8.1	2.26	40.1	15.2	1.71	1.47	33.5		35	10	55						5.104	2.64
PM34	1	15	7.7	0.54	39.3	4.7	0.6	1.2	31.4	0.5	43	15	42		0.15	1.14			1.911	8.36
PM34	2	50	7.7	0.88	35.5	7	0.65	0.77	43.8	0	43	11	46		0.056	0.56			1.484	5.07
PM34	3	75	8	3.32	38.3	10.2	2.07	0.86	31		42	8	50						6.677	3.75
PM34	4	120	8	1.66	55.7	13.5	5.7	1.11	32.7		38	10	52						17.431	4.13
PM10	1	20	7.7	0.75	40.7	7.8	0.69	2.34	30.3	5.5	42	30	28		0.128	0.82			2.277	5.22
PM10	2	40	8.4	0.49	34.3	11.7	1.54	1.13	33.3	2	38	24	38		0.08	1.06			4.625	2.93
PM10	3	80	8.3	2.79	32.5	12.7	0.8	1.09	37		30	25	45						2.162	2.56
PM10	4	120	8.3	7.96	54.2	15.5	14.3	1.08	35.2		37	30	43						40.625	3.50
PM21	1	15	8.1	0.57	39.2	5.8	0.89	0.78	24.3	1	54	16	30		0.0869	0.71			3.663	6.76
PM21	2	40	8.8	2.25	26.2	11.7	8.23	0.84	27.8	0	43	15	42		0.039	0.47			29.604	2.24
PM21	3	85	8.4	8.63	33.7	13.5	20.9	0.86	28.8		38	12	50						72.569	2.50
PM21	4	120	8.5	17.7	36.7	15.5	27	2.56	31		31	18	51						87.097	2.37
PM8	1	20	7	0.65	23	4.3	0.67	2.18	25.4	0	58	8	38		0.1	0.87			2.638	5.35
PM8	2	40	8.1	0.65	26.2	6.8	0.69	1.42	25.2	0	49	7	44		0.004	0.4			2.738	3.85
PM8	3	65	8	0.85	24.1	6.3	0.82	1.47	28.2		52	4	44						2.908	3.83
PM8	4	120	8	0.45	20.2	4.7	0.94	1.82	25.3		53	3	44						3.715	4.30
A032	1	10	8.3	1.55	23.75	15.3	6.77	0.85	39.8	0.92	38	15	47		0.067	0.76	2.36	0.046	17.010	1.56
A032	2	85	7.8	13.29	24	15.6	8.45	0.79	34.8	0.4	35	15	50		0.048	0.62	3.04	0.034	24.282	1.54
A032	3	160	8	8.97	14.05	17.3	17.5	0.62	40.9		33	12	55				2.53		42.787	0.81
A032	4	200	8.1	9.88	14.62	21.1	23.6	0.62	43.4		25	15	60				3.12		54.309	0.69
A058	1	11	8.1	0.57	24.4	6.27	0.2	1.49	28.6	3.22	13	50	37		0.078	0.93	20.02	0.022	0.699	3.89
A058	2	30	8.1	0.41	24.5	6.5	0.22	1.06	29.3	1.26	13	42	45		0.073	0.83	19.81	0.022	0.751	3.77
A058	3	140	7.8	3.4	35	5.85	0.6	0.97	24		13	40	47				19.6	0.844	2.500	5.98
A058	4	200	7.9	5.3	59.3	8.83	1.84	0.76	21.7		15	38	47				21.07	1.14	8.479	6.72
A059	1	10	8.1	0.64	27.05	10	1.02	0.95	37.1	1.04	33	17	40		0.097	1.12	3.96	0.028	2.749	2.71
A059	2	40	8.3	6	14.25	18.1	20.7	0.45	38.4	0.28	38	15	47		0.041	0.62	8.26		53.958	0.79
A059	3	75	8	13.86	54.38	10.1	1.46	0.52	33.9		30	18	52				3.04	0.733	4.307	5.41
A059	4	160	8.2	7.95	9.2	13.2	14.3	0.47	49.8		30	13	57				2.19		28.614	0.70
A076	1	7	7.8	0.84	17.75	5.79	0.25	1.37	25.4	3.68	58	10	32		0.115	1.29	0.33	0.014	0.984	3.07
A076	2	18	8.3	0.79	15.84	7.9	2.75	0.67	25.5	0.8	53	7	40		0.045	0.49	7.92	0.085	10.784	2.01
A076	3	65	9	2.34	7.45	7.14	9.15	0.54	28		48	12	40				9.02	0.033	32.679	1.04
A076	4	130	8.9	7.72	5.86	7.03	24.9	0.89	30		45	10	45				5.44		82.933	0.83

A077	1	45	8.05	1.02	17.58	1.57	0.04	0.75	15.7	2.45	70	10	20		0.056	0.77	2.29		0.255	11.20
A077	2	90	8.25	0.93	20.29	2.61	0.11	0.28	16.2	1.1	65	10	25		0.036	0.51	8.35		0.679	7.77
A077	3	165	8	3.11	22.81	1.7	0.09	0.27	15.9		60	12	28				9.81		0.566	13.42
A077	4	200	8.1	3.78	25	8.38	0.14	0.21	16.7		55	17	28				22.96		0.838	2.98
A078	1	8	7.9	1.08	29.04	8.05	0.39	1.63	35.1	3.78	15	30	55		0.081	1.05	20.44	0.018	1.111	3.61
A078	2	120	8.2	0.77	24.67	13.6	0.92	0.79	32.9	0.8	20	23	57		0.049	0.71	20.23	0.009	2.796	1.82
A078	3	180	7.8	4.2	26.44	13.7	17.9	0.89	33		18	20	62				20.44	0.058	54.091	1.93
A103	1	12	8	2.34	22.73	15.8	1.7	0.72	32.4	0.85	24	31	45		0.084	0.8	26.66		5.247	1.44
A103	2	50	8.1	6.67	12.12	16	6.7	0.5	33.5	0.29	22	28	50		0.081	0.56	24.56		20.000	0.76
A103	3	105	7.8	11.56	22	15.5	7.05	0.67	28.7		24	21	55				24.45	0.27	24.564	1.42
A103	4	180	8	12.01	12.25	14.4	5.62	0.58	34.3		22	19	60				26.24		16.385	0.85
B157	1	13	8.1	0.73	15.5	8.23	1.35	0.66	28.8	1.18	49	14	37		0.07	0.54	4.95	0.27	4.688	1.88
B157	2	48	8.4	5.11	9.9	15.4	10	0.49	29.9	0.29	42	14	44		0.035	0.24	8.15		33.445	0.64
B157	3	135	8	12.2	13.12	5.87	0	0.42	25.4		50	10	40				5.08	1.06	0.000	2.24
B157	4	200	8.3	10.56	6.66	10.5	9.5	0.53	27.2		50	12	38				4.53		34.926	0.64
B159	1	10	7.8	0.89	40.19	7.31	0.36	1.81	38.6	3.18	35	17	48		0.148	1.48	4.03	0.02	0.933	5.50
B159	2	30	7.9	0.7	26.13	8.11	0.42	0.94	33.9	0.51	40	12	48		0.07	0.54	5.37	0.02	1.239	3.22
B159	3	120	8.2	1.1	13.35	8.63	2.96	0.58	33.6		42	10	48				6.13	0.03	8.810	1.55
B159	4	190	7.9	9.26	60	21	6.95	0.98	22.2		30	22	48				4.12	1.09	31.306	2.86
B159	5	200	7.9	9.47	38.13	15	5.75	0.84	26.6		30	22	48				5.37	1.09	21.617	2.55
D008	1	10	8.3	1.8	33.2	4.2	0.06	1.8	26.2	6	33	37	30		0.1	1	2		0.229	7.90
D008	2	23	8.3	0.8	30.1	5.7	0.1	1.9	23.9	1.5	35	27	38		0.06	0.5	3.5	0.01	0.418	5.28
D008	3	41	8.2	1.6	25.6	6.3	0.1	1.9	22.4		30	20	50				7.6		0.446	4.06
D008	4	79	8	3.7	33.7	2.4	0.1	2	24		20	32	48				12	0.9	0.417	14.04
D008	5	106	7.9	3	100	7.5	0.2	1.5	16		20	55	25				13.4	1.3	1.250	13.33
D012	1	22	8.2	1.5	49.3	10.5	0.5	3.3	37.6	2.2	15	35	50		0.1	1.5	14.1	0.02	1.330	4.70
D012	2	50	8.4	4.8	35.1	18	7.2	0.7	33.8	0.4	15	20	65		0.04	0.6	18.7		21.302	1.95
D012	3	123	8.2	11.5	70	20.2	7.2	0.9	33		15	27	58				15.6	1	21.818	3.47
G052	1	15	8.1	1.1	50.3	7.6	0.4	1.2	35.6	1.6	36	24	50		0.09	1.2	13	0.07	1.124	6.62
G052	2	44	8.7	0.8	34.8	8.8	0.7	0.5	31.9	0.5	27	23	50		0.08	0.7	12	0.04	2.194	3.95
G052	3	108	8.4	1.4	34.7	15.2	2.1	0.5	32.6		22	20	58				12.6	0.03	6.442	2.28
G052	4	150	8.7	3.7	23.3	16.6	6.2	0.6	31.4		22	20	58				11.4	0	19.745	1.40
G059	1	23	7.5	1.3	51.9	8.7	0.3	2	38.2	1	25	10	65		0.1	1.5	1.2	0.06	0.785	5.97
G059	2	77	8.3	0.9	45.7	11	0.8	0.82	30.5	0.1	36	11	53		0.03	0.4	9.5	0.04	2.623	4.15

G059	3	135	8.1	3.1	40.6	11.5	1.7	0.4	30.2		34	13	53				9.3	0.18	5.629	3.53
G137	1	20	7.9	1.4	39.6	7.9	0.3	1.3	34.3	0.9	22	23	55		0.07	0.9	1	0.06	0.875	5.01
G137	2	70	8.6	0.9	24.5	10.5	0.7	0.8	23.2	0.2	30	22	48		0.03	0.4	11.2	0.02	3.017	2.33
G137	3	190	8.4	5.7	38.7	10.5	1.3	0.3	21.6	0	26	29	45		0	0	14.3	1.3	6.019	3.69
G138	1	30	7.8	0.8	44.8	7.3	0.3	1.6	30.7	1.2	28	14	58		0.02	1	3.2	0.04	0.977	6.14
G138	2	105	8.2	0.6	44.3	8.9	0.6	1.1	30.2	0.5	29	11	60		0.04	0.5	1.2	0.02	1.987	4.98
G138	3	155	7.9	2.8	50	11.7	1.9	0.7	32.7		29	16	55				2	0.08	5.810	4.27
G140	1	15	8.3	1.1	45.7	12.5	0.3	1.9	35.7	0.8	23	28	49		0.09	1.3	17.3	0.07	0.840	3.66
G140	2	35	8.3	0.8	38	11.7	0.5	0.8	34.4	0.2	22	28	50		0.05	0.6	14.7	0.04	1.453	3.25
G140	3	63	8.2	1.3	43.8	16	0.8	0.6	33.9		24	23	53				16.3		2.360	2.74
G140	4	200	8.3	2.9	26.3	17.6	1.2	0.6	33.5		19	26	55				16.1		3.582	1.49
G141	1	27	8.2	1	34.6	6.8	0.4	1.4	24.7	0.9	34	33	33		0.07	0.8	11.4	0	1.619	5.09
G141	2	90	8.7	1.1	26.2	10.6	2.9	0.8	26.3	0.3	26	29	45		0.06	0.5	11	0	11.027	2.47
G141	3	135	8.2	0.6	94.6	11.8	4	0.7	21		23	59	18				7.9	0	19.048	8.02
T008	1	11	8.1	1.8	51	6.9	0.3	2.1	35	2.8	22	28	48		0.1	1.3	12.8	0.04	0.857	7.39
T008	2	24	8	1.3	49.6	8.9	0.5	0.9	33.2	0.8	20	25	55		0.08	0.9	14.5	0.02	1.506	5.57
T008	3	50	8.2	7.3	24.1	18.2	5.1	1	31.4		12	28	60				22	0	16.242	1.32
T008	4	124	7.9	7.2	31.2	12.4	1.8	0.8	28.8		15	25	60				12	0.9	6.250	2.52
T008	5	183	7.9	8.6	80.3	13.5	0.8	0.5	24.5		17	28	55				10.1	1.2	3.265	5.95
T009	1	13	8.1	1.8	19.7	4.8	0.02	2.8	27.4	13.1	30	40	30		0.1	1	13.7	0.02	0.073	4.10
T009	2	40	8.1	1	26.6	6.1	0.08	1.5	24.7	0.8	22	38	40		0.08	0.6	14.3	0	0.324	4.36
T009	3	116	8.1	1.6	23.1	9.1	0.2	1.8	24.3		15	45	40				15.7	0.02	0.823	2.54
T020	1	15	8.7	2.1	21.7	6.5	2.5	0.8	27.8	1.4	20	45	35		0.1	1	16.3	0	8.993	3.34
T020	2	40	9.1	2.8	14	9.9	11.5	0.4	26.4	0.6	17	35	48		0.05	0.6	20.9	0.01	43.561	1.41
T020	3	80	8.5	16.3	32.9	9	13	0.6	28.3		17	33	50				17.8	0.4	45.936	3.66
T020	4	140	8.6	15.4	44	9.4	10.8	0.5	29.7		17	30	53				13.6	0.6	36.364	4.68
T020	5	200	8.5	15.8	83.4	10.2	15.2	0.5	24.8		15	30	55				9.7	1	61.290	8.18
T021	1	21	7.9	1.2	27.3	5.7	0.1	2	28.2	10.6	25	27	38		0.1	1.7	2.4	0.02	0.355	4.79
T021	2	50	8.3	1.3	17.6	6.1	0.1	1.5	21.3	2.4	30	25	45		0.05	0.5	9.5	0.01	0.469	2.89
T021	3	107	8.4	1.3	15	9.1	0.1	1.5	22.6		20	35	45				21.1		0.442	1.65
T021	4	137	8.6	0.8	13.4	13.1	0.2	1.9	18		22	40	38				17.6		1.111	1.02
T021	5	190	8.6	2.1	10.6	7.9	0.2	2	15.5		32	38	30				16.3		1.290	1.34
T024	1	10	8.2	12.6	75	10.4	0	0.2	22.3	0.1	22	60	18		0.01	0.2	9.4	0.9	0.000	7.21
T024	2	60	8.1	1.6	16.7	4.1	0.06	1.5	19.4	10.3	47	25	28		0.08	1	3.5		0.309	4.07

T024	3	110	8.7	1.5	10.8	5.7	0.09	4	13.7		45	32	23				9.9		0.657	1.89
T024	5	210	8.8	1.8	6.5	2.8	0.04	0.8	3.8		94	1	5				3.1		1.053	2.32
T027	1	15	8.1	1.9	35.5	9.6	0.3	1	33.4	0.8	15	43	42		0.06	0.9	18.5	0	0.898	3.70
T027	2	35	8.2	1.1	29.1	10.9	0.6	0.6	32.1	0.3	18	36	46		0.05	0.7	19.6	0.03	1.869	2.67
T027	3	130	8.3	1.8	26.1	14.5	2	0.6	10.3		18	31	51				21.6	0	19.417	1.80
T027	4	200	7.9	12	17.1	14.2	0	0.5	6.1		23	31	46				18.3	0.09	0.000	1.20
T028	1	18	8.2	1	20.1	6.1	0.08	2.1	26.8	2.6	52	17	31		0.1	2	5.3	0.003	0.299	3.30
T028	4	100	8.4	17	96.5	19.2	10.5	0.7	21.2		27	27	46				10.3	0.7	49.528	5.03
T028	5	200	8.4	3	34.4	12.5	5.3	0.5	24.1		30	14	56				12.2		21.992	2.75
T029	1	20	8.1	1.1	31.5	6.1	0.7	1	28.8	1.9	20	32	48		0.1	2.1	3.9	0	2.431	5.16
T029	2	45	8.3	0.6	45	11.1	0.8	0.9	16.6	0.7	20	22	58		0.04	1.1	10.1	0	4.819	4.05
T029	3	82		1.4	35.3	15.3	2	0.7	7.2		20	19	61				11.1	0.01	27.778	2.31
T029	5	190	8.1	5.9	75.6	15.6	2.5	0.8	14.4		20	23	57				11.3	0.8	17.361	4.85
T031	1	30	8	1.9	26.7	7.9	1.1	1.2	30.2	1.1	25	22	53		0.05	0.7	10.1	0	3.642	3.38
T031	2	94	7.9	6.7	32.1	17	1.5	0.4	23.1		13	34	53				10	0.03	6.494	1.89
T031	3	134	8	6.9	96.8	18.7	1.5	0.3	22.5		18	64	18				11.3	1.3	6.667	5.18
T032	1	30	6.9	1.3	3	2.3	0.06	0.2	4.9	2.7	94	2	6		0.03	0.4	0.8		1.224	1.30
T032	2	80	8.2	7.3	6.1	4.8	5.3	0.9	11.3	0.8	77	2	21		0.03	0.2	0.5		46.903	1.27
T032	3	130	8.7	12.6	15.5	5.2	6	1.1	13		67	5	28				0.6		46.154	2.98
T032	4	200	8.9	9.6					18.2		65	7	28				3.5		0.000	0.00
T075	1	10	8.2	1.3	33.9	6	0.4	0.3	34		20	50	32		0.1	1.9	8.8	0.07	1.176	5.65
T075	2	36	8.4	0.8	16	4.4	0.3	0.5	25.8		20	46	34		0.04	0.5	15.4	0	1.163	3.64
T075	3	80	8.4	0.7	21	7.5	0.3	0.2	25.5		23	41	36				12.3	0.05	1.176	2.80
T075	4	130	8.5	1.3	25.9	9.2	0.7	0.5	27.4		30	29	41				10.8		2.555	2.82
T075	5	200	8.3	2.5	47.1	13.4	2.6	0.7	36		24	13	63				8.3		7.222	3.51
T076	1	30	8.2	0.8	51.3	9.2	0.3	1.8	37.7	4.8	25	17	58		0.1	1.8	4.3	0.04	0.796	5.58
T076	2	80	8.4	0.7	22.7	8.3	0.4	0.7	29.5	0.8	19	28	53		0.04	0.6	21.3	0.03	1.356	2.73
T076	3	150	8.5	0.7	31.9	15.7	0.8	0.7	28.7		20	29	51				20.9	0.03	2.787	2.03
T076	4	200	8.2	0.4	26.8	16.9	1.7	0.7	28.8		20	25	55				12.2	0.14	5.903	1.59
T077	1	20	8.3	0.4	29.2	6.3	0.1	3.8	26	15.6	37	43	20		0.1	1.5	4.3	0.01	0.385	4.63
T077	2	76	8.5	0.9	27.5	6.9	0.2	1.8	22.4	2.6	35	32	31		0.03	0.4	8.2	0.01	0.893	3.99
T077	3	130	8.6	1.5	10.8	5.2	0.1	1.3	17.5		40	36	24				10.7	0	0.571	2.08
T077	4	200	8.1	7.1	65	10.8	1.4	1.2	24.6		25	30	45				8.9	1.2	5.691	6.02
T078	1	25	8.3	0.4	13	3.4	0.1	1.3	17.3	2.2	50	37	13		0.05	0.5	5.1	0.05	0.578	3.82

T078	2	70	8.6	0.6	19.8	5.3	0.5	0.4	18.6	0.5	44	33	23		0.02	0.3	8.2	0.03	2.688	3.74
T078	3	135	9.1	2.7					26.9		27	28	45				13.3	0	0.000	0.00
T078	4	190	8.3	9.7	31.8	14	4.7	0.5	26.6		22	30	48				12.7	0.9	17.669	2.27
T079	1	20	8.3	0.9	20.8	2.2	0.4	0.7	27.2	1.7	27	43	30		0.08	1	10.7	0.03	1.471	9.45
T079	2	60	8.6	0.5	17.7	4.8	0.6	0.3	21.9	0.4	37	28	35		0.02	0.3	12.4	0.02	2.740	3.69
T079	3	90	8.7	1.9	21.3	10.6	3	0.5	23.6		40	25	35				11.5		12.712	2.01
T079	4	150	8.6	6.4	10.9	8	2.5	0.4	23.3		37	23	40				10.9		10.730	1.36
T080	1	30	8.2	1.8	25.8	4.4	0.5	2.1	21	1.9	47	15	38		0.06	0.8	12.6	0.03	2.381	5.86
T080	2	60	8.8	8	17.1	13.8	12.2	1.7	24.9	0.5	37	18	45		0.03	0.3	15.9	0	48.996	1.24
T080	3	110	8.6	13.9	63.1	8.5	7.9	1.2	22.1		37	18	45				12.4	1	35.747	7.42
T080	4	200	8.6	13.5	18.4	10.9	2.2	0.9	24.5		27	18	55				14.5	0.1	8.980	1.69
T081	1	20	7.8	1.5	43.7	6	0.6	1.4	38	1.5	30	7	63		0.1	1.2	2	0.01	1.579	7.28
T081	2	50	7.9	1.7	37.6	7.5	1.1	0.9	29.6	0.5	37	5	58		0.05	0.5	2.4	0.02	3.716	5.01
T081	3	145	8.1	2	24.6	5.7	1.4	0.4	25.3		45	5	50				2	0	5.534	4.32
T081	4	200	8	6.2	15.3	1.5	0	0.3	29.2		37	5	58				1.4	1.1	0.000	10.20
T135	1	30	8.4	1.1	15.5	2.7	0.06	1.8	27.4	16.7	40	35	25		0.1	2.3	3.4	0.08	0.219	5.74
T135	2	65	8.4	0.8	28.8	2.9	0.1	1.3	21.9	1.9	37	28	35		0.04	0.4	6.5	0.04	0.457	9.93
T135	3	115	8.3	0.6	31.8	3.3	0.1	1	22.3		27	38	35				12.5	0.03	0.448	9.64
T135	4	190	8.6	0.6	53	5	0.1	0.2	19.7		32	40	28				11	0.05	0.508	10.60
T136	1	30	8.4	0.7	31.5	2.6	0.1	2.3	36.5	4.2	27	35	38		0.1	1.5	3.9	0.05	0.274	12.12
T136	2	60	8.6	1.8	17.4	4.7	0.1	0.8	18.6	1.2	45	20	25		0.02	0.3	4.7	0.04	0.538	3.70
T136	3	155	8.4	0.5	11.2	3.1	0.2	0.4	13.9		52	28	20				9.8	0.04	1.439	3.61
T137	1	18	8.2	1.4	24.1	4.7	0.08	2.1	22.5	2.5	50	30	20		0.1	1.3	17.6	0.04	0.356	5.13
T137	2	65	8.4	1	17.9	4.7	0.4	0.5	21.1	0.4	40	27	33		0.02	0.3	8.8	0.04	1.896	3.81
T137	3	142	9	1.8	16	7.7	2.3	0.3	24.4		40	25	35				8.1		9.426	2.08
T137	4	190	8.3	3	25.7	8.3	1.2	0.4	31.5		27	20	53				11.4		3.810	3.10
T139	1	15	8.5	0.7	17.1	4.4	0.7	0.8	0	1.3	16	34	50		0.09	1	17.4	0.06	0.000	3.89
T139	2	40	8.6	0.8	34.1	10.1	0.8	1.2	34.7	0.9	16	33	51		0.06	1	18.2	0.02	2.305	3.38
T139	3	100	8.7	0.9	20.9	11.8	2.7	1.1	33.9		16	30	54				17.6	0.02	7.965	1.77
T139	4	140	8.6	3.9	19.4	14.8	4.4	1	35.7		14	26	60				18.6	0	12.325	1.31
T139	5	200	8.1	3.8	168.5	20.1	5.2	1	30.2		16	71	13				17.6	1.2	17.219	8.38
T191	1	20	8.4	1.2	31.1	4.5	0.2	1.3	20.6	0	41	41	18		0	0	10.9	0.02	0.971	6.91
T191	2	60	8.6	1	29.5	7.2	0.5	0.5	23.5		28	34	38				13.1	0.04	2.128	4.10
T191	3	90	8.5	1.8	28.3	8.9	1.7	0.4	25.4		31	31	38				9.2	0.01	6.693	3.18

T191	4	200	8	7.3	34.1	10.1	4.8	0.4	25		31	29	40				12.1	0.5	19.200	3.38
T252	1	20	8.4	0.6	31.3	4.4	0.2	1.1	24.7	3.6	24	46	30		0.08	0.8	16.8	0.08	0.810	7.11
T252	2	36	8.4	0.7	23	3.7	0.1	0.6	16.9	2.1	49	26	25		0.02	0.4	13.3	0.04	0.592	6.22
T252	3	57	8.5	0.7	27.4	4.8	0.5	0.5	22.4		23	49	28				16.6	0.04	2.232	5.71
T252	4	80	8.6	1	30.4	8.1	0.9	0.8	32.1		13	29	58				11.6	0.02	2.804	3.75
T252	5	190	8.3	5	59.3	12	1.8	0.8	31		20	22	58				15.5	1.2	5.806	4.94
T255	1	27	8.7	0.8	23.3	2.9	0.2	0.6	15.8	1.3	40	47	13		0.04	0.6	10.4	0.07	1.266	8.03
T255	2	60	8.7	1	20.3	4.8	0.3	0.4	16.3	0.7	44	33	23		0.01	0.3	10.2	0.03	1.840	4.23
T255	3	130	9	0.4	27.8	11.8	2.4	0.5	29.9		26	24	50				15.5	0.01	8.027	2.36