Chapter One
Introduction

1.1 General

This chapter present an introduction the research project, objectives, problem statement, Thesis structure and study area.

1.2 Background

Foundation always defined as an structural element that created with proper design and carefully constructed to give high economic factors, reasonable safety parameters, durability. The main function of foundation is to support:

1. Variable types of building structures using defined foundation such as isolated, combined strip, raft pile.
2. highways, railways and bridges.
3. variable types of factories and machine foundations.
4. other special structures such as: (soils, tunnel, communication towers and L.P.G are product tank foundations).

Foundation soil mechanic and its properties are main causes of increment of foundation cost, ignorance of soil physical and chemical properties and its effect for foundation types causes, means of foundation and structure problems.

The most common causes of foundation failure is an excessive or differential settlement. Other some extend appearance of an up-heaval events.

Both of them (settlement, up-heaval) systematically lead to un unequilibrium of foundation, structure and guide to real damage. Further more poor or bad techniques and methodologies of foundation construction also lead to damage. Workmanship which consist of manpower utilized machines failure of previous indicate future foundation problems we identify some of the common problems for foundation which can be summarized in site soil mechanic, type of selected materials, and behavior or soil properties considered as the core of all problems.

Therefore, investigation and identification of soil properties to determine, proper foundation type which is safe, durable and economical one are required. This also lead to how select suitable materials for proposed foundation and adequate techniques to construct the proposed type of foundation.

Foundation of special structure is the topic that fetch, defined suitable and recommendable kinds of data to execute that type of special foundations.
Product tank foundation selected as a case of special foundation type because it covers of the main sectors oil or petroleum field and factories in industrial field.
To avoid any future chronic problems a detailed information through collection and gathering soil exploration reports which can be arrange and recorded properly using identified programs. Such as geographical information system G.I.S for each location or point that accurately have real EN (East, North) coordination using Geographical positioning system GPS.

Storage tanks are containers that hold liquids, compressed gases (gas tank) or mediums used for the short- or long-term storage of heat or cold [www.merriam-webster]. The term can be used for reservoirs (artificial lakes and ponds), and for manufactured containers. The usage of the word tank for reservoirs is uncommon in American English but is moderately common in British English. In other countries, the term tends to refer only to artificial containers.

Storage tanks are available in many shapes: vertical and horizontal cylindrical; open top and closed top; flat bottom, cone bottom, slope bottom and dish bottom. Large tanks tend to be vertical cylindrical, or to have rounded corners transition from vertical side wall to bottom profile, to easier withstand hydraulic hydrostatically induced pressure of contained liquid. Most container tanks for handling liquids during transportation are designed to handle varying degrees of pressure.

There are several types of storage tanks, e.g., above-ground, flat-bottomed, cylindrical tanks for the storage of refrigerated liquefied gases, petroleum, etc., steel or concrete silos for the storage of coke, coal, grains, etc., steel, aluminium, concrete or FRP tanks including elevated tanks for the storage of water, spherical tanks (pressure vessels) for the storage of high pressure liquefied gases, and under-ground tanks for the storage of water and oil. The trend in recent years is for larger tanks, and as such the seismic design for these larger storage tanks has become more important in terms of safety and the environmental impact on society as a whole.

Since there are a wide variety of surface, subsurface and climatic conditions, it is not practical to establish design data to cover all situations of design foundation. However it is common practice to build tanks on the following foundation types:

a. Earth foundation
b. Earth foundation with a concrete ringwall
c. Earth foundation with crushed stone ringwall
d. Concrete slab foundation, plain
e. Concrete slab foundation, with piles

The allowable soil loading and the exact type of subsurface construction to be used must be decided for each individual case after careful consideration. The same rules and precautions shall be used in selecting foundation sites as would be applicable in designing and constructing foundations for other structures of comparable magnitude.

Cylindrical storage tanks form a familiar part of petroleum refineries. chemical plants and many other manufacturing units. They hold large volumes of hazardous products. Failure of such tanks can lead to severe environmental damage, loss of human life and big financial losses. Literature suggests that differential settlement has been a major cause of distress in such tanks. Therefore. reliable estimation of settlements constitutes an important step in design of foundations of oil tanks

1.3 Research Problem Statement:

Sudan and South Sudan, both located in northeastern Africa, became independent countries in July 2011, following a referendum in South Sudan where the people overwhelmingly voted for independence. Prior to the split, the unified Sudan was the second-largest oil producer in Africa in 2010, outside of the Organization of the Petroleum Exporting Countries (OPEC). Since the split, Sudan and South Sudan's production has declined, and together they ranked as the fourth-largest non-OPEC African oil producer in 2013. For the first half of 2014, Sudan and South Sudan's oil production averaged 260,000 barrels per day (bbl/d), down from almost 490,000 bbl/d in 2010.

Sudan has two export pipelines that travel northbound across the country to the Bashayer Marine Terminal, located about 15 miles south of Port Sudan. The pipeline stretches 850 miles, and its design (maximum) capacity is 500,000 bbl/d. It includes several heating units along its length to facilitate the movement of the waxy crude oil.

Sudan has two oil refineries with a total capacity of 121,700 bbl/d and three topping plants, which are small scale, less complex refineries, with a total capacity of 22,000 bbl/d. The largest refinery, the Khartoum or al-Jaili refinery, is located just north of Khartoum and has a distillation capacity of 100,000 bbl/d as shown in Table 1.1.

Table 1.1: Oil refineries in Sudan and South Sudan

Country	**Refinery**	**Capacity ('000 bbl/d)**	**Operator**
Sudan	Khartoum (al-Jaili)	100	CNPC/Sudapet
	Port Sudan	21.7	Sudapet
	El Obeid	10	Sudapet
	Shajirah	10	Concorp
	Abu Gabra	2	Sudapet
Total Capacity		**143.7**	
Planned Refineries		**Operator and/or builder**	
South Sudan	Unity State (Bentiu)	5	Safinat (Russia)/Nilepet
	Upper Nile (Thiangrial)	10	Frontier Resource Group/Ventech Engineers International
Proposed Refineries			
Sudan	Port Sudan	100	--
	Khartoum (expansion)	100	--

Source: Arab Oil & Gas Journal, Embassy of Sudan (in Malaysia), Sudan Petroleum Corporation, the Middle East Economic Survey (MEES), and Bloomberg

The design of these huge amount of oil tanks in field and refinery need special consideration since variation of soil properties and environmental conditions. The design of foundations and other facilities is often governed by the possibility of loadings or conditions from extreme events and over loadings. Current research efforts are also studying the effects of blast loading from terrorist attack and damage to structures. Design methodologies and details for new construction tanks for any one of these extreme events often provide increased protection for other extreme events. Geotechnical design considerations such as transient loading effects, the interaction between the solid and fluid phases in soil, and the nonlinear, plastic behavior of soil are common considerations with respect to development of design analyses for extreme event loadings. These commonalities allow for new developments in geotechnical design for extreme events to "crossover" from one area to another to another, e.g. advances in geotechnical engineering and analysis for foundations and earth structures can often be applied to advance the state-of-the practice with respect to loading and other events.

1.4 Research Objectives

The objectives of the research are to implement analyses necessary to fully incorporate performance design for in the design of foundations for oil tanks structures. The final product will be guidance on based geotechnical design, including determination of required input parameters; a database of observations useful for calibration of the models; and descriptions of alternative, simplified methods of analysis for deformation. Tasks necessary to achieve these objectives include:

1. Perform a search of the existing literature to collect information on past of foundations for tanks structures.
2. Develop guidelines for tolerable deformations for foundations. Consider both transient and permanent deformations.
3. Select advanced and simplified methods of analysis for evaluation and identify the input parameters needed for analysis.
4. Collect existing data on appropriate soils testing and associated parameters and prepare a database correlating soil characteristics and soil behavior to facilitate selection of soils parameters.
5. Describe procedures for estimating necessary parameters for analysis using the database and sampling/testing necessary to utilize or augment existing data.
6. Prepare a recommended practice for analysis of extreme event loadings considering the load deformation response of the soil-structure system and corresponding load path to failure for different foundation elements and earth structures.

1.5 Study Area

Figure 1.1 below presents the area of oil production and refinery that need oil tanks. Different area and states.

Figure 1.: Oil infrastructures in Sudan

Source: Independent Statistics and analysis (EIA), US Energy Information Administration, Country Analysis Brief: Sudan and South Sudan, Sep 2014.

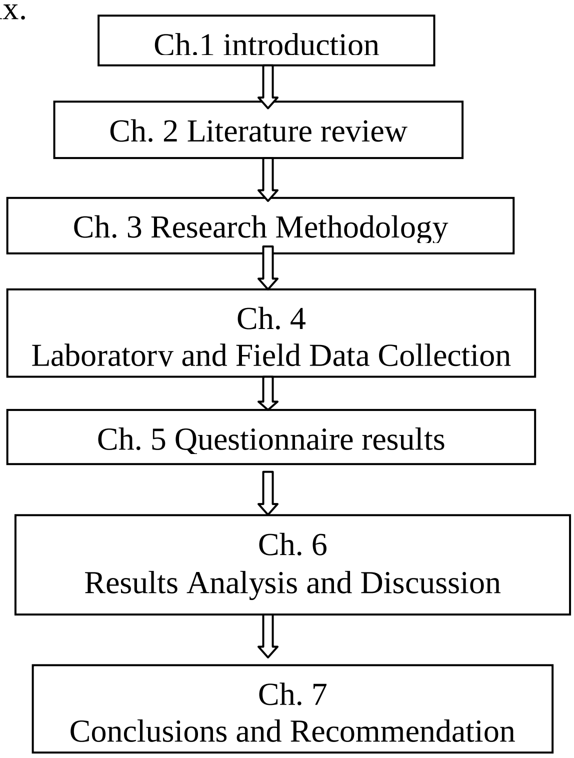
1.6 Thesis Structure

Figure 1.2 presents the thesis structure of different chapters. Chapter one general introduction, problem statement, objectives, scope and the layout of the thesis. In chapter two general foundation literature review foundation problem, types, and its history that load to failure. Identification and classification of their types and proper implementation methodologies that derivate of standards, modified references, latest papers that published and distributed in most European countries or the 1st world as they call.

Chapter three shows definitions of case study product tank foundation practice in Sudan, Khartoum North (KRT.N). General types, definition of each, then details that express formation of Sudanese practice in this field. Modified sequence during implementation or variable climates and regions.

Chapter four shows data collected with its parallel limits. One of them is that gathered or collected soil exploration report to depths limit 7.5, 10, 15m concentrated of KAT.N City and boundaries. Collected records arranged using GIS. The other questionnaire data which gives parameters of man power, workmanship, and materials.

Chapter five concern with arrangement of collected data and analyzing them. Chapter six give a conclusion and recommendation for this thesis. Finally arrange references list and appendix.



Chapter Two

Background and Literature Review

2.1 General

Literature review was carried out to cover many aspects of the oil tanks foundation system. Since the behaviour of oil tank foundation is similar to piled embankment in some ways. That is followed by the review of existing physical and numerical studies of embankment. The literature review then focuses on previous field and numerical studies on oil tank foundations. The differential settlements that often cause tank failure will be reviewed in details.

2.2 Background

Existing case studies on oil storage tanks supported on soft soils (Bell and Iwakiri 1980; D'Orazio and Duncan 1987; Green and Height 1975; Marr et al. 1982) reveal that shear failure of the foundation or excessive settlement of tank due to compression of the soft soils can lead to tank rupture or even complete failure. Foundation instability in the form of shear failure can be evaluated using conventional bearing capacity theories that take into account the thickness of the weak soil layer beneath the tank in comparison with the tank width (Duncan & D'Orazio, 1984). The case histories presented illustrate two important points:

1. Foundation instability may develop quickly or slowly. This often results in large non-uniform settlements and tilting of the tank, and can lead to complete rupture of the tank.
2. Tanks can be stabilized by installing piles to support the tanks.

Soft soil can be reinforced by gradual filling of the tanks at such a rate that the gain in soil strength under the applied loads would ensure stability. However, this method is time consuming and may not be feasible when the program of construction was compact due to the need for of early availability of tanks (Thornburn et al., 1984). Other measures that can be taken to enhance stability include replacement of soft ground with compacted material, reinforcement of the soft ground and various techniques to strengthen and modify the soft ground. Pile raft foundation can be used to transfer the load from the storage tank to more competent soil strata below. However, it is recognized that the tank base slab may not be sufficiently flexible to accommodate the differential settlements

2.2.1 Stability

A tank stability study of 40 tanks, which included 6 foundation shear failures and 2 ruptures, was carried out by Duncan *et al.* (1984). Significant findings of these case histories include:

- Larger non-uniform settlement and tilting of the tank can lead to complete rupture of the tank. Either base shear or edge shear can be the critical failure mechanism, thus both should be evaluated.
- Thin weak layers near the surface have greater effects on the edge shear stability, whereas deep and thick weak layers have great effects on base shear stability.
- Either accelerating drainage or slow loading can be used to improve the strength of tank foundation on cohesive soils.
- A thin granular pad can improve edge stability but do not improve base stability.
- Tanks have been successfully stabilitized after failure by: (1) reconstruction on pile foundations or repairing with very slow filling; (2) lifting the tank up, replacing soft foundation soils and constructing stability berms.

All the case studies of this paper were with shallow foundations; theoretical method use to analyze the stability and estimate the settlement could not take in to account the influence of non-uniform soil layer (see Figure 2.1).

Figure 2.1: Construction of Cylindrical oil Tanks

2.2.2 Criteria for settlement of tanks

Marr *et al.* (1982) stated that differential settlement is an important factor of tank rupture. Differential settlement is defined as the difference in vertical settlement between two points at the foundation-structure interface. Reasons leading to differential settlement could be non-homogeneous geometry or compressibility of the soil deposit, non-uniform distribution of the load applied to the foundation, and uniform stress acting over a limited area of the soil stratum. These causes exist with varying degrees of importance for a tank foundation.

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Soft soil can be reinforced by gradual filling of the tanks at such a rate that the gain in soil strength under the applied loads would ensure stability. However, this method is time consuming and may not be feasible when the program of construction was compact due to the need for of early availability of tanks (Thornburn et al., 1984). Other measures that can be taken to enhance stability include replacement of soft ground with compacted material, reinforcement of the soft ground and various techniques to strengthen and modify the soft ground. Pile raft foundation can be used to transfer the load from the storage tank to more competent soil strata below. However, it is recognized that the tank base slab may not be sufficiently flexible to accommodate the differential settlements

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The settlement pattern may influence differently the tank structural elements, which include the shell, bottom plate, connection of shell to bottom plate and roof. Firstly, uniform settlement is not a big concern in practice.

Secondly, planar tilt causes additional stress in the shell but apparently not large enough to cause overstressing. Finally, non-planar settlement is most destructive to the tank. Non-planar settlement may radically distort the shell or overstress the shell and it also causes dish-shaped settlement and localized depressions to bottom plate. Radial distortion of the shell may lead to malfunction of a floating roof.

In addition, overstress may cause rupture and spillage of contents inside the tank.

The paper reported on the control of differential settlement to prevent the damage of each kind of tank structure component. Uniform settlement seems not dangerous but care should be taken in case of non planar settlement.

2.2.3 Differential Settlements in Tanks

Duncan and D'Orazio (1987) studied 31 case histories of tank settlement and damage to investigate which factors controlled the differential settlements of tank and the magnitudes of the differential settlement tolerance. They stated that the shape of the settlement dish, as well as the magnitude of differential settlements is important factors for the tank rupture caused by settlement. They classified the shape of settlement into 3 profiles:

Profile A: The maximum settlement is located at the center of the tank. This settlement profile could be seen from the case of flexible raft seated on deep soft soil.

The depth of soft soil to produce this settlement profile depends on the factor of safety.

Profile B: Settlement is relatively flat at interior and decreases rapidly toward the tank edge. This settlement profile could be seen from the case of flexible raft seated on shallower depths of soft soil. It also depends on the factor of safety Profile C: Maximum settlement is located about two third of the radius from the center of the tank. This settlement profile could be seen from the case of flexible raft seated on a thin layer of soft soil.

Different settlement profiles produce different amounts of distortion for the same magnitude of center settlement. The settlement profile A is the least severe with respect to distortion and profile C is the most severe

Design Guidelines in BS 8006

BS8006 (1995) Code of practice for strengthened/reinforced soils and other fill, provides guidelines for, “Reinforcement used as a component to control embankment stability and settlement”. Clause 8.8.8 stated that “the technique of piling enables embankments to be constructed to unrestricted heights at any construction rate with subsequent controlled post-construction settlement”. The two most relevant sub-clause discussing the design of embankment piles are **Clause 8.3.3.3 Limit states**

2.3 Oil Storage Tanks Foundations:

This provides important consideration design and construction of foundations for aboveground steel oil storage tanks with flat bottoms. Recommendations are offered to outline good practice and to point out some precautions that should be considered in the design and construction of strong tank foundation.

Since there is a wide variety of surface, subsurface and climatic conditions, it is not practical to establish design data to cover all situations. The allowable soil loading and the exact type of subsurface consternation to be used must be decided for each individual case after careful consideration. The same rules and precautions shall be used in selecting foundations sites as would be applicable in designing and constructing foundations for other structure of comparable magnitude.

2.3.1 Subsurface Investigation and construction:

At any tank site the subsurface conditions must be known to estimate the soil bearing capacity and settlement that will be experienced. This information is generally obtained from soil boring, load tests, sampling laboratory testing, and analysis by an experienced go geotechnical engineer familiar with the history of similar structures in the vicinity. The subgrade must be capable of supporting the load of the tank and its content. The total settlement must not strain connecting piping or produce gauging inaccuracies and the settlement should not continue to a point at which the tank bottom is below the surrounding ground surface. The estimated settlement shall be within the acceptable tolerances for the tank shell and bottom.

When actual experience with similar tanks and foundations at a particular site is not available, the following ranges for factors of safety should be considered for use in the foundations design criteria for determining the allowable, soil bearing pressure (the owner or geotechnical engineer responsible for the project may use factors of safety outside these ranges).

a. for 2.0 to 3.0 against ultimate bearing failure for normal operating conditions.

b. From 1.5 to 2.25 against ultimate bearing failure during hydrostatic testing.
c. From 1.5 to 2.25 against ultimate bearing failure for operating conditions plus the maximum effect of wined or seismic loads.

Some of the many conditions that require special engineering consideration are as follows:

a. Sites on hillside, where part of tank may be on undisturbed ground or rock and part may be on fill or another construction or where the depth of required fill is variable.
b. Sites on swampy or filled ground, were layers of muck, or compressible regetation are at or below the surface or where unstable or corrosive materials may have been deposited as fill.
c. Sites underlain by soils, such as layers of plustic clays or organic days, that may support heavy loads temporarily but settle excessively overlong periods of time.
d. Sites adjacent to water courses or deep excarations, where the lateral stability of ground is questionable.
e. Sites immediately adjacent to heavy structures that distribute some of their load to the subsoil under the tank sites, there by reducing the subsoil's capacity to carry additional loads with out excessive settlement.
f. Sites where tanks may be exposed to flood waters possibly resulting in uplift, displacement or scour.
g. Sites in regions of high seismicity that may be susceptible to liquefaction.
h. Sites with thin layers of soft day soils that are directly beneath the tank bottom and that can cause lateral ground stability problems.

If the sub-grade is inadequate to carry the load of the filled tank with out excessive settlement shallow or superficial construction under the tank bottom will not improve the support conditions. One or more of the following general methods should be considered to improve the support conditions.

a. Removing the objectionable material and replacing it with suitable, compacted material.
b. Compacting the soft material with short piles.
c. Compacting the soft material by preloading the area with on overburden of soil. Strip or sand drains may be used in conjunction of this method.

d. Stabilizing the soft materials by chemical method or injection of cement grout. transferring to a more stable materials underneath .
e. The sub-grade by driving pile or constructing foundation piers.
f. This involves constructing a reinforced concrete slab on the piles to distribute the load of the tank button.
g. Constructing slab foundation that will distribute the load over a sufficiently large area of soil materials so that the load intensity will be within allowable limits excessive settlement not occur.
h. Improving soil properties by vibro-compacting, vibro replacement or deep dynamic-compaction.
i. Slow and controlled filling of the tank during hydrostatic testing. When this method is used the integrity of the tank may be compromised by excessive settlement of the shell or bottom. For this reason the settlement of the tank shall be closely monitored. In the even of settlement beyond established range the test may have to be stopped.

The fill material used to replace muck or other objectionable material or to build up the grade to suitable right shall be adequate for the support of the tank and product after the material has been compacted. The fill material shall be free vegetation, organic matters, cinders and any material that will cause corrosion of the tank bottom. The grade and type of fill material shall be capable of being compacted with standared industry compaction techniques to. Density sufficient to provide appropriate bearing capacity and acceptable settlement. The placement of the fill material shall be in accordance with the project specifications prepared a qualified geometrical engineer.

2.3.2 Tank Grades:

The grade or surface on which a tank bottom will rest should be constructed at least. 3m (1ft) above the surrounding ground surface. This will provide suitable drainage help keep the tank bottom dry, and compensate for some small settlement that is likely to occur. If a large settlement is expected the tank bottom elevation shall be raised so that the find elevation above grade will be a minimum of 150mm (6in) after settlement.

There are several different materials that can be used for the grade or surface on which the tank bottom will rest to minimize future corrosion problems and maximize the effect of corrosion prevention systems such as cathodic protection the must rail in contact with the tank bottom should be fine and uniform gravel or large particles shall be avoided. Clean washed sand (75-100) deep is recommended as final layer because it can be readily shaped to the bottom contour of the tank to provide maximum contact with large particles and premature derbies. Large foreign objects or point contact by gravel or rocks could cause corrosion cells that will cause pitting and premature tank bottom failure.

During constructing, the movement of equipment and materials across the grade will mark the graded surface. These irregularities, should Corrected before bottom plates are placed for welding.

Adequate provisions, such as making size gradients in sublayers progressively smaller from bottom to top should be made to prevent the fine material from leaching down into the larger material negating the effect of using the fine material as a final layer this is particularly important for the top of a crushed rock ring wall.

Note: for more information tank bottom corrosion prevention that relaters to the foundation of tank see APIRP 651.

Unless other wise specified by the purchaser, the finished tank grade shall be crowned from its outer periphery to its center at a slope of 1in10ft the crown will partly compensate for slight settlement, which is likely to be greater at the, center it will also facilitate cleaning and the removal of water and sludge through openings in the shell or from sumps situated near the shell. Because crowing will affect the length of roof-supporting columns, it is essential that the tank manufacture be fully informed of this feature sufficiently in advance.

2.4 Typical Foundation Types:

Earth foundations with a ring-wall:

When the engineering evaluation of subsurface condition that is based on experience and/or explaratory work has shown that the subgrade has adequate bearing capacity and that settlement will be acceptable, satis factory foundations may be construed earth material.

The pefromance requirements for earth foundation are identical to those for more extensive foundations. Specifically , an earth foundation should accomplish the following.

a. Praide astable plane for the support of the tank.
b. Limit overall settlement of the tank grade to values compatible with the allowances used in the design of the connecting piping.
c. Provide adequate drainage.

d. Not settle excessively at the perimeter due to the weight of the shell wall.

Many satisfactory designs are possible when sound engineering judgment is used in their development. Three design are preferred to in this appendix or the basis of their satisfactory long term performance. For smaller tanks foundations can consist of compacted crushed stone, screening, fine gravel clean or similar material placed directly on soil. Any unstable material must be removed and any replacement material must be thoroughly compacted. Two recommended designs that include ringwalls are illustrated in Figure B-1 and B-2 and described in B:4.2 and 4.3.

Figure

Notes:

1. See B.4.2 for requirements for reinforcement.
2. the top of concrete ringwall shall be smooth and bevel.

   The concrete strength shall be at last MP a (3000 Ibf/in^2) after 28 days. Reinforcement splices must be staggered and shall be lapped to develop full strength in the bond. If staggering of laps is not possible, see AC 318 for additional development requirement.
3. ring walls that 300mm (12in) in width shall have rebars distributed on both faces.
4. see B.4.2 for the position of the tank shell on the rignwall

2.3.3 Earth foundation with concrete ring wall:

Large tanks and tanks with heavy or tall and/or self-supported roofs impose a substantial load on the foundation under the shell, this is particularly important with regared to shell distortion in floating roof tanks, when there is some doubt whether a foundation will be able to carry the shell load directly, a concrete ring wall foundation should be used. As an alternative to the concrete ring wall noted in this section, a crushed stone ring wall (see B.4.3) my be used. A foundation with a concreting-wall has the following advantage:

a. It provides better distribution of the concentrated load of the shell to produce a more nearly uniform soil loading under the tank.
b. It provides a level, solide starting plane for construction of the shell.
c. It provides better means of leveling the tank grade, and it is capable of preserving for contour during construction.
d. It retains the fill under the tank bottom and prevents loss of material as result of erosion.
e. It minimizes moisture under the tank.

A disadvantage of concrete ring walls is that they may not smoothly conform to differential settlement. This disadvantage my led to high bending stresses bottom plates adjacent to the ring wall.

When a concrete ring wall is designed, it shall be proport proportioned so that the allowable soil bearing is not exceeded the rign wall shall not be less then 300mm (12in) thick, the centerline dicemeter of the ring wall should equal the mominal diameter of the tank however, the ring wall depend on local condition but the depth must be sufficient to place the bottom of the ring wall below the anticipated frost penetration and within the specified bearing strata. As a minimum, the bottom of the ring wall, if founded on soil, shall be located 6m (2ft) below the howest adjacent finish grade. Tank foundation must be constructed within tolderance specified already recesses shall be provided in the wall for flush type, dean out draw off sumps and any other appurtenance that require recesses.

A ring wall should be reinforced against temperature changes and shrinkage and reinforced to resist the lateral pressure of the confined fill with its surcharge from product loads ACI 318 is recommended for design stress, values material specification and rebar development and cover. The following items concerning a ring wall shall be considered:

a. The ring wall shall be reinforced to resist the direct hoop tension resulting from the lateral earth pressure on the ring walls inside face. Unless substantiated by proper geotechnical analysis, the lateral earth pressure shall be assumed to be at least 50% of the vertical pressure due to fluid and soil weight. Of granular back fill is used, a lateral earth pressure coefficient- 30% may be used.
b. The ring wall shall be reinforced to resist the bending moment . Uniform moment load shall account for the eccentricities of the applied shell and pressure load relative to the centroid of the resulting soil pressure the pressure load is due to the fluid pressure on the horizontal projection of the ring wall inside the shell.
c. The ring wall shall be reinforced to resist the bending and torsion moment resulting from lateral wind or secsmic loads applied eccentrically to it. A rational analysis, which includes the effect of the foundation stiffness, shell be used to determine the moment and soil distribution.
d. The total hoop steel area required to resist the load noted above shall not be less than the area required for temperature changes and chrinkage. The hoop steel area required for temperature changes and and shrinkage is 0.0025 times of the vertical cross-sectional area of the ring or minimum reinforcement for wall called for in ACI 318 chapter 14.
e. For ring walls the vertical steel are required for tempter changes and shrinkage is 0.0015 times the horizontal cross-sectional area of ring wall or the minimum reinforcement for wall called in ACL, 318 chapter 14 additional vertical steel. may be required for up-lift or torsional resistance. If the ring foundation is wider than its depth, the design shall consider its behavior as on annular slab with flexure in the radial direction. Temperature and shrinkage reinforcement shall meet the ACI 318 provisions for slab see ACI 318 chapter 7.
f. When the ring wall within exceeds 460 mm (18in) using a footing beneath the wall should be considered. Footing may also be useful for resistance to up-lift to up lift forces.
g. Structural back fill within and adjacent to concrete ring wall and around items such as vaults, under tank piping and sumps requires close field control to maintain settlement tolerance, backfill should be granular material compacted to the density and compacting as specified in the foundation construction

specifications. For other back fill materials, sufficient tests shall be conducted to verify that the material has adequate strength and will under minimal settlement.

2.3.4 Earth Foundation with crushed stone gravel ring wall:

A crushed stone or gravel ring wall will provide adequate support for high loads imposed by a shell. A foundation with a crushed stone or gravel ring wall has the flowing advantages.

a) It provides better distribution of the concentrated load of the shell to produce a more nearly unfirom soil loading under the tank.
b) It provides means of leveling the tank grade and it is capable of preserving its contour during construction.
c) It retains the fill under the tank buttom and prevents loss of material as result of erosion.
d) It can more smoothly accommodate differential settlement because of its flexibility.

A disadvantage of the crushed stone or gravel ring wall is that it is more diffcult to construct it to close a tolerances and achieve a flat level plane for construction of the tank shell.

For crushed stone or gravel ring wall careful selection of design details is necessary to ensure satisfactory performance. Thy type of foundation suggested is shown in Figure B-2 significant details include the flowings:

a) The 9m (3ft) shoulder and berm shall be protected from erosion by being constructed of crushed stone or covered with a permanent paving material.
b) Care shall be taken during construction to prepare and maintain a smooth, level surface for the tank bottom plates.
c) The tank grade shall be constructed to provided adequate during drainage away from the tank foundation.
d) The tank foundation must be true to the specified of specification.

2.3.5 Slab Foundations:

When the soil bearing loads must be distributed over an area larger than the tank area or when it is specified by the owner a reinforced concrete slab shall be used. Piles beneath the slab may be required for proper tank support.

The structural design of slab whether on grade or on piles, shall properly account for all loads imposed upon he slab by the tank, the reinforcement requirements and design details of construction shall be in accordance with ACI 318 (API, 2012).

2.3.5.1 Raft to with stand large settlements on made ground:

The depth and consistency of the fill were such that piled foundations were out of the question on grounds of cost how ever since the fill varied in composition from soft clay to a compact mass of hard slag boulders, the raft had to be designed to be stiff enough to resist a tendency two words considerable differential settlement even though the loading at the base of the walls was only a bout 30-45 KN/m run stiffness was achieved by means of beams beneath and longitudinal and cross walls and fabric reinforcement in the top and bottom of the 254mm thick slab. The beams were placed at the bottom of the slab to enable the letter latter to form the ground floor of the flats. The total dead load of the supers was equivalent to a uniformly distributed load the raft of 600 KN/m^2. And total design dead and live load was 463 KN/m^2 in one of the blacks the raft with stood a total settlement of 100 mm and differential settlement of 65 mm without distress to the foundation or superstructure.

2.3.5.2 Raft Foundation for Oil Storage Tanks:

Oil storage for refineries gathering ground fuel depots… etc, are usually provided in large numbers on any given site, it is therefore essential to achieve economy in foundation construction. Oil compares are very relocation to provide piled foundation for their tanks even in very foundation poor soil conditions, except in case where very large differential settlement must be prevented, i.e. for the floating roof kind of storage tank. The normal type of fixed-top cylindrical storage tanks are never the less not insensitive to differential settlement since they are usually of welded steel plate construction. Excessive differential settlement around the periphery of welded tanks is liable to cause splitting of the plates in the walls or the bottom.

Any form of rigidity in the foundation raft should be avoided since deflexion and cracking of a concrete slab could cause excessive stresses to develop on the bottom plates. However, some form of base is required for oil tanks, since it is desirable to raise the bottom plates above ground level in order to prevent surface or subsoil water from collecting around the plates and corroding them. It is also desirable to have a clean smooth surface on which to lay the plates and weld their joints.

Resilience in the surface is required to prevent local stress concentrations in the plates and to allow the plates to breathe or more radially and circumferentially under varying conditions of temperature and stress.

Compacted small stone chippings are frequently used but the most atis factory surface is a 50 mm thick layer of bitumen-sand mixture as recommended in B.S. 2654: 1973. this is laid on the overall raft or tank base various type of materials are used for the base depending on its thickness and the materials available in the locality. Sand is used for thin bases materials such as crushed brick or stone chalk or gravel-sand mixtures are frequently used. The essential feature is to avoid any form of rigidity lean-mix concrete or stabilized soil would be unsuitable. The minimum thickness of the base dictated by the need to maintain the bottom plates at a level 100mm or so above the ground surface after consolidation.

Settlement of the soil below the tank bottom is complete thus, if it is estimated that the ultimate settlement of a tank and its base will be bout 600mm then the base would be made 750mm thick. If hard materials bricks or crushed stone, are used in the base it is essential to interpose a layer of sand, quarry dust or graded stone chippings between the hard materials and the bitumen-sand layer. The function of this intermediate course is to prevent the stone pushing through the bitumen-sand and causing local stress concentrations in the plates during settlement of the tank.

Where tanks are founded on soft silts or clays it is useful to increase the thickness of the base, and thus to take advantage of the spread of load through the fill to reduce the bearing pressures on the soil. Thus for a tank 25m in diameter on a 1.5 m thick base, the area in contact with the soil is increased from the net base area of the tank of 491 m^2 to 616m^2, assuming a 45° spread of load through the fill. A projection of the toe beyond the tank walls greater than is given by the stable slope of the fill plus atop marginal width of 1-1.5 m is not justifiable because the load-spreading in a flexible fill material is unlikely to be at an angle flatter than 45° . also, increase in thickness of the fill beyond a certain amount will merely increase the bearing pressure on the soil without any useful gain in spread of load. The thick base also serves the useful function of reducing concentrations of stress in the soil below the periphery of the tank. Soft alluvial sitlts and clay often have a crust of stiff dried-out soil at the ground surface. This crust should be preserved as far as possible in it's the thickness, as it serves to spread the tank loads still further so reducing the shear stresses in the underlying soft layers.

Surcharging the sites of tanks, or slow filling of the tank (a filling period of a year can be contemplated) can make it possible to construct heavy oil tanks on very soft sits and clays.

The slope of the tiling should be protected from erosion by a layer of bitumen-sand and drain should be provided at the toe of the slope to collect surface water and any seepages of oil from the tank pipes or valves. A design for a tank base in accordance with the recommendations of B.S 265.

The use of 3 m thick layer of compacted clay filling to support 42.7m diameter by 14.6 m high oil tanks at the Avon-Refinery in on Francisco bay has been described by Roberts. On this site some 1.5-3m of soft organic clay containing peat were overlying stiffer material the shear strength of the soft clay containing varied fro 9.5 to 14 kN/m^2 and the bearing pressures imposed by the full tanks would have caused serious overstressing. However by placing the tanks on a layer of imported clay filling 3m thick the stresses on the soft material were reduced and the frictional forces developed at the top and bottom of the soft layer between the surface fill and lower stratum, respectively, prevented this of clay from hawing a way case because of the relatively thin layer of soft clay. If deep soft deposits had been present the overstressed zones the method was successfully unparticular have been very large and would probably have resulted in tilting and overturning of the tanks. As it was, the tanks a maximum settlement of 10mm was recorded over the filling. Period and 90mm three months after completing the filling the maximum differential settlements between points on the periphery was 50mm a thick peat layer on one side of the tank a maximum settlement of 305 mm was recorded five months after commencement of filling. The differential tank by jacking the walls from brackets welded to the tank plates followed by the injection of the beneath bottom; another method of containing a relatively thin layer of soft clay is to construct a ring of compacted rock fill around the periphery of the tank. This is method was despaired by Roberts 4%, in a comprehensive review of foundation method for oil storage tanks. He states that piled foundations are rarely used since the cost of such a foundation is likely to be used the cost of a pile cap can be saved by surmounting the piles with compacted rock fill. Atypical design consists of a 1.4 m thick layer of compacted crushed rock with the heads of the piles projection 0.46m into this layer. The crushed rock layer is covered by 2m thick of compacted granular fill (Tomlinson 2001).

2.4 Interaction Between Soil and Buildings:

Under natural conditions, water and air fill the spaces between the soil particles. The properties of soil are influenced greatly by the amount of water so held, and volume and strength changes which may occur when this water is reduced or increased. Changes in the behavior of soils influence that of the foundations in contact with then and this affects the behavior of the superimposed building.

The building itself, through the loads transmitted via the foundations, compresses the soil and can change its behaivour. Interactions between the soil, the foundations and the building are complex and highly dependent upon the forces involved when soil shrink or expand due to loss or gain of moisture.

2.4.1 Soil Movement:

When the water present between soil particles is removed the latter will tend to move. Closer together conversely, when water is absorbed they will tend to move apart. Large movement can occur with clays, for these are capable of absorbing and relinquishing large quantities of moisture drying leads to shrinkage and a gain in strength, and absorption to swelling and a loss in strength. Movement in sands is for the most part negligible, for they have little capacity to hold water. Silts have movement which lies between that of clays and sands. Peat can exhibit very large movement and has little bearing capacity.

Changes in water content of soils may be caused in several ways. The most obvious is that caused when the soil is loaded by the weight of the foundations and superimposed building. Water is then squeezed out of the soil and the soil particles move closer together. As the ground is compressed or consolidated in this way the foundations settle, until equilibrium is achieved between the load imposed on the soil and the forces acting between its particles. The more clay there is contained in the soil, the longer does take for this equilibrium to be achieved. With soils wholly of clay such settlement may go on for years while, With sands it is rapid and substantially finished by the time building is completed. It may be of interest to note that a reductions in loading, such as will be caused by demolition or excavation can lead to water migrating towards the unloaded soil causing it to sell-again. Appreciable with clays and negligible with sands.

2.4.2 Effect of Vegetation:

Knowledge that movement can be caused by loss of water through the growth of vegetation and to gain of water by its removal seems to have been overlooked at least up until 1976, when the severe drought and hot weather in the UK led to a rash of troubles. In fact problems associated with vegetation and climate were of long standing and both research and reported upon by Word in the immediate post-war years.

Tree roots can extract large quantities of water from soil a fully grown type of tree uses over 50000 liters in a year. When soil is of clay, this will lead to drying shrinkage the magnitude of which will depend upon the inherent properties of the clay and of course, on the nature of the tree and its moisture requirements. Of tree roots take up moisture from under or near to foundations, the latter will subside and such subsidence will almost inevitably be uneven. The possible adverse effects on foundations and thus upon the final structure of the drying action of the tree roots in the areas of shrinkable clays is not appreciated by many involved in the construction process and unfortunately by many owners of building. The small immature tree which seems to be a fair distance away initially , looks uncomfortably close in later years.

The distance to which the roots of a tree spread depend largely upon the type of tree and its height. The roots of many common trees extend to a distance at least equal to their height. The roots of willow elm and popular can extend twice the height.

It is also most important to understand that when trees are felled clay soils will gradually swell as water returns to the ground. A day site cleared of trees needs to be allowed to recover before building begins or if this is not possible for economic or other reasons, then foundations need to be specially designed as described later, to prevent damage caused by this swelling.

2.4.3 Other Causes of Ground Movement:

Major ground movement can occur over underground mining areas as the ground collapses over the working.

Now a days, good records are of mine workings but this was not so during much of the 19th century.

Rather uncommon combination of circumstances can lead to the expansion of ground when frozen. The soils mainly involved are silts fine sand and chalk. In areas where the water table is high and when there are prolonged periods of freezing, ice lenses can be formed in these soil which cause heaving of the ground and the foundations upon it a phenomenon known as frost heave in practice, little trouble has been caused in the UK and, even in severe winters, the ground at foundations, base level near to occupied and heated buildings, is not likely to froze. The risk small very ways is confined to unheated building and those under construction.

2.4.4 Effects of foundations movement:

The greatest problems have occurred when shrinkable soils have dried excessively through the ,removal of moisture by nearby growing vegetation. Such drying likely to be greatest at the corners of foundations. As the ground falls away the weight of building pushes the then suspended parts of the foundations down and the walls in that vicinity cracking is predominantly diagonal and follows the vertical and horizontal mortar joints in brickwork, unless the mortar is abnormally strong for the bricks used, when cracking may occur through the latter. The cracks are widest at the top corners of the building and decrease as they approach ground level. The appearance of cracks of this pattern at the end of a specially dry summer is a fairly sure sign of desiccation of shrinkable clay soil.

Door and window frames also distort due to the deformation of the walls, leading to their sticking or jammig. In server cases service pipes may fracture walls may bulge and floors may slope noticeably. The cracks tend to close partly, following periods of prolonged rain for example by the end of the following winter.

When trees large shrubs and hedges are cut down before building long-term swelling of clay soils can be substantial and can take place over several years the upward forces on foundations can cause server stresses at the canners of the building or may act more centrally. In the former cause cracking patterns are usually similar to these already mentioned but with the important difference that crack width is greatest near to foundation level and becomes narrower at the higher levels. When forces act more centrally cracks tend to be straight rather than diagonal and are widest at the top. Often there will be a single crack in each of the two opposite walls of the building and they may be connected with a crack in the floor if this is of concrete.

When subsidence occurs to active mining operation the building tilts towards the advancing working and random from of cracking generally occur. Diagnosis is fairly obvious through knowledge of the presence of active mining in the area. Over old forgotten working, diagnosis is clearly more difficult but the presence of random cracking is a guide, through this can occure from other causes, for example from the use of parley consolidated fill or from seismic tremors.

2.4.5 Avoidance of Failure Due to Soil Movement:

Detailed guidance on the design and construction of foundations is given in BS.CP 8004 [29] and BSCP 101 [30]. The latter deals with Non-industrial building of not more than four storeys and it is in this category of building that most post-war problem have occurred particularly in housing. The National house building council (NHBC) has produced a related manual intended for house builders, engineers and architects [ ] which gives a chieves-list of actions required to prevent trouble. A first need is for adequate site reconnaissance, and a study of any local recorded information to determine the topography the basic type of ground the vegetation present and the type proximity of ground water and to glean as much information as possible on the previous use of the site for example any possible relationships to mining.

Geological maps will give guidance on the main ground strata to be expected but study of these needs to be augmented by the digging of trial pits (or hand augured bore holes) and by descriptions in detail of the soil profiles revealed and the level ground water**.** If such inspections reveal the like-lihood of hazardous ground conditions, shuch as those associated with peat or shrinkable clay or the presence of mining or of old building then specialist advice need to be sought. Failure to undertake these essentially simple steps has caused much expenditure in post war years.

On sites where the soil is of firm shrinkable clay it is necessary to take the foundation down to a depth which should eliminate significant ground movement. A foundation depth of 1m is generally adequate in such circumstance when the sites is unaffected by trees.

The NHBC has provided guidance on the depth of foundations required on sites with tree relating such depth to the type of tree, its mature height it distance from the foundations and its geographical location [ ]. Several types of foundation can be used in these circumstance and choice is likely to be dictated by financial consideration. The traditional strip foundation of concrete is usually some 150 mm thick with a minimum width of 450 mm from which two leaves of brick work are built up to DPC level. At a foundation depth of 1m at least twelve courses of brick work would be needed. The cavity wall up to ground level is filled with concrete and the trench is back filled with earth and hardcore these traditional strip foundation are labour-intensive and as the depth required increases trench fill or narrow strip foundation are being used increasingly. These are formed by cutting a trench narrower than the needed for the traditional strip and pouring concrete to a depth such that generally only four courses of brick work are required to reach DPC level. It is important that setting out is accurately accomplished to ensure that the brick courses do not over-sail the edges of the narrow strip. As the depth for foundations increase, and in soil liable to swell, it can become un satisfactory to use ever-deeper trench fill. Swelling pressures can act on the large areas of a foundation then in contact with the soil to cause lateral movement and rotation of the foundations and also vertical movement on the side of the trash fill. It will be better and often cheaper, to use bored piles.

The likelihood of damage from the swelling of clay soils following the cutting or removal of vegetation is difficult to prefect but it is known that many years can elapse before movement can be considered complete. BSCP 101 considers it un wise to assume that swelling will be completed with in two winter seasons following the removal of tree and hedges and calls for special foundations such as bored piles and ground beam to be used if building are sited over or close to former trees shrubs or hedges. The time scale of swelling and the distance over which the effect is appreciable, requires further research.

If additions are to be made to existing buildings in areas where soils movement is likely to be a problem then it is probable that differential movement will occur between the new and old structure. It is necessary to ensure that such movement can take place without causing damage two either by the use, where possible, of flexible or slowing joints.

Where subsidence due to mining is a risk expert advice needs to be sought on the design of foundation which is out side the scope of this book. The National coal board or the equivalent authority for other types of mining should be consulted.

Detailed guidance on the type of foundation for low rise buildings. With particular reference to special ground problem, including soils of firm shrinkable clay and mining subsidence, it given by Tom Iinson Driscoll and Burland.

2.4.5.1 Remedial Measures:

Repairs to foundations are very expensive and if things have gone wrong, much care should be taken in deciding whether repairs are necessary and, if so, the form they should take. There was general over-reaction to damage caused by the 1976 drought and many unnecessary repairs were undertaken. Underpinning of foundations is an extreme measure to adopt and may do more harm than good in some circumstances, for example, where swelling of the soil may take places afterwards, through normal return of water to the soil in the wet season or following the wholesale removal of trees and vegetation at the time when shrinkage damage first become apparent the following table shows a classification of visible damage to walls and related ease of repair of plaster and brick work.

2.4.5.2 Fill:

Good building land is scarce and this has put pressure on developers to fill other possible sites such as grovel pits, railway cutting and open-cast mines. The support given by the fill depends crucially upon its type, the degree of consolidations it has reached and the way this has been achieved. All made-up ground should be treated as suspect.

Degree of Damage	**Description**
Very slight/slight	Fine creaks, not grater than 5mm wide often not visible in external brick work and easily filled, Some slight sticking of doors and windows possible
Moderate	Cracks may be typically forms 5 to 15 mm wide, external brick work will need repointing and some local replacement may be necessary. Doors and window will stick and service pipes may fracture general weather tightness may be impaired
Sever/very sever	Cracks will typically 15 mm width and may exceed 25mm. walls are likely to lean or bulge noticeably and may require shoring, beams may lose their bearing. Window frames and doors frames will distort and glass is likely to break service pipes are likely to be disrupted external repair work will be necessary involving partial or complete rebuilding

Based on foundations for low-Rise building (the structural engineer June 1978).

Because of the likelihood of extreme variability. The NHBC has recorded that the largest single cause of foundation failures to dwellings has been the use of poor fill. Mostly difficulties have arisen through settlement of the fill following inadequate compaction.

2.4.5.3 Settlement of Fill:

Along time is usually needed for the natural settlement of fill, particularly if the predominant particle size is small. Slow consolidation occurs, two when the fill has been inadequately broken or graded and contains excessive viols. Considerable compaction of originally loosely compacted fill can occur later if water reaches it, perhaps through a rise in the water-table level. Sites containing materials which domestic refuse are specially hazardous for these contain material which may have large voids, such as old metal, glass and plastic containers and also regrettable matter which eventually decomposes and also vegetable matter which eventually decomposes and also results in subsidence of the super-imposed foundation. Shrinkable clay used as fill will shrink on drying and can cause settlement difficulties, particularly if construction takes place when the clay is saturated during wet weather.

2.4.5.4 Heaving of Fill:

While settlement of fill is the major cause of trouble when building is on made-up ground, swelling of shale used as fill has also caused extensive damage, through the problem seems not to be widespread in the UK. Swelling shale are known to have cause failures in the USA and in Canada.

In this century a series of failures occurred in the Teesside area and one in Glasgow in the 1970s. investigations identified the ironstone shale which caused the trouble as belonging to the whitebait of Upper lays ,probably of the jet-rock series but also likely to be mixed with alum shale’s [34] . the cause of swelling was attributed to the oxidation of pyrites in shale, resulting in a marked volume increase. The oxidation process also produced sulpharic acid and this reacts with calcite present in the shale to form gypsum. The crystallization of this gypsum between laminations in the rock is beloved to be the predominant expansive force. The possibility of such problems occurring at points other than Teesside and Glassgow in the UK sums small but cannot be ruled out.

4.4.5.5 Effects of movement of fill:

Movement due to settlement of fill are usually large and major cracking of external walls, screeds and internal portions often results: doors and window jam, gaps occur at head of partitions and brick work may bulge out.

The expansive forces due to swelling pyretic shales cause concrete ground floors to lift and arch, and to crack. Internal walls and partitions lift and crack and there may be out word movement of the perimeter walls near to DPS level.

2.4.5.6 Avoidance of damage by fill:

Where ever possible, it is better to avoid sites which have been filled and all possible information about the site should be obtained by visits there by discussion with local people and the local authority and by studies of local maps. Site visits should aim at observing signs of a damage to any buildings bordering the site and should include the digging of trial pits to assess the nature of the soil. If it is clear that the site has been filled and cannot be avoided then numerous trial pits will be needed to assess the nature and variability of the fill and its boundaries, its depth , its chemical composition, the degree of compaction, and the method by which the fill seems to have been laid and compacted. In addition, the level of the water table will need to be monitored for at least a year before building begins and the likelihood of further settlement should be assessed consequent upon the fills becoming inundated. Adequate flexibility and protection to services to buildings will need to be provided. Specialist advice should be sought on ways of helping to consolidate the fill further and on the possible foundation solutions to the building to be erected by for example the use of piles.

Where chemical analysis has included the presence of pyrite and calcite the best course to adopts is to remove the fill and replace it with a non-hazardous one. Where new fill is to be used on site- the builder can at least exercise proper control over it. It should be of a granular nature, ideally a coarse, sand or a gravel free from organic matter, and should be thoroughly compacted layer by layer (Ransom, 1987).

Foundation failure parameters:

1- Soil moisture loss:
   - Evaporation
   - transpiration
   - combination
2- Increment of soil moisture:
   - Rain fall.
   - Domestic water.
   - Redistribution of soil.
3- Other foundation failure causes:
   - lateral movement.
   - consolidation compaction.
   - frost heave.
   - Perma. frost.
   - construction defects.

2.5 Foundations Problems Not Moisture Related:

2.5.1 Lateral Movement:

Serious soil movement can be the result of some variety of lateral displacement. Lateral movement can be the result of soils eroding, sliding or sloughing: this is generally associated with construction on slopes with unstable bearing soils movement is often precipitated or exacerbated by the intrusion of water into the soil to the extent that both cohesion and structural strength are threatened or destroyed. The structural damage caused by these problems is often complete destruction. When possible remediation is addressed in a manner generally consistent, with that for acute settlement. Severe lateral movement is generally beyond the methods available to the repair contractor. However, the contractor can often provide measures to stop lateral movement. This could involve the placement of retaining walls earth anchors terraces or other such measures.

2.5.2 Consolidation or Compaction:

Settlement can also occur as a result of consolidation of fill, base or, sub base materials. With respect to residential construction the most common problem deals with construction on either abnormally thick fill or a sanitary land fill. In either case over time the intended bearing soils fail due to consolidation. Normal settlement of fill often active for periods up to ten years and is some what dependent upon the cycles of precipitation and drought. Sanitary land fill can be active for longer periods of time due to voids continually provided by the decay of organic materials.

Consolidation of non expansive soils often result from removal of pore water. One example of this might be instances where the water levels of lakes or ponds are lowered, allowing water to drain from the surrounding soils, often sand or coral Elutriation of soluble material usually salts from soils facilitated by the invasion of water, can create voids that at some point collapse and cause consolidation. In many cases deep grouting is a required remedial procedure for the correction of either problem. Once the deep seated causes has been. addressed procedures common to foundation settlement can be used to (re level) the structure.

2.5.3 Construction Defects:

Construction practices or mishaps often create conditions that are conducive to foundation problems. Where possible, these factors are grouped for either slab or pier-and beam foundations.

Slab Foundation:

There seems to be number of events inherent to the original construction that can possibly result in foundations problems or in other cases impede the desired repairs. Some of these are:

1. Utility leaks beneath the foundation .

   Pouring the slab foundation off grade.

3. Faulty slab design or construction slab foundation poured with.
   a. insufficient slab and or beam thickness.
   b. undersized, improper placement or absence of reinforcement.
   c. Too much water in the concrete which results in poor quality and substantial loss in strength are faulty.
4. add-or slabs poured in contact with another slab that already suffer differential deflection. This situation is most difficult to improved. The common joint poses a real problem. If the faulty slab is raised the add-on will be low. If the add-on is also raised the existing framing will be destroyed.
5. faulty exterior grade on consistent watering practices, location and design of lands plants each can promote foundation problem.

Pier and- Beam foundations:

The problems of foundation constructed with the pier and beam design probably happen with the same frequency as those of other foundations but their degree is much less the crawl space provides access for correcting minor grade problems experienced by interior floors. Other factors not so easily addressed include.

2.5.4 Negligent Maintenance:

Negligent maintenance could refer to instances where:

1. Standing water is permitted to approach and/or invade the foundation. Moisture accumulating in the crawl space of pier and beam foundation acerbates wood warping and contributes to in stability of interior piers and pier caps. A substantial warp will prevent proper leveling (shimming pier caps) and cause increased costs. Water beneath slab foundation frequently cause upheaval.
2. failure to address problems caused by erosion before they become critical. This concern would also include embankment failure.
3. the neglect of proper maintenance procedures is probably the froe most issue in the category proper maintenance is fully discussed in other paper already. Section 7C

2.6 Summary

Literature review on some aspects of oil tanks foundation reveals that the design method for such oil tank foundation can be further developed. Two factors which are most concerned to engineering are differential settlement and shape of settlement dish.

To achieve the uniform base settlement is objective of a good tank foundation design.

Oil tank foundation can be classified into two types which are shallow foundation and foundation. However, the choice of either pile raft or pile group with a thin granular pad are very important, and then the parameters which should be used to have the most effective foundation system also need to be considered. However, these factors have not been investigated in detail by early researchers.

Although considerable research studies have been carried out on the load distribution and arching effect of embankment, relatively few studies have been carried out to investigate the performance of oil tank foundation. At present, there is generally no accepted method or criteria to design oil tank supported by either pile group or pile raft. A tank with pile group can be used to enhance the stability and reduce the settlement as well as the differential settlement. However, the thickness of the granular pad, the number of piles, the pile configuration and their load distribution to achieve the most effective foundation system is still in question. Non-uniform soil layer are commonly found in reality especially for very large tanks, but it is not easy to predict the performance of the foundation system in this kind of soil layer by any methods which were discussed in this chapter.

From the above, this research will focus on developing a design procedure in which many parameters of the pile foundation system are taken into consideration. It is hoped that this procedure can be used as a guide for the design engineers to build cost effective pile foundation system for oil tanks.

Chapter Three

Typical Product Tank Foundation

3.1 General

This chapter presents a typical foundation of product tanks used worldwide and in Sudan. It covers all types of foundation in practice.

3.1 Reinforced Concrete foundation (R.C.F)

These can be defined as foundation that properly designed and constructed. Main types are : R.C. R.F - reinforced concrete raft foundation

3.1.1Reinforced Concrete Raft Foundation (R.C.R.F)

These types always used where material involved are available – any rare of any other attentive material as shown in Figure 3.1 and 3.2 .

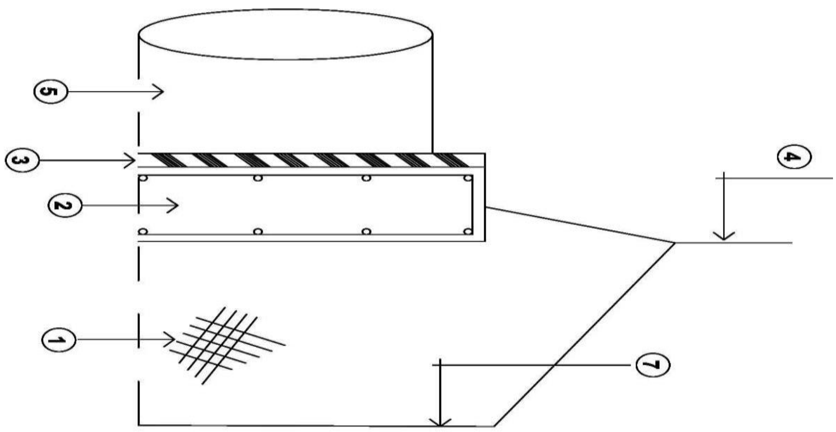


Figure 3.1: R.C. Raft foundation Section

Where:

1 = Stone gravel placed in layers, curing compaction to give 95% min Procter test (D.D.T).

2 = Reinforced concrete raft foundation designed properly with two layers of reinforced calculated .

3 = 50mm Bitumen Sand Layer .

4 = Natural Ground Level (N.G.L).

5 = Product Tank (Steel Sheet) .

6 = Excavation External Boundary or Limits .

7 = Foundation Bottom Level

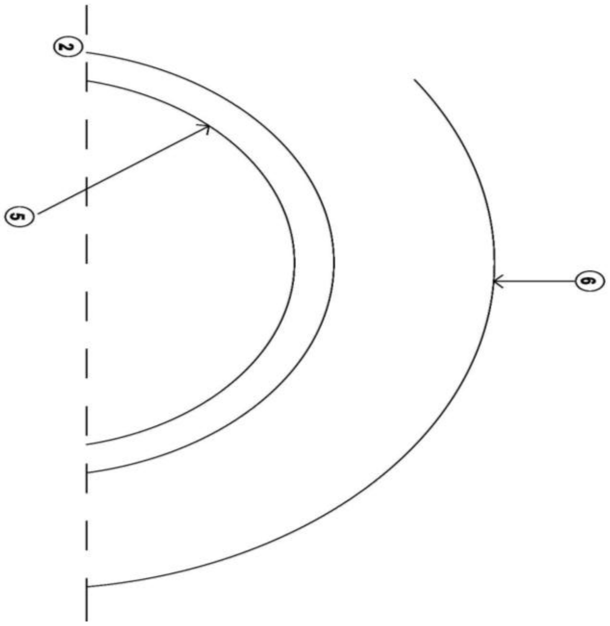


Figure 3.2: R.C Raft foundation (R.C.R.F) Plan

3.1.2 R.C. Wall Foundation

Figure 3.3 and 3.4 show a typical RC Wall Foundation Section with different sections. These sections are:

1= Stone Gravel Placed in Layers 200mm , curing , compaction achieve 95% Procter test

3= 50mm Bitumen Sand Layer .

4= N.G.L t 0.00 Natural ground level .

5= Steel product tank with convex base .

6= Excavation boundary or limits .

7= Foundation bottom level .

8= R.C.W.F Reinforced concrete wall foundation designed properly with reinforcement and c grade c30mm .

9= Inspection chamber (MH) .

10= Wall Foundation Brick base

11= Cavity .

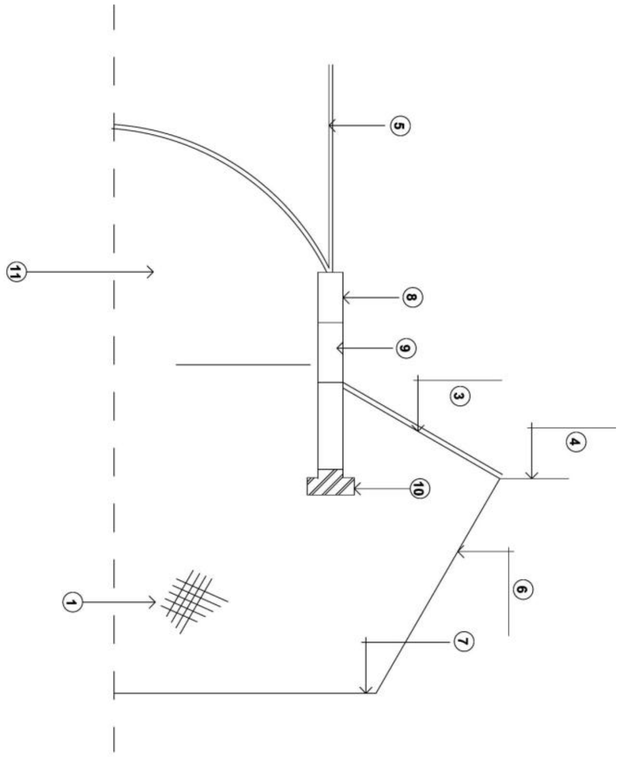


Figure 3.3 Typical RC Wall Foundation Section

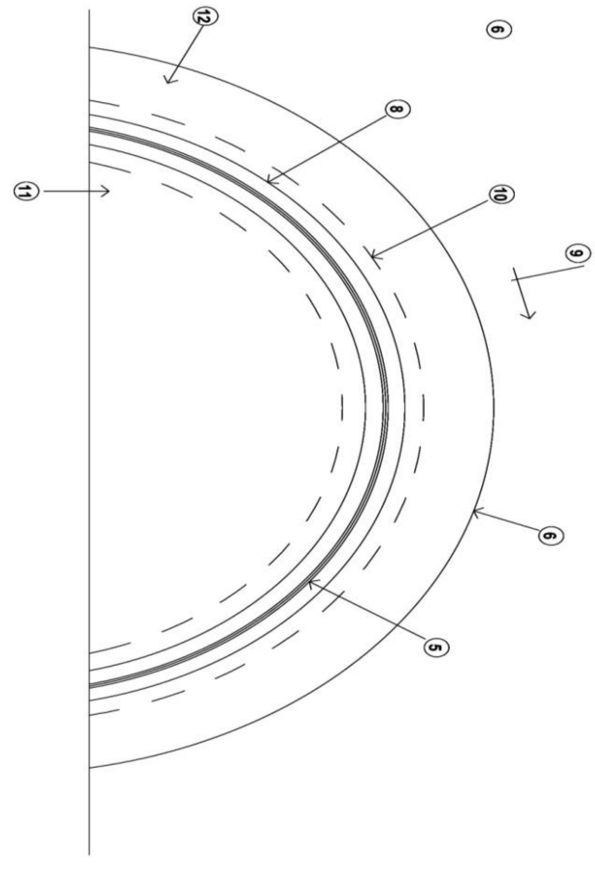


Figure 3.4: Typical RC Wall Foundation Plan

3.2. Earth Foundation :

Is that foundation which designed and constructed to support product tank .tis type of foundation always recommended where selected materials are available or have no economic factor to be used .Stone gravel always used as a recommended material for its stability and durability as shown in Figure 3.5 and 3.6.

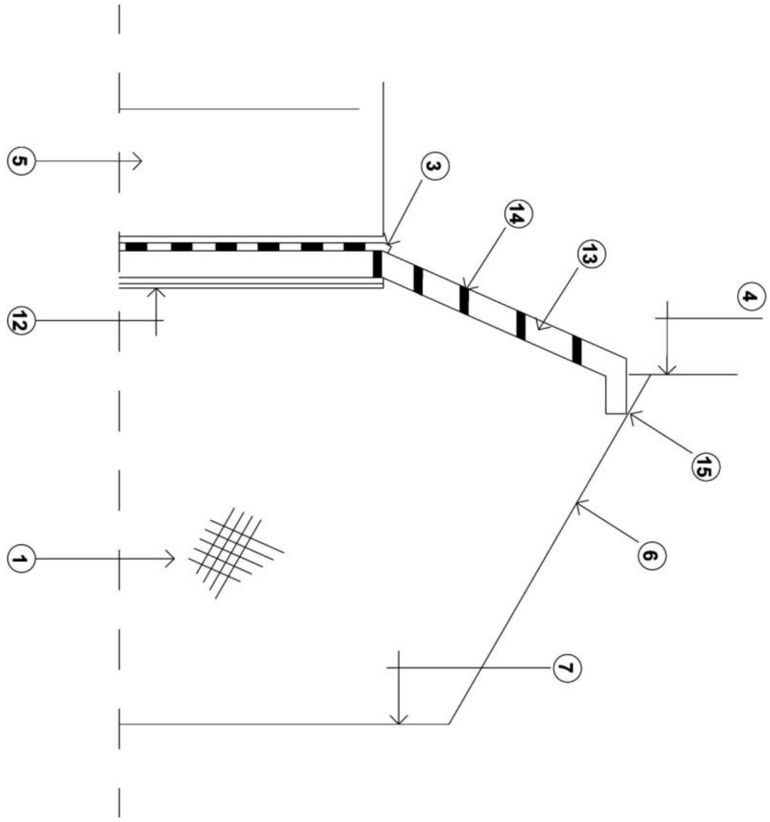


Figure 3.5: Typical Earth Foundation Section

Where these section are:

1= Stone gravel placed in layer 200mm curing and compaction 95% pockets test

3= 50mm bitumen sand layer .

4= N.G.L Natural gravel level .

5= Steel product tank .

6= Foundation boundary or limits .

7= Foundation bottom level .

12= 900mm compacted sand layer .

13= 50 – 100mm d P.C costing 1:2:3 .

14= fillet material (Asphalt) .

15= I.5 BKW to support Casted PC .

16= PC boundary or limit

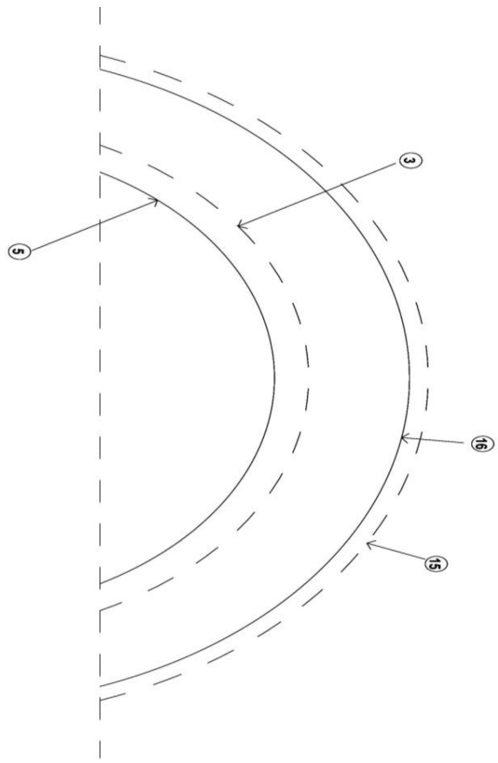


Figure 3.6: Typical Earth Foundation Plan

3.2.1 Earth Foundation With Retaining Wall :-

This can be designed as foundation that designed constructed using specific type of earth such as (I.S.G) iron stone gravel , sand or sahaya , which bounded by one of the following type of retaining walls .

3.2.2 Reinforced Concrete Ring Retaining Wall :

Definition : (R.C.R.W) properly designed and constructed to contain selected materials which will support product tank as shown in Figure 3.7 and 3.8 below, where these section are:

3 = 50mm bitumen sand layer .

4 = N.G.L Natural ground level .

5 = Steel product tank .

6 = Excavation boundary or limits .

7 = Foundation bottom level .

12 = 400mm compacted sand layer .

17 = ORD.RED BKW base C\S 1:8 mortar .

18 = Reinforced concrete retaining wall .

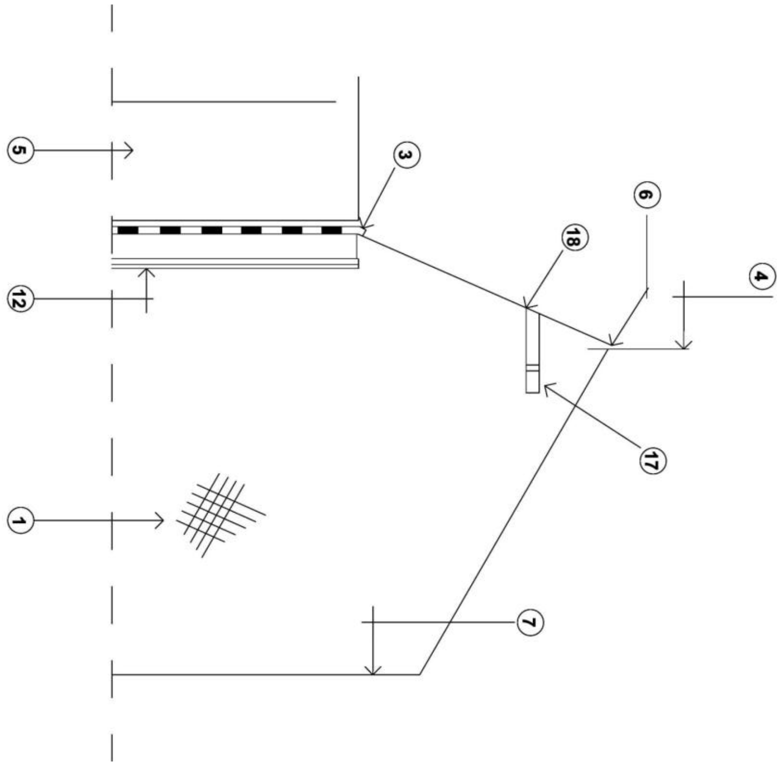


Figure 3.7: Typical Earth Foundation with (R.C.R.W)

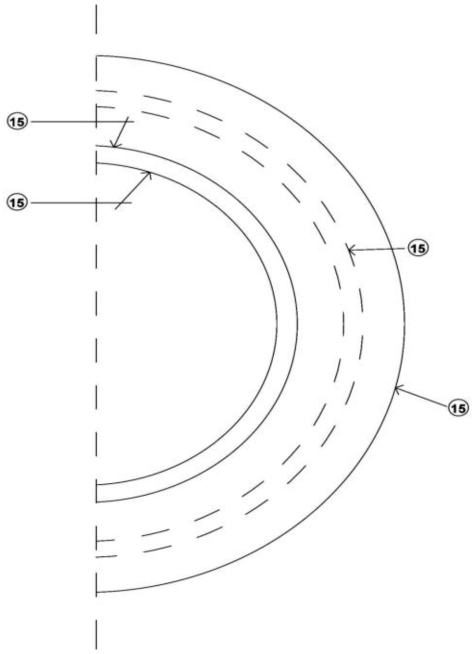


Figure 3.8: Earth Foundation with (R.C.R.W) Plan

Types of Earth Foundation with (R.C.R.W) (R.C.R.W) :-

Figure 3.9 below presents the details section of the two types of R.C.R.W foundation, where:

X , h   - Designed section .

A   - Designed binders of 12mm min .

B   - Designed main Reinforced

C, - Out side direction .

D, - Inside direction .

E - Secondary reinforcement .

F - Ordinary red brick base in C\S 1:8 mix mortar

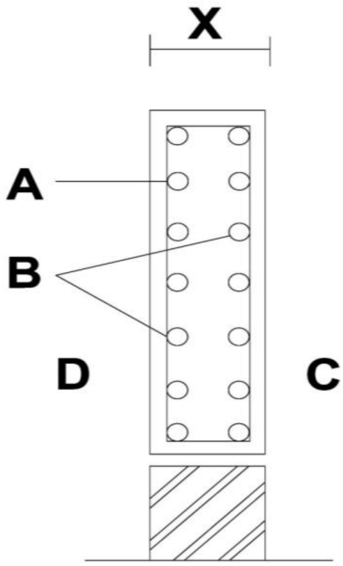


Figure 3.9: R.C.R.W type (or Alt.) 01 Section

.

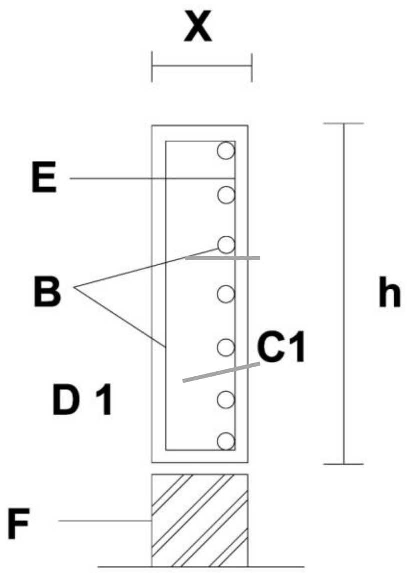
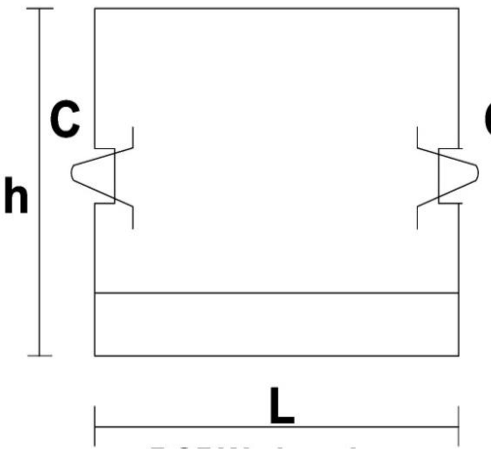


Figure 3.10: R.C.R.W type (or Alt.) 02 Section

3.2.3 Precast – Concrete Retaining Wall (P.C.R.W)

Definition :defined as structural element , that design and construct reinforced concrete pieces to support or resist lateral forces of compacted filling material. It should be transported and handled properly and to be assembled at site in accordance to required foundation type, size, level and dimension .

Each piece of precast units can be in one of the following shapes or sections as shown in Figure 3.11 and 3.12.



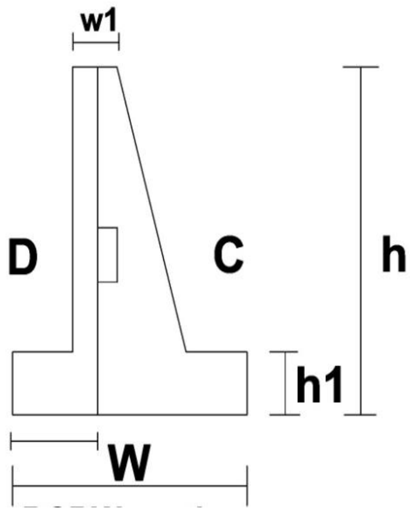


Figure 3.11:P.C.R.W Elevation Figure 3.12: P.C.R.W Section

Where:

W,w1 , h,h1 in accordance to design parameters :

D - inside direction .

C - outside direction .

L - precast element length .

G - tie or fixing points .

Figure 3.13 and 3.14 show typical Precast Returning wall section and plan, where these sections are:

1= Stone gravel placed in layer 200mm curing and compaction 95% pockets test.

3= 50mm bitumen sand layer .

4= N.G.L Natural ground level .

5= Steel product tank .

6= Excavation boundary or limits .

7= Foundation bottom .

12= 400mm compacted sand layer .

19= Precast concrete retaining wall .

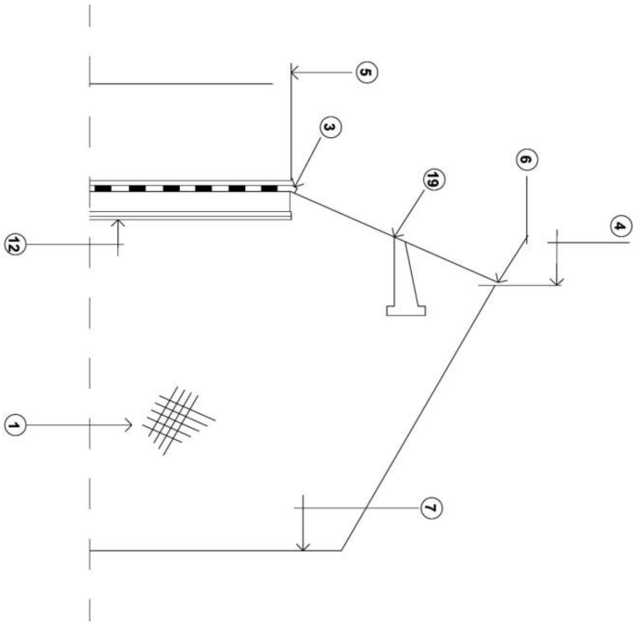


Figure 3.13: Precast Returning wall typical section

.

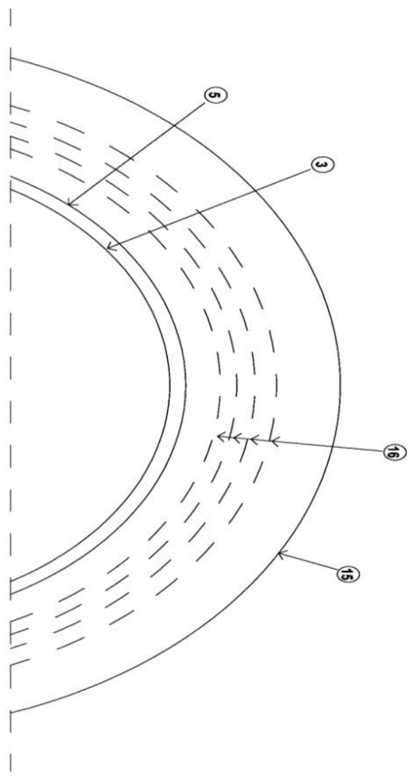


Figure 3.14: Precast concrete retaining plan

3.2.4 Ordinary Red Brick work retaining wall (O.R.B.R.W)

Figure 3.15 and 3.16 show section and plan of Ordinary Red Brick work retaining wall, where these sections are:

3 = 50mm bitumen sand layer .

4 = N.G.L Natural ground level .

5 = Steel product tank .

6 = Excavation boundary or limits .

7 = Foundation bottom level .

12 = 400mm compacted sand layer .

17 = ORD.RED BKW base C\S 1:8 mortar .

22 = ORD.RED BKW Retaining Wall.

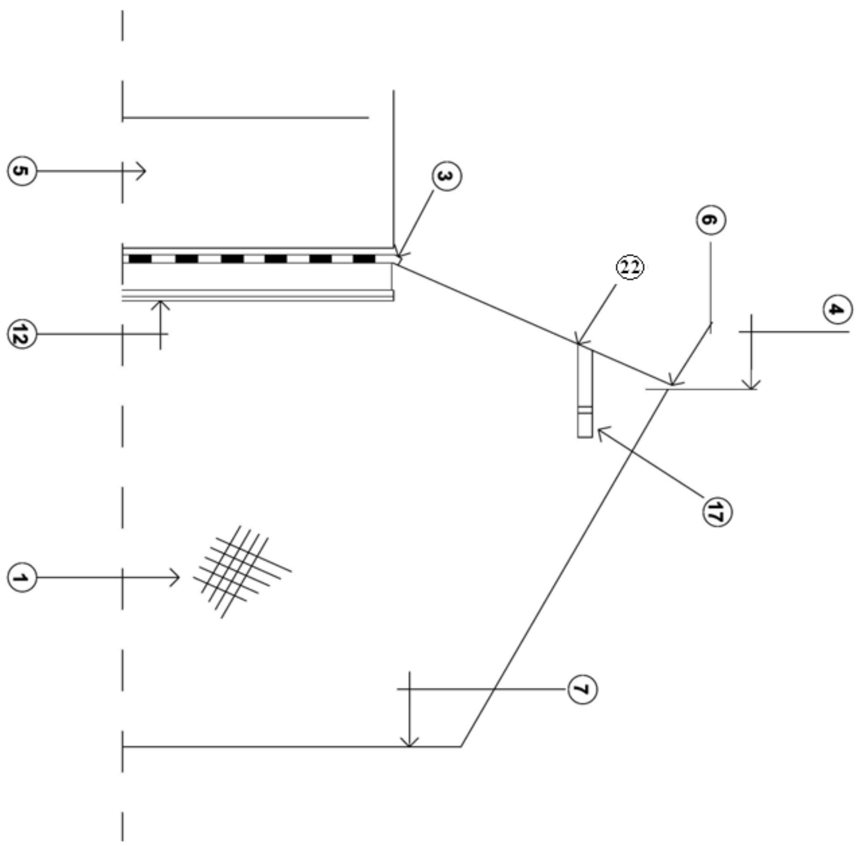


Figure 3.15: Ordinary Red Brick work retaining wall section

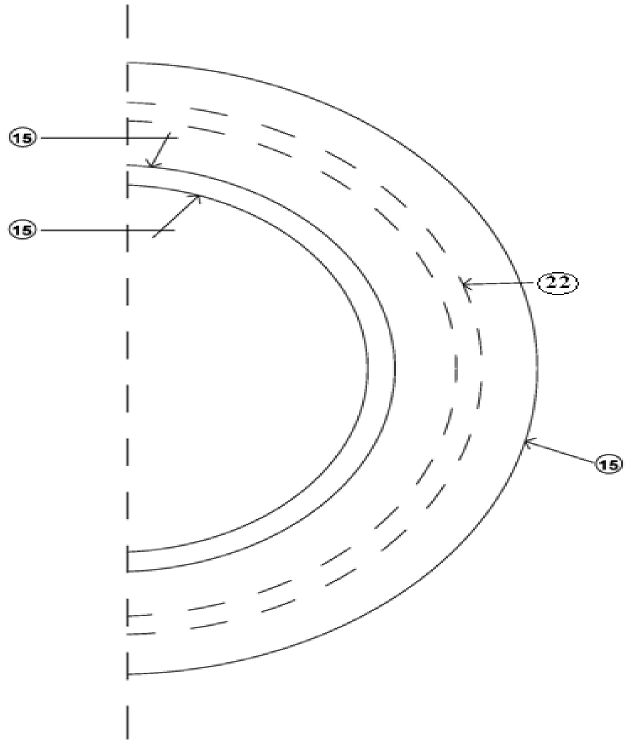


Figure 3.16: ORD.RED BKW Retaining Wall (O.R.B.R.W) Plan

3.2.5 Hollow Block Retaining Wall (H. B.R.W)

Figure 3.17 and 3.18 shows a typical section and plan for a Hollow Block Retaining Wall (H.B.R.W), these section are:

3= 50mm bitumen sand layer .

4= N.G.L Natural ground level .

5= Steel product tank .

6= Excavation boundary or limits .

7= Foundation bottom level .

12= 400mm compacted sand layer .

17= ORD.RED BKW base C\S 1:8 mortar

21= Hollow Block Retaining Wall.

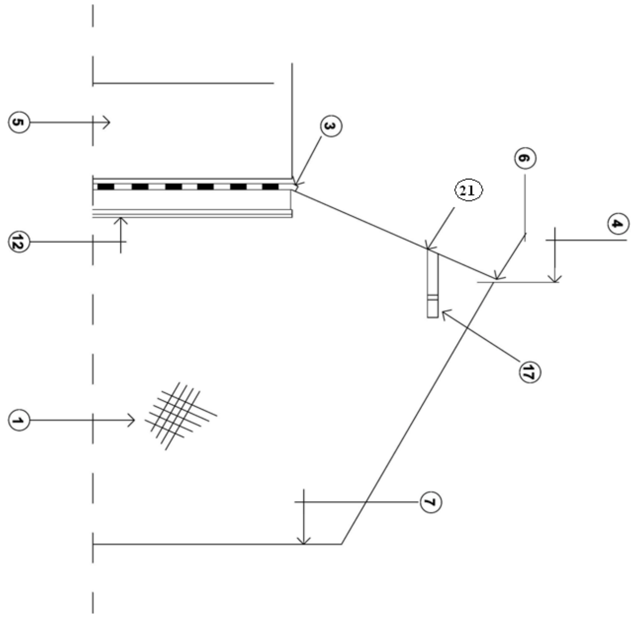


Figure 3.17: Hollow Block Retaining Wall (H. B.R.W) Section

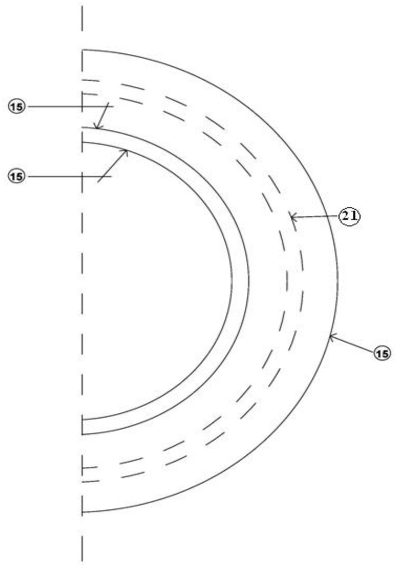


Figure 3.18: Hollow Block Retaining Wall (H. B.R.W) Plan

3.2.6 Stone Retaining Wall (S.R.W)

This will defined as structural element that designed and constructed using any of the following alterations which are properly and safely en-contain compacted filling material. Figure 3.19 shows alternatives f stone retaining wall. Figure 3.20 and 3,21 show a typical section and plan of a Normal Rectangular Stone Retaining Wall, these section are:

3= 50mm bitumen sand layer .

4= N.G.L Natural ground level .

5= Steel product tank .

6= Excavation boundary or limits .

7= Foundation bottom level .

12= 400mm compacted sand layer .

17= ORD.RED BKW base C\S 1:8 mortar .

20 = Normal Rect. Stone Retaining Wall.

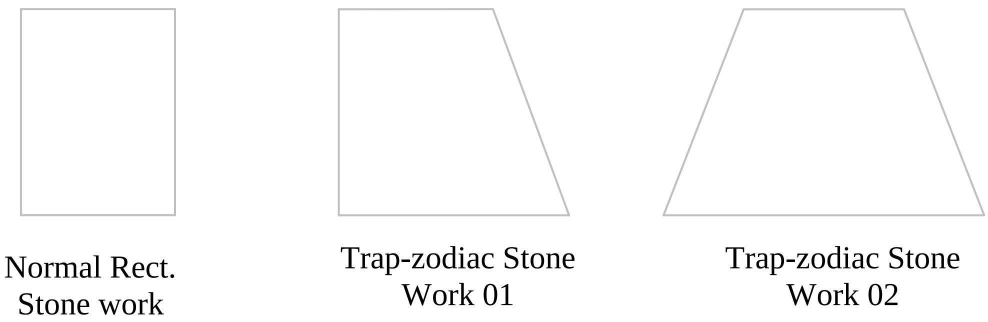


Figure 3.19: Different type of Stone retianing wall

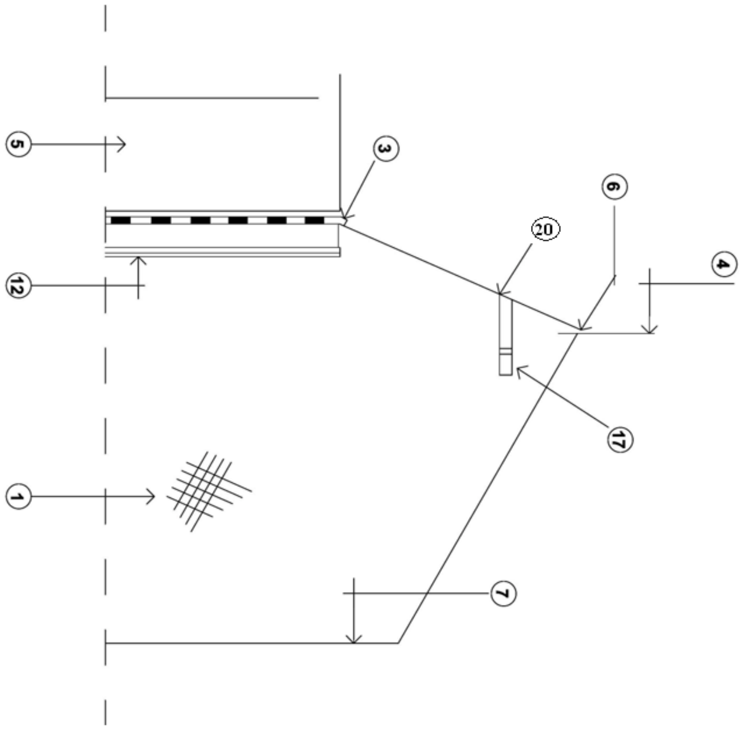


Figure 3.20: Normal Rect. Stone Retaining Wall Section

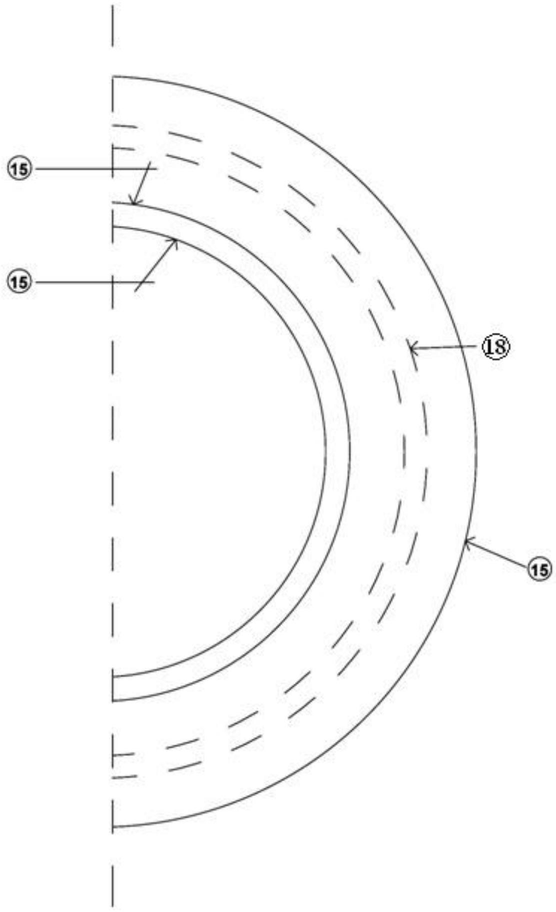


Figure 3.21: Normal Rect. Stone Retaining Wall Plan

Figure 3.22: photo of storage tank foundation

Chapter Four

Data Collections and Analysis of Data

4.1 Introduction:

This chapter presents the experimental test results of the field and laboratory investigations that were carried out to evaluate the soil conditions and geotechnical investigation of Khartoum North, Sudan at different locations.

The study was divided into two different areas to simplify the field work. The field and experimental works were conducted during two years period from 2009 to 2012. The data consists of summary presentation of the soil classification, compaction test results, shear strength, standard penetration test for the field and laboratory investigations.

4.2 Limitations

This study has been prepared to present the observation and findings of the laboratory and field investigation. This study was prepared in accordance with generally accepted geotechnical engineering practice.

The observations and findings presented in this study are based on information collected during the field exploration and laboratory testing program. The results described in this study reflect subsurface conditions only at the specific locations, and to the depths explored. Soil conditions and water levels at other locations may differ from conditions observed at boring locations. Some data have been obtained from already drilled boreholes at the same area to reduce time and cost.

4.3 The Field Exploration:

Due to the difficult access and additional permitting requirements for the drilling within the study area the geotechnical exploration was conducted in different phases. The first phase of field exploration program to cover 20 boreholes was performed and consisted of drilling and sampling soil borings. The borings extended to depths approximately between 8 to 25m below ground surface. The second phase for laboratory testing. Following phases were carried out to cover all area under study.

The site study and investigation were comprised of powered (backhoe) excavation of selected test pits and drilling machine in some areas. The pits were powered excavated or drilled for sampling and collection of the amounts of materials to be tested. Bulk samples of the predominant soil were obtained from each borehole.

Samples were stored in plastic bags, labeled and transported to laboratory in Sudan University of science and technology, Khartoum for testing.

All selected location were identified using GPS to locate their locations (Easting, E and Northing, N). Then further digital maps are produced from soil investigations reports. The following Tables 4.1 to 4.4 presents the selected boreholes locations and their depth.

Table 4.1: Location and depth of the selected borehole on study area

Site location	Borehole No.	Northing, N (m)	Easting, E (m)	Borehole depth, (m)
Khobar	1	15.630556	32.553056	22
	2	15.630556	32.553056	22
	3	15.630556	32.553056	19
	4	15.630556	32.553056	22
Nebta	1	15.646111	32.638611	20
North Brain Silo	1	15.660000	32.565556	15
	2	15.660000	32.565556	15
	3	15.660000	32.565556	15
	4	15.660000	32.565556	15
	5	15.660000	32.565556	5
	6	15.660000	32.565556	5
	7	15.660000	32.565556	5
Electric Corporation Industrial zone	1	15.649167	32.648889	20
	2	15.649167	32.648889	20
	3	15.649167	32.648889	20
	4	15.649167	32.648889	20
	5	15.649167	32.648889	10
	6	15.649167	32.648889	10
	7	15.649167	32.648889	10
	8	15.649167	32.648889	10

Table 4.1: Location and depth of the selected borehole on study area ……(Continued)

Site location	Borehole No.	Northing, N (m)	Easting, E (m)	Borehole depth, (m)
Kafouri	1	15.622222	32.574444	10
	2	15.622500	32.574444	10
	3	15.622500	32.574444	10
	4	15.622222	32.574167	20
Kafouri Amipharma	1	15.654167	32.275000	15
	2	15.654444	32.575278	20
	3	15.654167	32.575278	25
Kafouri Amipharma	1	15.654167	32.275000	25
	2	15.654167	32.275000	20
Kafouri Amipharma	2	15.654444	32.275556	20
	3	15.654167	32.275278	25
Eltayba	1	15.671389	32.562500	16
	2	15.671389	32.562500	16
Elirsad	1	15.736389	32.559167	15
	2	15.736389	32.559167	15
Umdawan ban	1	15.430833	32.830278	10
	2	15.430556	32.830000	10
Carri	1	16.194444	32.606944	10
	2	16.181944	32.328889	10
	3	16.165833	32.643889	10
Tasc Tower	1	16.150278	32.633333	10
	2	16.147500	32.632222	10
Hag Yousif	1	15.656667	32.631111	10
Gaili	1	16.010833	32.590278	10
	2	16.010833	32.590278	10
Dardoug	1	15.695556	32.630556	10

Table 4.1: Location and depth of the selected borehole on study area ……(Continued)

Site location	Borehole No.	Northing, N (m)	Easting, E (m)	Borehole depth, (m)
Gaili Sumor	1	16.005278	32.578333	3
	2	16.005278	32.578333	3
Bataheen	1	15.623889	32.620833	9
Om-Algura	1	15.761667	32.583056	10
Droushab	1	15.720556	32.561944	10
	2	15.717500	32.571111	10
Tegani	1	15.746111	32.578611	10
	2	15.746111	32.578611	10
Hag Yousif	1	15.620833	32.625000	20
	2	15.620833	32.625000	20
Wawisi	1	16.075000	32.583056	10
	2	16.075000	32.583056	10
Kabbaashi	1	15.888056	32.579167	10
Safya	1	15.649444	32.536111	10
	2	15.649444	32.536111	10
Dahab	1	15.633056	32.656111	10
	2	15.633056	32.656111	10
Hadad	1	15.610278	32.653889	10
Manawwar	1	15.643333	32.558056	10
	2	15.643333	32.558056	10
Haigadisisa	1	15.603611	32.600000	10
	2	15.603611	32.600000	10
Pony	1	15.598333	32.645000	10
Silate	1	16.191667	32.607222	10
Shambat	1	15.654722	32.529722	15
	2	15.654722	32.529722	10

Table 4.1: Location and depth of the selected borehole on study area ……(Continued)

Site location	Borehole No.	Northing, N (m)	Easting, E (m)	Borehole depth, (m)
Gibril	1	15.605556	32.634722	10
Omdom	1	15.535278	32.628881	10
	2	15.535278	32.628881	10
Hag Yousif	1	15.626389	32.6291167	15
	2	15.626389	32.6291167	15
Alsamrab	1	15.703889	32.590278	15
	2	15.703889	32.590278	15
Halfaya	1	15.720000	32.556667	15
	2	15.720000	32.556667	15
Textile	1	15.656389	32.546667	12
	2	15.656389	32.546667	8
Kadaro	1	15.754444	32.574167	10
Kabbashi	1	15.903333	32.577222	18
	2	15.903333	32.577222	18
Koko	1	15.620556	32.585278	10
Sheihkamin	1	15.559722	32.834722	10
Shegail	1	15.765278	32.645000	10
Mirghaniya	1	15.635833	32.521667	15
	2	15.635833	32.521667	15
	2	15.635833	32.521667	15
Safya-44	1	15.651944	32.539167	15
	2	15.651944	32.539167	15
Shambat-45	1	15.669167	32.545278	15
Safya-46	1	15.648056	32.542778	20
	2	15.648056	32.542778	20
Kafouri-47	1	15.642222	32.577500	10

Table 4.1: Location and depth of the selected borehole on study area ……(Continued)

Site location	Borehole No.	Northing, N (m)	Easting, E (m)	Borehole depth, (m)
Kafouri-48	1	15.633611	32.574722	20
	2	15.633611	32.574722	10
Kafouri-49	1	15.624722	32.575000	13
Kafouri-50	1	15.626389	32.56778	15
	2	15.626389	32.56778	10
	3	15.626389	32.56778	10
Kafouri-51	1	15.626667	32.560000	13
	2	15.626667	32.560000	15
	3	15.626667	32.560000	25

Figure 4.1 to 4.4 show the locations of the selected study area on Khartoum North, Sudan. The study area cover all areas in Khartoum North where the oil tank and refinery are expected to be built there according the master plan for oil tanks in Khartoum State.

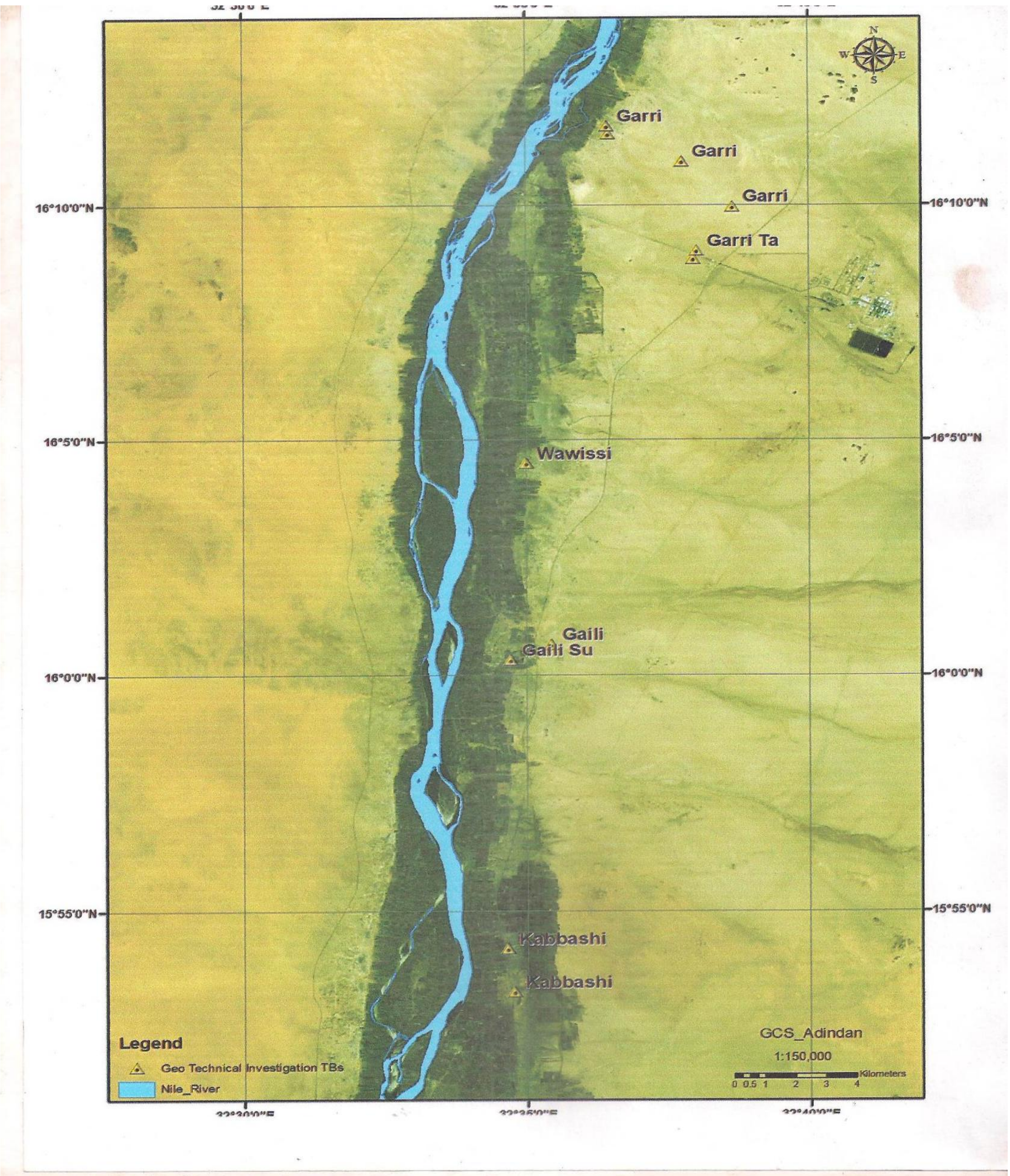


Figure 4.1: Location of study area 1

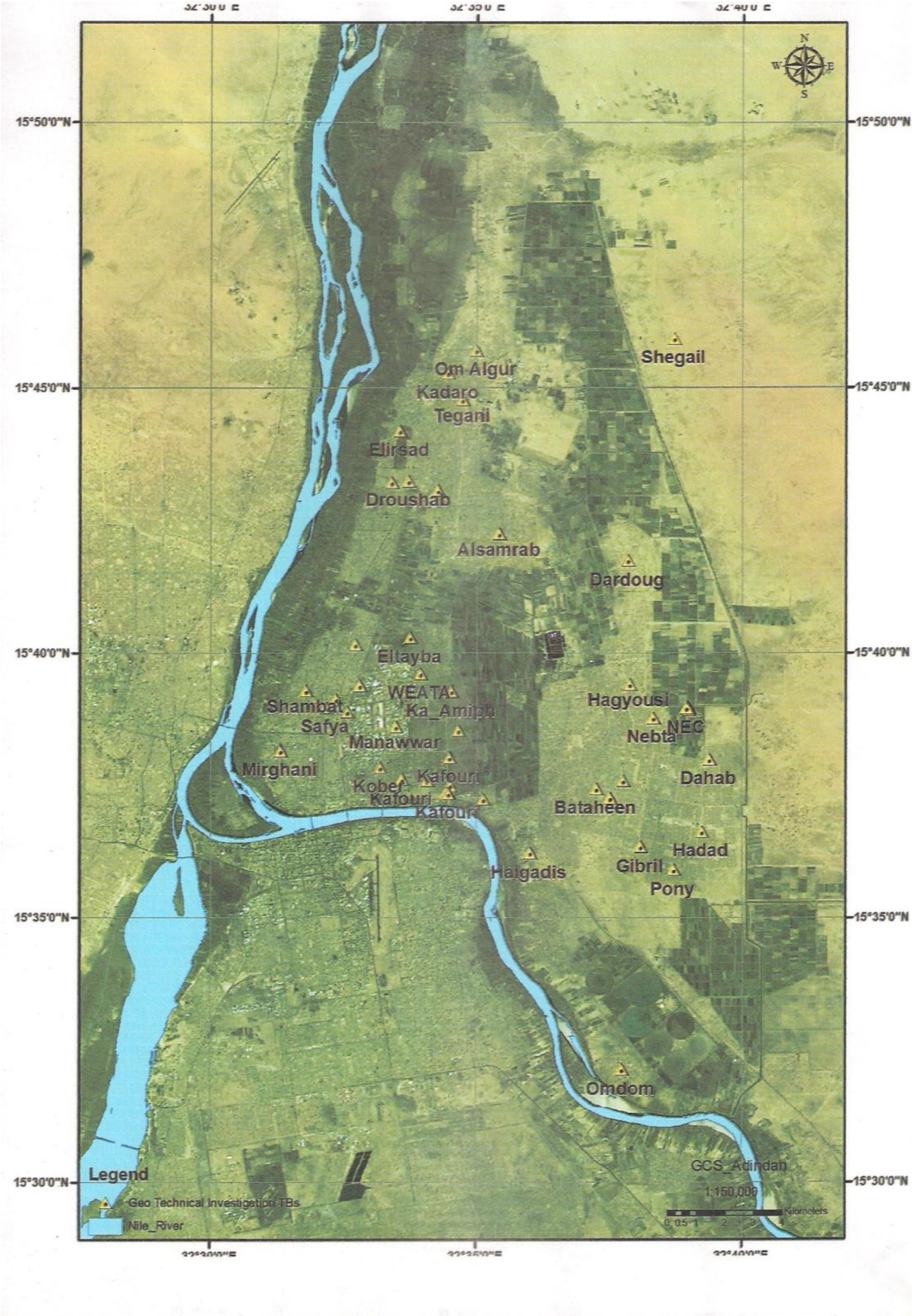


Figure 4.2: Location of study area 2

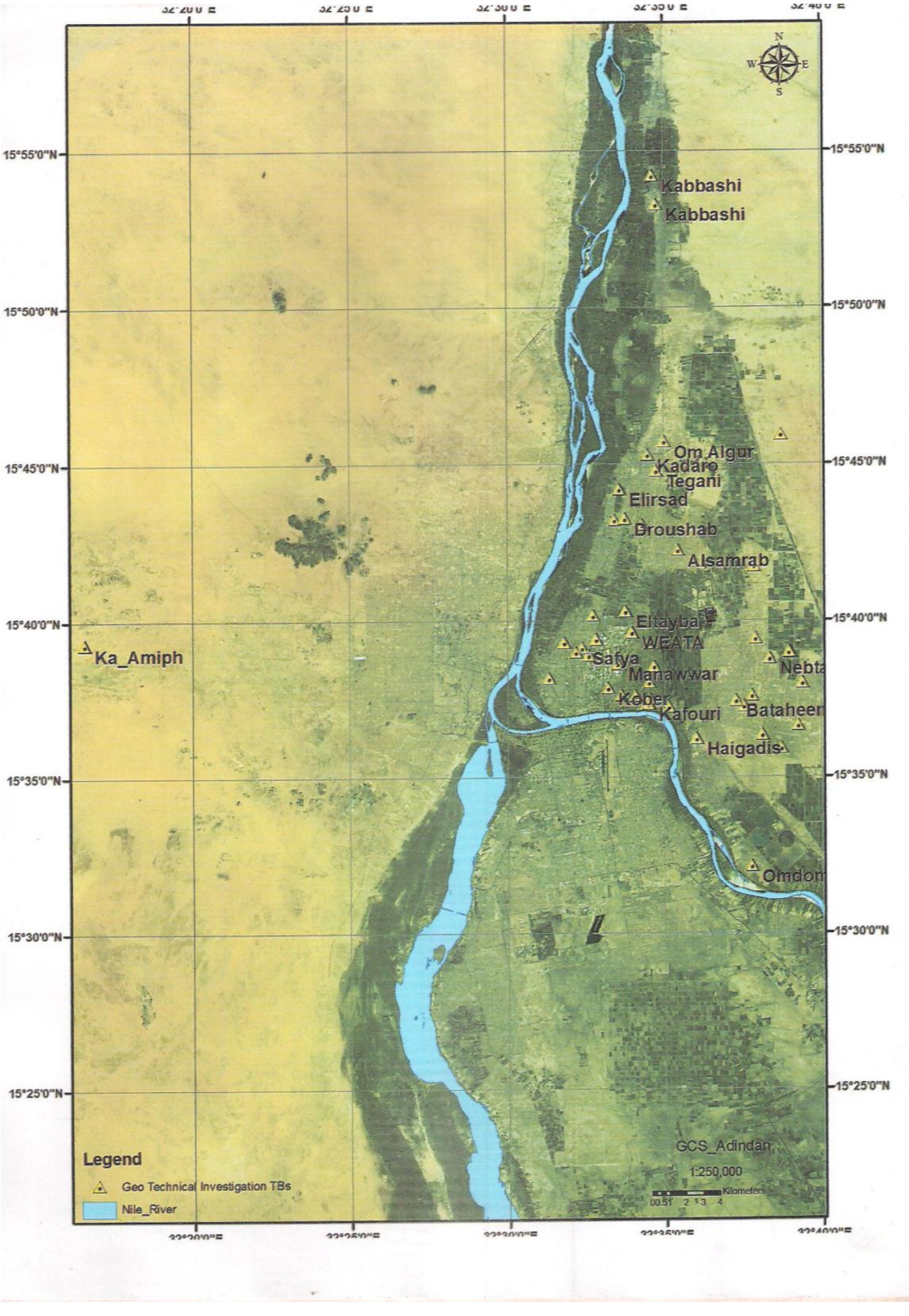


Figure 4.3: Location of study area 3

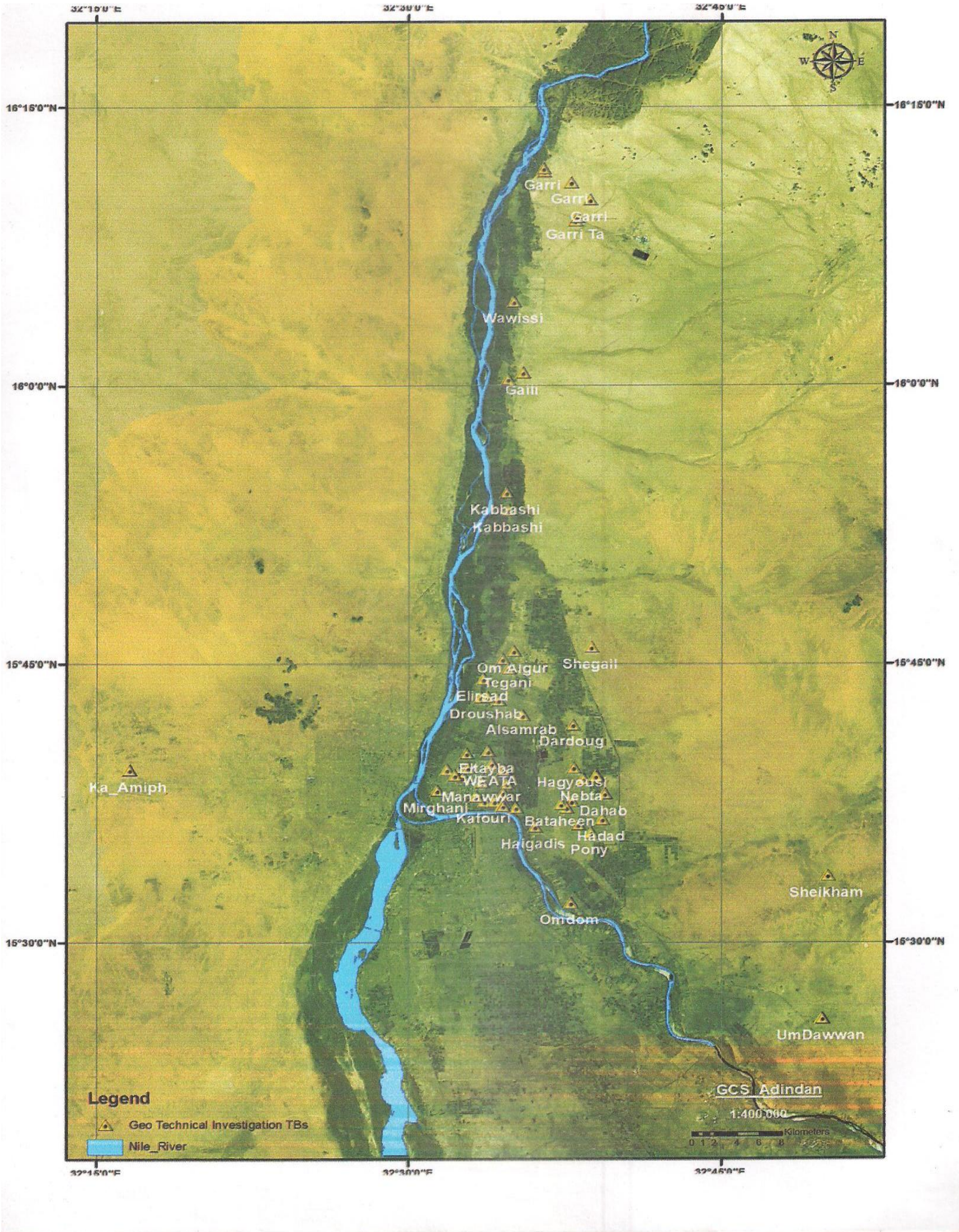


Figure 4.4: Location of study area 4

4.3.1 Investigation Preparation

Researcher visited the site to identify and mark the proposed boring locations. Boring locations were selected in the field based on accessibility.

4.3.2 Permits

Prior to the investigation, the following permits for the work were obtained: an encroachment permit and a drilling permit from Water District, a standard permit from the Department of Planning, Building and Code Enforcement. Work performed during the investigation was completed in accordance with permit requirements.

4.3.3 Health and Safety

Investigation activities were performed in accordance with a site-specific Health and Safety Plan (HSP) prepared for the project. On the first day of the field investigation, researcher and its others crew held a brief meeting which included an inspection of drilling equipment, discussion of drilling and sampling procedures, and a review of safety policies and procedures. Because some of the drilling locations are situated near the landfills, an oil tanks, consisting of periodical readings of flammable gas such as Methane by a Combustible Gas Indicator, was included in the HSP. No explosion hazard was detected during this field exploration.

4.3.4 Drilling

Borings were drilled by Pitcher Drilling and some boreholes were drilled using a truck-mounted drill rig. Load pads were used for the track-mounted drill rig to access the boring locations. All borings were advanced using the rotary wash methods and a 3-7/8 inch diameter drag bit. Upon completion, borings were grouted to the ground surface using a neat cement grout. Grout was installed in accordance with the requirements. The District was notified 24 hours prior to grouting; they elected not to be on site to witness the sealing operation.

Observers provided continuous observation and logging of the borings. Sample descriptions, results of field testing, and observations of any unusual conditions during drilling were recorded on the field soil boring logs.

4.3.5 Soil Sampling

Soil samples were collected from the borings for identification, classification, and geotechnical engineering characterization. Disturbed and relatively undisturbed soil samples were generally collected from the borings at approximately 0.5 intervals to a depth of about 5m and at approximately 1.0m intervals thereafter. A total of 300 disturbed and 100 intact soil samples were collected during the field investigation.

Disturbed samples were collected using a 2.0 inch outside diameter, 1.4 inch inside diameter standard split-spoon sampler in general accordance with requirements of the Standard Penetration Test (SPT) as described in American Society of Testing and Materials (ASTM) D-1586. Disturbed samples were also recovered using the 3-inch outside diameter Modified Sampler. Disturbed soil samples were stored, labeled, and sealed in plastic bags immediately after sampling.

Intact soil samples were collected using 3-inch outside diameter, thin-walled Shelby tube samplers, in general accordance with procedures for thin-walled tube sampling of soil as described in ASTM D-1587. After intact samples were collected, Shelby tubes were labeled and the ends were sealed with tight-fitting plastic caps and electrical tape.

4.3.6 Waste Collection and Storage

All soil cuttings and mud were stored in drums and bags, labeled and left in the secure area in Laboratory. The drums and bags were temporarily staged in a containers in a fenced area at the corner of College of Engineering. A tailgate truck was used by the driller to transport the drums from the investigation area to the fencing area. Then all the drums and bags were transported to an appropriate off-site disposal facility.

4.4 Laboratory Investigation

Laboratory tests to determine the index and engineering properties of selected soil samples were performed by the Soil Laboratory of the Civil Engineering Department, Sudan University of Science and Technology (SUST) and Building and Road Research Institute, Khartoum university. Tests performed for soil classification and to evaluate index properties included sieve and hydrometer (grain size) analyses, Atterberg limits, and water content. Strength properties of intact samples were evaluated using Unconsolidated Undrained (UU) and Consolidated Undrained (CU) triaxial compression tests. Consolidation tests were also performed to evaluate the compressibility of soils with time. The surface water and groundwater in the study area is expected to be at lower depth.

Geotechnical laboratory test results are summarized in Tables 4.1 to 4.52.

Soil classifications based on laboratory test results may differ from those made by visual manual procedures used in the field. Therefore, preliminary soil classifications made in the field were revised as appropriate to incorporate the results of the geotechnical laboratory testing. Descriptions of soil conditions presented in this study and soil classifications identified in the soil boring logs reflect these changes.

Representative samples of the site soils were tested in the laboratory to aid in the soil classification and to evaluate relevant engineering properties of the site soils. The samples were subjected to the following laboratory tests:

1. In situ moisture contents and dry densities (ASTM Standard D2216)
2. Grain size distribution (ASTM Standard D422)
3. Maximum dry density and optimum-moisture content relationship (ASTM Standard D1557)
4. Direct shear (ASTM Standard D3080), Triaxial, Unconfined Compression and Specific Gravity Test Results
5. Atterberg Limits and % passing 200 for classification purposes
6. Standard Penetration Test (SPT)

All the tests were performed in accordance with the British Standards (B. S. 1377 1990). All soil samples were classified according to AASHTO and Unified Soil Classification System (USCS).

4.5 Results and Findings

Sample identification, depth and description are summarized, along with the test results of Atterberg Limits, % passing sieve no. 200 and soil classification. The results indicate that the soil is predominantly clay, very rarely interrupted by low-plasticity clay. Thus, due to the homogeneity of the soil in the project areas, some samples were selected and tested for detailed Grain-Size Analysis Gradation Curves, Compaction, Unconfined Compression and Specific Gravity.

A cross section of the 107 borings is shown in Tables 4.1 to 4.107 below. The results of field investigation are generally consistent with expected soil conditions as described in Preliminary Geotechnical and Foundation Recommendations. Therefore preliminary geotechnical and foundation recommendations remain applicable.

)1 KOBER_1

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.630556	32.553056	1	1	-1.0	CL	47	25	22
15.630556	32.553056	1	1	-2.0	CL	43	19	24
15.630556	32.553056	1	1	-3.0	CL	0	0	0
15.630556	32.553056	1	1	-4.0	SC	26	15	11
15.630556	32.553056	1	1	-5.0	CH	65	24	41
15.630556	32.553056	1	1	-6.0	CH	0	0	0
15.630556	32.553056	1	1	-7.0	SM	0	0	0
15.630556	32.553056	1	1	-8.0	SM	0	NP	NP
15.630556	32.553056	1	1	-9.0	SM	0	0	0
15.630556	32.553056	1	1	-10.0	SP	0	0	0
15.630556	32.553056	1	1	-11.0	SP	0	0	0
15.630556	32.553056	1	1	-12.0	SP	0	0	0
15.630556	32.553056	1	1	-13.0	SP	0	0	0
15.630556	32.553056	1	1	-14.0	SP	0	0	0
15.630556	32.553056	1	1	-15.0	SP	0	0	0
15.630556	32.553056	1	1	-16.0	SP	0	0	0
15.630556	32.553056	1	1	-17.0	SP	0	0	0
15.630556	32.553056	1	1	-18.0	SP	0	0	0
15.630556	32.553056	1	1	-19.0	SP	0	0	0
15.630556	32.553056	1	1	-20.0	SP	0	0	0
15.630556	32.553056	1	1	-21.0	SP	0	0	0
15.630556	32.553056	1	1	-22.0	SP	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	he_C_KNn	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	79.5	0	0	Kober
30.78	0	0	0	0	63.2	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	30.9	0	0	Kober
19.42	20.6	17.26	45	304.17	74.4	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	27.3	0	0	Kober
0	0	0	0	0	27.3	12.11.12.12.11	46	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	5.3	10.10.11.9.10	40	Kober
0	0	0	0	0	2.9	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	0.8	5.3.3.4.4	14	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	0	4.2.3.3.3	11	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	2.3	6.5.5.4.5	19	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	2.3	0	0	Kober

01 KOBER_1

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.630556	32.553056	1	2	-1.0	CH	56	27	29
15.630556	32.553056	1	2	-2.0	CH	0	0	0
15.630556	32.553056	1	2	-3.0	CL	24	17	7
15.630556	32.553056	1	2	-4.0	CL	0	0	0
15.630556	32.553056	1	2	-5.0	CL	44	21	23
15.630556	32.553056	1	2	-6.0	CH	55	24	31
15.630556	32.553056	1	2	-7.0	ML	33	26	7
15.630556	32.553056	1	2	-8.0	-	0	0	0
15.630556	32.553056	1	2	-9.0	-	0	0	0
15.630556	32.553056	1	2	-10.0	GP	0	0	0
15.630556	32.553056	1	2	-11.0	GP	0	0	0
15.630556	32.553056	1	2	-12.0	GP	0	0	0
15.630556	32.553056	1	2	-13.0	SP	0	0	0
15.630556	32.553056	1	2	-14.0	SP	0	0	0
15.630556	32.553056	1	2	-15.0	SP	0	0	0
15.630556	32.553056	1	2	-16.0	SP	0	0	0
15.630556	32.553056	1	2	-17.0	SP	0	0	0
15.630556	32.553056	1	2	-18.0	SP	0	0	0
15.630556	32.553056	1	2	-19.0	-	0	0	0
15.630556	32.553056	1	2	-20.0	-	0	0	0
15.630556	32.553056	1	2	-21.0	-	0	0	0
15.630556	32.553056	1	2	-22.0	-	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	76.1	0	0	Kober
0	0	0	0	0	0	0	0	Kober
13.42	0	0	0	0	50.33	0	0	Kober
0	0	0	0	0	0	0	0	Kober
19.5	20.6	17.26	29	219.32	64.3	0	0	Kober
0	0	0	0	0	61.6	0	0	Kober
0	0	0	0	0	67.1	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	15	22.19.16.14.2	50	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	0.62	10.9.9.10.8	36	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	1.3	9.7.6.7.7	27	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	1	0	0	Kober
0	0	0	0	0	0	15.10.12.15.14	50	Kober
0	0	0	0	0	3.7	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	14.31	0	0	Kober
0	0	0	0	0	0	0	0	Kober

01 KOBER_1

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.630556	32.553056	1	3	-1.0	CL	0	0	0
15.630556	32.553056	1	3	-2.0	CL	32	17	15
15.630556	32.553056	1	3	-3.0	SC	22	14	8
15.630556	32.553056	1	3	-4.0	CL	35	20	15
15.630556	32.553056	1	3	-5.0	ML	0	0	0
15.630556	32.553056	1	3	-6.0	ML	44	30	14
15.630556	32.553056	1	3	-7.0	ML	0	0	0
15.630556	32.553056	1	3	-8.0	ML	29	23	6
15.630556	32.553056	1	3	-9.0	-	0	0	0
15.630556	32.553056	1	3	-10.0	GW	0	0	0
15.630556	32.553056	1	3	-11.0	GP	0	0	0
15.630556	32.553056	1	3	-12.0	SP	0	0	0
15.630556	32.553056	1	3	-13.0	SP	0	0	0
15.630556	32.553056	1	3	-14.0	SP	0	0	0
15.630556	32.553056	1	3	-15.0	SP	0	0	0
15.630556	32.553056	1	3	-16.0	SP	0	0	0
15.630556	32.553056	1	3	-17.0	SP	0	0	0
15.630556	32.553056	1	3	-18.0	SP	0	0	0
15.630556	32.553056	1	3	-19.0	SP	0	0	0

N_M_C%	yb_KNm3	d_KNm	e_d	C_KN	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	Kober
8.7	0	0	0	0	61.3	0	0	Kober
0	0	0	0	0	27.4	0	0	Kober
17.94	21.19	18.05	26	190.9	54.8	0	0	Kober
0	0	0	0	0	0	0	0	Kober
20.33	0	0	0	0	60	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	65.7	0	0	Kober
0	0	0	0	0	0	7.6.6.11.12	35	Kober
0	0	0	0	0	5.46	0	0	Kober
0	0	0	0	0	2.38	9.8.8.7.6	29	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	2.6	7.5.5.6.5	21	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	1.13	6.7.6.6.7	26	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	4.7	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	2.8	0	0	Kober

01 KOBER_1

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.630556	32.553056	1	4	-1.0	CH	63	27	36
15.630556	32.553056	1	4	-2.0	SC	30	15	15
15.630556	32.553056	1	4	-3.0	SC	0	0	0
15.630556	32.553056	1	4	-4.0	SM	NP	NP	0
15.630556	32.553056	1	4	-5.0	SM	0	0	0
15.630556	32.553056	1	4	-6.0	CL	44	25	19
15.630556	32.553056	1	4	-7.0	CL	0	0	0
15.630556	32.553056	1	4	-8.0	CL	0	NP	NP
15.630556	32.553056	1	4	-9.0	GP	0	0	0
15.630556	32.553056	1	4	-10.0	GP	0	0	0
15.630556	32.553056	1	4	-11.0	GP	0	0	0
15.630556	32.553056	1	4	-12.0	GW	0	0	0
15.630556	32.553056	1	4	-13.0	SP	0	0	0
15.630556	32.553056	1	4	-14.0	SP	0	0	0
15.630556	32.553056	1	4	-15.0	SP	0	0	0
15.630556	32.553056	1	4	-16.0	SP	0	0	0
15.630556	32.553056	1	4	-17.0	SP	0	0	0
15.630556	32.553056	1	4	-18.0	SP	0	0	0
15.630556	32.553056	1	4	-19.0	SM	0	0	0
15.630556	32.553056	1	4	-20.0	SM	0	0	0
15.630556	32.553056	1	4	-21.0	SP	0	0	0
15.630556	32.553056	1	4	-22.0	SP	0	0	0

N_M_C%	yb_KNm3	d_KNm	e_d	_C_KN	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	82.7	0	0	Kober
12.42	0	0	0	0	47.6	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	38.2	10.6.7.7.7	27	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	54.2	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	51.6	14.10.10.12.13	45	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	2.28	9.7.7.6.7	27	Kober
0	0	0	0	0	0	9.8.9.7.6	30	Kober
0	0	0	0	0	4.23	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	1.6	7.6.5.5.5	21	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	4.6	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	4	0	0	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	23.96	0	50	Kober
0	0	0	0	0	0	0	0	Kober
0	0	0	0	0	1.6	0	0	Kober

02 Nebta_2

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.646111	32.638611	2	2	-1.0	-	0	0	0
15.646111	32.638611	2	2	-2.0	CL	49	22	27
15.646111	32.638611	2	2	-3.0	-	0	0	0
15.646111	32.638611	2	2	-4.0	CH	74	31	43
15.646111	32.638611	2	2	-5.0	-	0	0	0
15.646111	32.638611	2	2	-6.0	ML	52	36	12
15.646111	32.638611	2	2	-7.0	MH	51	31	20
15.646111	32.638611	2	2	-8.0	-	0	0	0
15.646111	32.638611	2	2	-9.0	-	0	0	0
15.646111	32.638611	2	2	-10.0	-	0	NP	NP
15.646111	32.638611	2	2	-11.0	SM	0	0	0
15.646111	32.638611	2	2	-12.0	SM	0	0	0
15.646111	32.638611	2	2	-13.0	SM	0	0	0
15.646111	32.638611	2	2	-14.0	SM	0	0	0
15.646111	32.638611	2	2	-15.0	SM	0	0	0
15.646111	32.638611	2	2	-16.0	SM	0	0	0
15.646111	32.638611	2	2	-17.0	SM	0	0	0
15.646111	32.638611	2	2	-18.0	SM	0	0	0
15.646111	32.638611	2	2	-19.0	SM	0	0	0
15.646111	32.638611	2	2	-20.0	SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	Nebta
14.39	21.58	19.03	29	122.41	62.2	0	0	Nebta
0	0	0	0	0	0	0	0	Nebta
22	20.01	16.38	12	133.9	72.4	0	0	Nebta
0	0	0	0	0	0	0	0	Nebta
25.2	0	0	0	0	76.4	0	0	Nebta
0	0	0	0	0	55.5	0	0	Nebta
0	0	0	0	0	0	17.15.14.14.8	50	Nebta
0	0	0	0	0	0	0	0	Nebta
0	0	0	0	0	50	9.10.10.11.12	43	Nebta
0	0	0	0	0	18.6	0	0	Nebta
0	0	0	0	0	0	10.9.9.8.8	34	Nebta
0	0	0	0	0	0	9.9.8.7.7	31	Nebta
0	0	0	0	0	31.4	0	0	Nebta
0	0	0	0	0	0	0	0	Nebta
0	0	0	0	0	24.2	9.7.6.6.8	27	Nebta
0	0	0	0	0	24.6	0	0	Nebta
0	0	0	0	0	0	0	0	Nebta
0	0	0	0	0	0	9.8.9.8.8	33	Nebta
0	0	0	0	0	23.7	0	0	Nebta

North_Grain_Silos_3

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.660000	32.565556	3	1	-1.0	-	0	0	0
15.660000	32.565556	3	1	-2.0	CH	80	26	54
15.660000	32.565556	3	1	-3.0	CH	0	0	0
15.660000	32.565556	3	1	-4.0	CH	79	22	57
15.660000	32.565556	3	1	-5.0	CH	0	0	0
15.660000	32.565556	3	1	-6.0	CH	59	28	31
15.660000	32.565556	3	1	-7.0	CH	0	0	0
15.660000	32.565556	3	1	-8.0	-	0	NP	NP
15.660000	32.565556	3	1	-9.0	-	0	0	0
15.660000	32.565556	3	1	-10.0	SM	34	29	5
15.660000	32.565556	3	1	-11.0	SM	0	0	0
15.660000	32.565556	3	1	-12.0	SM	0	NP	NP
15.660000	32.565556	3	1	-13.0	SM	0	0	0
15.660000	32.565556	3	1	-14.0	SM	0	0	0
15.660000	32.565556	3	1	-15.0	SC	36	22	14

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	WEATA
38.6	18.44	15.21	34	68.48	95.2	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
18.03	18.84	15.6	18	71.89	78.2	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
25.84	16.19	12.16	9	56.17	82.9	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	84.2	16.11.19.19.2	50	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	49.3	20.15.14.14.8	50	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	35.6	12.9.11.15.11	46	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	28.7	11.7.12.12.9	40	WEATA

03 Kh_North_Grain_Silos_3

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.660000	32.565556	3	2	-1.0	CH	57	22	35
15.660000	32.565556	3	2	-2.0	CH	63	23	40
15.660000	32.565556	3	2	-3.0	CH	0	0	0
15.660000	32.565556	3	2	-4.0	CH	68	27	41
15.660000	32.565556	3	2	-5.0	CH	0	0	0
15.660000	32.565556	3	2	-6.0	ML	40	32	8
15.660000	32.565556	3	2	-7.0	ML	0	0	0
15.660000	32.565556	3	2	-8.0	ML	0	0	0
15.660000	32.565556	3	2	-9.0	ML	41	28	13
15.660000	32.565556	3	2	-10.0	SM	0	0	0
15.660000	32.565556	3	2	-11.0	SM	0	0	0
15.660000	32.565556	3	2	-12.0	SM	0	NP	NP
15.660000	32.565556	3	2	-13.0	SM	0	0	0
15.660000	32.565556	3	2	-14.0	SM	26	20	6
15.660000	32.565556	3	2	-15.0	SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	53.7	0	0	WEATA
25.45	0	0	0	0	89.4	0	0	WEATA
0	0	0	0	0	67.4	0	0	WEATA
26.11	18.25	14.72	4	134.13	0	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
28.68	0	0	0	0	90.6	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	75.1	16.12.14.11.11	48	WEATA
0	0	0	0	0	45.8	9.7.7.6.7	27	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	28	6.5.6.6.5	22	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	32.3	7.6.6.7.6	25	WEATA
0	0	0	0	0	0	0	0	WEATA

lorth_Grain_Silos_3

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.660000	32.565556	3	3	-1.0	CH	73	25	48
15.660000	32.565556	3	3	-2.0	CH	77	26	51
15.660000	32.565556	3	3	-3.0	CH	0	0	0
15.660000	32.565556	3	3	-4.0	CH	0	0	0
15.660000	32.565556	3	3	-5.0	CH	0	0	0
15.660000	32.565556	3	3	-6.0	ML	42	31	11
15.660000	32.565556	3	3	-7.0	ML	0	0	0
15.660000	32.565556	3	3	-8.0	ML	39	29	10
15.660000	32.565556	3	3	-9.0	ML	0	0	0
15.660000	32.565556	3	3	-10.0	SM	0	0	0
15.660000	32.565556	3	3	-11.0	SM	0	0	0
15.660000	32.565556	3	3	-12.0	SM	0	0	0
15.660000	32.565556	3	3	-13.0	SM	0	0	0
15.660000	32.565556	3	3	-14.0	SM	0	0	0
15.660000	32.565556	3	3	-15.0	SM	0	0	0
15.660000	32.565556	3	3	-16.0	CL	40	21	19
15.660000	32.565556	3	3	-17.0	ML	37	26	11
15.660000	32.565556	3	3	-18.0	ML	0	0	0
15.660000	32.565556	3	3	-19.0	SM	0	NP	NP
15.660000	32.565556	3	3	-20.0	SM	0	0	0

N_M_C%	yb_KNm3	d_KNm	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	93	0	0	WEATA
21.83	17.95	14.72	15	121.02	93.2	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
23.39	0	0	0	0	68.3	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	80.8	11.11.16.16.8	50	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	48.8	26.13.19.19	50	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	14.6	0	0	WEATA
0	0	0	0	0	0	10.5.6.7.1	28	WEATA
0	0	0	0	0	13.2	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	63.4	0	0	WEATA
0	0	0	0	0	64.2	9.8.7.7.6	28	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	13.5	6.5.5.4.4	18	WEATA
0	0	0	0	0	0	0	0	WEATA

North_Grain_Silos_3

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.660000	32.565556	3	4	-1.0	CH	64	25	39
15.660000	32.565556	3	4	-2.0	CH	0	0	0
15.660000	32.565556	3	4	-3.0	CH	57	16	41
15.660000	32.565556	3	4	-4.0	CL	43	23	20
15.660000	32.565556	3	4	-5.0	CL	0	0	0
15.660000	32.565556	3	4	-6.0	ML	45	36	9
15.660000	32.565556	3	4	-7.0	ML	0	0	0
15.660000	32.565556	3	4	-8.0	ML	44	34	10
15.660000	32.565556	3	4	-9.0	ML	0	0	0
15.660000	32.565556	3	4	-10.0	ML	29	23	6
15.660000	32.565556	3	4	-11.0	-	0	0	0
15.660000	32.565556	3	4	-12.0	SM	27	22	5
15.660000	32.565556	3	4	-13.0	SM	0	0	0
15.660000	32.565556	3	4	-14.0	SP-SM	0	NP	NP
15.660000	32.565556	3	4	-15.0	SP-SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
20.3	18.74	15.7	23	112.98	89.4	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	52.1	0	0	WEATA
15.34	0	0	0	0	55.3	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
22.33	0	0	0	0	52.7	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	67.6	19.13.15.23	50	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	57.3	16.8.12.17.12	49	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	38.8	6.6.10.15.12	43	WEATA
0	0	0	0	0	0	0	0	WEATA
0	0	0	0	0	0	3.2.4.6.8	20	WEATA
0	0	0	0	0	11.5	0	0	WEATA

North_Grain_Silos_3

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.660000	32.565556	3	5	-1.0	CH	65	22	43
15.660000	32.565556	3	5	-2.0	CH	63	20	43
15.660000	32.565556	3	5	-3.0	CH	91	20	71
15.660000	32.565556	3	5	-4.0	CH	0	0	0
15.660000	32.565556	3	5	-5.0	ML	46	31	15

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
16.6	0	0	0	0	62.7	0	0	WEATA
0	0	0	0	0	66.6	0	0	WEATA
20.8	20.01	15.17	2	107.14	80.6	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
25.35	0	0	0	0	63.6	0	0	WEATA

North_Grain_Silos_3

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.660000	32.565556	3	6	-1.0	CH	72	26	46
15.660000	32.565556	3	6	-2.0	CH	56	21	35
15.660000	32.565556	3	6	-3.0	CH	56	20	36
15.660000	32.565556	3	6	-4.0	CH	0	0	0
15.660000	32.565556	3	6	-5.0	CH	56	25	31

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
26.08	0	0	0	0	78.1	0	0	WEATA
0	0	0	0	0	82.6	0	0	WEATA
18.3	0	0	0	0	77.2	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
24.11	0	0	0	0	72.8	0	0	WEATA

North_Grain_Silos_3

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.660000	32.565556	3	7	-1.0	CH	72	24	48
15.660000	32.565556	3	7	-2.0	CH	57	18	39
15.660000	32.565556	3	7	-3.0	CH	68	20	48
15.660000	32.565556	3	7	-4.0	CH	0	0	0
15.660000	32.565556	3	7	-5.0	ML	44	29	15

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
35.11	0	0	0	0	90	0	0	WEATA
0	0	0	0	0	55.8	0	0	WEATA
21.81	20.01	16.58	8	98.9	78.5	0	0	WEATA
0	0	0	0	0	0	0	0	WEATA
22.02	0	0	0	0	72.4	0	0	WEATA

Electric Corporation Industrial Zone_4

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.649167	32.648889	4	1	-1.0	CH	51	23	28	0
15.649167	32.648889	4	1	-2.0	ML	0	NP	NP	6.91
15.649167	32.648889	4	1	-3.0	SM	0	0	0	6.47
15.649167	32.648889	4	1	-4.0	SM	0	0	0	4.54
15.649167	32.648889	4	1	-5.0	SM	0	0	0	5.51
15.649167	32.648889	4	1	-6.0	SM	0	0	0	7.17
15.649167	32.648889	4	1	-7.0	SM	0	0	0	5.36
15.649167	32.648889	4	1	-8.0	SM	0	0	0	5.24
15.649167	32.648889	4	1	-9.0	SM	0	0	0	9.2
15.649167	32.648889	4	1	-10.0	SM	0	0	0	14.19
15.649167	32.648889	4	1	-11.0	SM	0	0	0	14.98
15.649167	32.648889	4	1	-12.0	-	0	0	0	6.74
15.649167	32.648889	4	1	-13.0	-	0	NP	NP	15.24
15.649167	32.648889	4	1	-14.0	-	0	0	0	16.94
15.649167	32.648889	4	1	-15.0	SP	0	0	0	26.56
15.649167	32.648889	4	1	-16.0	-	0	0	0	23.41
15.649167	32.648889	4	1	-17.0	SP-SM	0	0	0	26.27
15.649167	32.648889	4	1	-18.0	-	0	0	0	23.83
15.649167	32.648889	4	1	-19.0	-	0	0	0	29.49
15.649167	32.648889	4	1	-20.0	-	0	0	0	22.71

yb_KNm3	yd_KNm3	S_G	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	67.92	0	0	NEC
0	0	2.67	0	0	52.42	8.8.7.7.5	27	NEC
0	0	0	0	0	23.71	5.4.4.3.4	15	NEC
0	0	0	0	0	0	16.11.12.1210	45	NEC
0	0	0	0	0	16.2	8.7.7.8.10	33	NEC
0	0	0	0	0	0	6.5.7.7.6	25	NEC
0	0	0	0	0	18.1	9.8.8.9.10	35	NEC
0	0	0	0	0	0	6.5.6.6.6	23	NEC
0	0	0	0	0	26.8	2.6.7.7.6	26	NEC
0	0	0	0	0	0	8.9.8.10.11	38	NEC
0	0	0	0	0	36.3	10.8.9.8.8	33	NEC
0	0	0	0	0	0	7.7.6.9.13	35	NEC
0	0	0	0	0	29.61	11.8.8.6.7	27	NEC
0	0	0	0	0	0	10.8.7.7.8	30	NEC
0	0	0	0	0	3.3	8.6.7.7.6	26	NEC
0	0	0	0	0	0	5.4.3.4.3	14	NEC
0	0	0	0	0	7.61	4.4.3.4.4	15	NEC
0	0	0	0	0	0	5.3.2.3.5	12	NEC
0	0	0	0	0	5.76	5.4.3.3.3	13	NEC
0	0	0	0	0	7.43	5.3.4.4.3	14	NEC

Electric Corporation Industrial Zone_4

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.649167	32.649167	4	2	-1.0	MH	56	40	16	0
15.649167	32.649167	4	2	-1.0	MH	0	0	0	0
15.649167	32.649167	4	2	-2.0	SP	0	0	0	6.91
15.649167	32.649167	4	2	-3.0	SM	NP	NP	NP	6.47
15.649167	32.649167	4	2	-4.0	-	0	0	0	4.54
15.649167	32.649167	4	2	-5.0	-	0	NP	NP	5.51
15.649167	32.649167	4	2	-6.0	-	0	0	0	7.17
15.649167	32.649167	4	2	-7.0	-	0	0	0	5.64
15.649167	32.649167	4	2	-8.0	-	0	0	0	5.24
15.649167	32.649167	4	2	-9.0	-	0	0	0	9.15
15.649167	32.649167	4	2	-10.0	-	0	0	0	14.19
15.649167	32.649167	4	2	-11.0	-	0	0	0	14.98
15.649167	32.649167	4	2	-12.0	SM	0	0	0	6.74
15.649167	32.649167	4	2	-13.0	-	0	0	0	15.24
15.649167	32.649167	4	2	-14.0	SP-SM	0	0	0	16.94
15.649167	32.649167	4	2	-15.0	-	0	0	0	26.56
15.649167	32.649167	4	2	-16.0	-	0	0	0	23.41
15.649167	32.649167	4	2	-17.0	-	0	0	0	26.27
15.649167	32.649167	4	2	-18.0	-	0	0	0	23.83
15.649167	32.649167	4	2	-19.0	-	0	0	0	29.49
15.649167	32.649167	4	2	-20.0	SP	0	0	0	22.71

yb_KNm3	yd_KNm3	S_G	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	2.69	0	0	70.31	0	0	NEC
0	0	0	0	0	73.38	0	0	NEC
0	0	0	0	0	4.86	4.4.3.3.5	15	NEC
0	0	2.67	0	0	33.37	5.4.4.3.4	15	NEC
0	0	0	0	0	0	14.11.10.13.1	48	NEC
0	0	0	0	0	28.48	8.7.7.8.6	28	NEC
0	0	0	0	0	26.47	6.5.7.6.6	24	NEC
0	0	0	0	0	0	12.11.12.13.1	48	NEC
0	0	0	0	0	15.42	6.6.5.7.5	23	NEC
0	0	0	0	0	0	7.9.10.10.9	38	NEC
0	0	0	0	0	29.18	5.4.5.5.4	18	NEC
0	0	0	0	0	0	6.3.5.3.4	15	NEC
0	0	0	0	0	31.74	7.5.6.4.4	19	NEC
0	0	0	0	0	33.6	8.6.6.5.7	24	NEC
0	0	0	0	0	7.44	7.5.7.8.8	28	NEC
0	0	0	0	0	0	5.5.5.6.8	24	NEC
0	0	0	0	0	6.64	4.3.4.5.4	16	NEC
0	0	0	0	0	0	5.3.2.3.4	12	NEC
0	0	0	0	0	8.14	6.7.6.6.5	24	NEC
0	0	0	0	0	0	7.8.6.6.6	26	NEC
0	0	0	0	0	1.6	0	0	NEC

Electric Corporation Industrial Zone_4

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.649167	32.649722	4	5	-1.0	CL	48	19	29	0
15.649167	32.649722	4	5	-2.0	SC	34	17	17	5.75
15.649167	32.649722	4	5	-3.0	ML	0	NP	NP	11.93
15.649167	32.649722	4	5	-4.0	SM	0	0	0	4.25
15.649167	32.649722	4	5	-5.0	-	0	0	0	3.56
15.649167	32.649722	4	5	-6.0	SP-SM	0	0	0	6.73
15.649167	32.649722	4	5	-7.0	-	0	0	0	2.81
15.649167	32.649722	4	5	-8.0	ML	0	0	0	19.12
15.649167	32.649722	4	5	-9.0	ML	0	0	0	22.61
15.649167	32.649722	4	5	-10.0	ML	0	0	0	15.8

yb_KNm3	yd_KNm3	S_G	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	63.27	0	0	NEC
0	0	2.71	0	0	48.94	14.10.12.13.10	45	NEC
0	0	0	0	0	76.09	6.5.5.5.9	24	NEC
0	0	0	0	0	18	3.2.4.5.6	17	NEC
0	0	0	0	0	0	3.3.3.4.4	14	NEC
0	0	0	0	0	10.78	3.2.2.4.5	13	NEC
0	0	0	0	0	0	10.6.8.13.14	51	NEC
0	0	0	0	0	65.46	20.13.16	51	NEC
0	0	0	0	0	0	12.8.10.8.9	36	NEC
0	0	0	0	0	54.83	11.7.9.12.11	39	NEC

Electric Corporation Industrial Zone_4

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.649444	32.649167	4	6	-1.0	CL	36	19	17	0
15.649444	32.649167	4	6	-2.0	SM	0	NP	NP	0
15.649444	32.649167	4	6	-3.0	-	0	0	0	0
15.649444	32.649167	4	6	-4.0	-	0	0	0	0
15.649444	32.649167	4	6	-5.0	SP-SM	0	0	0	0
15.649444	32.649167	4	6	-6.0	-	0	0	0	0
15.649444	32.649167	4	6	-7.0	-	0	0	0	0
15.649444	32.649167	4	6	-8.0	-	0	0	0	0
15.649444	32.649167	4	6	-9.0	-	0	0	0	0
15.649444	32.649167	4	6	-10.0	-	0	0	0	0

yb_KNm3	yd_KNm3	S_G	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	53.54	11.8.8.10	37	NEC
0	0	2.7	0	0	45.22	7.3.3.3.4	13	NEC
0	0	0	0	0	33.33	7.5.4.3.3	15	NEC
0	0	0	0	0	0	4.3.5.5.6	19	NEC
0	0	0	0	0	10.92	4.3.4.5.5	17	NEC
0	0	0	0	0	0	12.9.10.8.7	34	NEC
0	0	0	0	0	8.75	7.5.4.4.5	18	NEC
0	0	0	0	0	0	12.12.10.9.11	42	NEC
0	0	0	0	0	11.81	8.8.5.5.6	24	NEC
0	0	0	0	0	0	7.5.7.8.9	29	NEC

Electric Corporation Industrial Zone_4

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.649444	32.649444	4	7	-1.0	CH	58	27	31	0
15.649444	32.649444	4	7	-2.0	SM	0	0	0	0
15.649444	32.649444	4	7	-3.0	-	0	NP	NP	0
15.649444	32.649444	4	7	-4.0	SP-SM	0	0	0	0
15.649444	32.649444	4	7	-5.0	-	0	0	0	0
15.649444	32.649444	4	7	-6.0	-	0	0	0	0
15.649444	32.649444	4	7	-7.0	-	0	0	0	0
15.649444	32.649444	4	7	-8.0	SM	0	0	0	0
15.649444	32.649444	4	7	-9.0	SP-SM	0	0	0	0
15.649444	32.649444	4	7	-10.0	-	0	0	0	0

yb_KNm3	yd_KNm3	S_G	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	2.68	0	0	74.68	0	0	NEC
0	0	0	0	0	28.4	8.6.8.15.16	45	NEC
0	0	0	0	0	47.44	11.10.12.15.14	51	NEC
0	0	0	0	0	10.44	2.3.3.5.5	16	NEC
0	0	0	0	0	7.66	7.7.8.8.10	33	NEC
0	0	0	0	0	0	15.14.13.16.6	51	NEC
0	0	0	0	0	33.44	3.4.6.7.9	26	NEC
0	0	0	0	0	11.28	9.11.9.11.10	41	NEC
0	0	0	0	0	0	0	0	NEC
0	0	0	0	0	0	0	0	NEC

Electric Corporation Industrial Zone_4

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.649722	32.649167	4	8	-1.0	CH	80	26	54	0
15.649722	32.649167	4	8	-2.0	CL	31	19	12	0
15.649722	32.649167	4	8	-3.0	-	0	0	0	0
15.649722	32.649167	4	8	-4.0	ML	NP	NP	NP	0
15.649722	32.649167	4	8	-5.0	SM	0	0	0	0
15.649722	32.649167	4	8	-6.0	-	0	0	0	0
15.649722	32.649167	4	8	-7.0	-	0	0	0	0
15.649722	32.649167	4	8	-8.0	-	0	0	0	0
15.649722	32.649167	4	8	-9.0	SP-SM	0	0	0	0
15.649722	32.649167	4	8	-10.0	-	0	0	0	0

yb_KNm3	yd_KNm3	S_G	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	2.71	0	0	81.25	0	0	NEC
0	0	0	0	0	50.73	5.4.4.5.6	19	NEC
0	0	0	0	0	40.49	6.3.4.4.5	16	NEC
0	0	0	0	0	69.91	18.19.14	51	NEC
0	0	0	0	0	48.62	9.8.8.8.9	33	NEC
0	0	0	0	0	0	5.4.5.4.5	18	NEC
0	0	0	0	0	17.64	7.5.5.8.8	26	NEC
0	0	0	0	0	0	7.8.7.8.7	30	NEC
0	0	0	0	0	10.54	10.7.8.10.11	36	NEC
0	0	0	0	0	0	0	0	NEC

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N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.622222	32.574444	5	1	-1.0	SM	0	NP	NP
15.622222	32.574444	5	1	-2.0	-	0	0	0
15.622222	32.574444	5	1	-3.0	-	0	0	0
15.622222	32.574444	5	1	-4.0	SP-SM	0	0	0
15.622222	32.574444	5	1	-5.0	-	0	0	0
15.622222	32.574444	5	1	-6.0	-	0	0	0
15.622222	32.574444	5	1	-7.0	SM	0	0	0
15.622222	32.574444	5	1	-8.0	-	0	0	0
15.622222	32.574444	5	1	-9.0	-	0	0	0
15.622222	32.574444	5	1	-10.0	-	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	25.41	5.5.5.5.5	20	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	43.82	6.5.5.5.4	19	Kafouri
0	0	0	0	0	7.54	5.3.4.4.5	19	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	8.87	5.4.5.6.4	19	Kafouri
0	0	0	0	0	15.25	6.4.4.5.6	19	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	14.84	7.6.6.7.8	27	Kafouri
0	0	0	0	0	0	0	0	Kafouri

05 Kafouri_5

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.622500	32.574444	5	2	-1.0	SP-SM	0	0	0
15.622500	32.574444	5	2	-2.0	-	0	0	0
15.622500	32.574444	5	2	-3.0	SM	0	0	0
15.622500	32.574444	5	2	-4.0	-	0	0	0
15.622500	32.574444	5	2	-5.0	-	0	0	0
15.622500	32.574444	5	2	-6.0	-	0	0	0
15.622500	32.574444	5	2	-7.0	-	0	0	0
15.622500	32.574444	5	2	-8.0	-	0	0	0
15.622500	32.574444	5	2	-9.0	-	0	0	0
15.622500	32.574444	5	2	-10.0	-	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	10.44	3.2.2.3.3	10	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	25.75	5.4.5.6.5	20	Kafouri
0	0	0	0	0	18.75	7.4.5.3.3	17	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	13.13	4.5.4.3.3	15	Kafouri
0	0	0	0	0	16.74	5.3.5.4.3	15	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	16.46	7.3.5.4.5	17	Kafouri
0	0	0	0	0	0	0	0	Kafouri

05 Kafouri_5

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.622500	32.573889	5	3	-1.0	CL	49	25	24
15.622500	32.573889	5	3	-2.0	-	0	0	0
15.622500	32.573889	5	3	-3.0	SP-SM	0	0	0
15.622500	32.573889	5	3	-4.0	-	0	0	0
15.622500	32.573889	5	3	-5.0	-	0	0	0
15.622500	32.573889	5	3	-6.0	-	0	0	0
15.622500	32.573889	5	3	-7.0	-	0	0	0
15.622500	32.573889	5	3	-8.0	-	0	0	0
15.622500	32.573889	5	3	-9.0	SP	0	0	0
15.622500	32.573889	5	3	-10.0	-	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	71.44	5.4.3.5.6	18	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	9.84	5.4.5.6.5	20	Kafouri
0	0	0	0	0	7.8	7.4.5.3.5	17	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	8.02	4.5.4.3.3	15	Kafouri
0	0	0	0	0	5.44	5.3.5.4.3	15	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	4.51	7.3.5.4.5	17	Kafouri
0	0	0	0	0	0	0	0	Kafouri

05 Kafouri_5

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.622222	32.574167	5	4	-1.0	SM	0	NP	NP
15.622222	32.574167	5	4	-2.0	-	0	0	0
15.622222	32.574167	5	4	-3.0	SP-SM	0	0	0
15.622222	32.574167	5	4	-4.0	-	0	0	0
15.622222	32.574167	5	4	-5.0	-	0	0	0
15.622222	32.574167	5	4	-6.0	-	0	0	0
15.622222	32.574167	5	4	-7.0	SP	0	0	0
15.622222	32.574167	5	4	-8.0	-	0	0	0
15.622222	32.574167	5	4	-9.0	SP-SM	0	0	0
15.622222	32.574167	5	4	-10.0	-	0	0	0
15.622222	32.574167	5	4	-11.0	-	0	0	0
15.622222	32.574167	5	4	-12.0	SM	0	0	0
15.622222	32.574167	5	4	-13.0	-	0	0	0
15.622222	32.574167	5	4	-14.0	-	0	0	0
15.622222	32.574167	5	4	-15.0	-	0	0	0
15.622222	32.574167	5	4	-16.0	-	0	NP	NP
15.622222	32.574167	5	4	-17.0	-	0	0	0
15.622222	32.574167	5	4	-18.0	-	0	NP	NP
15.622222	32.574167	5	4	-19.0	-	0	0	0
15.622222	32.574167	5	4	-20.0	-	0	NP	NP

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	19.16	4.3.34.3	13	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	9.93	4.3.4.3.4	14	Kafouri
0	0	0	0	0	6.6	5.3.3.2.4	12	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	5.18	4.3.3.3.4	13	Kafouri
0	0	0	0	0	3.43	5.4.4.3.3	14	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	6.97	4.5.3.4.4	16	Kafouri
0	0	0	0	0	6.73	9.8.8.7.7	30	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	25.26	10.8.7.6.6	27	Kafouri
0	0	0	0	0	22.48	9.7.7.6.7	0	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	24.29	8.7.8.8.6	29	Kafouri
0	0	0	0	0	27.98	11.10.13.6.10	0	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	19.08	14.10.10.9.9	38	Kafouri
0	0	0	0	0	0	0	0	Kafouri
0	0	0	0	0	25.38	13.11.10.12.12	45	Kafouri

06 Kafouri_Amipharma_6

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.654167	32.275000	6	1	-1.0	CL	45	20	25
15.654167	32.275000	6	1	-2.0	CL	0	0	0
15.654167	32.275000	6	1	-3.0	SM	NP	NP	0
15.654167	32.275000	6	1	-4.0	SM	0	0	0
15.654167	32.275000	6	1	-5.0	SM	0	0	0
15.654167	32.275000	6	1	-6.0	CL	38	20	18
15.654167	32.275000	6	1	-7.0	CL	0	0	0
15.654167	32.275000	6	1	-8.0	SM	0	NP	NP
15.654167	32.275000	6	1	-9.0	SM	0	NP	NP
15.654167	32.275000	6	1	-10.0	SM	0	0	0
15.654167	32.275000	6	1	-11.0	-	0	0	0
15.654167	32.275000	6	1	-12.0	SM	0	0	0
15.654167	32.275000	6	1	-13.0	-	0	0	0
15.654167	32.275000	6	1	-14.0	-	0	0	0
15.654167	32.275000	6	1	-15.0	-	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	53.14	0	0	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	18.5	0	0	Ka_Amipharma
0	0	0	0	0	21.25	6.5.5.4.5	19	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	58.94	8.7.78.9	31	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	41.1	6.5.7.8.9	29	Ka_Amipharma
0	0	0	0	0	36.3	7.6.7.8.9	30	Ka_Amipharma
0	0	0	0	0	24.47	6.5.6.7.9	27	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	25.43	6.5.4.5.6	20	Ka_Amipharma
0	0	0	0	0	33.92	7.5.6.6.5	22	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	19.43	0	0	Ka_Amipharma

06 Kafouri_Amipharma_6

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.654444	32.575278	6	2	-1.0	ML	40	25	15
15.654444	32.575278	6	2	-2.0	ML	0	0	0
15.654444	32.575278	6	2	-3.0	SM	0	0	0
15.654444	32.575278	6	2	-4.0	SM	0	0	0
15.654444	32.575278	6	2	-5.0	SM	0	0	0
15.654444	32.575278	6	2	-6.0	SM	0	NP	NP
15.654444	32.575278	6	2	-7.0	SM	0	NP	NP
15.654444	32.575278	6	2	-8.0	SM	0	0	0
15.654444	32.575278	6	2	-9.0	ML	0	0	0
15.654444	32.575278	6	2	-10.0	ML	0	NP	NP
15.654444	32.575278	6	2	-11.0	ML	0	0	0
15.654444	32.575278	6	2	-12.0	ML	0	0	0
15.654444	32.575278	6	2	-13.0	SP-SM	0	0	0
15.654444	32.575278	6	2	-14.0	-	0	0	0
15.654444	32.575278	6	2	-15.0	SM	0	0	0
15.654444	32.575278	6	2	-16.0	-	0	0	0
15.654444	32.575278	6	2	-17.0	-	0	0	0
15.654444	32.575278	6	2	-18.0	-	0	NP	NP
15.654444	32.575278	6	2	-19.0	-	0	0	0
15.654444	32.575278	6	2	20.0	-	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	68.74	10.8.8.7.9	32	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	23.98	5.4.4.5.3	16	Ka_Amipharma
0	0	0	0	0	21.56	6.5.5.4.5	19	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	40.73	8.7.6.8.7	28	Ka_Amipharma
0	0	0	0	0	44.54	10.9.8.9.10	36	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	53	8.7.7.6.7	27	Ka_Amipharma
0	0	0	0	0	62.08	9.7.6.6.6	25	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	67.61	6.5.5.6.5	21	Ka_Amipharma
0	0	0	0	0	7.9	7.6.5.5.6	22	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	12.6	6.4.5.5.4	18	Ka_Amipharma
0	0	0	0	0	24.29	5.4.3.2.2	11	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	22.75	4.2.1.2.2	7	Ka_Amipharma
0	0	0	0	0	18.59	4.3.3.4.3	13	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma

06 Kafouri_Amipharma_6

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.654167	32.575278	6	3	-1.0	CH	58	23	35
15.654167	32.575278	6	3	-2.0	SM	0	0	0
15.654167	32.575278	6	3	-3.0	SM	0	0	0
15.654167	32.575278	6	3	-4.0	SM	0	0	0
15.654167	32.575278	6	3	-5.0	SM	0	0	0
15.654167	32.575278	6	3	-6.0	SM	0	NP	NP
15.654167	32.575278	6	3	-7.0	SM	0	0	0
15.654167	32.575278	6	3	-8.0	ML	0	NP	NP
15.654167	32.575278	6	3	-9.0	SM	0	NP	NP
15.654167	32.575278	6	3	-10.0	SM	0	0	0
15.654167	32.575278	6	3	-11.0	-	0	0	0
15.654167	32.575278	6	3	-12.0	SM	0	0	0
15.654167	32.575278	6	3	-13.0	-	0	0	0
15.654167	32.575278	6	3	-14.0	-	0	0	0
15.654167	32.575278	6	3	-15.0	-	0	0	0
15.654167	32.575278	6	3	-16.0	-	0	0	0
15.654167	32.575278	6	3	-17.0	-	0	0	0
15.654167	32.575278	6	3	-18.0	SP-SM	0	0	0
15.654167	32.575278	6	3	-19.0	-	0	0	0
15.654167	32.575278	6	3	-20.0	-	0	0	0
15.654167	32.575278	6	3	-21.0	-	0	0	0
15.654167	32.575278	6	3	-22.0	-	0	0	0
15.654167	32.575278	6	3	-23.0	-	0	0	0
15.654167	32.575278	6	3	-24.0	-	0	0	0
15.654167	32.575278	6	3	-25.0	-	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	59.7	0	0	Ka_Amipharma
0	0	0	0	0	20.37	6.6.5.4.5	20	Ka_Amipharma
0	0	0	0	0	16.52	7.5.5.6.6	22	Ka_Amipharma
0	0	0	0	0	30.34	6.6.7.5.6	24	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	42.49	7.6.5.6.6	23	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	67.74	10.7.8.8.9	32	Ka_Amipharma
0	0	0	0	0	31.52	9.8.7.8.7	30	Ka_Amipharma
0	0	0	0	0	12.53	8.6.6.5.6	23	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	22.64	7.5.5.4.5	19	Ka_Amipharma
0	0	0	0	0	12.96	9.7.6.6.7	30	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	14.69	6.5.4.4.5	18	Ka_Amipharma
0	0	0	0	0	12.48	7.6.4.5.4	19	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	8.78	7.5.6.5.5	21	Ka_Amipharma
0	0	0	0	0	0	8.7.6.6.6	24	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	17.56	51	51	Ka_Amipharma
0	0	0	0	0	21.97	51	51	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	25.09	51	51	Ka_Amipharma
0	0	0	0	0	0	51	51	Ka_Amipharma

07 Kafouri_Amipharma_7

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.654167	32.275000	7	1	-1.0	CL	45	20	25
15.654167	32.275000	7	1	-2.0	CL	0	0	0
15.654167	32.275000	7	1	-3.0	SM	NP	NP	0
15.654167	32.275000	7	1	-4.0	SM	0	0	0
15.654167	32.275000	7	1	-5.0	SM	0	0	0
15.654167	32.275000	7	1	-6.0	CL	38	20	18
15.654167	32.275000	7	1	-7.0	CL	0	0	0
15.654167	32.275000	7	1	-8.0	SM	0	NP	NP
15.654167	32.275000	7	1	-9.0	SM	0	NP	NP
15.654167	32.275000	7	1	-10.0	SM	0	0	0
15.654167	32.275000	7	1	-11.0	-	0	0	0
15.654167	32.275000	7	1	-12.0	SM	0	0	0
15.654167	32.275000	7	1	-13.0	-	0	0	0
15.654167	32.275000	7	1	-14.0	-	0	0	0
15.654167	32.275000	7	1	-15.0	-	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	53.14	0	0	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	18.5	0	0	Ka_Amipharma
0	0	0	0	0	21.25	6.5.5.4.5	19	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	58.94	8.7.78.9	31	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	41.1	6.5.7.8.9	29	Ka_Amipharma
0	0	0	0	0	36.3	7.6.7.8.9	30	Ka_Amipharma
0	0	0	0	0	24.47	6.5.6.7.9	27	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	25.43	6.5.4.5.6	20	Ka_Amipharma
0	0	0	0	0	33.92	7.5.6.6.5	22	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	19.43	0	0	Ka_Amipharma

07 Kafouri_Amipharma_7

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.654444	32.275556	7	2	-1.0	ML	40	25	15
15.654444	32.275556	7	2	-2.0	ML	0	0	0
15.654444	32.275556	7	2	-3.0	SM	0	0	0
15.654444	32.275556	7	2	-4.0	SM	0	0	0
15.654444	32.275556	7	2	-5.0	SM	0	0	0
15.654444	32.275556	7	2	-6.0	SM	0	NP	NP
15.654444	32.275556	7	2	-7.0	SM	0	NP	NP
15.654444	32.275556	7	2	-8.0	SM	0	0	0
15.654444	32.275556	7	2	-9.0	ML	0	0	0
15.654444	32.275556	7	2	-10.0	ML	0	NP	NP
15.654444	32.275556	7	2	-11.0	-	0	0	0
15.654444	32.275556	7	2	-12.0	ML	0	0	0
15.654444	32.275556	7	2	-13.0	SP-SM	0	0	0
15.654444	32.275556	7	2	-14.0	-	0	0	0
15.654444	32.275556	7	2	-15.0	SM	0	0	0
15.654444	32.275556	7	2	-16.0	-	0	0	0
15.654444	32.275556	7	2	-17.0	-	0	0	0
15.654444	32.275556	7	2	-18.0	-	0	NP	NP
15.654444	32.275556	7	2	-19.0	-	0	0	0
15.654444	32.275556	7	2	20.0	-	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	68.74	10.8.8.7.9	32	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	23.98	5.4.4.5.3	16	Ka_Amipharma
0	0	0	0	0	21.56	6.5.5.4.5	19	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	40.73	8.7.6.8.7	28	Ka_Amipharma
0	0	0	0	0	44.54	10.9.8.9.10	36	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	53	8.7.7.6.7	27	Ka_Amipharma
0	0	0	0	0	62.08	9.7.6.6.6	25	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	67.61	6.5.5.6.5	21	Ka_Amipharma
0	0	0	0	0	7.9	7.6.5.5.6	22	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	12.6	6.4.5.5.4	18	Ka_Amipharma
0	0	0	0	0	24.29	5.4.3.2.2	11	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	22.75	4.2.1.2.2	7	Ka_Amipharma
0	0	0	0	0	18.59	4.3.3.4.3	13	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma

07 Kafouri_Amipharma_7

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.654167	32.275278	7	3	-1.0	CH	58	23	35
15.654167	32.275278	7	3	-2.0	SM	0	0	0
15.654167	32.575278	7	3	-3.0	SM	0	0	0
15.654167	32.575278	7	3	-4.0	SM	0	0	0
15.654167	32.575278	7	3	-5.0	SM	0	0	0
15.654167	32.575278	7	3	-6.0	SM	0	NP	NP
15.654167	32.575278	7	3	-7.0	SM	0	0	0
15.654167	32.575278	7	3	-8.0	ML	0	NP	NP
15.654167	32.575278	7	3	-9.0	SM	0	NP	NP
15.654167	32.575278	7	3	-10.0	SM	0	0	0
15.654167	32.575278	7	3	-11.0	-	0	0	0
15.654167	32.575278	7	3	-12.0	SM	0	0	0
15.654167	32.575278	7	3	-13.0	-	0	0	0
15.654167	32.575278	7	3	-14.0	-	0	0	0
15.654167	32.575278	7	3	-15.0	-	0	0	0
15.654167	32.575278	7	3	-16.0	-	0	0	0
15.654167	32.575278	7	3	-17.0	-	0	0	0
15.654167	32.575278	7	3	-18.0	SP-SM	0	0	0
15.654167	32.575278	7	3	-19.0	-	0	0	0
15.654167	32.575278	7	3	-20.0	-	0	0	0
15.654167	32.575278	7	3	-21.0	-	0	0	0
15.654167	32.575278	7	3	-22.0	-	0	0	0
15.654167	32.575278	7	3	-23.0	-	0	0	0
15.654167	32.575278	7	3	-24.0	-	0	0	0
15.654167	32.575278	7	3	-25.0	-	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	59.7	0	0	Ka_Amipharma
0	0	0	0	0	20.37	6.6.5.4.5	20	Ka_Amipharma
0	0	0	0	0	16.52	7.5.5.6.6	22	Ka_Amipharma
0	0	0	0	0	30.34	6.6.7.5.6	24	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	42.49	7.6.5.6.6	23	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	67.74	10.7.8.8.9	32	Ka_Amipharma
0	0	0	0	0	31.52	9.8.7.8.7	30	Ka_Amipharma
0	0	0	0	0	12.53	8.6.6.5.6	23	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	22.64	7.5.5.4.5	19	Ka_Amipharma
0	0	0	0	0	12.96	9.7.6.6.7	30	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	14.69	6.5.4.4.5	18	Ka_Amipharma
0	0	0	0	0	12.48	7.6.4.5.4	19	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	8.78	7.5.6.5.5	21	Ka_Amipharma
0	0	0	0	0	0	8.7.6.6.6	24	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	17.56	51	51	Ka_Amipharma
0	0	0	0	0	21.97	51	51	Ka_Amipharma
0	0	0	0	0	0	0	0	Ka_Amipharma
0	0	0	0	0	25.09	51	51	Ka_Amipharma
0	0	0	0	0	0	51	51	Ka_Amipharma

ı8 ELtayba_8

N	E	Serial	BH	Depth	Group_symbol	Soil_Profile	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.671389	32.562500	8	1	-1.0	-	SILTY CLAY	0	0	0	0
15.671389	32.562500	8	1	-2.0	-	SILTY CLAY	58.4	25.3	33.1	0
15.671389	32.562500	8	1	-3.0	-	SILTY CLAY	0	0	0	0
15.671389	32.562500	8	1	-4.0	-	SILTY CLAY	60.1	21.5	38.6	0
15.671389	32.562500	8	1	-5.0	-	SILTY CLAY	58.8	22.6	36.2	0
15.671389	32.562500	8	1	-6.0	-	SILTY SAND	0	0	0	0
15.671389	32.562500	8	1	-7.0	-	SILTY SAND	0	0	0	0
15.671389	32.562500	8	1	-8.0	-	SILTY SAND	0	0	0	0
15.671389	32.562500	8	1	-9.0	-	SILTY SAND	0	0	0	0
15.671389	32.562500	8	1	-10.0	-	SILTY SAND	0	0	0	0
15.671389	32.562500	8	1	-11.0	-	SILTY SAND	0	0	0	0
15.671389	32.562500	8	1	-12.0	-	SILTY SAND	0	0	0	0
15.671389	32.562500	8	1	-13.0	-	SILTY SAND	0	0	0	0
15.671389	32.562500	8	1	-14.0	-	SILTY SAND	0	0	0	0
15.671389	32.562500	8	1	-15.0	-	SILTY SAND	0	0	0	0
15.671389	32.562500	8	1	-16.0	-	SILTY SAND	0	0	0	0

yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	She_m_c%	%Pass_sieve	SPT_Blows	SPT_N_Value	U_W_KN/m3	Location
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	30	100	23.1	0	0	0	20.2	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	36	0	0	0	0	0	19.8	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba

)8 ELtayba_8

N	E	Serial	BH	Depth	Group_symbol	Soil_Profile	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.671389	32.562500	8	2	-1.0	-	SILTY CLAY	0	0	0	0
15.671389	32.562500	8	2	-2.0	-	SILTY CLAY	0	0	0	0
15.671389	32.562500	8	2	-3.0	-	SILTY CLAY	54.4	24	30.4	0
15.671389	32.562500	8	2	-4.0	-	SILTY CLAY	0	0	0	0
15.671389	32.562500	8	2	-5.0	-	SILTY CLAY	0	0	0	0
15.671389	32.562500	8	2	-6.0	-	SILTY CLAY	58.5	19.7	38.8	0
15.671389	32.562500	8	2	-7.0	-	SAND	0	0	0	0
15.671389	32.562500	8	2	-8.0	-	SAND	0	0	0	0
15.671389	32.562500	8	2	-9.0	-	SAND	0	0	0	0
15.671389	32.562500	8	2	-10.0	-	SAND	0	0	0	0
15.671389	32.562500	8	2	-11.0	-	SAND	0	0	0	0
15.671389	32.562500	8	2	-12.0	-	SAND	0	0	0	0
15.671389	32.562500	8	2	-13.0	-	SAND	0	0	0	0
15.671389	32.562500	8	2	-14.0	-	SAND	0	0	0	0
15.671389	32.562500	8	2	-15.0	-	SAND	0	0	0	0
15.671389	32.562500	8	2	-16.0	-	SAND	0	0	0	0

yb_KNm3	yd_KNm3	She_deg	he_C_KNr	She_m_c%	%Pass_sieve	SPT_Blows	SPT_N_Valu	U_W_KN/m3	Location
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	28	75	23.3	0	0	0	20.1	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	38	0	0	0	0	0	19.5	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba
0	0	0	0	0	0	0	0	0	Eltayba

09 Elirsad_9

N	E	Serial	BH	Depth	Group_symbol	Soil_Profile	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.736389	32.559167	9	1	-1.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	1	-2.0	-	SILTY CLAY	67.9	31.1	36.8	0
15.736389	32.559167	9	1	-3.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	1	-4.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	1	-5.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	1	-6.0	-	SILTY CLAY	84.7	37.1	47.6	0
15.736389	32.559167	9	1	-7.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	1	-8.0	-	SILTY CLAY	57.3	26	31.1	0
15.736389	32.559167	9	1	-9.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	1	-10.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	1	-11.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	1	-12.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	1	-13.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	1	-14.0	-	SILTY CLAY	58.7	28.6	30.1	0
15.736389	32.559167	9	1	-15.0	-	SILTY CLAY	0	0	0	0

yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	She_m_c%	%Pass_sieve	SPT_Blows	SPT_N_Value	U_W_KN/m3	Location
0	0	0	0	0	0	0	0	0	Elirsad
0	0	26	75	20.1	0	0	0	19.3	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	31	50	18.6	0	0	0	18.9	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad

09 Elirsad_9

N	E	Serial	BH	Depth	Group_symbol	Soil_Profile	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.736389	32.559167	9	2	-1.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	2	-2.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	2	-3.0	-	SILTY CLAY	72.2	32	40.2	0
15.736389	32.559167	9	2	-4.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	2	-5.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	2	-6.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	2	-7.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	2	-8.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	2	-9.0	-	SILTY CLAY	79.8	34	45.8	0
15.736389	32.559167	9	2	-10.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	2	-11.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	2	-12.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	2	-13.0	-	SILTY CLAY	0	0	0	0
15.736389	32.559167	9	2	-14.0	-	SILTY CLAY	57.5	26.7	30.8	0
15.736389	32.559167	9	2	-15.0	-	SILTY CLAY	0	0	0	0

yb_KNm3	yd_KNm3	She_deg	he_C_KNm	She_m_c%	%Pass_sieve	SPT_Blows	SPT_N_Value	U_W_KN/m3	Location
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	33	25	18.7	0	0	0	19	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad
0	0	28	60	17.8	0	0	0	19.1	Elirsad
0	0	0	0	0	0	0	0	0	Elirsad

10 Um Dawwan Ban_10

N	E	Serial	BH	Depth	Group_symbol	Sample_Type	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.430833	32.830278	10	1	-1.0	-	C	0	0	0	0
15.430833	32.830278	10	1	-2.0	CH	C	0	0	0	0
15.430833	32.830278	10	1	-3.0	CH	C	0	0	0	0
15.430833	32.830278	10	1	-4.0	CH	C	0	0	0	0
15.430833	32.830278	10	1	-5.0	CH	C	0	0	0	0
15.430833	32.830278	10	1	-6.0	CH	C	0	0	0	0
15.430833	32.830278	10	1	-7.0	CH	C	63.2	20.8	0	0
15.430833	32.830278	10	1	-8.0	CH	C	0	0	0	0
15.430833	32.830278	10	1	-9.0	CH	C	0	0	0	0
15.430833	32.830278	10	1	-10.0	CH	C	0	0	0	0

yb_KNm3	yd_KNm3	She_deg	he_C_KNm	%Pass_siev	SPT_Blows	SPT_N_Value	qp_kg_cm2	yb__gm_cm3	Location
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	1.5	0	UmDawwanBan
0	0	0	0	0	0	0	0.44*	1.9	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan

10 Um Dawwan Ban_10

N	E	Serial	BH	Depth	Group_symbol	Sample_Type	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.430556	32.830000	10	2	-1.0	-	C	0	0	0	0
15.430556	32.830000	10	2	-2.0	CH	C	56.2	20	0	0
15.430556	32.830000	10	2	-3.0	CH	C	0	0	0	0
15.430556	32.830000	10	2	-4.0	CH	C	0	0	0	0
15.430556	32.830000	10	2	-5.0	CH	C	0	0	0	0
15.430556	32.830000	10	2	-6.0	CH	C	0	0	0	0
15.430556	32.830000	10	2	-7.0	CH	C	0	0	0	0
15.430556	32.830000	10	2	-8.0	CH	C	0	0	0	0
15.430556	32.830000	10	2	-9.0	CH	C	0	0	0	0
15.430556	32.830000	10	2	-10.0	CH	C	0	0	0	0

yb_KNm3	yd_KNm3	She_deg	he_C_KNm	%Pass_siev	SPT_Blows	SPT_N_Value	qp_kg_cm2	yb__gm_cm3	Location
0	0	0	0	0	0	0	0.6	0	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	0.50*	1.98	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan
0	0	0	0	0	0	0	0	0	UmDawwanBan

11 Garri_11

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
16.194444	32.606944	11	1	-1.0	SC	34	20	14
16.194444	32.606944	11	1	-2.0	SM	0	0	0
16.194444	32.606944	11	1	-3.0	SM	0	0	0
16.194444	32.606944	11	1	-4.0	SM	0	NP	NP
16.194444	32.606944	11	1	-5.0	SM	0	0	0
16.194444	32.606944	11	1	-6.0	SM	0	0	0
16.194444	32.606944	11	1	-7.0	SC	41	17	24
16.194444	32.606944	11	1	-8.0	SC	49	20	29
16.194444	32.606944	11	1	-9.0	SC	0	0	0
16.194444	32.606944	11	1	-10.0	SC	45	22	23

N_M_C%	yb_KNm3	yd_KNm3	She_deg	he_C_KNm	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	20.53	0	0	Garri
0	0	0	0	0	13.26	10.12.18.18.3	50	Garri
0	0	0	0	0	0	0	0	Garri
0	0	0	0	0	21.86	51	50	Garri
0	0	0	0	0	0	0	0	Garri
0	0	0	0	0	17.4	51	50	Garri
0	0	0	0	0	38.86	0	0	Garri
0	0	0	0	0	43.11	51	50	Garri
0	0	0	0	0	0	0	0	Garri
0	0	0	0	0	30.36	51	50	Garri

11 Garri_11

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
16.181944	32.628889	11	2	-1.0	SC	0	0	0
16.181944	32.628889	11	2	-2.0	SC	39	18	21
16.181944	32.628889	11	2	-3.0	SC	0	0	0
16.181944	32.628889	11	2	-4.0	SM	0	0	0
16.181944	32.628889	11	2	-5.0	SM	0	NP	NP
16.181944	32.628889	11	2	-6.0	SM	0	NP	NP
16.181944	32.628889	11	2	-7.0	SM	0	0	0
16.181944	32.628889	11	2	-8.0	SM	0	NP	NP
16.181944	32.628889	11	2	-9.0	SM	0	0	0
16.181944	32.628889	11	2	-10.0	SM	0	NP	NP

N_M_C%	yb_KNm3	yd_KNm3	She_deg	he_C_KNm	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	Garri
0	0	0	0	0	43.16	12.14.18.18.1	50	Garri
0	0	0	0	0	0	0	0	Garri
0	0	0	0	0	22.9	10.11.13.13.14	50	Garri
0	0	0	0	0	26.94	0	0	Garri
0	0	0	0	0	24.08	11.12.14.18.7	50	Garri
0	0	0	0	0	0	0	0	Garri
0	0	0	0	0	26.99	11.11.13.15.12	50	Garri
0	0	0	0	0	0	0	0	Garri
0	0	0	0	0	26.68	12.10.12.14.15	50	Garri

11 Garri_11

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
16.165833	32.643889	11	3	-1.0	SC	40	17	23
16.165833	32.643889	11	3	-2.0	SP-SM	0	0	0
16.165833	32.643889	11	3	-3.0	SM	0	0	0
16.165833	32.643889	11	3	-4.0	-	0	NP	NP
16.165833	32.643889	11	3	-5.0	-	0	0	0
16.165833	32.643889	11	3	-6.0	-	0	NP	NP
16.165833	32.643889	11	3	-7.0	-	0	0	0
16.165833	32.643889	11	3	-8.0	-	0	NP	NP
16.165833	32.643889	11	3	-9.0	-	0	0	0
16.165833	32.643889	11	3	-10.0	-	0	NP	NP

N_M_C%	yb_KNm3	yd_KNm3	She_deg	he_C_KNm	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	28.23	0	0	Garri
0	0	0	0	0	10.03	51	50	Garri
0	0	0	0	0	15.62	0	0	Garri
0	0	0	0	0	20.7	51	50	Garri
0	0	0	0	0	0	0	0	Garri
0	0	0	0	0	21.48	15.18.33	50	Garri
0	0	0	0	0	0	0	0	Garri
0	0	0	0	0	21.83	12.10.12.14.15	50	Garri
0	0	0	0	0	0	0	0	Garri
0	0	0	0	0	30.27	11.10.11.14.16	50	Garri

i_Tasc_Towers_12

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
16.150278	32.633333	12	1	-1.0	CH	62	28	34
16.150278	32.633333	12	1	-2.0	CH	0	0	0
16.150278	32.633333	12	1	-3.0	CH	62	25	37
16.150278	32.633333	12	1	-4.0	CH	0	0	0
16.150278	32.633333	12	1	-5.0	SM	0	NP	NP
16.150278	32.633333	12	1	-6.0	ML	0	NP	NP
16.150278	32.633333	12	1	-7.0	ML	0	0	0
16.150278	32.633333	12	1	-8.0	SM	0	NP	NP
16.150278	32.633333	12	1	-9.0	CH	53	23	30
16.150278	32.633333	12	1	-10.0	CH	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
6.5	0	0	0	0	93.8	14.18.19.14	50	Garri Tasc
0	0	0	0	0	0	0	0	Garri Tasc
6	0	0	0	0	81.9	18.17.17.14.3	50	Garri Tasc
0	0	0	0	0	0	0	0	Garri Tasc
4	0	0	0	0	43.2	10.5.6.6.7	24	Garri Tasc
7.5	0	0	0	0	79.7	12.9.12.10.11	42	Garri Tasc
0	0	0	0	0	0	0	0	Garri Tasc
4	0	0	0	0	26.4	10.9.9.9.9	36	Garri Tasc
13	0	0	0	0	69.75	8.6.6.10.12	34	Garri Tasc
0	0	0	0	0	0	0	0	Garri Tasc

i_Tasc_Towers_12

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
16.147500	32.632222	12	2	-1.0	-	0	0	0
16.147500	32.632222	12	2	-2.0	-	0	0	0
16.147500	32.632222	12	2	-3.0	-	0	0	0
16.147500	32.632222	12	2	-4.0	-	0	0	0
16.147500	32.632222	12	2	-5.0	-	0	0	0
16.147500	32.632222	12	2	-6.0	-	0	0	0
16.147500	32.632222	12	2	-7.0	-	0	0	0
16.147500	32.632222	12	2	-8.0	-	0	0	0
16.147500	32.632222	12	2	-9.0	-	0	0	0
16.147500	32.632222	12	2	-10.0	-	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	Garri Tasc
0	0	0	0	0	0	0	0	Garri Tasc
0	0	0	0	0	0	0	0	Garri Tasc
0	0	0	0	0	0	0	0	Garri Tasc
0	0	0	0	0	0	0	0	Garri Tasc
0	0	0	0	0	0	0	0	Garri Tasc
0	0	0	0	0	0	0	0	Garri Tasc
0	0	0	0	0	0	0	0	Garri Tasc
0	0	0	0	0	0	0	0	Garri Tasc
0	0	0	0	0	0	0	0	Garri Tasc

Hagyousif_13

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.656667	32.631111	13	2	-1.0	CH	56	23	33	0
15.656667	32.631111	13	2	-2.0	CH	69	26	43	20.98
15.656667	32.631111	13	2	-3.0	CH	0	0	0	0
15.656667	32.631111	13	2	-4.0	CH	59	18	41	11.2
15.656667	32.631111	13	2	-5.0	CH	0	0	0	0
15.656667	32.631111	13	2	-6.0	CH	75	25	50	10.7
15.656667	32.631111	13	2	-7.0	CH	0	0	0	0
15.656667	32.631111	13	2	-8.0	CH	68	22	46	10.85
15.656667	32.631111	13	2	-9.0	CH	0	0	0	0
15.656667	32.631111	13	2	-10.0	CH	75	23	52	11.38

yb_KNm3	yd_KNm3	S_G	She_deg	he_C_KNm	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	73.86	0	0	Hagyousif
19.84	16.4	2.014	2	157.89	86.84	0	0	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	89.43	51	50	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	60.8	51	50	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	65.54	51	50	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	63.2	51	50	Hagyousif

Bataheen_17

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.623889	32.620833	17	1	-1.0	CL	49	15	34
15.623889	32.620833	17	1	-2.0	CL	0	0	0
15.623889	32.620833	17	1	-3.0	SC	58	16	42
15.623889	32.620833	17	1	-4.0	SC	0	0	0
15.623889	32.620833	17	1	-5.0	CH	76	22	54
15.623889	32.620833	17	1	-6.0	CH	0	0	0
15.623889	32.620833	17	1	-7.0	CH	98	29	69
15.623889	32.620833	17	1	-8.0	CH	0	0	0
15.623889	32.620833	17	1	-9.0	SC	126	36	90

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	60	0	0	Bataheen
0	0	0	0	0	0	0	0	Bataheen
0	0	0	0	0	41	0	0	Bataheen
0	0	0	0	0	0	0	0	Bataheen
0	0	0	0	0	81	0	0	Bataheen
0	0	0	0	0	0	0	0	Bataheen
0	0	0	0	0	84	0	0	Bataheen
0	0	0	0	0	0	0	0	Bataheen
0	0	0	0	0	47	0	0	Bataheen

Om_Algura_18

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.761667	32.583056	18	1	-1.0	SC	40	17	23
15.761667	32.583056	18	1	-2.0	SC	0	0	0
15.761667	32.583056	18	1	-3.0	SC	34	16	18
15.761667	32.583056	18	1	-4.0	SC	0	0	0
15.761667	32.583056	18	1	-5.0	SC	35	13	22
15.761667	32.583056	18	1	-6.0	SC	0	0	0
15.761667	32.583056	18	1	-7.0	SC	0	0	0
15.761667	32.583056	18	1	-8.0	SC	0	0	0
15.761667	32.583056	18	1	-9.0	SC	0	0	0
15.761667	32.583056	18	1	-10.0	SC	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	he_C_KNm	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	36	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura
0	0	0	0	0	31	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura
0	0	0	0	0	47	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura

Om_Algura_18

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.761667	32.583056	18	2	-1.0	SC	0	0	0
15.761667	32.583056	18	2	-2.0	SC	0	0	0
15.761667	32.583056	18	2	-3.0	SC	0	0	0
15.761667	32.583056	18	2	-4.0	SC	0	0	0
15.761667	32.583056	18	2	-5.0	SC	0	0	0
15.761667	32.583056	18	2	-6.0	SC	0	0	0
15.761667	32.583056	18	2	-7.0	SC	23	14	9
15.761667	32.583056	18	2	-8.0	SC	0	0	0
15.761667	32.583056	18	2	-9.0	SC	31	15	16
15.761667	32.583056	18	2	-10.0	SC	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura
0	0	0	0	0	29	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura
0	0	0	0	0	49	0	0	Om Algura
0	0	0	0	0	0	0	0	Om Algura

Droushab_19

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.720556	32.561944	19	1	-1.0	SC	60	17	43
15.720556	32.561944	19	1	-2.0	SC	0	0	0
15.720556	32.561944	19	1	-3.0	SC	60	17	43
15.720556	32.561944	19	1	-4.0	SC	0	0	0
15.720556	32.561944	19	1	-5.0	CH	90	20	70
15.720556	32.561944	19	1	-6.0	CH	88	22	66
15.720556	32.561944	19	1	-7.0	CH	68	26	42
15.720556	32.561944	19	1	-8.0	CH	0	0	0
15.720556	32.561944	19	1	-9.0	CH	53	28	25
15.720556	32.561944	19	1	-10.0	CH	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	46.22	26.51	50	Droushab
0	0	0	0	0	0	0	0	Droushab
0	0	0	0	0	42.9	24.51	50	Droushab
0	0	0	0	0	0	0	0	Droushab
0	0	0	0	0	60.01	24.20.18.13	50	Droushab
0	0	0	0	0	71.33	24.19.18.14	50	Droushab
0	0	0	0	0	87.11	17.12.14.16.9	50	Droushab
0	0	0	0	0	0	0	0	Droushab
0	0	0	0	0	97.81	16.10.13.17.11	50	Droushab
0	0	0	0	0	0	0	0	Droushab

Droushab_19

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.717500	32.571111	19	2	-1.0	-	0	0	0
15.717500	32.571111	19	2	-2.0	-	0	0	0
15.717500	32.571111	19	2	-3.0	-	0	0	0
15.717500	32.571111	19	2	-4.0	-	0	0	0
15.717500	32.571111	19	2	-5.0	-	0	0	0
15.717500	32.571111	19	2	-6.0	-	0	0	0
15.717500	32.571111	19	2	-7.0	-	0	0	0
15.717500	32.571111	19	2	-8.0	-	0	0	0
15.717500	32.571111	19	2	-9.0	-	0	0	0
15.717500	32.571111	19	2	-10.0	-	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	Droushab
0	0	0	0	0	0	0	0	Droushab
0	0	0	0	0	0	0	0	Droushab
0	0	0	0	0	0	0	0	Droushab
0	0	0	0	0	0	0	0	Droushab
0	0	0	0	0	0	0	0	Droushab
0	0	0	0	0	0	0	0	Droushab
0	0	0	0	0	0	0	0	Droushab
0	0	0	0	0	0	0	0	Droushab
0	0	0	0	0	0	0	0	Droushab

Hagyousif_21

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.620833	32.625000	21	1	-1.0	CH	0	0	0
15.620833	32.625000	21	1	-2.0	CH	75	21	54
15.620833	32.625000	21	1	-3.0	SC	60	18	42
15.620833	32.625000	21	1	-4.0	SM	0	0	0
15.620833	32.625000	21	1	-5.0	SC	106	29	77
15.620833	32.625000	21	1	-6.0	CH	104	24	76
15.620833	32.625000	21	1	-7.0	SM	0	0	0
15.620833	32.625000	21	1	-8.0	SM	0	0	0
15.620833	32.625000	21	1	-9.0	-	0	0	0
15.620833	32.625000	21	1	-10.0	SP-SM	0	0	0
15.620833	32.625000	21	1	-11.0	SP-SM	0	0	0
15.620833	32.625000	21	1	-12.0	SP-SM	0	0	0
15.620833	32.625000	21	1	-13.0	SP-SM	0	0	0
15.620833	32.625000	21	1	-14.0	SC	31	19	12
15.620833	32.625000	21	1	-15.0	SM	0	0	0
15.620833	32.625000	21	1	-16.0	SM	0	NP	NP
15.620833	32.625000	21	1	-17.0	SM	0	0	0
15.620833	32.625000	21	1	-18.0	SM	0	0	0
15.620833	32.625000	21	1	-19.0	SM	0	0	0
15.620833	32.625000	21	1	-20.0	SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	53.3	0	0	Hagyousif
0	0	0	0	0	48.7	0	0	Hagyousif
0	0	0	0	0	38.7	0	0	Hagyousif
0	0	0	0	0	44.3	0	0	Hagyousif
0	0	0	0	0	59.9	7.6.6.7.8	27	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	12.6	6.5.5.4.5	19	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	10.9	6.4.5.5.4	18	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	9.1	8.10.9.9.10	38	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	20.4	15.13.12.11.11	47	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	14.1	14.12.12.13.10	47	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	14.5	14.13.11.13.12	49	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	16.1	0	0	Hagyousif

Hagyousif_21

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.620833	32.625000	21	2	-1.0	CH	0	0	0
15.620833	32.625000	21	2	-2.0	CH	86	25	61
15.620833	32.625000	21	2	-3.0	CH	0	0	0
15.620833	32.625000	21	2	-4.0	CH	101	35	66
15.620833	32.625000	21	2	-5.0	CH	95	39	56
15.620833	32.625000	21	2	-6.0	SM	0	0	0
15.620833	32.625000	21	2	-7.0	SM	0	0	0
15.620833	32.625000	21	2	-8.0	SM	0	0	0
15.620833	32.625000	21	2	-9.0	SM	0	0	0
15.620833	32.625000	21	2	-10.0	SM	0	0	0
15.620833	32.625000	21	2	-11.0	SM	0	0	0
15.620833	32.625000	21	2	-12.0	SM	0	0	0
15.620833	32.625000	21	2	-13.0	SM	0	0	0
15.620833	32.625000	21	2	-14.0	SM	0	0	0
15.620833	32.625000	21	1	-15.0	SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	he_C_KNm	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	Hagyousif
18.89	20.01	16.87	16	112.01	71.5	0	0	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	60.7	0	0	Hagyousif
0	0	0	0	0	77.3	0	0	Hagyousif
0	0	0	0	0	46.3	10.8.7.6.6	37	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	23.9	6.5.5.6.6	22	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	25.1	7.6.7.7.6	26	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	14.2	10.9.10.10.10	39	Hagyousif
0	0	0	0	0	0	0	0	Hagyousif
0	0	0	0	0	14.4	13.12.12.10.10	44	Hagyousif
0	0	0	0	0	12	0	0	Hagyousif

2 Wawissi_22

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
16.075000	32.583056	22	1	-1.0	ML	NP	NP	NP
16.075000	32.583056	22	1	-2.0	ML	0	0	0
16.075000	32.583056	22	1	-3.0	ML	NP	NP	NP
16.075000	32.583056	22	1	-4.0	SM	0	0	0
16.075000	32.583056	22	1	-5.0	SM	NP	NP	NP
16.075000	32.583056	22	1	-6.0	SM	0	0	0
16.075000	32.583056	22	1	-7.0	SM	0	0	0
16.075000	32.583056	22	1	-8.0	SM	0	0	0
16.075000	32.583056	22	1	-9.0	SM	0	0	0
16.075000	32.583056	22	1	-10.0	SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	86	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	66	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	11	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi

2 Wawissi_22

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
16.075000	32.583056	22	1	-1.0	ML	NP	NP	NP
16.075000	32.583056	22	1	-2.0	ML	0	0	0
16.075000	32.583056	22	1	-3.0	ML	NP	NP	NP
16.075000	32.583056	22	1	-4.0	SM	0	0	0
16.075000	32.583056	22	1	-5.0	SM	NP	NP	NP
16.075000	32.583056	22	1	-6.0	SM	0	0	0
16.075000	32.583056	22	1	-7.0	SM	0	0	0
16.075000	32.583056	22	1	-8.0	SM	0	0	0
16.075000	32.583056	22	1	-9.0	SM	0	0	0
16.075000	32.583056	22	1	-10.0	SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	86	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	66	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	11	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi

2 Wawissi_22

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
16.075000	32.583056	22	2	-1.0	ML	0	0	0
16.075000	32.583056	22	2	-2.0	ML	0	0	0
16.075000	32.583056	22	2	-3.0	ML	0	0	0
16.075000	32.583056	22	2	-4.0	SM	0	0	0
16.075000	32.583056	22	2	-5.0	SM	0	0	0
16.075000	32.583056	22	2	-6.0	SM	0	0	0
16.075000	32.583056	22	2	-7.0	SM	NP	NP	NP
16.075000	32.583056	22	2	-8.0	SM	0	0	0
16.075000	32.583056	22	2	-9.0	SM	NP	NP	NP
16.075000	32.583056	22	2	-10.0	SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	14	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	17	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi

2 Wawissi_22

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
16.075000	32.583056	22	2	-1.0	ML	0	0	0
16.075000	32.583056	22	2	-2.0	ML	0	0	0
16.075000	32.583056	22	2	-3.0	ML	0	0	0
16.075000	32.583056	22	2	-4.0	SM	0	0	0
16.075000	32.583056	22	2	-5.0	SM	0	0	0
16.075000	32.583056	22	2	-6.0	SM	0	0	0
16.075000	32.583056	22	2	-7.0	SM	NP	NP	NP
16.075000	32.583056	22	2	-8.0	SM	0	0	0
16.075000	32.583056	22	2	-9.0	SM	NP	NP	NP
16.075000	32.583056	22	2	-10.0	SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	14	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	17	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi

Kabbashi_23

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.888056	32.579167	23	1	-1.0	CH	59	30	29
15.888056	32.579167	23	1	-2.0	CH	0	0	0
15.888056	32.579167	23	1	-3.0	SC	43	21	22
15.888056	32.579167	23	1	-4.0	SC	NP	NP	NP
15.888056	32.579167	23	1	-5.0	SM	0	0	0
15.888056	32.579167	23	1	-6.0	SM	NP	NP	NP
15.888056	32.579167	23	1	-7.0	SM	0	0	0
15.888056	32.579167	23	1	-8.0	SM	0	0	0
15.888056	32.579167	23	1	-9.0	SM	NP	NP	NP
15.888056	32.579167	23	1	-10.0	SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	78	0	0	Kabbashi
0	0	0	0	0	0	0	0	Kabbashi
0	0	0	0	0	45	19.14.32	46	Kabbashi
0	0	0	0	0	13	8.5.6.6.7	24	Kabbashi
0	0	0	0	0	0	0	0	Kabbashi
0	0	0	0	0	16	13.8.10.12.15	45	Kabbashi
0	0	0	0	0	0	0	0	Kabbashi
0	0	0	0	0	0	0	0	Kabbashi
0	0	0	0	0	13	0	0	Kabbashi
0	0	0	0	0	0	0	0	Kabbashi

2 Wawissi_22

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
16.075000	32.583056	22	1	-1.0	ML	NP	NP	NP
16.075000	32.583056	22	1	-2.0	ML	0	0	0
16.075000	32.583056	22	1	-3.0	ML	NP	NP	NP
16.075000	32.583056	22	1	-4.0	SM	0	0	0
16.075000	32.583056	22	1	-5.0	SM	NP	NP	NP
16.075000	32.583056	22	1	-6.0	SM	0	0	0
16.075000	32.583056	22	1	-7.0	SM	0	0	0
16.075000	32.583056	22	1	-8.0	SM	0	0	0
16.075000	32.583056	22	1	-9.0	SM	0	0	0
16.075000	32.583056	22	1	-10.0	SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	86	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	66	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	11	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi

2 Wawissi_22

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
16.075000	32.583056	22	2	-1.0	ML	0	0	0
16.075000	32.583056	22	2	-2.0	ML	0	0	0
16.075000	32.583056	22	2	-3.0	ML	0	0	0
16.075000	32.583056	22	2	-4.0	SM	0	0	0
16.075000	32.583056	22	2	-5.0	SM	0	0	0
16.075000	32.583056	22	2	-6.0	SM	0	0	0
16.075000	32.583056	22	2	-7.0	SM	NP	NP	NP
16.075000	32.583056	22	2	-8.0	SM	0	0	0
16.075000	32.583056	22	2	-9.0	SM	NP	NP	NP
16.075000	32.583056	22	2	-10.0	SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	14	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	17	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi

2 Wawissi_22

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
16.075000	32.583056	22	2	-1.0	ML	0	0	0
16.075000	32.583056	22	2	-2.0	ML	0	0	0
16.075000	32.583056	22	2	-3.0	ML	0	0	0
16.075000	32.583056	22	2	-4.0	SM	0	0	0
16.075000	32.583056	22	2	-5.0	SM	0	0	0
16.075000	32.583056	22	2	-6.0	SM	0	0	0
16.075000	32.583056	22	2	-7.0	SM	NP	NP	NP
16.075000	32.583056	22	2	-8.0	SM	0	0	0
16.075000	32.583056	22	2	-9.0	SM	NP	NP	NP
16.075000	32.583056	22	2	-10.0	SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	14	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi
0	0	0	0	0	17	0	0	Wawissi
0	0	0	0	0	0	0	0	Wawissi

Kabbashi_23

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.888056	32.579167	23	1	-1.0	CH	59	30	29
15.888056	32.579167	23	1	-2.0	CH	0	0	0
15.888056	32.579167	23	1	-3.0	SC	43	21	22
15.888056	32.579167	23	1	-4.0	SC	NP	NP	NP
15.888056	32.579167	23	1	-5.0	SM	0	0	0
15.888056	32.579167	23	1	-6.0	SM	NP	NP	NP
15.888056	32.579167	23	1	-7.0	SM	0	0	0
15.888056	32.579167	23	1	-8.0	SM	0	0	0
15.888056	32.579167	23	1	-9.0	SM	NP	NP	NP
15.888056	32.579167	23	1	-10.0	SM	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	78	0	0	Kabbashi
0	0	0	0	0	0	0	0	Kabbashi
0	0	0	0	0	45	19.14.32	46	Kabbashi
0	0	0	0	0	13	8.5.6.6.7	24	Kabbashi
0	0	0	0	0	0	0	0	Kabbashi
0	0	0	0	0	16	13.8.10.12.15	45	Kabbashi
0	0	0	0	0	0	0	0	Kabbashi
0	0	0	0	0	0	0	0	Kabbashi
0	0	0	0	0	13	0	0	Kabbashi
0	0	0	0	0	0	0	0	Kabbashi

24 Safya_24

N	E	Serial	BH	Depth	Group_symbol	Sample_Type	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.649444	32.536111	24	1	-1.0	CL	C	0	0	0	0
15.649444	32.536111	24	1	-2.0	SC	C	0	0	0	0
15.649444	32.536111	24	1	-3.0	SC	C	0	0	0	0
15.649444	32.536111	24	1	-4.0	SC	C	0	0	0	0
15.649444	32.536111	24	1	-5.0	SC	SPT	0	0	0	0
15.649444	32.536111	24	1	-6.0	ML	C	36.4	26	0	0
15.649444	32.536111	24	1	-7.0	-	C	0	0	0	0
15.649444	32.536111	24	1	-8.0	CL	C	43.9	23	0	0
15.649444	32.536111	24	1	-9.0	-	C	0	0	0	0
15.649444	32.536111	24	1	-10.0	-	C	0	0	0	0

yb_KNm3	yd_KNm3	She_deg	he_C_KNm	%Pass_sieve	SPT_Blows	SPT_N_Value	SPT_N_30cm	qp_kg_cm2	Location
0	0	0	0	0	0	0	0	0	Safya
0	0	0	0	0	0	0	0	4	Safya
0	0	0	0	0	0	0	0	4.2	Safya
0	0	0	0	0	0	0	0	0	Safya
0	0	0	0	0	0	0	50/13	0	Safya
0	0	0	0	0	0	0	0	3.5	Safya
0	0	0	0	0	0	0	0	3	Safya
0	0	0	0	0	0	0	0	3.2	Safya
0	0	0	0	0	0	0	0	3	Safya
0	0	0	0	0	0	0	0	0	Safya

24 Safya_24

N	E	Serial	BH	Depth	Group_symbol	Sample_Type	Att_L_L%	Att_P_L%	Att_P_I%	N_M_C%
15.649444	32.536111	24	2	-1.0	CL	C	0	0	0	0
15.649444	32.536111	24	2	-2.0	SC	C	0	0	0	0
15.649444	32.536111	24	2	-3.0	SC	C	0	0	0	0
15.649444	32.536111	24	2	-4.0	SC	C	0	0	0	0
15.649444	32.536111	24	2	-5.0	SC	SPT	0	0	0	0
15.649444	32.536111	24	2	-6.0	CL-ML	C	38.9	26	0	0
15.649444	32.536111	24	2	-7.0	CL-ML	C	43.7	26	0	0
15.649444	32.536111	24	2	-8.0	CL-ML	C	0	0	0	0
15.649444	32.536111	24	2	-9.0	CL-ML	C	0	0	0	0
15.649444	32.536111	24	2	-10.0	CL-ML	C	0	0	0	0

yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	SPT_N_30cm	qp_kg_cm2	Location
0	0	0	0	0	0	0	0	0	Safya
0	0	0	0	0	0	0	0	4.2	Safya
0	0	0	0	0	0	0	0	4.2	Safya
0	0	0	0	0	0	0	0	0	Safya
0	0	0	0	0	0	0	50/10	0	Safya
0	0	0	0	0	0	0	0	3.5	Safya
0	0	0	0	0	0	0	0	3.3	Safya
0	0	0	0	0	0	0	0	3.2	Safya
0	0	0	0	0	0	0	0	3	Safya
0	0	0	0	0	0	0	0	0	Safya

:5 Dahab_25

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.633056	32.656111	25	1	-1.0	CH	53	18	35
15.633056	32.656111	25	1	-2.0	CH	0	0	0
15.633056	32.656111	25	1	-3.0	CH	47	19	28
15.633056	32.656111	25	1	-4.0	CH	0	0	0
15.633056	32.656111	25	1	-5.0	CH	74	23	51
15.633056	32.656111	25	1	-6.0	CH	0	0	0
15.633056	32.656111	25	1	-7.0	SC	0	0	0
15.633056	32.656111	25	1	-8.0	SC	0	0	0
15.633056	32.656111	25	1	-9.0	SC	0	0	0
15.633056	32.656111	25	1	-10.0	SC	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	57	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab
0	0	0	0	0	51	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab
0	0	0	0	0	59	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab

:5 Dahab_25

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.633056	32.656111	25	2	-1.0	CH	0	0	0
15.633056	32.656111	25	2	-2.0	CH	0	0	0
15.633056	32.656111	25	2	-3.0	CH	0	0	0
15.633056	32.656111	25	2	-4.0	CH	0	0	0
15.633056	32.656111	25	2	-5.0	CH	0	0	0
15.633056	32.656111	25	2	-6.0	CH	0	0	0
15.633056	32.656111	25	2	-7.0	SC	62	24	38
15.633056	32.656111	25	2	-8.0	SC	0	0	0
15.633056	32.656111	25	2	-9.0	SC	72	22	50
15.633056	32.656111	25	2	-10.0	SC	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	0	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab
0	0	0	0	0	48	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab
0	0	0	0	0	48	0	0	Dahab
0	0	0	0	0	0	0	0	Dahab

!6 Hadad_26

N	E	Serial	BH	Depth	Group_symbol	Att_L_L%	Att_P_L%	Att_P_I%
15.610278	32.653889	26	1	-1.0	SC	50	21	29
15.610278	32.653889	26	1	-2.0	SC	0	0	0
15.610278	32.653889	26	1	-3.0	CH	72	20	52
15.610278	32.653889	26	1	-4.0	CH	0	0	0
15.610278	32.653889	26	1	-5.0	SC	78	21	57
15.610278	32.653889	26	1	-6.0	SC	0	0	0
15.610278	32.653889	26	1	-7.0	SC	79	20	59
15.610278	32.653889	26	1	-8.0	SC	0	0	0
15.610278	32.653889	26	1	-9.0	SC	75	24	51
15.610278	32.653889	26	1	-10.0	SC	0	0	0

N_M_C%	yb_KNm3	yd_KNm3	She_deg	She_C_KNm2	%Pass_sieve	SPT_Blows	SPT_N_Value	Location
0	0	0	0	0	41	0	0	Hadad
0	0	0	0	0	0	0	0	Hadad
0	0	0	0	0	52	0	0	Hadad
0	0	0	0	0	0	0	0	Hadad
0	0	0	0	0	20	0	0	Hadad
0	0	0	0	0	0	0	0	Hadad
0	0	0	0	0	17	0	0	Hadad
0	0	0	0	0	0	0	0	Hadad
0	0	0	0	0	27	0	0	Hadad
0	0	0	0	0	0	0	0	Hadad

Chapter 5
Questionnaire for Oil Tanks Practicing Engineers

5.1 General

This chapter presents the results of questionnaire obtained from engineers who are practicing oil tanks construction in Khartoum state. Because there are a few contractors and engineers in this field of oil tanks only 19 respondents are collected out of 50 questionnaires distributed among engineers in the field of oil tanks.

5.2 Need and Purpose of Study

This chapter summarizes an independent track background study and a main research component of the geotechnical investigation and foundation design of oil tanks and real practice in Khartoum State, Sudan. It describes the approach and efforts aimed to investigate and collect special types of expertspecific data, which aims to analyze design problems associated from geotechnical investigations. This incorporates a comprehensive Questionnaire study that was conducted and analyzed for this State.

In addition to the data collection initiatives for this project, which involved considerable shortcomings in terms of availability, the project study strived to explore all possible approaches to collect and investigate all accessible information for geotechnical research problems for this project.

As a result, the researcher proposed a group of indirect approaches that work in parallel to the traditional, data coding methods to investigate causes and reasons for geotechnical investigations and foundation problems, according to the engineers perspective and guided by experts. Also, the researcher aimed to understand any additional designfoundation issues that could lead to additional important work in this field of oil tank design, which could lead to additional studies or significant improvements, by including other direct and indirect stakeholders' opinions and insights in the analysis phase of this study.

The researcher, therefore, designed and completed a questionnaire survey, which aimed to capture the expert engineers perspectives of geotechnical investigation issues in Khartoum state.

5.3 Survey Objectives

This study aims at investigating the problems of geotechnical investigation and the practice of design foundation in Khartoum state. Also, our goal is to analyze and examine the underlying problems of this issue and suggest treatments to enhance the design and safety. In order to design a successful Questionnaire that would achieve the study goals, the researcher defined a group of objectives that was taken into consideration during the design and data collection phases. The researcher design endeavored to design a questionnaire that would achieve the following objectives:

- Geotechnical investigations practice and problems according to expert engineer perspectives;
- Statistically definethe most significant problems and practice, according to the engineer's own experience and perspective;
- Define solutions for solving problems according to operator perspectives;
- Capture engineers perspectives of their own experience of working in Khartoum and oil tanks design

5.3 Questionnaire Survey Development and Design

A questionnaire survey was carried out among expert in Khartoum State in 2009. A multiple survey approach was used to collect data from experts. One of the main objectives of the current study was to gain in-depth understanding of the geotechnical issues, foundation of oil tanks and operation problems.

Furthermore, it was important to further understand the problematic locations and safety issues from the expert point of view, and lastly to compare these results to the traditional design and safety results.

The questionnaire used in this study consists of different parts that were directed to experts engineers. The expert group was from three sectors, which are state departments, contractors, and consultants engineers whom directly involved in oil tanks design foundation or construction in Khartoum state.

Therefore, it was so important to apply special care while designing the Questionnaire to clearly guide the Audit team and provide them with expert perspectives of the practices, problems and possible solutions and treatment. On the other hand, the survey aimed also to provide the analysts with another perspective of geotechnical patterns and habits.

As a result, the researcher was challenged to design a questionnaire of multi-level purpose and need, and also includes a huge amount of data collected from each subject. On the other hand, the design of the questionnaire also took into consideration a complete understanding of these problematic areas and geotechnical issues, and to provide a mechanism to rank and rate of each problems.

Experts Survey Group: The Questionnaire was designed to target and include groups of professional experts that are involved in the design, build, control, operation or finance of the oil tanks, geotechnical investigation and design of foundation. Therefore, the questionnaire design would include specific questions that acknowledge their experience and expert inputs. The experts' knowledge of the problem, based on their previous work and experience, were expected to provide the researcher with invaluable information that steer the analysis to the most precise answers and solutions;

In addition to the above challenges, this questionnaire incorporated a critical design issue. Therefore, the researcher created a draft Questionnaire design and went through a number of iterations (5 complete iterations) which were revised by different peers and experts, including students, employees, and Sudan University of Science and Technology employees.

The result of the draft and trial phase was a final version of the Questionnaire. The next sections summarize these different sections, and the English versions of the final questionnaire is also included in Appendices Aof this thesis.

5.4 Analysis of the Questionnaire Results

Table (5-1): Profile exploration and soil test

	Frequency	Percent
yes	17	89.5
no	2	10.5
Total	19	100

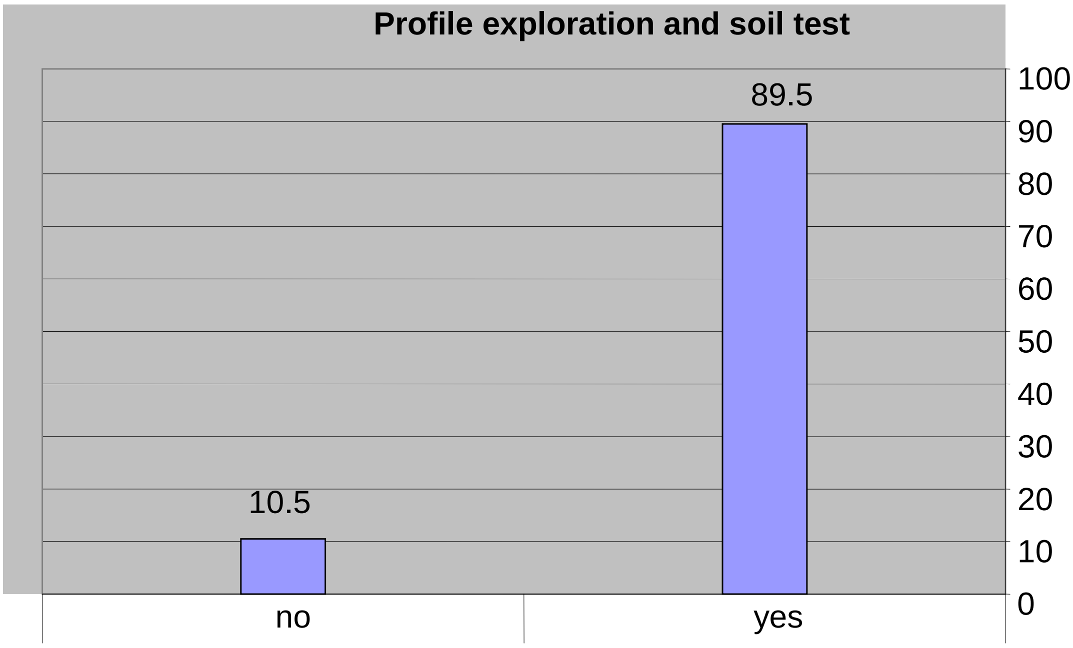


Figure (5-1): profile exploration and soil test

Table (5-2): Type of test

	classification	field density	consolidation	shear
yes	52.6	84.2	57.9	31.6

no	47.4	15.8	42.1	63.2
Total	19			

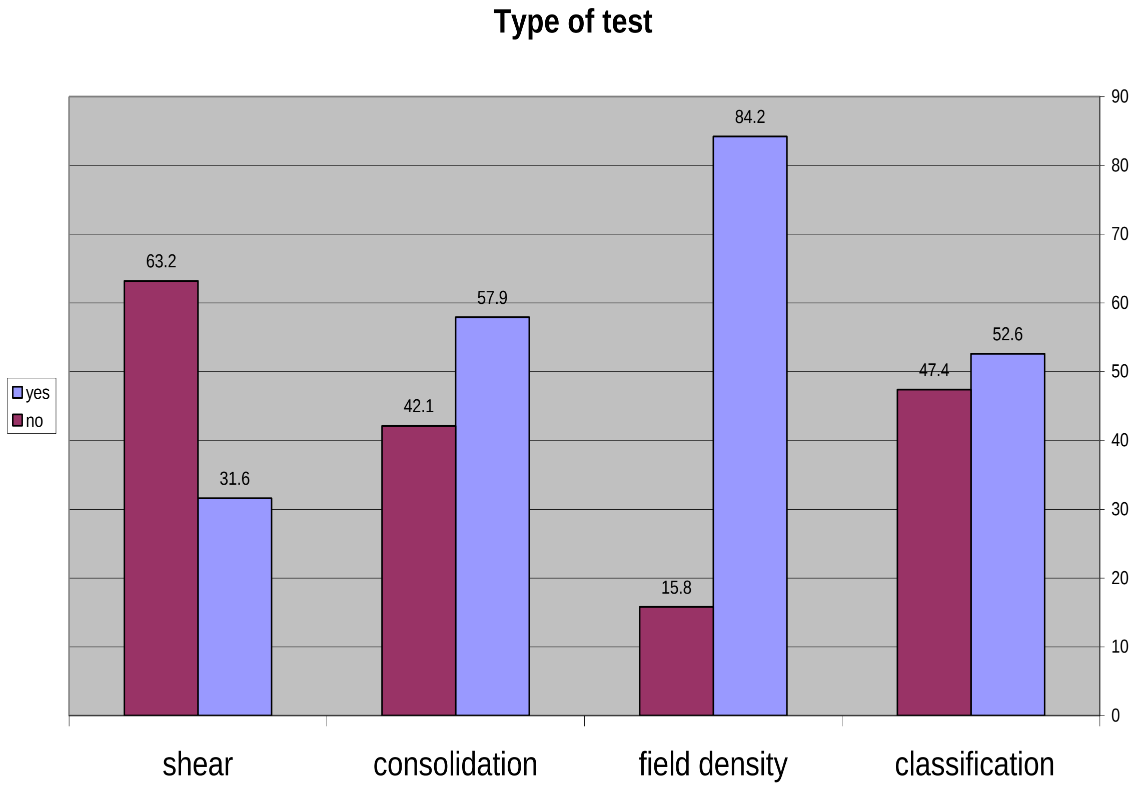


Figure (5-2): types of tests

Table (5-3): Excavation shape

	cylindrical	inverted conical	rectangular	square
yes	68.4	36.8	15.8	36.8
no	31.6	63.2	84.2	63.2

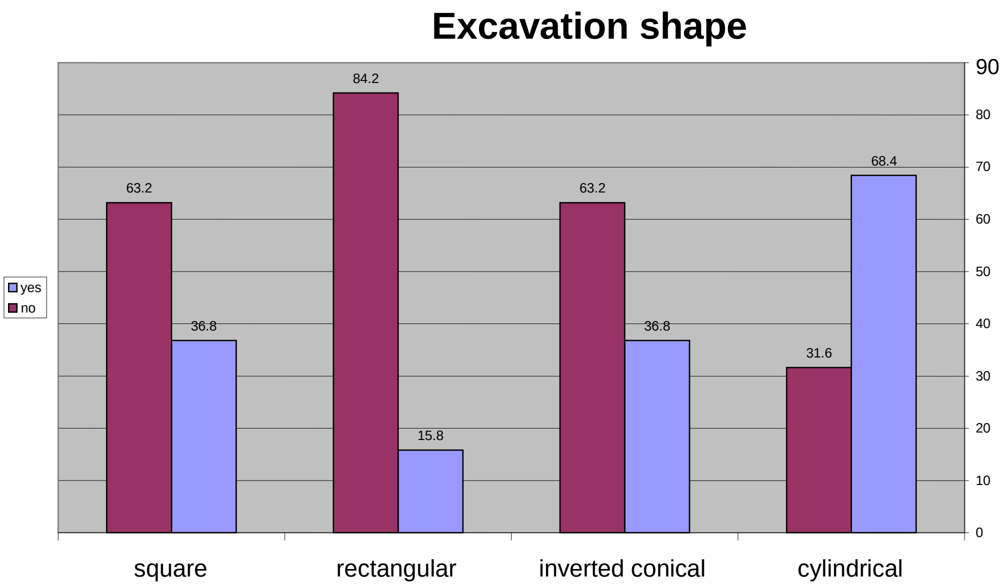
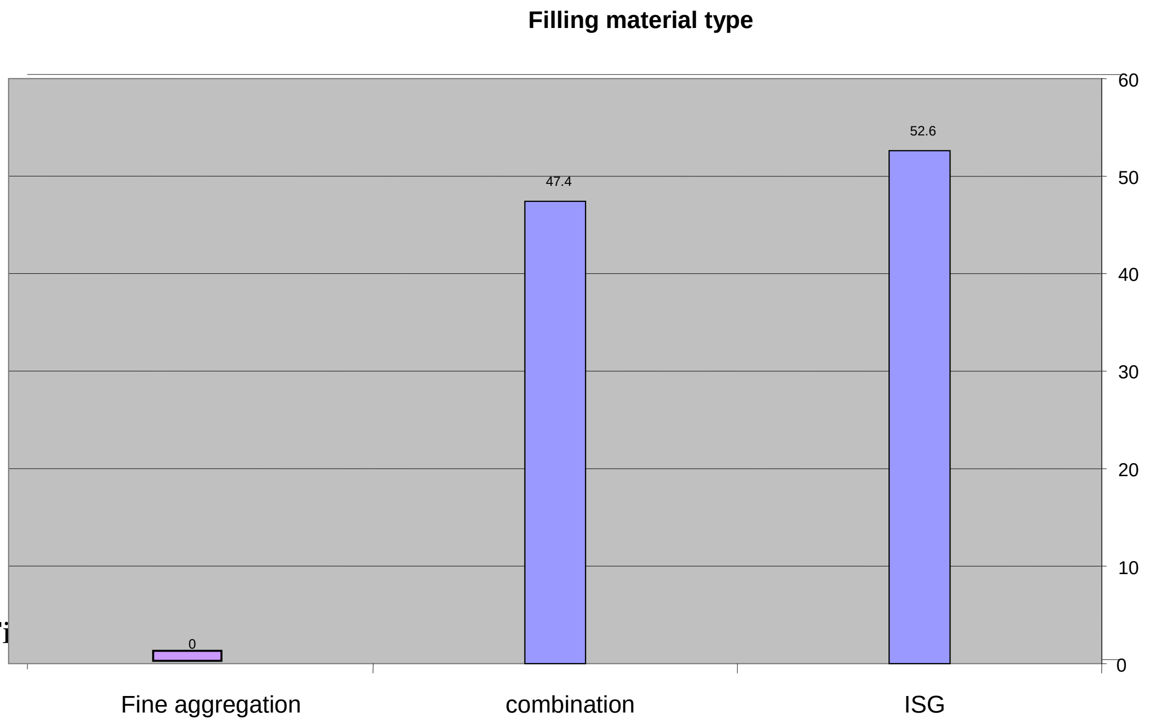


Figure (5-3):excavation shapes

Table (5-4): Filling material type

	Yes	No
ISG	10	52.6
combination	9	47.4
Fine aggregation	0	0
Total	19	100



Fi

Table (5-5): Properties of materials (testing)

	Frequency	Percent
yes	17	89.5
no	2	10.5
Total	19	100

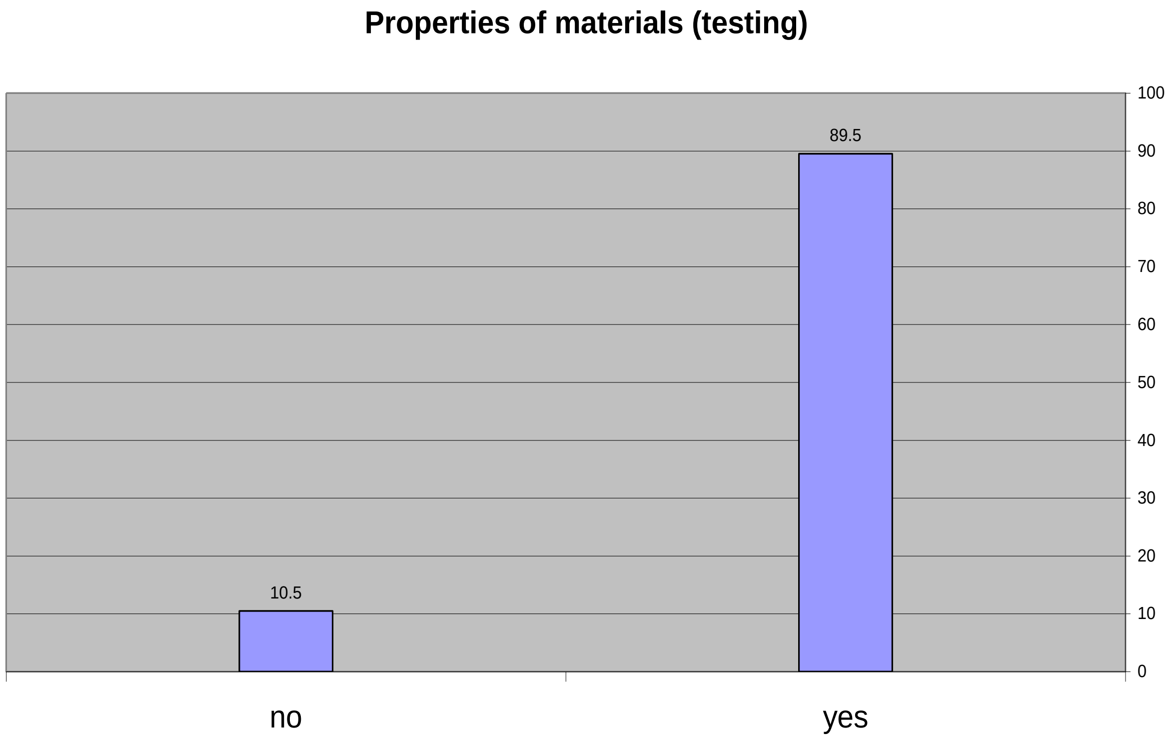


Figure (5-5):properties of materials (testing)

Table (5-6): Total filling layer depth

	Frequency	Percent
200	8	42.1
10	1	5.3
13	2	10.5
15	2	10.5
20	1	5.3
23	1	5.3
25	1	5.3
30	2	10.5
150	1	5.3
Total	19	100

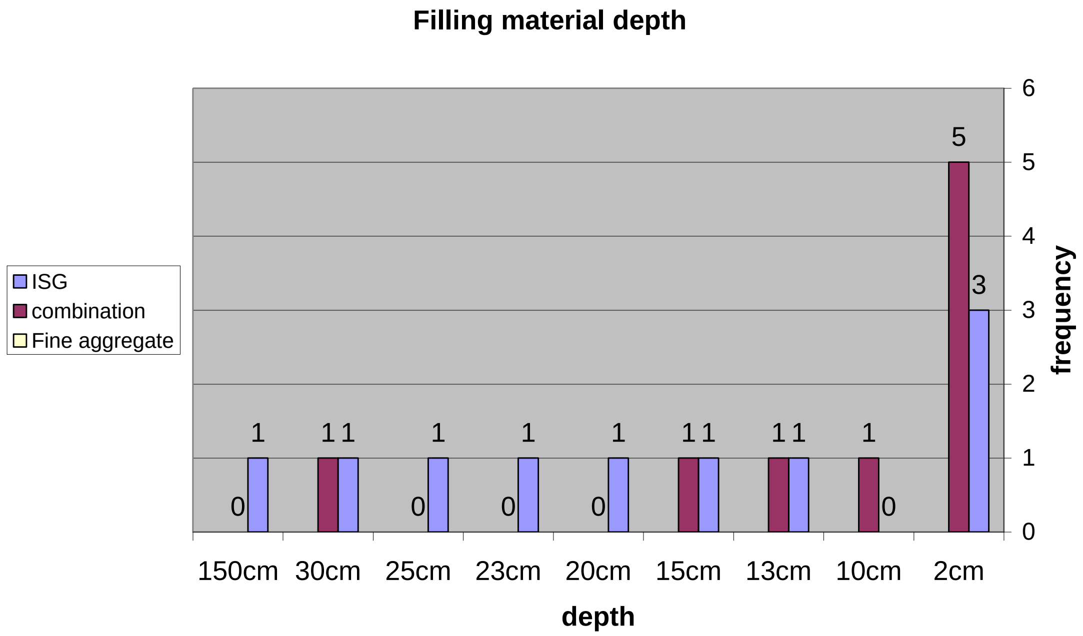


Figure (5-6):filling materials depth

Table (5-7): Large scale

	SD	DD	**Pneumatic**	**Protrusion**
yes	68.4	31.6	26.3	0
no	31.6	68.4	73.7	100
Total	100			

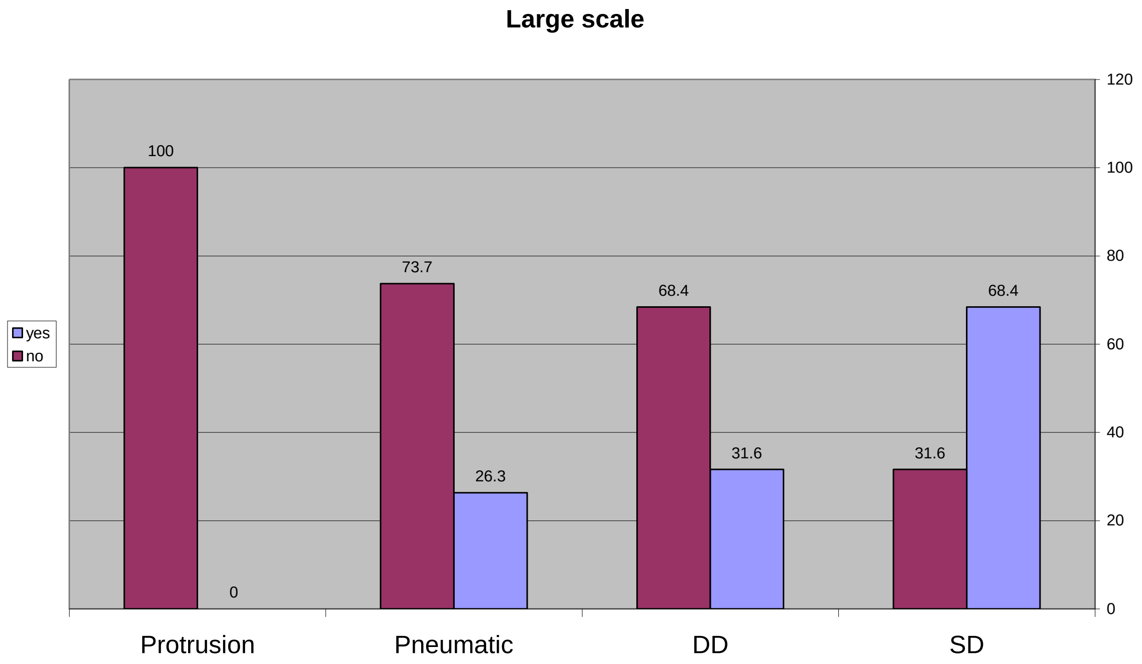


Figure (5-7):large scale

Table (5-8): Small scale

	DC	EC	Manual	Combination
yes	47.4	5.3	5.3	15.8
no	52.6	94.7	94.7	84.2
Total	19	100	100	

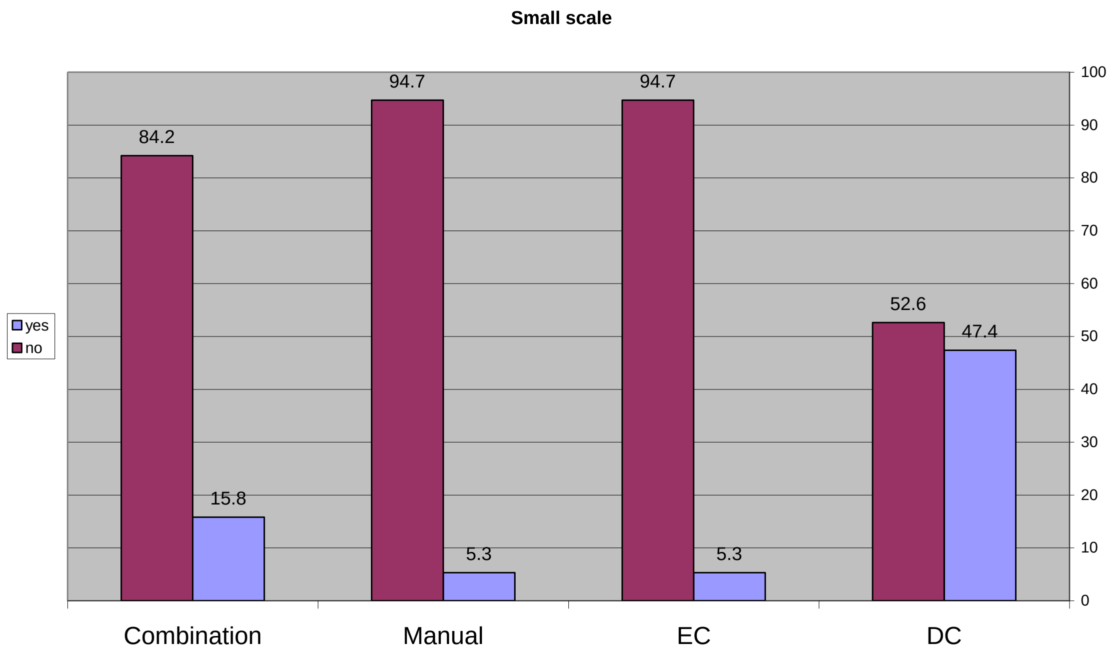


Figure (5-8): Small scale

Table (5-9): Retaining wall referring to

	Frequency	Percent
45 deg. Angle	15	78.9
60 deg. Angle	3	15.8
Total	18	94.7
System	1	5.3
	19	100

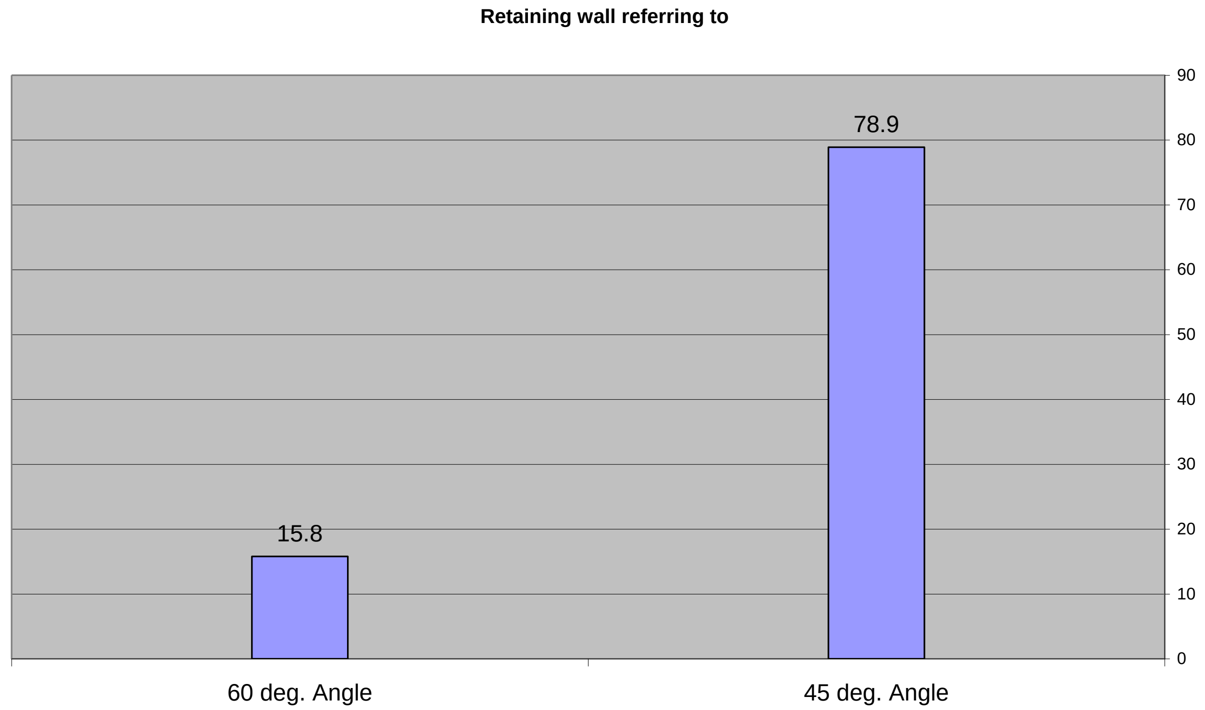


Figure (5-9): Retaining wall referring to

Table (5-10): RC retaining wall

	Frequency	Percent
Insitu cast	19	100
Precast units	0	0

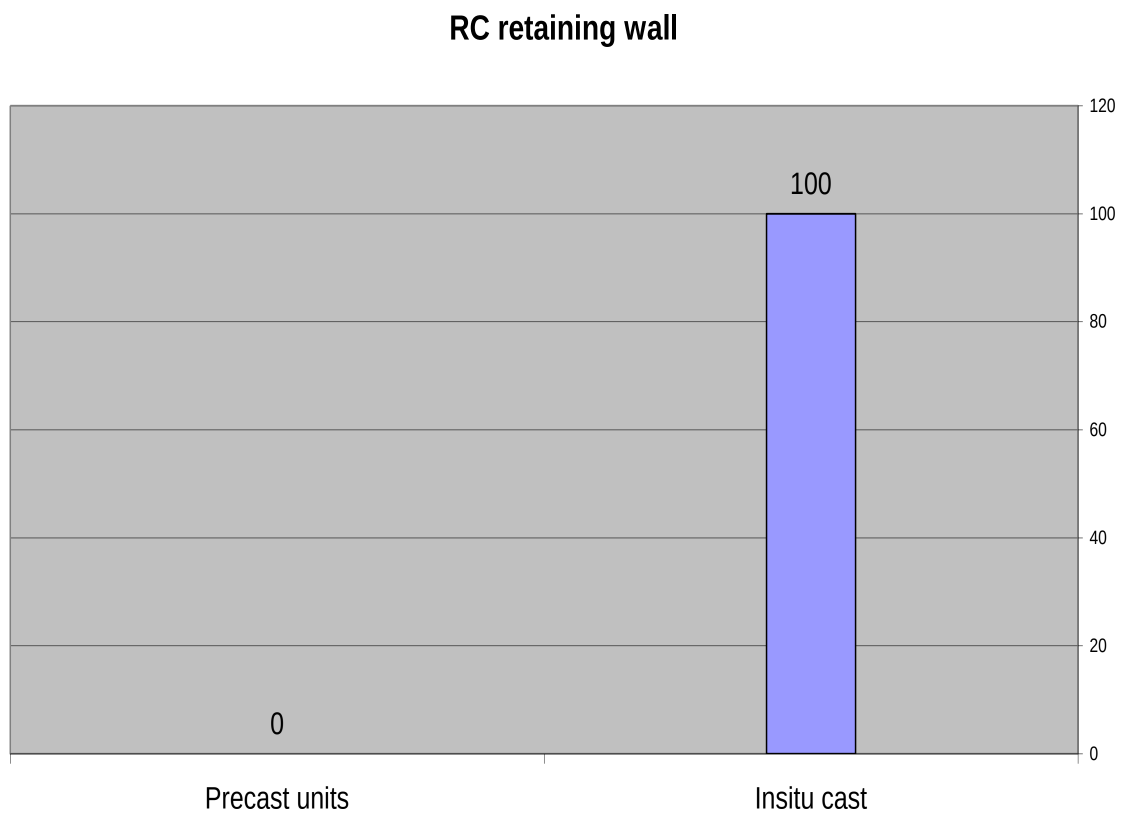


Figure (5-10): RC retaining wall

Table (5-11): Other retaining wall materials

	Ord. red BKW	**H blocks**	**Mud BK**	**Adobe**	Mud
yes	52.6	42.1	10.5	0	0
no	47.4	57.9	89.5	100	100
Total	100				

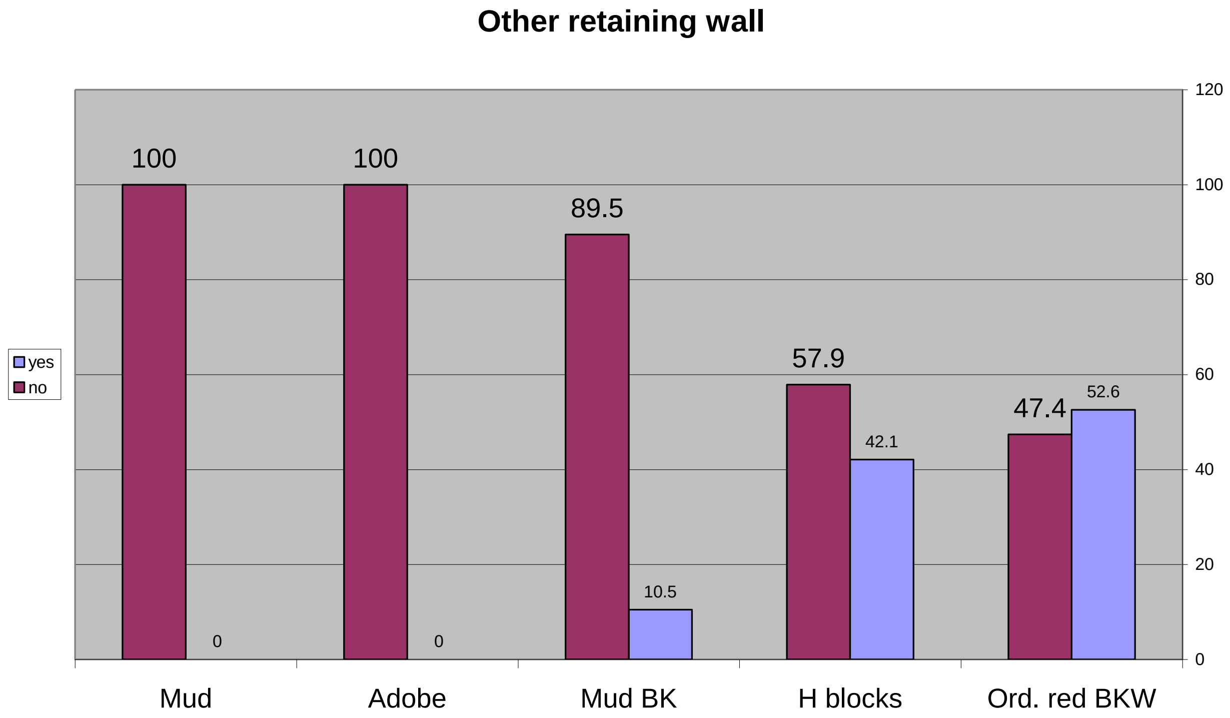


Figure (5-11): Other retaining wall materials

Table (5-12): Difficulties during construction

	Frequency	Percent
yes	12	63.2
no	7	36.8
Total	19	100

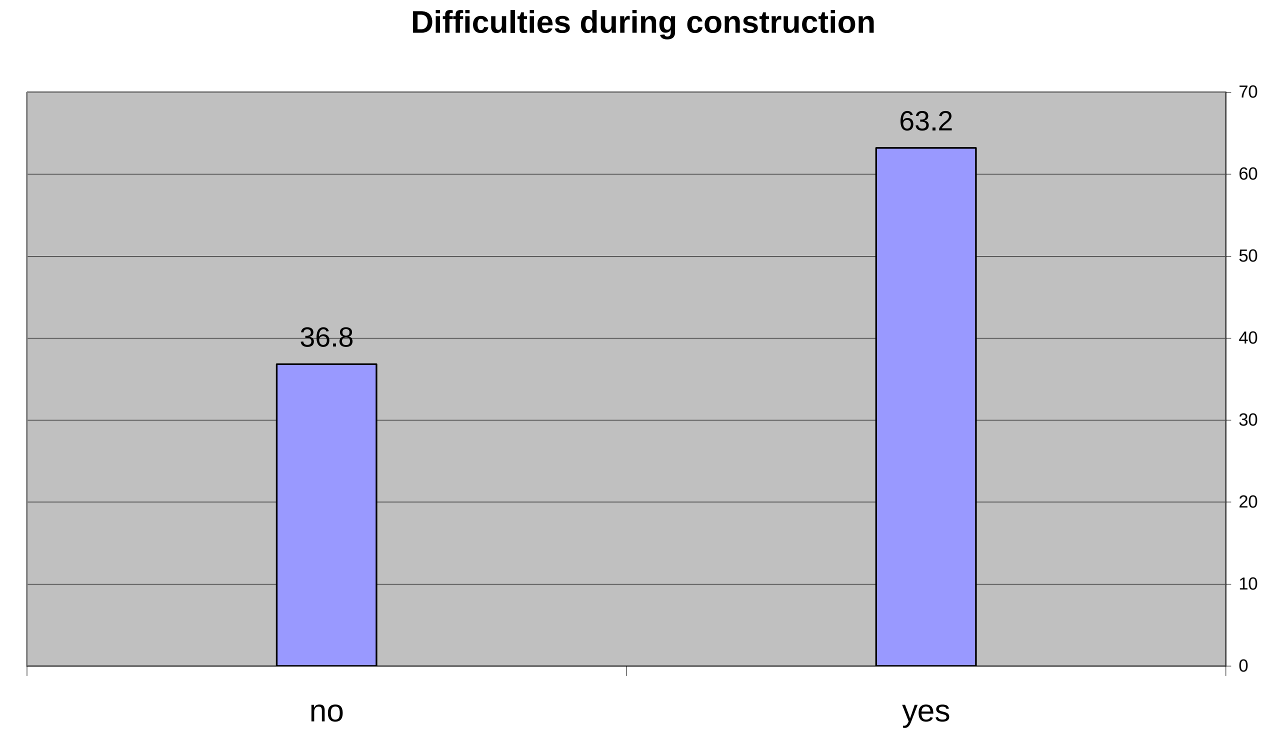


Figure (5-12): Difficulties during construction

Table (5-13): Difficulties

	Materials	**Workmanship**	**Combination**
yes	26.3	42.1	36.8
no	73.7	57.9	63.2
Total	19	100	100

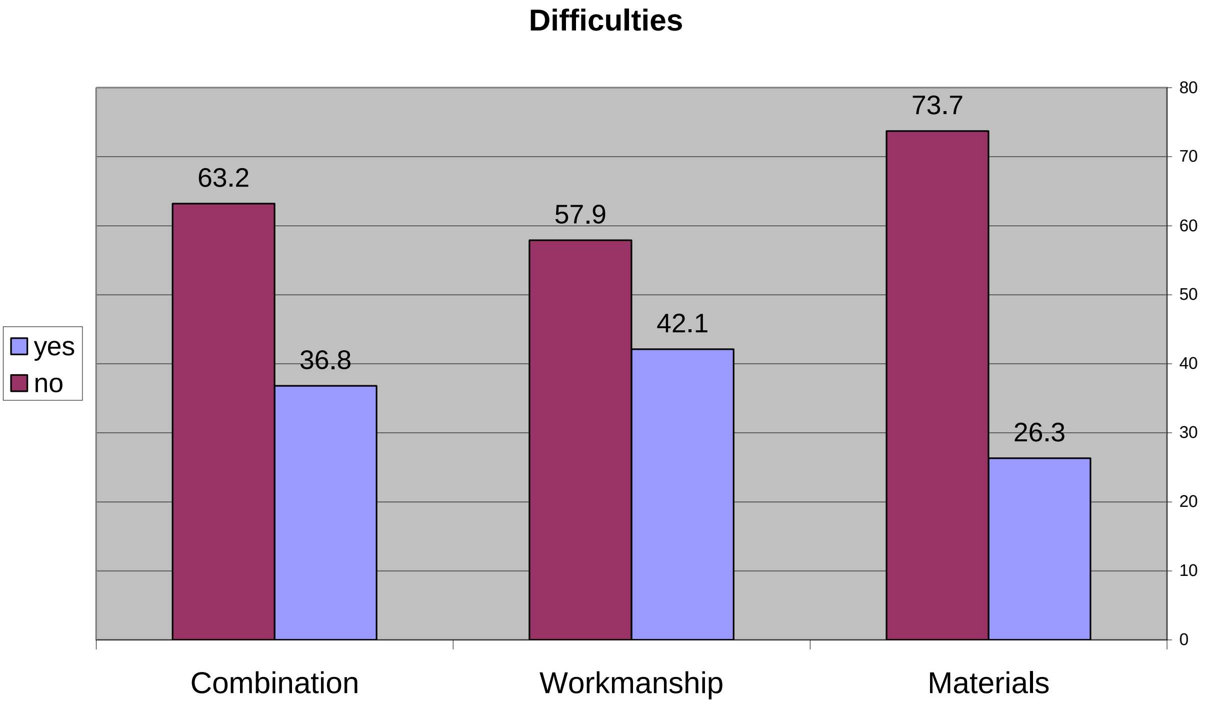


Figure (5-13): Difficulties

Table (5-14): Remarks and Modifications

	Modifications	**Supervision**
yes	31.6	52.6
no	68.4	47.4
Total	19	100

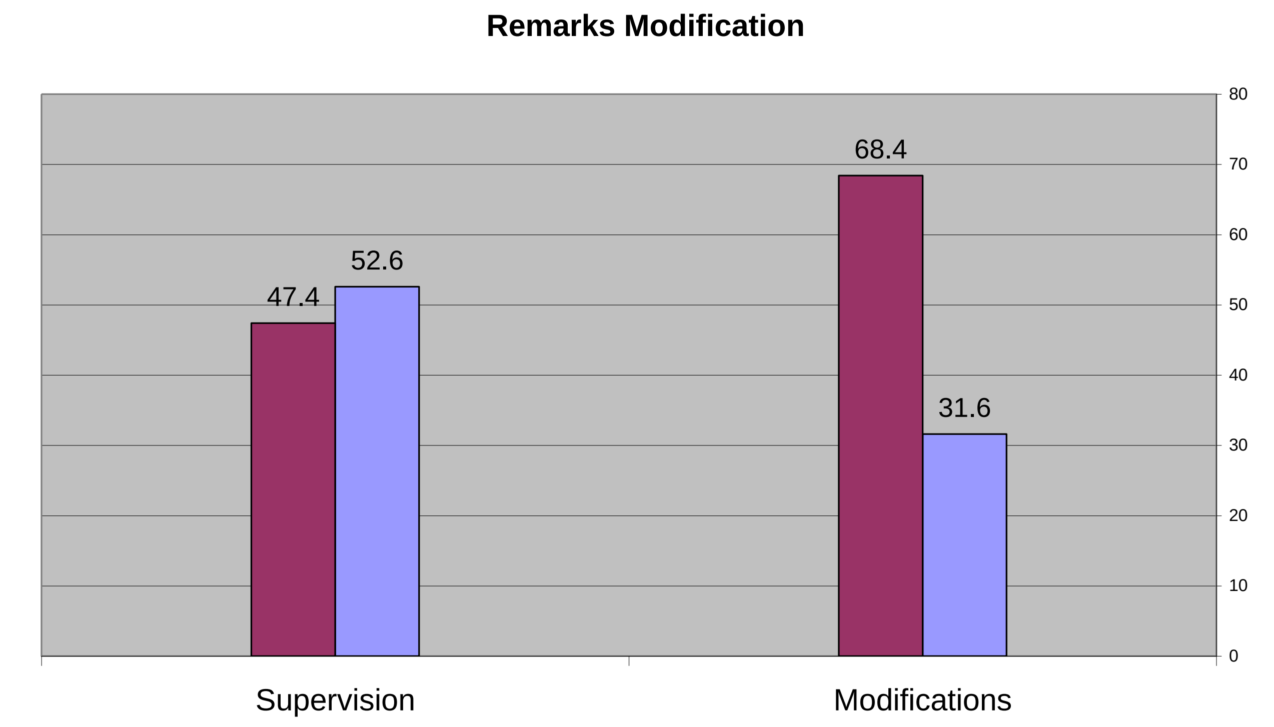


Figure (5-14): Remarks and Modifications

Chapter Six
Analysis and Discussions

6.1 General

Laboratory testing was performed to determine the physical characteristics and engineering properties of the subsurface soils. Results of in situ moisture and dry density tests are presented on the Logs of Borings, Field Exploration, and remaining test results are presented and tabulated in previous chapter 4 at Laboratory Testing Program. The Geotechnical and produced digital maps cover the research area that generally plain and have gradient to Blue Nile and Nile.

6.2 Analysis and Discussion on the test results:

This analysis and discussions for the laboratory tests results and field works investigation performed in selected study area in Khartoum North, Sudan. 107 boreholes with different depth varies from 10m to 25m were drilled in site at different locations to study the subsoil profile. Two borehole at depth of 3 m at Gaili Sumor, and 3 borehole with depth of 5m at North Grain Silo.

Water table has a variable depth that with accordance to Upper Nile and Tana region rain season.

Clay, black cotton soil or expansive soil properties appear at upper two meters at most of KRT N, three meter at Umdom, it extend to ten meter deep at Umdowanban. Silt clay appears at Shanbat, Halfaia, Samrab, Hag Yousif and Kabbashi.

6.2.1 Gradation Analysis

- Results of the tested samples indicate that the soils tested are mainly clay soil with low or high plasticity (CL or CH) up to depth 5m. Between 5m to 10m the soil tends to be sand silt or silt with low plasticity for most of the boreholes tested. Below 10 m the soil mainly poorly graded sand or poorly graded gravel and some location is sandy soil.
- Khafouri Amipharma boreholes give silt soil with low plasticity on top 5 m. Also the top 5m gives sandy clay soil in some location like Droushab, Om-Alqura, Garri, Pony.
- For Algaili boreholes the top layers strata have a soil types of poorly graded sand for the top soil layers and sand silt in some location as shown in the laboratory tests results.

6.2.2Maximum Dry Density and Optimum Moisture Content

- A typical moisture density relationship of the representative surficial soils are provided and summarized in the tables at chapter 4.
- The average moisture content for the tested soil samples range from 13% to 25% in some locations.
- The dry density of the tested soil sample varies according to soil types. Its range from 15kN/m^3 to 19kN/m^3.

6.2.3Triaxial and Direct Shear tests

Triaxial tests, unconfined compression tests and direct shear tests were performed on representative soil samples. They performed to determine their angle of internal friction (ϕ) and cohesion (C). These parameters represents the shear strength parameter which are very useful for the foundation design purposes. Tests were performed on one relatively undisturbed sample and one sample remolded to at least 90 percent relative compaction in soaked moisture conditions. Each direct shear test was performed on three ring samples collected at the same depth with a range of normal loads. Details results of shear tests are provided and summarized in the tables in chapter 4.

The average values of the angle of internal friction (ϕ) range from 4° to 45°. The cohesion value for the tested soils varies from 98kN/m^2 to 307kN/m^2.

6.2.4 SPT Test

The SPT test results reveal that the soils layers have a N value range from 15 to 50 in some locations.

6.3 Summary

Profile exploration and soil test are essential it give bearing capacity, soil stability and foundation depth, rapture of soil strata's moisture content and water table.

Based on the analysis of the soils testes it can be said that for the Khartoum North area the following can examined as a guide for oil tank foundations:

- Rectangular shape recommended where a group of foundation are in a certain row, easy can be prepared using mechanical method.
- Other square, cylindrical and inverted always used in single foundation. Where cohesive soil.

- Inverted conical always utilized and recommendable in single product tank foundation at cohesive or cohesion less soil.
- Classification directly lead to soil physical properties such as filed density, classification, soil mechanical properties such as consolidation shear.
- Stone gravel always recommended as filling material with compaction 100% min..
- Plastic Index (PI) less than 11% for a soil passing sieve 200 - not less than 35%:

i) Filling layers thickness.

ii) Total filling material depth.

- S.D.D. D: single drum and double drum compactors are available and can be used pneumatic capacitor always used where large scale projects.
- Selected diesel compactor DC, EC, combination: used always where seen the utilize mechanical large compactors, manual system used where narrow areas.
- Always recommended both $< 45°$ / $< 60°$ to ensure effect of lateral forces equal to zero.
- Always recommended where designed, and materials of manpower available.
- ORD red BKW hollow black, used always in accordance to material available we should ensure their construction in accuracy without (lateral force effects) and adobe are not recommended or utilized in our country the Sudan
- It was normal when difficulties occur during executing any foundation type difficulties arises in material of workmanship

Chapter Seven

Conclusions and Recommendations

6.1. Conclusions:

From The study which presents an analysis and discussions of the laboratory tests results and field works investigation performed in selected study area in Khartoum North, Sudan. 107 boreholes with different depth varies from 3m to 25m were drilled in site at different locations to study the subsoil profile. Based on the findings and tests results the following points can be concluded:

- Water table has a variable depth that with accordance to Upper Nile and Tana region rain season.
- Clay, black cotton soil or expansive soil properties appear at upper two meters at most of KRT N, three meter at Umdom, it extend to ten meter deep at Umdowanban. Silt clay appears at Shanbat, Halfaia, Samrab, Hag Yousif and Kabbashi.
- Khafouri Amipharma boreholes give silt soil with low plasticity on top 5 m. Also the top 5m gives sandy clay soil in some location like Droushab, Om-Alqura, Garri, Pony.
- For Algaili boreholes the top layers strata have a soil types of poorly graded sand for the top soil layers and sand silt in some location as shown in the laboratory tests results.
- The average moisture content for the tested soil samples range from 13% to 25% in some locations.
- The dry density of the tested soil sample varies according to soil types. Its range from 15kN/m3 to 19kN/m3.
- The average values of the angle of internal friction (ϕ) range from 4° to 45°. The cohesion value for the tested soils varies from 98kN/m2 to 307kN/m2.
- The SPT test results reveal that the soils layers have a N value range from 15 to 50 in some locations.
- Further soil data and registration will give details of soil characteristics and properties. So the term: (foundation depth to be decided on site) will be omitted and deleted later.
- More information regarding product tank foundation practice in our country, will lead systematically to an specified code of practice in the field.

- A certain location designed with (E,N) coordination, soil data and properties can be achieved and derivate by:
    I. Solving two of three instructed lines equations simultaneously.
    II. Creating an elimination procedure using an augmented matrix and will give a real indication of soil strata.

6.2. Recommendations:

From study: recommendations as the following:

- Filling material is the main item of product tank foundation and to avoid any future problems. It should be selected in accordance to lab tests of raw materials and manufactured or produced layers, and furthermore the recommendation of an expert engineer.
- The compaction should be based on: Compaction effort, layer depth or thickness, moisture content, number of passes, execution stages follow up and quality tests
- A close supervision of an engineer required to ensure: Activities, sequence, arrangement material supply and quality, workmanship control, budget and time management.

6.2.1 Recommendations for Future:-

I. Enclosed considerable soil data, ought to be utilized where essential or where needed for future foundation design and construction.

II. Registration of gathered soil information will give an accurate data for design in future.

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