UNIVERSITY OF GHANA

DEPARTMENT OF EARTH SCIENCE

USE OF TRENCH GEOCHEMICAL RESULTS TO DELINEATE SURFACE GOLD MINERALIZATION AT THE APAPAM CONCESSION OF THE KIBI GOLD BELT

BY

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DECLARATION/SIGNATURE PAGE

This thesis is the result of research undertaken by Michael Kwasi Dwumfuor towards the award of MASTER OF SCIENCE IN MINERAL EXPLORATION in the Department of earth science, University of Ghana

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This dissertation has not been published in whole or in part to University of Ghana or elsewhere for a degree.

Michael Kwasi Dwumfuor (1044021)

……………………………………………… Date………………………………..

DEDICATION

This dissertation is dedicated to the Almighty God and also to my late father, Mr. Peter Kenneth Dwumfuor.

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Thanks and praise to the almighty God for giving me the needed health and wisdom to come out successfully with this dissertation. I say thanks to my wonderful supervisors, Prof. F. Nyame and Dr. Johnson Manu, for their constant guidance, tolerance and understanding through the writing of this dissertation.

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ABSTRACT

Twenty five (25) grass root exploration trenches in the Apapam concession in the Kibi Winneba Gold Belt Ghana were used for this thesis. The trenches were sampled and geological features controlling gold mineralization were mapped in detail to better delineate gold –in- soil anomalies delineated during the initial soil sampling exercise carried out. It was also to determine the major features that may control surface gold mineralization in the Apapam concession and to eliminate possible forms of false anomaly associated with surface gold delineation. The Apapam concession was divided into five main zones for the follow up trenching exercise namely: the Big Bend zone, East Dyke zone, South Ridge zone, Mushroom zone of the western ends of the Atewa range and the Cobra Creek zone of the eastern end. Five trenches with varying lengths were excavated in each zone on a 200m interval north west – south east grid. A total of four thousand, seven hundred and sixty nine (4769) trench samples were collected and submitted to the laboratory for gold (Au_ppm) analysis. Major lithologies of the four zones of the western end of the concession were metasediments, mafic volcanics and quartz diorite in contact with the volcaniclastic sediments of the eastern ends of the concession. Lithologically, trenches showed high correlation of gold anomalies in the (granitoids) quartz diorite in the western part of the concession as compare to the metasediments and the mafic volcanics while gold mineralization in the eastern end was strictly confined to the gold bearing volcaniclastic sediments shear.

A careful structural analysis and interpretation was undertaking on each of the five gold zones to help understand and delineate the major structure controls on the concession.

The study showed that the high grade gold mineralization in the Big Bend zone were concentrated in the limbs and nose of the folded quartz diorite respectively while that of the East Dyke zone was found in the Jogs and the pinching sections of the Pinch and Swell diorite . The low grade South Ridge deposit corresponded to a sill which was concordant to the mafic volcanic ridge. The Mushroom zone which showed significant mineralization during the soil geochemistry survey recorded very low grades far below the trench cut -off grade. This shows that, those areas were depositional environments. The soil sampling done in the Mush Room zone were not representative fraction of these zones but rather these soils were transported from areas of good mineralization to these area. The source of mineralization in the Mush Room zone was not in-situ but was as a result of sediment transportation and was termed a false anomalous zone. Alternatively, the super high deposit of the Cobra creek zone was strictly confined to the gold bearing shear with exceptional high value within the intense carbonate alteration zone.

The dissertation concludes that surface gold mineralization in the Apapam concession is influence by lithology, structural intensity, wall rock alteration other than specific rock types. It also emphasizes that exploration trenching is an effective economic follow up tool in delineating surface gold anomalies in the Kibi Winneba Gold Belt.

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CHAPTER ONE

INTRODUCTION

1.1 Problem Definition

The principal objective of geochemical survey is to locate mineral deposits at lowest possible cost. It is therefore necessary to have reliable follow up survey results so that areas with no apparent insitu geochemical response can be abandoned with good confidence. Improper selection of convenient follow up survey tool in gold exploration in the Kibi Gold Belt lead previous exploration companies in delineation of large target areas due to the influence of false anomalies.

Previous exploration companies in the study area relied on auger hand and reverse circulation drilling as main followed up tools after gold –in –soil anomalies have been detected. This lead to misinterpretation of data, sampling inconsistencies , poor quality analytical reports that drives huge geochemical exploration cost and expenditure on areas with ‘’false anomalies ‘’ which was a waist if time and resources.

This dissertation focuses on the use of geochemical trench sampling studies as a an effective economic follow up tool by Xtra Gold Mining Limited as a systematic exploration method in delineating and confirming true soil - in- gold anomalies in the Kibi Winneba Gold Belt.

Trenches were excavated to encounter the saprolite horizon exposing all the possible guides and control on insitu surface gold mineralization which auger and reverse circulation drilling does not. Faults, folds, lithological contacts, veins and wall rock alterations that are hardly seen when such exploration methods are used as follow up were well expose during the trenching programme. The attitudes and orientation of these mineralize controlling features were identified, studied and mapped.

Xtra Gold Mining Limited used this information obtained from trenches in planning further exploration work such as drilling programme, structural mapping and resource modelling activities.

This dissertation therefore determines the features that are prominent in the delineation of surface gold mineralization, exposes some major causes of false anomalies in the Kibi Winneba Gold Belt, confirms the location of truly mineralize grounds in the gold belt in question and confirms that trenching is an effective economic follow-up tool in delineating surface gold mineralization in the Kibi Gold Belt.

1.2 Objectives

This dissertation has the objectives of

- using geochemical trench sample in the delineation of surface gold mineralization
- Determining the relationship between geology and gold mineralization in the Apapam concession in the Kibi gold belt.
- Determining the structures that control surface gold mineralization using trenches
- Determining some the major causes of false anomalies in the Kibi Apapam concession.

- Confirm locations and delineate areas covered by true surface gold mineralization in the Apapam concession.

1.3 Scope of Work

This dissertation is restricted to the use of twenty five trenches, undertaken on the Apapam Concession of Xtra Gold mining limited property, Kibi. The trench sampling was used as a follow up sampling tool to confirm gold in – soil –anomalies in the Kibi Gold Project

1.4 Methods Used

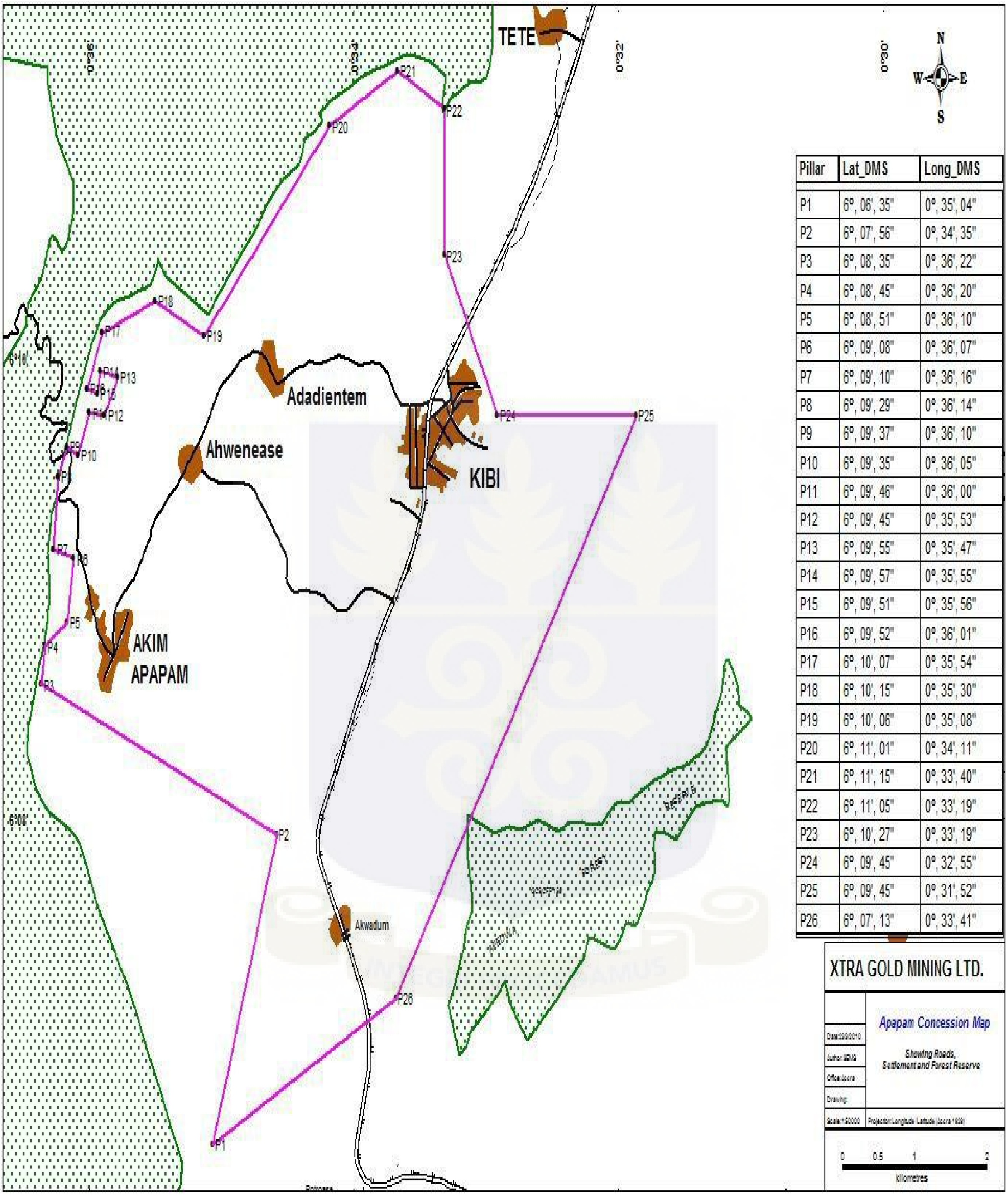
- Literature Review
- Planning of the trench programme
- Collection of data from the field
- Mapping of the Trenches
- Sampling of trenches
- Quality control in trench sampling
- Data analysis and discussion
- Report writing

CHAPTER TWO

LITERATURE REVIEW

2.1 Property Description, Location and Accessibility

The Apapam concession is Xtra-Gold Resources Corp.'s property of merit. The concession comprised of 33.65 sq km or 3,365 ha and is located at the northern extremity of the Kibi Greenstone Belt (the "Kibi Gold Belt"), in the East Akim District, in the Eastern Region of Ghana in figure 2.1. Two asphalted secondary highways provide access to the Apapam concession. Access to the concession is by driving northwest from Accra on the paved Accra-Kumasi Trunk Road which is the main national highway for approximately 75 km until the town of Kibi. A tarred road emanating from the Accra- Kumasi Trunk Road approximately 15 km northeast of Kibi dissects the north-central and south-eastern portions of the Kibi, while the tarred road servicing the town of Apapam provides access to the south-western extremity of the project. Xtra-Gold constructed a number of roads to provide access to the drill sites.



Pillar	Lat_DMS	Long_DMS
P1	6°, 06', 35"	0°, 35', 04"
P2	6°, 07', 56"	0°, 34', 35"
P3	6°, 08', 35"	0°, 36', 22"
P4	6°, 08', 45"	0°, 36', 20"
P5	6°, 08', 51"	0°, 36', 10"
P6	6°, 09', 08"	0°, 36', 07"
P7	6°, 09', 10"	0°, 36', 16"
P8	6°, 09', 29"	0°, 36', 14"
P9	6°, 09', 37"	0°, 36', 10"
P10	6°, 09', 35"	0°, 36', 05"
P11	6°, 09', 46"	0°, 36', 00"
P12	6°, 09', 45"	0°, 35', 53"
P13	6°, 09', 55"	0°, 35', 47"
P14	6°, 09', 57"	0°, 35', 55"
P15	6°, 09', 51"	0°, 35', 56"
P16	6°, 09', 52"	0°, 36', 01"
P17	6°, 10', 07"	0°, 35', 54"
P18	6°, 10', 15"	0°, 35', 30"
P19	6°, 10', 06"	0°, 35', 08"
P20	6°, 11', 01"	0°, 34', 11"
P21	6°, 11', 15"	0°, 33', 40"
P22	6°, 11', 05"	0°, 33', 19"
P23	6°, 10', 27"	0°, 33', 19"
P24	6°, 09', 45"	0°, 32', 55"
P25	6°, 09', 45"	0°, 31', 52"
P26	6°, 07', 13"	0°, 33', 41"

Figure 2.1: Location map showing of Apapam Concession

2.2 Location, Accessibility, Physiology and Geology

2.2.1 Location

The Apapam Concession is located approximately 75 km North West of Accra, in the East Akim District of the Eastern Region of Ghana, on the eastern flank of the Atewa Range near the headwaters of the Birim River (Figure 2.2)

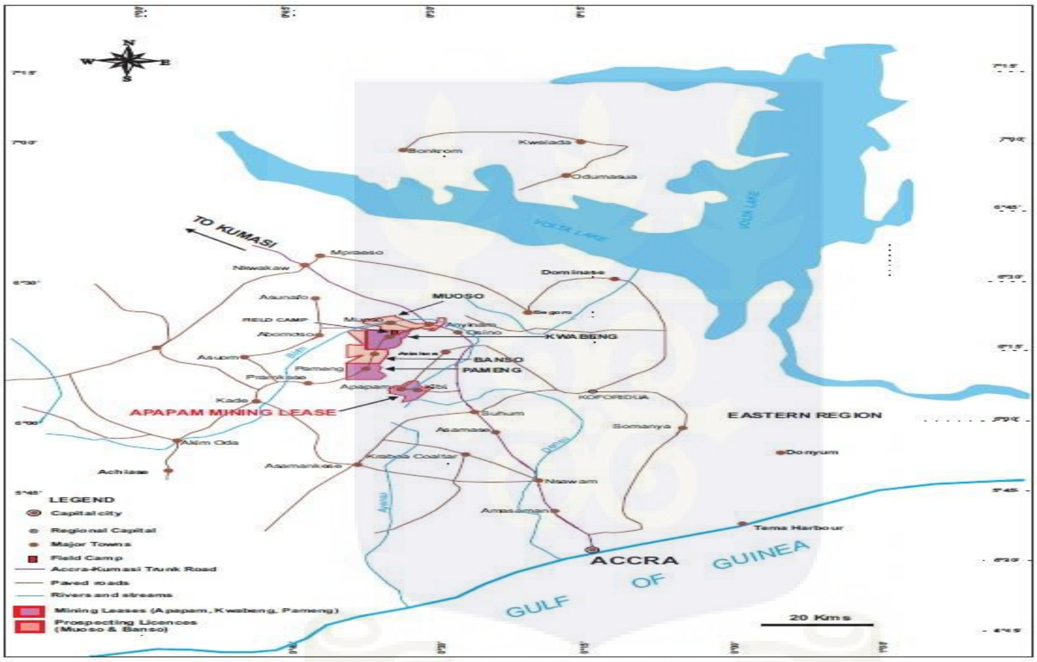


Figure 2.2: Location of Xtra-Gold Concessions, including the Apapam Concession, in south-eastern Ghana showing proximity to Accra.

2.2.2 Geomorphology and Vegetation

Topography is characterized by steep sloping ridges and undulating mountain side hills. The Apapam Concession is dominated by the prominent, NNE trending Atewa Range that is about 50 km long and 10-15 km wide. The steep flanks feature a wide variety of high canopy tropical hardwoods typical of south-western Ghana whereas the summit has a diverse flora, including extensive hanging vines. Relief in most parts of the Apapam Concession is quite modest (10-30 m) but changes abruptly at the base of the steep-sided flanks of the Atewa Range.

The maximum elevation on the Range is about 780 m above mean sea level and stands well above the surrounding lowlands, which are at approximately 180-200 m above mean sea level. The Birim River has its headwaters in the Atewa Range and is one of the sources of water for the local villagers. (Eisenlohr and Hirdes, 1992).

Vegetation on the Apapam Concession consists of low, thick bush and open canopy deciduous trees with occasional zones of moderately dense primary and secondary forest.

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Figure 2.2 a showing typical Vegetation cover in the Kibi Gold belt

Figure 2.2b showing typical elevation in the Apapam concession

2.2.3 Accessibility

Two asphalted secondary highways provide access to the Kibi Gold Project. Via driving northwest from Accra on the paved Accra- Kumasi Trunk Road which is the main national highway for approximately 75 km until the town of Kibi (Figure 2.2)

A tarred road emanating from the Accra-Kumasi Trunk Road approximately 15 km northeast of Kibi dissects the north-central and south-eastern portions of the Kibi Gold Project, while the tarred road servicing the town of Apapam provides access to the south- western extremity of the project. Xtra-Gold constructed a number of roads so that 4WD tracks could access the drill sites.

2.3 Regional Geology of Southern Ghana

The geology of south-western Ghana is dominated by the Paleoproterozoic Birimian Supergroup. This supergroup is dominated by of a series of metasedimentary basins alternating with metavolcanic belts. The basins and belts extend approximately 200 km along strike usually with a NE-SW trend (Figure 2.3).

The geological evolution of the belt commenced with stabilization of the crust followed by an episode of rifting and incipient ocean floor spreading. Rifting gave rise to the formation of tectonically active basins and micro-plates. Along plate margins, volcanic island arc complexes were formed. Volcaniclastics associated with the island arc complexes, along with sediments derived from uplift and erosion of the craton margins, fed the elongated basins. Rifting was followed by shortening during the Eburnean Orogeny in which the island arc and basinal assemblages were deformed. Under the compressional regime, the basinal sediments were folded and the island arc assemblages migrated along major thrust faults. Later deformation gave rise to major wrench faults, which occurred preferentially at the margins of the volcanic belts and basins.

These faults trend northeast-southwest and were similar in genesis and characteristics to the Asankrangwa Fault within the Kumasi Basin. The faults have a strike extent exceeding 200 km and control the location of many granitoids in the basin. The margins of the belt and basin commonly exhibit faulting on local and regional scales. These structures are of fundamental importance in the development of gold deposits in the region.

Syn- and post-tectonic granitoids intruded both the metasediments and metavolcanics of the Birimian Supergroup as a result of the Eburnean Orogeny. The granitoids can be broadly grouped into two (2) types; namely Basin and Belt types. Basin granitoids intruded the metasedimentary basins, whereas Belt granitoids intruded the volcanic and volcanosedimentary assemblages in the belts.

Uplift and erosion, prior to the final stages of deformation, resulted in the deposition of intracratonic sediments; the Tarkwaian Supergroup, which unconformably overlies the Birimian Supergroup. The contact between the Tarkwaian and Birimian Supergroup is always tectonic and may represent migration of the Tarkwaian along major thrusts.

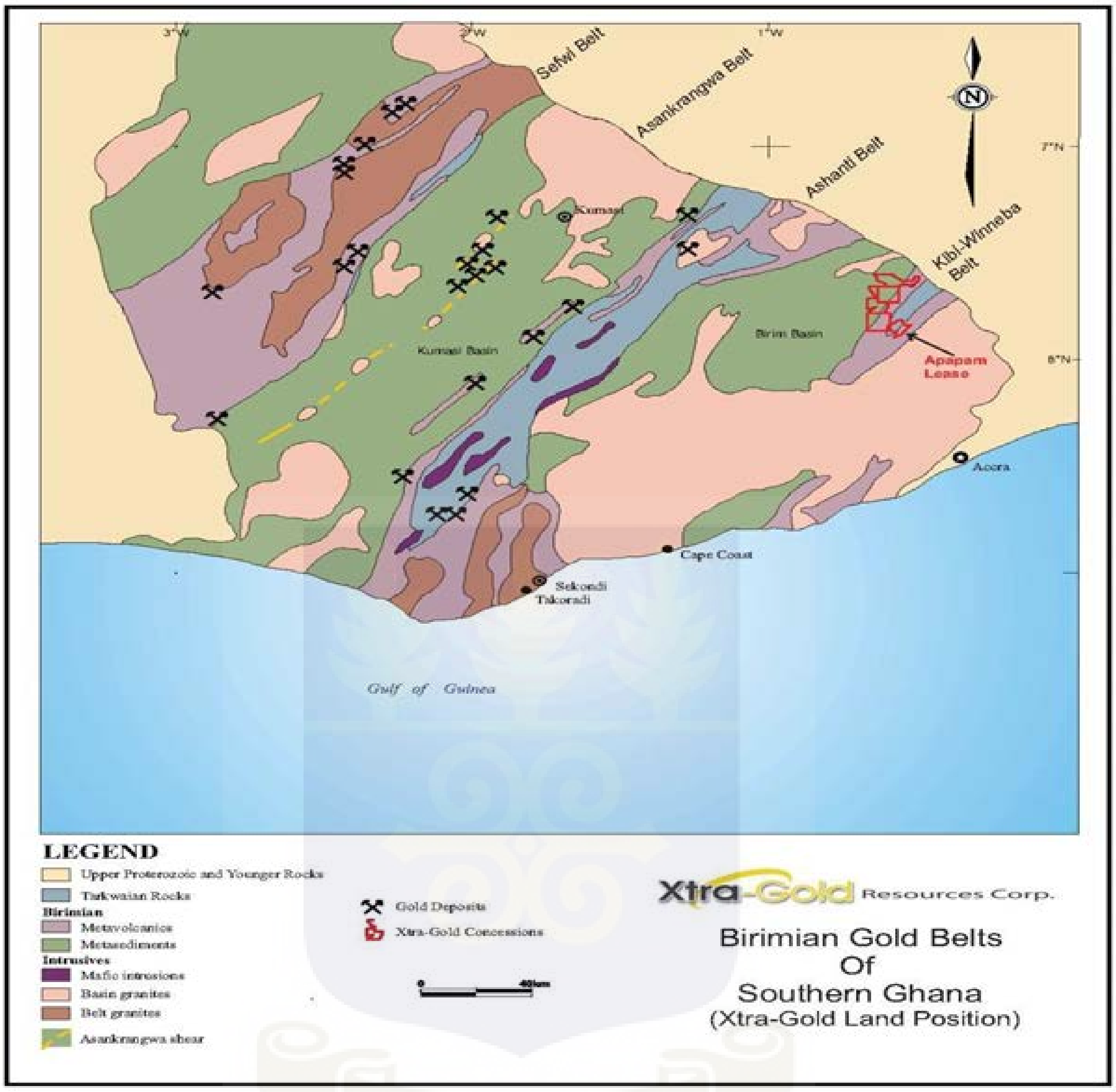

Figure 2.3: Geological map of southern Ghana showing metasedimentary basin (green), metavolcanic belts (purple), basin granitoids (pink) and belt granitoids (red).

2.4 Geology of the Kibi Belt

The Kibi Gold Belt is the easternmost of the Birimian metavolcanic belts in southern Ghana. It is located east of, and parallel to, the prolific Ashanti Gold Belt, which hosts many of Ghana's active producing gold mines. The NE-trending Kibi greenstone belt is approximately 60 km long. Its southern extremity is truncated by a large granitoid batholith, whereas its northern extremity is overlain by younger, flat lying sediments of the Pan-African Voltain Supergroup. The Kibi Belt appears to have gradational margins with the adjacent Birim River Basin. It is generally accepted that the Kibi Gold Belt and the Winneba Belt, located to the southwest in the Cape Coast area, formed one continuous volcanic belt at one point, which was severed by late Eburnean granitoid batholiths (Figure 2.3).

The geology of the Kibi Gold Belt is not as well established as the other Birimian greenstone belts of Ghana, due to the poor exposures, limited government survey mapping, and the lack of exploration activities. General property area geology is summarized from Griffis (1998) and Griffis et al (2002), and a Kibi Gold Belt geology map is provided in Figure 2.4

The property area is topographically dominated by the steep-sided Atewa Range exhibiting a relief of approximately 500 m with the surrounding valleys; with its flat summit attaining an elevation of approximately 780 m above sea level. The Atewa Range is underlain by NE-trending Birimian units described as greenstones (altered basalts and andesites), phyllites, meta-tuffs, epi-diorite, meta-greywacke and chert. The broad valleys are underlain by thick sequences of metasediments (greywacke, argillite, and phyllite).

The north-western extremity of the Atewa Range is the type-locality for the Birimian metasediments and metavolcanics.

Regional traverses and airborne geophysical data indicate the presence of extensive volcaniclastics with narrower bands of mafic flows and mafic sills. Numerous, small, radiometrically inferred plutons of Belt-type intrusives appear to be emplaced within the belt; and several northeast-elongated bodies of Basin-type intrusive are inferred within the metasediments along the western margin of the belt. The Belt-type granitoids of southern Ghana are most commonly of diorite to granodiorite composition, while the Basin-type granitoids are of granodiorite to granite composition. The Belt-type granitoids were emplaced earlier as subvolcanic plutonism between 2179 and 2136 Ma (Hirdes et al, 1992); while the Basin granitoids were emplaced mostly during the Eburnian Orogeny, between 2116 and 2088 Ma (Oberthür et al, 1998).

The belt exhibits a number of regional NE-trending structures inferred from airborne geophysical data and the topographic patterns. The topography also suggests several cross cutting features along several of the major valleys on the flanks of the Atewa Range. Some of these inferred structures correspond to valleys hosting significant alluvial gold occurrences which may be indicative of primary lode gold sources. Recent

Syn-depositional models for the basin and belt units suggest that the belt is an overturned antiformal structure with a major northeast-trending reverse fault (dipping northwest) along the eastern flank of the range (Eisenlohr and Hirdes, 1992).

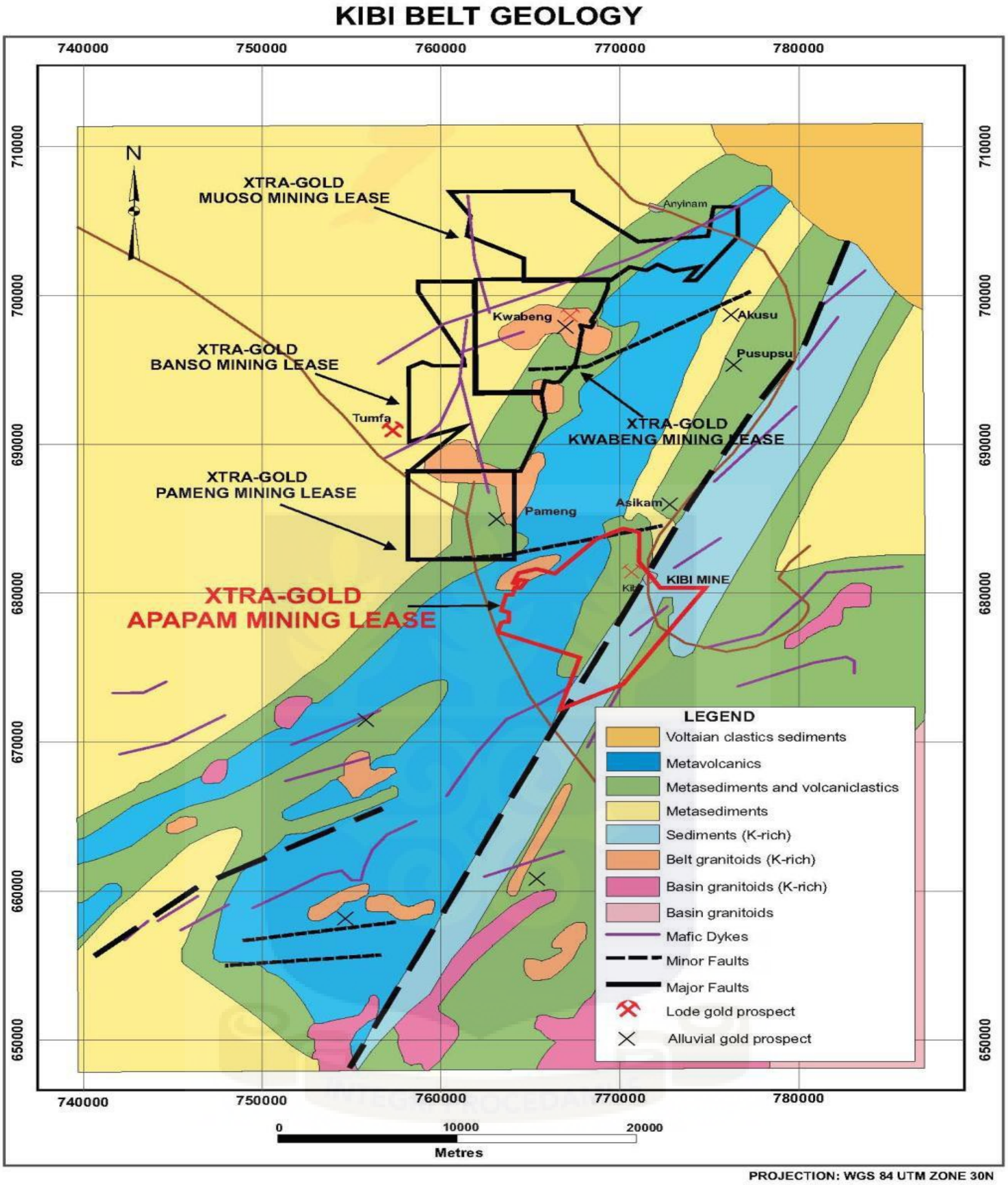

Figure 2.4 showing the geology of the Kibi Belt

2.5 Local Geology

The most recent Kibi Greenstone Belt geology map (Figure 2.4) is based on regional geological survey traverses and airborne geophysics interpretation (aeromagnetic and radiometric). This map indicates that the concession is underlain by a series of NE-trending, Paleoproterozoic Birimian units. These including an extensive metavolcanic sequence dominating the north-western portion of the concession, a central metasedimentary and volcaniclastic rock package, and a potassium-rich sedimentary rock unit along the south-eastern margin of the concession. A regional, NE-trending structure is interpreted to dissect the central portion of the property, along the contact between the metasediment/volcaniclastic and potassium-rich sediment units. An ENE-trending, radiometrically inferred body of belt-type granitoid appears to be present along the north-western margin of the property. NE-trending mafic dykes and sills of Mesozoic age also intrude the Birimian stratigraphy.

The Birimian stratigraphy is intruded by widespread sills, dykes, and possibly small plutons of granodiorite, quartz diorite, and tonalite. Granitoid sill/dykes exhibit highly variable dip attitudes and 3D geometry so additional work is required to define their true- width and orientations.Similarly, insufficient work has been conducted to determine if the numerous, variably trending, granitoid bodies identified to date represent fold and/or fault-related repetitions or distinct bodies; however individual granitoid sill/dyke segments have been traced to distances of up to approximately 225 m. Some granitoid bodies with presently undefined margins (open-ended) may represent small plutons.

Several N to NE-trending, steeply E to SE dipping shear zones, which appear to have developed contemporaneously with the Eburnean deformation event, occur in Zone 2, including: a shear zone developed along the contact of a quartz diorite body. It consists of\

1.5 m wide graphitic zone within phyllites at the zone’s eastern extremity, and a wide high- strain corridor in the tonalite body at the zone's western extremity.

Shears and veins appear to have formed during northwest directed thrusting. A SE over NW reverse sense of shear is indicated by the following structural observations: steeply plunging mineral lineation in sheared metasedimentary rocks indicative of dip-slip movement; rotation of foliation into shear zones in metasedimentary and mafic metavolcanic rocks indicative of SE over NW movement; and shallow-dipping extensional veins associated with steeply dipping fault-fill veins in granitoid bodies indicative of reverse sense of shear.

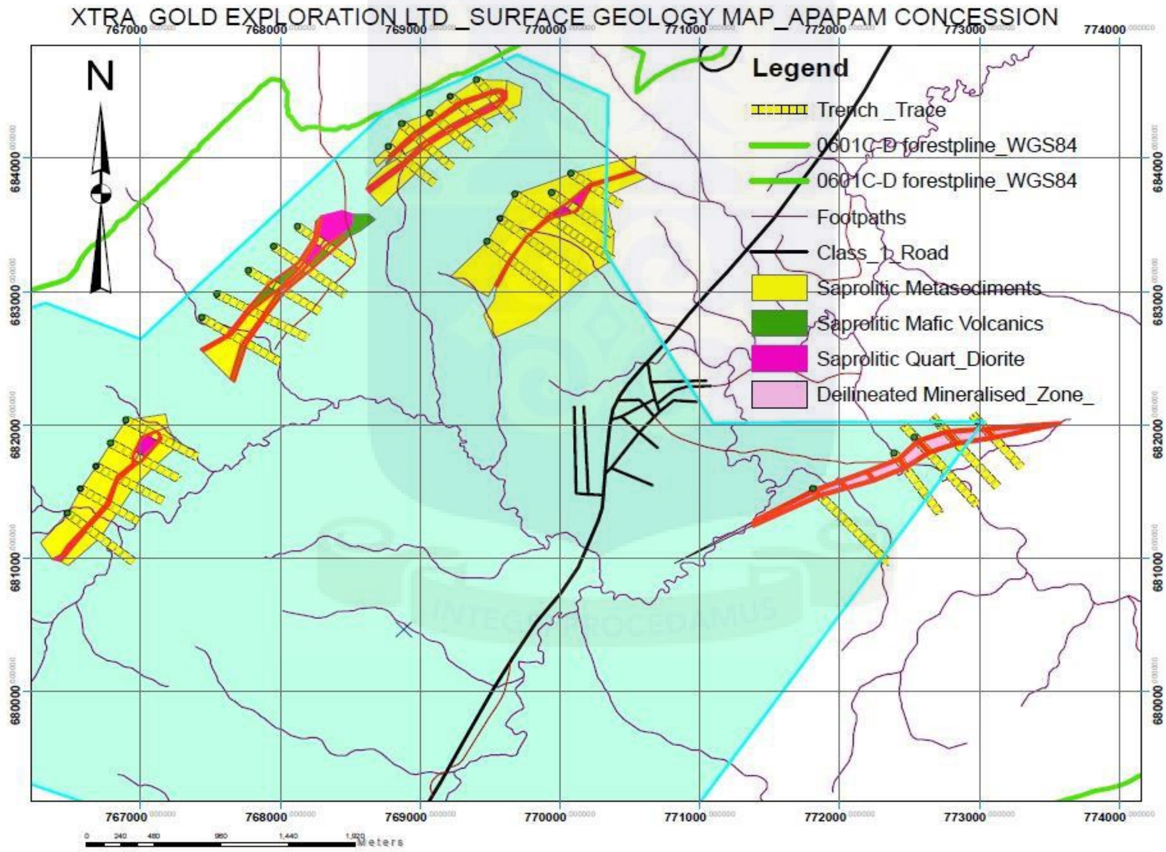

Figure 2.5 Map showing Local geology mapped by Xtra-Gold geologists in the north-western part of the Apapam Concession

2.6 Soil Geochemistry

In early 2008 and 2.1 km of baselines were established. The expanded grid now covers the entire north-western. The Apapam Concession grid was expanded to provide control for follow-up soil sampling and geophysical surveys total of 54.45 line-kilometres of cross-lines (sample lines) portion of the concession with a total of 78.8 line-kilometres of SE-trending cross-lines extending along a 6.1 km baseline.

An extensive soil geochemistry survey was undertaken on the Apapam Concession to provide detailed (100 m) soil sampling coverage of the gold-in-soil anomalies yielded by the Phase I (2006) work program and the bedrock gold occurrences identified in the 2007 trenching, and for reconnaissance (200 m) soil sampling to follow-up on anomalous gold- in- silt samples identified in streams at the south-western extremity of property during the 2006 regional exploration program. A total of 1,827 soil samples were collected at 25 m station spacing along 46.975 line-kilometres of cross lines. Including the Phase I (2006) work program, a total of 2,859 soil samples have been collected on the Apapam Concession. Grid establishment and soil sampling methodology is provided in Section 12.1 and Section 12.2, respectively.

The anomalous threshold for the soil sample results was arbitrarily set at 75 ppb gold based on past exploration experience by Xtra-Gold in the Kibi Greenstone Belt. A total of 666 (23%) out of the 2,859 soil samples returned gold values greater than the 75 ppb anomalous threshold, including: 253 (9%) samples from 76 ppb to 100 ppb gold; 297 (10%) samples from 101 ppb to 250 ppb gold; and 116 (4%) samples above 251 ppb gold (11,410 ppb Au maximum). The expanded Apapam Concession soil survey outlined an approximately 5.5 km long, NE-trending, anomalous gold-in-soil trend ("Apapam Concession gold-in-soil trend") characterized by several clusters of anomalous sample values (Figure2.6).

The typically NE-trending clusters are defined by discontinuous/patchy, greater than 75 ppb gold, anomalous gold-in-soil envelopes ranging from 50 m to 250 m by 900 m to 250 m – ,200 m by 2,500 m in area, Griffis et al (2002)

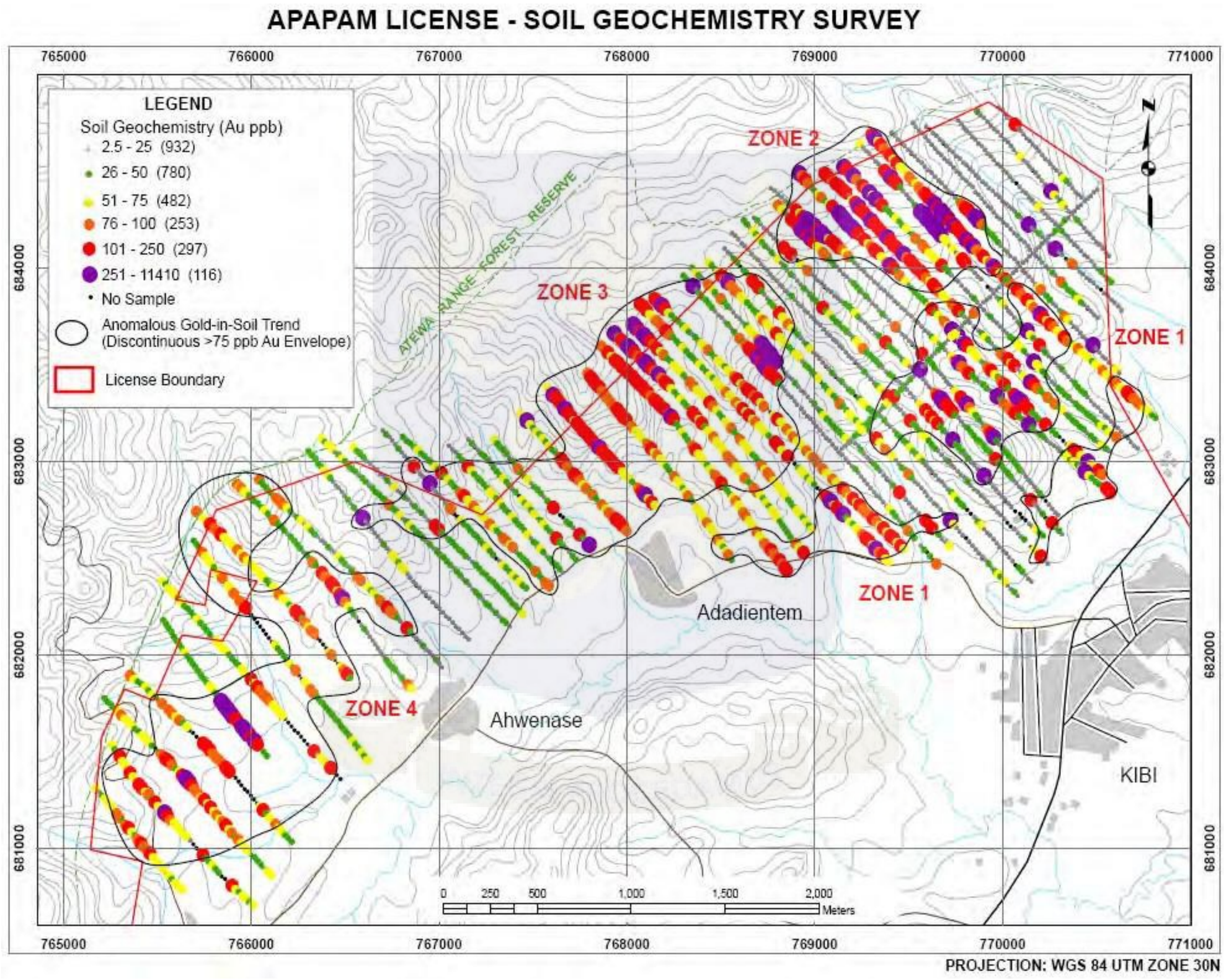

Figure 2.6: Soil Geochemistry Survey showing zone 1 _4 zone

The Apapam Concession gold-in-soil anomalies are considered significant based on the fact that in Ghana soil geochemistry values greater than 50 ppb gold can normally be considered anomalous (Griffis, 2002). For instance in the Obuasi gold camp, AngloGold-Ashanti reportedly follows up all soil anomalies greater than 50 ppb gold by trenching or drilling. At the Ahafo mine project, gold-in-soil anomalies in the 100 ppb to 200 ppb range led to multimillion ounce gold discoveries (Griffis, 2002).

2.7 Trench Sampling

Trenches or costeans are usually employed to expose steep dipping bedrock buried below shallow overburden, and are normally dug across the strike of the rocks or mineral zone being tested. Trenches are an excellent adjunct to RAB or RC drilling programs, where the structural data from trench mapping are needed to complement the lithological information obtained from the drill cuttings. In some cases, it may be possible to completely strip shallow unconsolidated overburden to expose large areas of bedrock. The bedrock can then be mapped and sampled in great details. Since the process is environmentally destructive, and rehabilitation would be expensive, extensive stripping would normally be attempted when a prospective mineralized zone had been defined, and special sampling and geological problems were present that needed this kind of 100% exposure for their resolution.(Nartey,2010)

In areas where soil cover is thin, the location and testing of bedrock mineralization is made relatively straightforward by the examination and sampling of outcrops. However in locations of thick cover such testing may involve deep sampling program by pitting, trenching, or drilling. Trenching forms the simple stand least expensive method of deep sampling but is much more costly below the water table. Trenching is usually completed at right angles to the general strike to test and sample overlong lengths, as across a mineralized zone. Trenches and other forms of excavation are used in exploration work to establish the surface trend, width and mineral character of an ore body or mineralized zone. Many types of ore weather readily at the surface, and these surface effects may need to be removed if the true character of the mineralization is to be determined. Once an anomaly has been found during reconnaissance sampling and a possible source identified, it is necessary to define that source by more detailed sampling, by highlighting areas of elemental enrichment, and eliminating

background areas until the anomaly is explained and a bedrock source, hopefully a drilling target, proven. Trenches can be dug by bulldozer, by excavator, by back-hoe or even by hand. Excavators and back-hoes are generally much quicker, cheaper and environmentally less damaging than bulldozers, and because these are nowadays the preferred option for costeaning. A large excavator can match a bulldozer in its power to dig rock. Back-hoes are relatively light machines suitable for digging narrow trenches. Back-hoe trenches are difficult or impossible to enter and back-hoes are really more of a geochemical sampling tool than a geological tool. When digging a trench, an excavator that can dig a trench of at least 1 m width and that is capable of penetrating a minimum of 1 m into recognizable bedrock should be used. It is very hard to observe details of geology on the walls of trenches that are smaller than this. Continuous trenching machines, which can rapidly cut a narrow (around 20 cm) trench to 1-2 m depth in soft material, have also been used in exploration for providing a continuous geochemical sample.

These trenches are generally of little use for anything other than basic lithological mapping. Hand-dug trenches are a valid option in places where power excavation equipment cannot be brought to a remote site, and abundant cheap labour is successfully employed in order to locate the source of anomalous float boulders or stream sediments geochemical anomalies. These trenches are long continuous notches, or incised tracks, cut along the contours of steep slopes. They can expose narrow strips of weathered bedrock along their inside edge. The exposed bedrocks can be geologically mapped and channel sampled. The trails provide convenient access to the property and they are readily surveyed using tape and compass. Contour trenches cause less environmental damage than trench that run across the slope since in high rainfall areas the latter tend to become damage channels that focus erosion. The length of the trenches will vary according to the soil geochemical soil anomaly but most will be in the range of 25-300m.

2.7.1 Safety and Logistics in Trenching

When digging a trench, attention to the following make subsequent mapping and sampling much safer and more convenient.

- Cut both sides of the top of the trench for one bucket width and to a depth of 50-100 cm. This prevents loose unconsolidated surface material from falling into the trench (and on the head of any geologist)
- Stack all topsoil and any loose surface material from the trench on one side of the opening; stack all bedrock material to the other side. This facilitates making a quick assessment of the trench material from the bedrock spoil heaps and will and will permit a bulk sample to be taken if required. When re-filling the trench the spoil should be repeated in reverse order so

that the topsoil is preserved on top.

- If the trench is deep (i.e. cannot be easily climbed into and out of) and more than 50 m long, provide an access ramp at its midpoint.
- Most trench wall collapses take place in the first few hours after digging or else after heavy rainfall. With deep trenches, it is therefore advisable to leave them for at least 24 hours before entering and not to enter them immediately after rain.
- In any case, never enter a deep trench unless accompanied by another person who should remain outside the trench and be ready to provide assistance if necessary.
- Before entering any trench, but particularly an old one, walk it out along the surface to check for incipient wall cave-ins. If in any doubt, do not enter. There is generally plenty of information to be obtained from the spoil heaps along the trench edge; the walls of old trenches are often covered in a grunge anyway and certainly not worth risking one's life for.

2.7.2 Types of Trenches

There are two types of trenches, namely overburden trench and bedrock trench.

Overburden trenches are made to check and map the type of bedrock below the overburden. These are very common if heavy equipment (i.e. back hoe) is available. Bedrock trenches are made to follow up on bedrock mineralization. These require blasting with dynamite and are far less common. While the former are usually backfilled immediately, the latter are usually left open

2.7.3 Trench Mapping

Detailed geological mapping should always precede the sampling so that sample intervals can be established and analytical results can be more effectively interpreted. Mapping is a means of discovering features that are too large, too complex or too diffuse to be recognized outright on the ground and being able to present these in three dimensions (Nartey, 2011).Accurate observation, measurement and recording of structural elements are essential. Structural data must be collected in conjunction with other lithological, petrological, and paleontological data. Mapping of trenches should not just be confined to those faces developed in ore. All exposures within and adjacent to the ore body are relevant to understanding a deposit and should be routinely mapped. Knowing what is mappable in a trench can only come from experience. Geologic features that might normally be mapped in a trench are;

- Visible boundaries of ore and any other significant mineralization
- Boundaries of major lithological units
- Position and orientation of major structures such as folds, faults, prominent joint sets, etc.
- Alteration patterns
- Major veins or vein sets
- Geotechnical data such as degree of fracturing

In the absence of map able and well-defined lithological boundaries, trend lines are used to show the trace of continuous features that can be observed in the rock, such as bedding planes, cleavage, joint or vein sets.

2.7.4 Sampling of Trenches

Once trenches are completed, then sampling crews, under close geological supervision, will take channel samples at or close to the base of one of the trench walls .Sample spacing will depend on the bedrock geology; where the geology indicates very little discernible structure or vein systems, the samples may be taken over2-3m lengths but in areas of obvious interest the sample interval will commonly be reduced to 1m. Some sample over 1m lengths over the entire trench but when you are doing a lot of trenches, the analytical costs can become substantial and modest savings can be achieved by using 2m or even 3m lengths where the bedrock geology displays fairly uniform lithology and structure. An acceptable and efficient practice is to initially sample one wall over 2-3m intervals and if mineralized zones are indicated in these samples, then apportion of the opposite wall is sampled at 1m intervals to better define the zone of interest. Naturally, all intervals need to be clearly marked so that trenches can be reentered and sampled at a later date if required .In most cases, it is usually appropriate to sample along a horizontal channel that will be approximately 8-10cmwide and

4-6cm deep. However, in cases where there maybe shallow dipping vein structures, horizontal channels will not be representative and vertical or diagonal channels would be preferable. It is also good practice to occasionally sample the same interval with a horizontal l or inclined channel or even a panel chip sample in order to compare results; the follow-up sampling needs to be done by an experienced geologist in order to avoid bias in the sampling. Careful procedures in the sampling and handling of samples need to be maintained in order to avoid sample bias or sample tampering. The ‘chain of custody’ of samples needs to be carefully maintained right to the commercial laboratory where the samples are analyzed.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 The Trench Programme

A systematic follow up survey was necessary to confirm and trace the source of the gold-in-soil anomalies covered by the geochemical soil sampling conducted. Trenching was considered a suitable follow up method since its exposes the saprolite horizon for insitu soil material sampling. The Apapam gold in soil grid was then divided into five zones base on the special distribution of the soil anomalies as shown in fig 3.10 .The trenching was excavated on a 200m interval grid and could extend several meters based on the extend of mineralization zone exposed

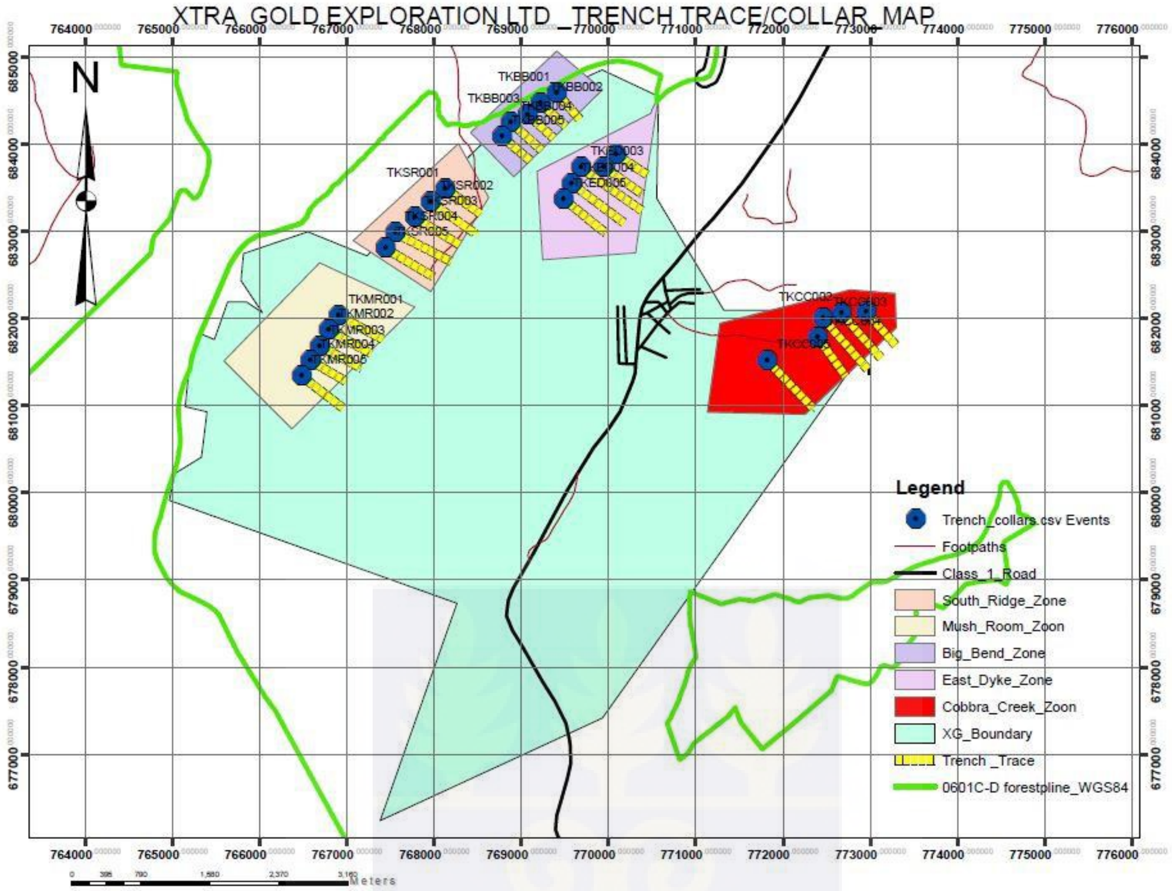

Fig 3.1.1 showing the five zones where the trench sampling was conducted

3.2 Field Work

The trench field work conducted on the Apapam Concession to determine and confirm the source of the gold-in-soil anomalies include:

- Site Preparation
- Excavation of Trenches
- Trench Sampling
- Logging of Trench Samples
- Trench mapping
- Laboratory Analysis

The field work was based on the knowledge or information obtained during the preliminary or previous work done.

3.2.1 Site Preparation

Site preparation concerns clearing of weeds and trees that would pose danger to workers during field workings and also facilitates easy workings of the excavator during excavation. This also includes making of access (road) that would enhance free movement of field personnel. These can be done by using an excavator under the supervision of a field technician.

3.2.2 Excavation of Trenches

Trenches were excavated across the strike of the mineralized zone in the North West to South East direction. Fifteen mechanical and ten manual trenches were excavated with varying lengths based on the extent of the mineralized zone. Trenching typically extends down to the saprolite horizon, or locally to sap rock, but often the saprolite cannot be reached due to safety concerns. The mechanical trenches were dug using a hydraulic excavator. The trenches were named after the Kibi town, the zone in which it was being excavated and the order in which it was excavated, that is whether it was the first, second, third or fourth to be excavated in the zone. For trench TKBB001, T denotes trench, K denotes the town (Kibi), BB denotes Big bend zone and 001 means it was the first trench excavated in the zone.

Fig. 3.1.2 showing mechanical excavation of TKBB001 in the North West _South East Direction

Fig. 3.1.3 showing the walls of TKBB001 after excavation.

Manual (pickaxe and shovel) trenches were also typically excavated to widths of 1 m, and an average depth of 3 m, with some sections of trenches reaching 4 to 5 m in depth. The trenching was excavated on a 200m interval grid as a follow up to the gold in soil mineralization.

Fig 3.1.4 showing manual excavating of TKMR002 in the Apapam concession

The meanings of the various lithological codes are as shown in the table 4.3 below:

Table 3.0 Lithological Codes and their Meanings

Lithological Codes	Meaning
Sp-Vc	Saprolitic volcaniclastic rock
Sh-Vc	Sheared volcaniclastic
Sp-Dr	Saprolitic Diorite
Sp-Mv	Saprolitic Mafic Volcanic

Sp-Msed	Saprolitic Meta sediments

Table 3.1 Length and Collar Coordinates of Trenches

Trench_ID	Eastern (X)	Northern (Y)	Elevation (m)	Max_Length(m)	max_depth(m)	trench_Type
TKBB001	769404	684590	300	216	4.2	Mechanical
TKBB002	769216	684463	300	226	3.2	Mechanical
TKBB003	769069	684338	406	224	3	Mechanical
TKBB004	768868	684258	440	224	4	Mechanical
TKBB005	768773	684086	395	238	5	Mechanical
TKED001	770080	683886	306	91	3.3	Mechanical
TKED002	769940	683740	299	134	3	Manuel
TKED003	769678	683730	306	81	3.4	Manuel
TKED004	769572	683547	366	92	2.3	Manuel
TKED005	769477	683375	321	64	2.8	Manuel
TKSR001	768124	683488	200	84	5	Mechanical
TKSR002	767953	683338	205	98	5.2	Mechanical
TKSR003	767773	683158	222	88	4	Mechanical
TKSR004	767547	682982	238	82	4.3	Mechanical
TKSR005	767439	682803	300	72	3.5	Mechanical
TKMR001	766329	682476	176	66	2.3	Mechanical
TKMR002	766134	682343	166	60	2.8	Mechanical
TKMR003	766068	682123	179	60	2.7	Mechanical
TKMR004	765682	681967	182	60	3.4	Mechanical
TKMR005	765591	681701	200	60	1.8	Mechanical
TKCC001	772948	682077	400	110	1.5	Mechanical
TKCC002	772665	682061	392	105	1.9	Mechanical
TKCC003	772456	681999	289	114	2	Mechanical
TKCC004	772390	681787	405	111	1.2	Mechanical
TKCC005	771810	681521	496	101	1.9	Mechanical

3.2.3 Trench Sampling and Logging

Once trenching is completed, the entire length of the trench was subjected to systematic channel sampling; with wooden pegs stuck to the side of the trench at 1 m intervals. Prior to sampling the wall of the trench is cleaned of any loose material to avoid contamination. Trenching typically extends down to the saprolite horizon, or locally to saprock, but often the saprolite cannot be reached due to safety concerns.

Fig 3.2.0 showing the saprolite horizon of altered quartz diorite in TKBED005

Fig 3.2.1a showing Logging of Vertical Sampling of low angle Quartz veinTKBBB001

Samples consist of continuous, horizontal channels excavated along the bottom sidewall of the trench (~ 0.10 m above floor) with emphasis on constant sample volume over the length of the sample interval. At each sampling station or location features such as the sample location, geology, color, sample ID, GPS readings were noted and recorded.

Fig 3.2.1b showing a horizontal channel line in altered quartz diorite in TKBED003

Saprolite/rock chips are collected on a clean plastic sheet laid on the trench floor and immediately placed into a labeled plastic sample bag containing a unique sample ticket stapled to the inside lip of the bag, and securely sealed by staples. Samples are typically 1 m in length. The sample intervals (i.e. sample numbers) are marked on aluminum tags stapled to wooden pegs stuck to the sidewall of the trench.

Fig3.2.2 showing verification of trench samples in plastic bags by sampling team

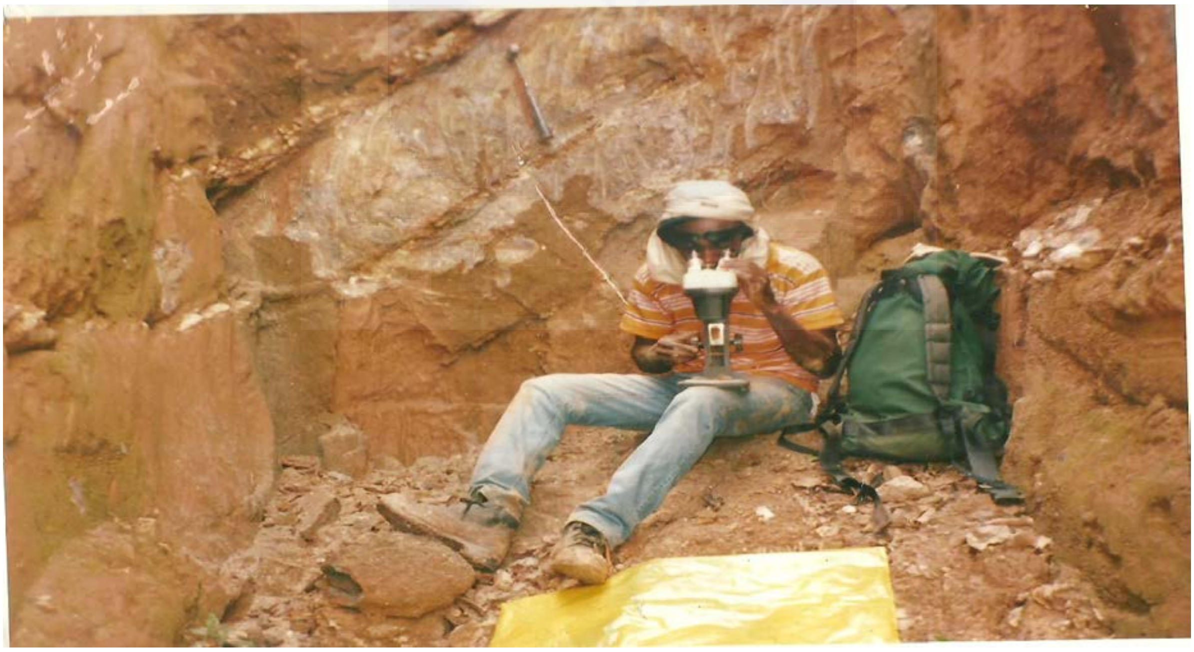

Figure 3.2.3 showing verification of grain size trench chip sample in TKBSR001

3.4.0 Precautionary measures in trenching

The following precautionary measures were ensured during sampling of the trenches;

- Walls of trenches were cleaned before sampling to prevent contamination of samples.
- Sampling was done at consistent intervals.
- Sample containers were sealed just after samples have being put into them.

Samples were mixed thoroughly to ensure uniformity

3.4.1Mapping of trenches

Geological features controlling mineralization were systematically mapped. Such features include;

- Visible boundaries of ore and any other significant mineralization
- Contacts of major lithological units
- Position and orientation of major structures such as folds, faults, prominent joint sets, etc.
- Alteration patterns
- Major veins or vein sets

The procedures used in mapping the geological features are as follows;

Wooden pegs were driven to the side of the trench wall at 1 m interval using a tape measure. The locations of individual geologic features controlling mineralization were determined and attitude measurements recorded. These features are described and recorded.

Figure 3.3.1a Mapping of Quartz veins at contact of Quartz diorite and Meta phyllite Trench TKSR001

Fig.3.3.1b mapping of a Low angle Milky Quartz Vein in Trench KT1110

Fig.3.3.2 showing a major ion carbonate and sulphide alteration zone in TKCC002

3.4.2 Laboratory Work

The laboratory work carried on the East dyke of the Kibi project includes sample preparation and sample analysis.

3.4.3 Sample Preparation

This is the act of getting the samples ready to be sent to the laboratory to determine the gold (Au) values in the samples. Samples from the field are sent to core shed where they are dried when wet. In addition to quality assurance controls at the laboratory, certified reference standards (low to high grade), coarse blanks, and field duplicates are randomly inserted into the sample stream at a rate of one each for every 20 samples. Validation parameters are established in the database to ensure quality control. Samples are transported in security – sealed bags by ALS Chemex personnel to the ALS Laboratory in Kumasi.

Fig 3.3.3 showing inspection of quality control samples

3.4.4 Sample Analysis

This is the act of analyzing the metallic content in the collected soil samples. Atomic Adsorption Spectrometry (AAS) and Fire assaying analytical method was used to detect the gold content in the soil samples. Samples are pulverized in their entirety to better than 85% passing 75 microns, and analyzed by industry standard 50 gram fire assay fusion with atomic absorption spectroscopy (AAS) finish. For samples returning values greater than 10 g/t gold, a second pulp is taken and fire assayed with a gravimetric finish. Samples with observed visible gold, as well as adjacent samples, are analyzed by Screen Fire Assay.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Analysis of sample Results

A total of four thousand, seven hundred and sixty nine trench samples were submitted to the laboratory for gold (Au_ppm) analysis. The gold (Au) results obtained from the laboratory were validated to check for accuracy and precision as shown in Appendix A. A descriptive summary statistical table was generated of the raw data with SPSS (Statistical software) as shown in Table 4.1

		Metasediment	Quartz	Metavolcan	Sheared Volca	Massive Volcanoclastic Sediment
N	Valid	2306	799	821	597	246
	Missing	0	1507	1485	1709	2060
Mean		.2362	.370	.228	4	.19740
Median		.0120	.309	.018	.	.05150
Std. Deviation		1.7784	.0926	1.7790	5.	.479781
Skewness		12.60	.840	12.4	4.260	8.193
Std. Error of		.051	.086	.085	.100	.155
Minimum		.001	.309	.002	.002	.000
Maximum		42.67	51.0	27.4	5	6.070
Percentiles	95	.30100	.5000	.15420	16.04000	.88510
	Number of Sa	198	506	162	523	148

Table 4.1 Statistics

Analysis of the descriptive statistics gave the range of mean gold grades of the various lithologies as 0.194 ppm - 0.371 ppm representing the values for the Metasedimentary rocks(Phyllite and greywackes) and Quartz diorite respectively. The 95th percentile was also used as the parameter for the cut –off grade (Thresh hold) since the data. Out of the four thousand, seven hundred and sixty nine (4769) trench assay results received from the laboratory: 1537 samples gave values above the 95th percentile (Anomalies) whereas 3232 samples gave values below the cut –off grade (background values).Three major lithological units dominated the western part of the Apapam concession, the metasediments, the quartz diorite and the metavolcanics. A total of 3926 samples were analysed for gold in the these lithologies, 866 samples reported grades above their respective cut – off grades .506 samples of these were found to be Quartz diorite returning a threshold > 0.500ppm, 198 were metasediments samples returning a threshold > 0.301ppm and 162 were metavolcanics samples giving a threshold > 0.154 ppm. With emphasis on consistency of grades, the threshold for the quartz diorite was found to be the most consistent; hence a nominal value of

0.50 ppm was selected as the base cut off gold grade for the entire delineation exercise. The trench assay results were then grouped into four ranges and were represented with varied color codes to enhance easy data analysis as shown. 0.00 – 0.500 ppm (gangue) ,Gray color, Au > 0.50 – 1.00ppm (Low grade ore) ,Green color code, Au >1.00 – 5.00 ppm (medium grade ore) Blue code, Au > 5.00 – 10.00 ppm (High grade ore) Red color and all values > 10 ppm (Super high grade ore) pink color code

Geology maps were then prepared by joining all the lithological contact for each of the zones to delineate the shapes of the various lithologies and controlling structures as shown in Figure 4.2 Detailed geological map for each zone can be found in Appendix B.

The trench assays values for each zone was plotted on a linear graph against the lithology using Surpac Gencom as in Figure 4.3. Gold grades delineated maps for each zone was then generated to enhance easy analysis of the data.

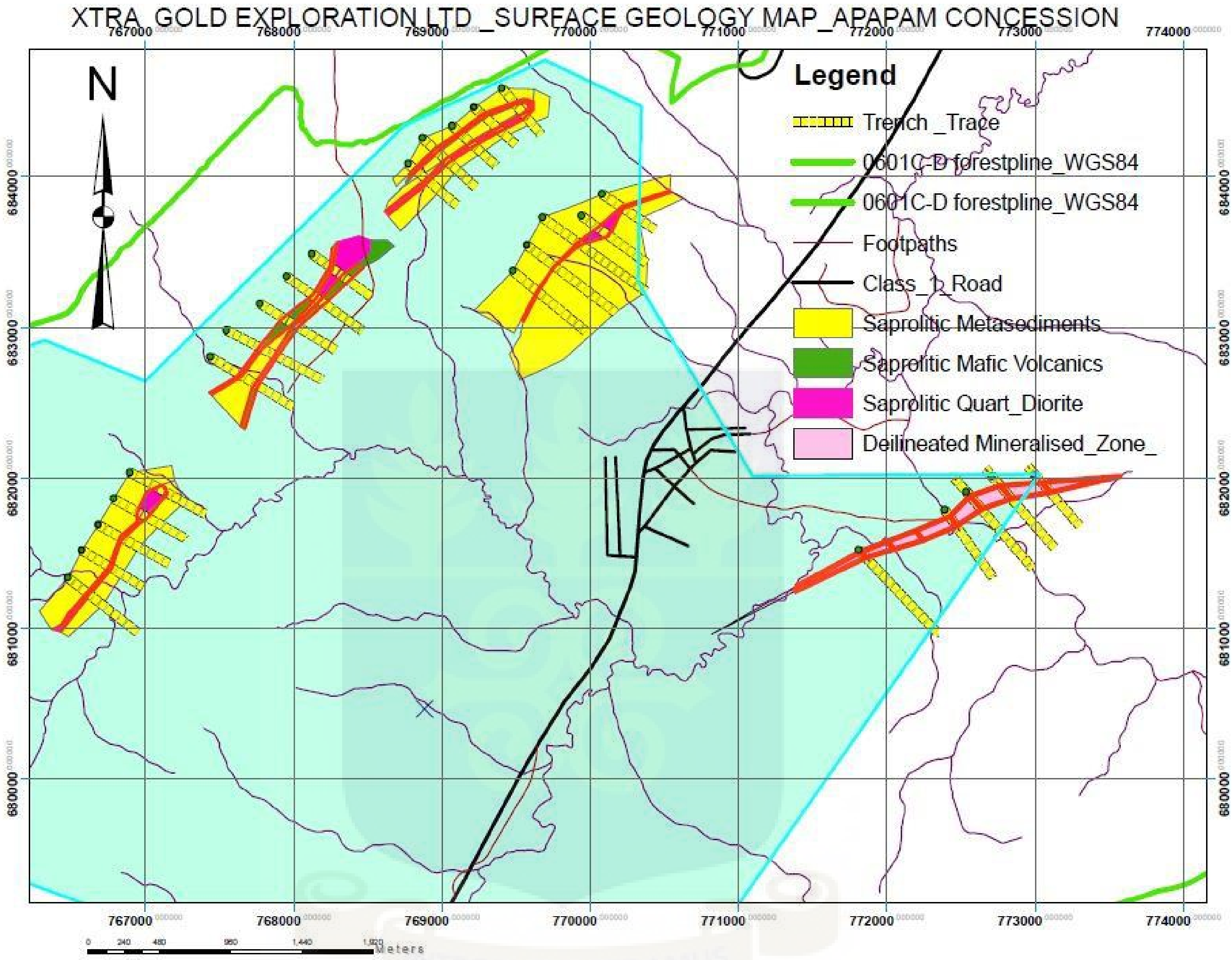

Figure 4.1 showing delineated surface geology map of the five zones of the Apapam Concession

4.2 DISCUSSION AND INTERPRETATION OF DATA

The variation in the length of the trenches was as a result of the extent of the mineralized Zone covered by the soil geochemistry. The entire length of these trenches showed significant mineralization above the background value (75 ppb) during the soil geochemistry survey. However, only three out of the five zones showed consistent significant values above the threshold Au > 0.5ppm used for the delineating follow up trench exercise. Details of trench assays samples are shown in Appendix C. The Mushroom zone which showed significant mineralization during the soil geochemistry survey recorded very low grades far below the trench cut -off grade. This shows that, those areas were depositional environments. The soil sampling done in the Mush Room zone were not representative fraction of these zones but rather these soils were transported from areas of good mineralization to these area, hence these showed good mineralization at shallow depth but no significant mineralization at deeper depth during trenching. The source of mineralization in the Mush Room zone was not in-situ but was as a result of sediment transportation and was termed a false anomalous zone and does not warrant further exploration work.

Alternatively, the Big Bend zone, The East Dyke zone, the South Ridge zone, and the Cobra Creek zone, recorded very high grades during the soil geochemistry survey and still recorded very high values during the follow-up survey (trenching) suggesting that, mineralization was in-situ at greater depth and further detailed program such as drilling would be necessary. Careful lithological and structural analyses of the trench assays and geology logs is provided in Appendix This reveals that, areas that showed low mineralization deposit in the South Ridge Zone corresponds to a Sill structure since the contacts of the quartz diorite was concordant (50˚/55˚) with that of the mafic metavolcanic Ridge. The diorite was very massive, coarse grain and very little alteration and veining was recorded.

It was also noted that the quartz diorite in the Big Bend Zone was tightly folded and the gold grades concentrated in the limbs and the nose (Bend) of the folded as shown in the delineated map. The assay results show very high grades at the metasediment and metavolcanic contacts where alteration intensity was high and veining pronounced.

Similarly, Gold mineralization in the East Dyke zone was strictly concentrated in the quartz diorite which was pinching and Swelling in nature shown in Fig. 4.23. The Super high grades in the East Dyke was recorded where the diorite begins to Pinch out (TKED004) and gets much narrower and where it jogs and kinks in TKED002.

This implies that gold mineralization in the Apapam concession is mainly hosted in the quartz diorite but the presence of structures and wall rock alteration have a major influence on grade distribution.

The metavolcanic sediments in the eastern part of the Apapam concession gave a mean gold value of 0.228 ppm and 4.910 ppm for the 821(massive) and the 597 (sheared) samples respectively. This implies that gold mineralization in the Cobra creek zone was strictly confined to the shear zone. That is 523 samples out of 597 samples collected in the intercepted sheared structure of the five trenches gave gold values above the thresh hold (Au > 0.5 ppm) representing 88.7% of the entire anomalous samples.

Analysis of the grades and the corresponding delineated logs shows that, areas that showed high grades in the entire concession were structurally influenced .Also, significant features such as folded and brecciated milky or smoky quartz veins, lithological contacts, joints, quartz stringers, and wall rock alterations such as iron sulphide alteration, jarosite alteration, iron carbonate alterations were the major factors that controlled gold mineralization as oppose to specific rock types. The dip and strike of these structures were also recorded to help define vein architecture and possibly gives a better understanding of the ore body geometry and angles to position a drill rig in carrying out further investigations.

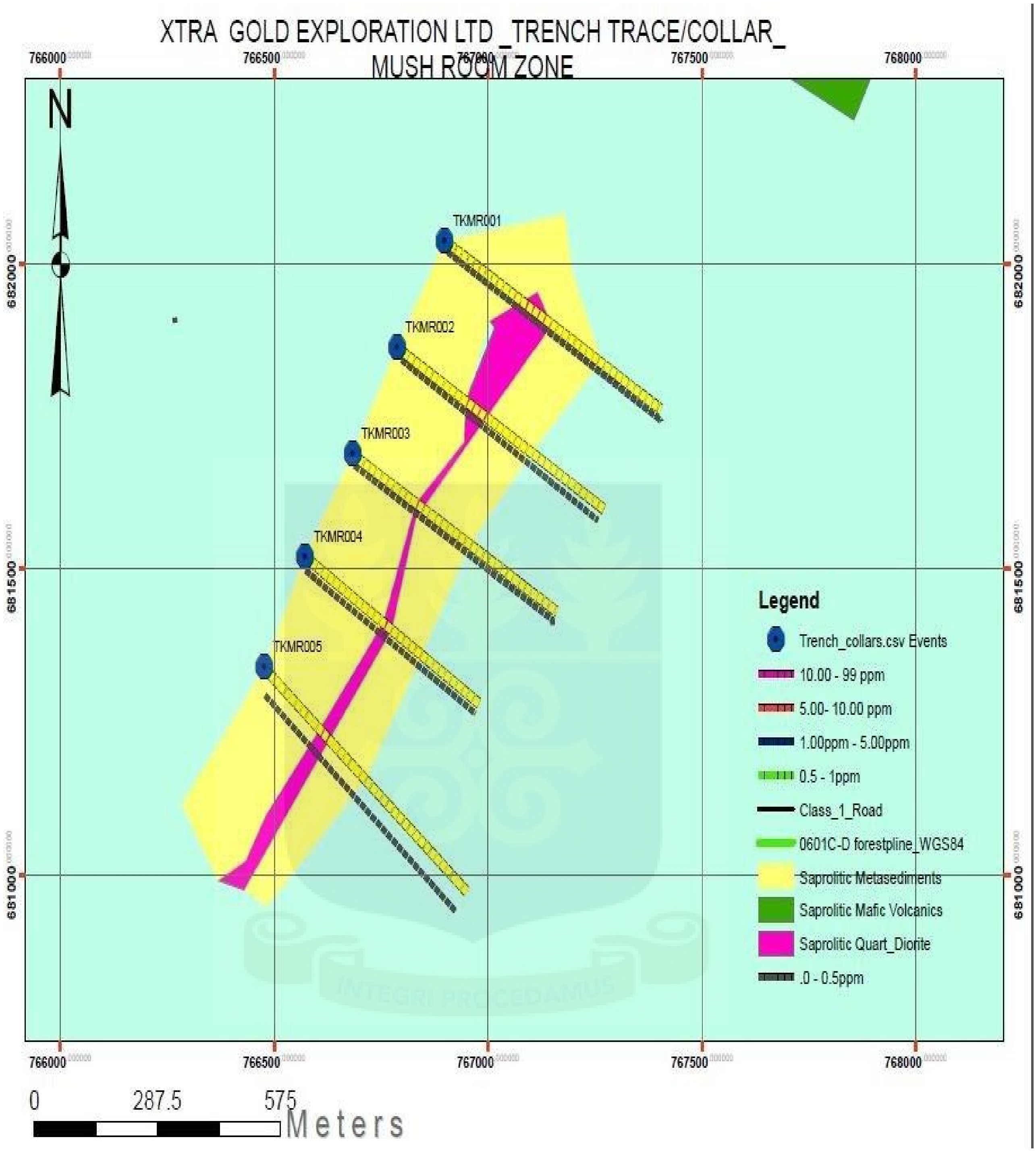

Figure 4.2 showing the delineated Quartz Diorite of the Mush Room Zone

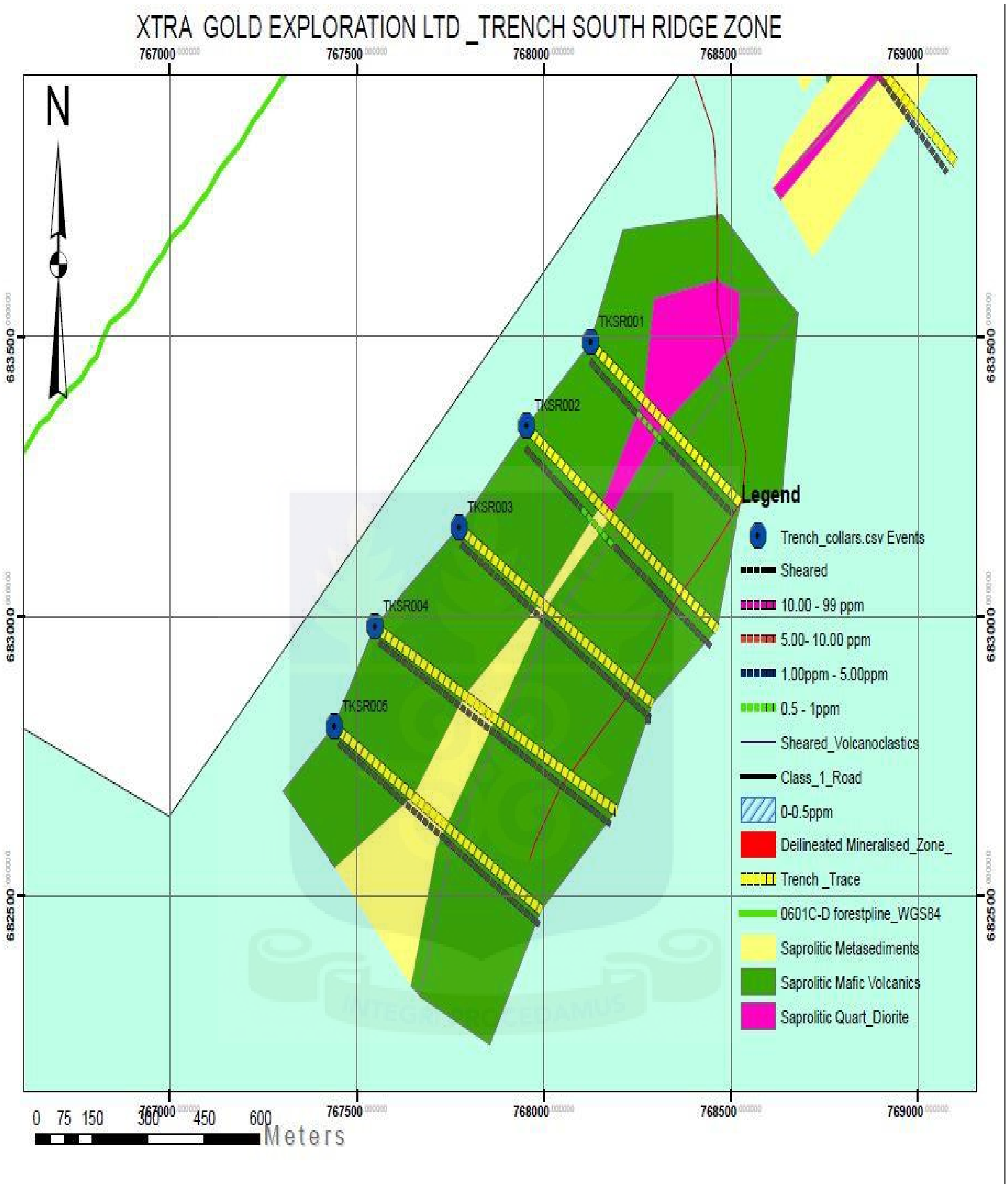

Figure 4.3 showing the delineated Low Grade Quartz Diorite of the South Ridge Zone

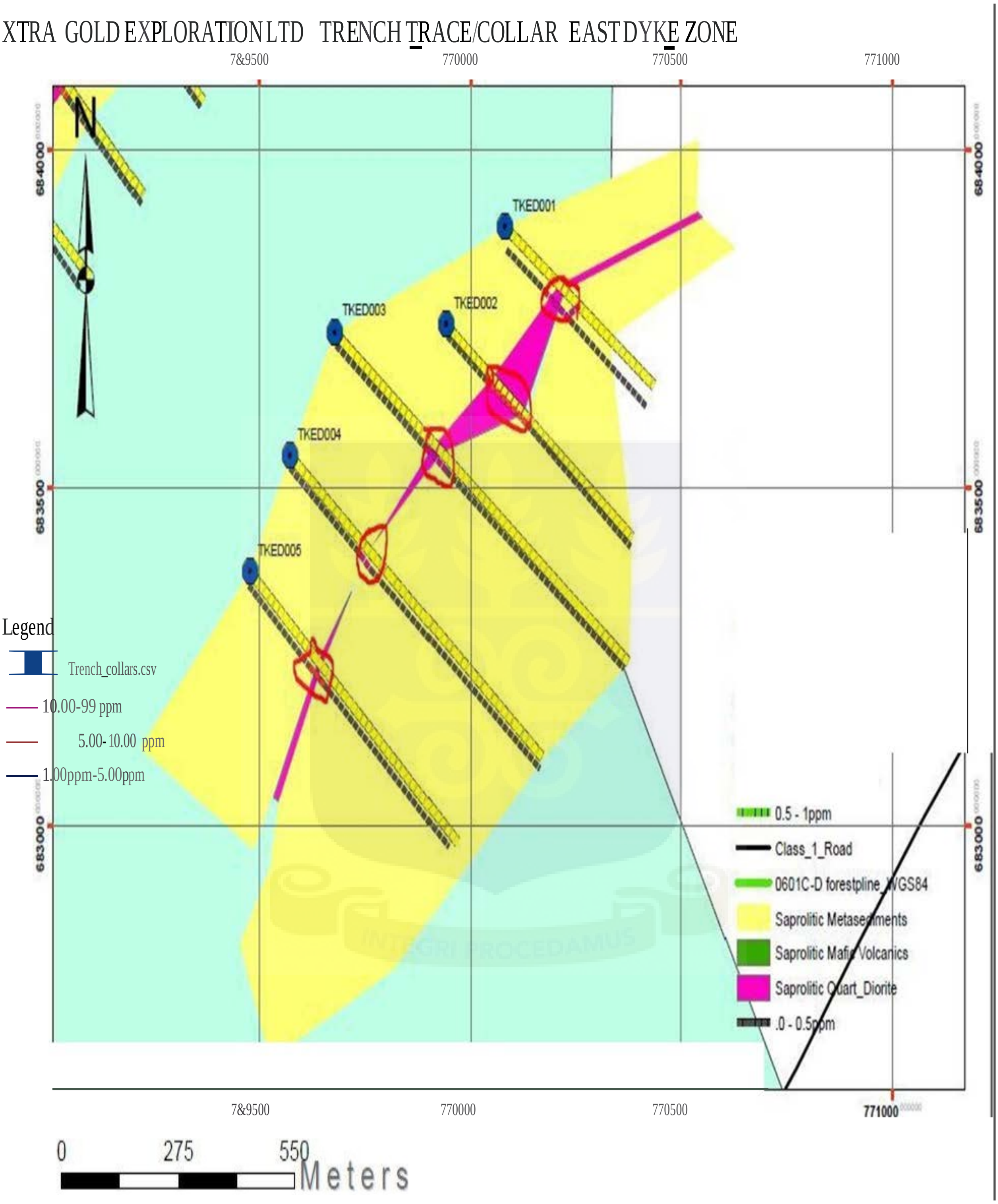

Figure 4.4 showing the delineated Pinch and Swell High Grade Quartz Diorite of the East Dyke Zone

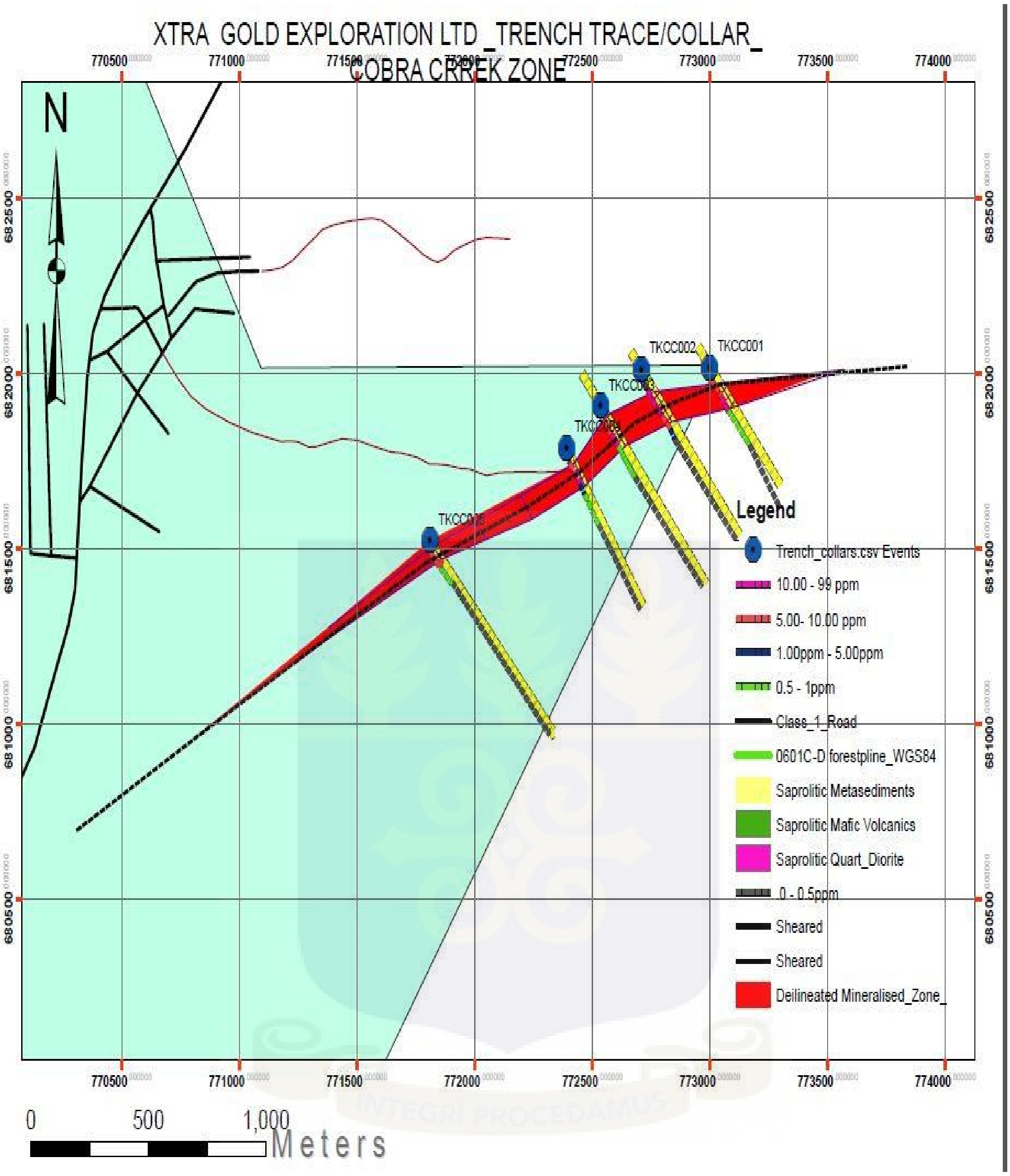

Figure 4.5 showing a map of the Delineated super high grade Sheared Metavoclastics Sediments of the Cobra Creek Zone

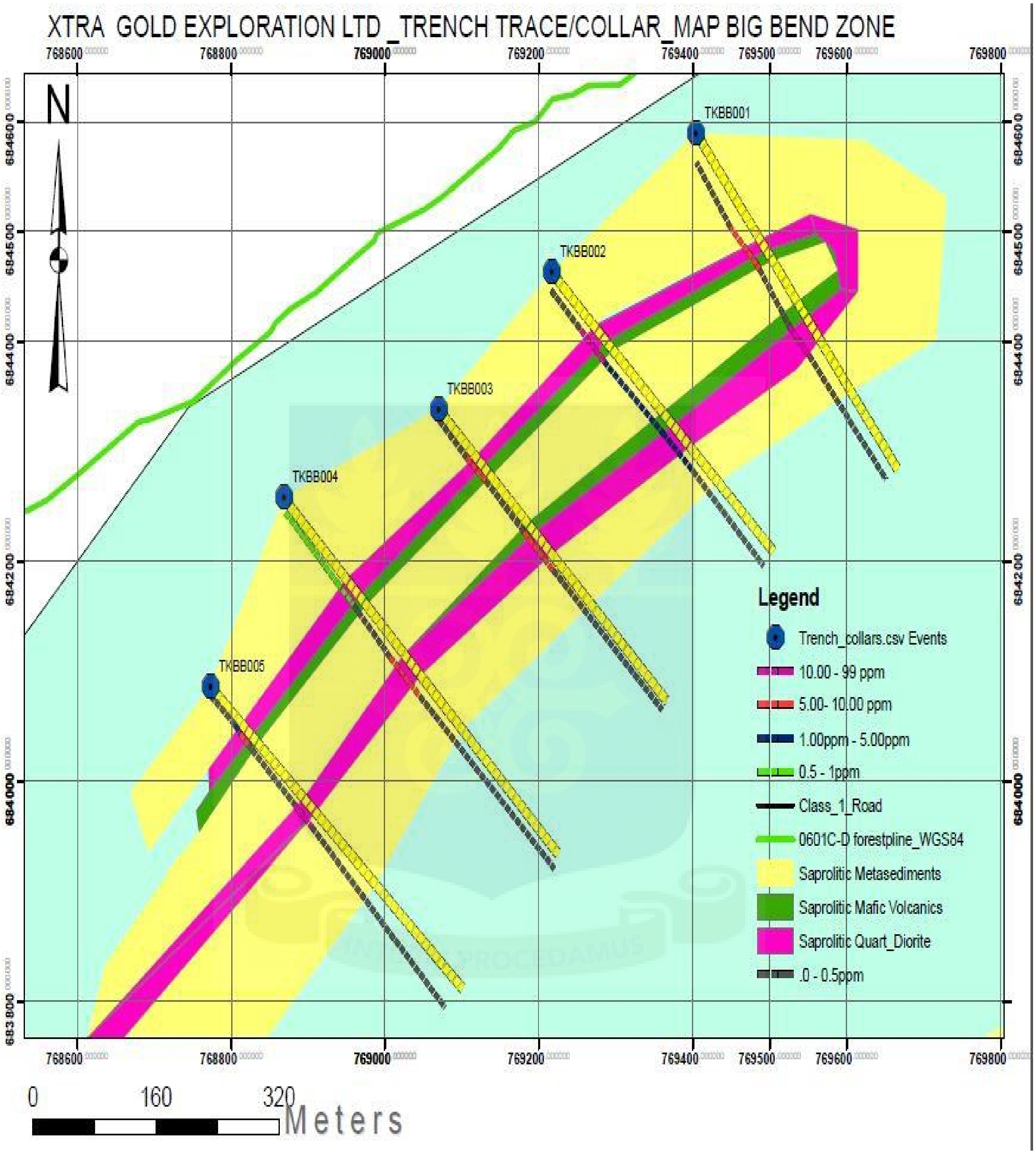

Figure 4.6 showing the delineated folded Quartz Diorite of the Big Bend Zone

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusions

From the studies conducted at Apapam Concession of the of the Kibi Belt, it can be concluded that;

- Trenching is good follow-up effective initial exploration tool in delineating surface gold mineralization in the Kibi Gold Belt as it exposes the saprolite horizon for insitu material sampling relative to hand auger and reverse circulation tool which were previously used.

- Gold mineralization in the Apapam Concession of the Kibi Belt is controlled by; Structures, lithology and wall rock alteration.
- Gold mineralization in the Big Bend, the East Dyke, the South Ridge and Cobra creek zone of the Apapam Concession are insitu and warrant further investigation such as drilling.
- Gold mineralization in the quartz diorite of the South Ridge zone conformed to a sill which was concordant to the mafic metavolcanic ridge

- Gold mineralization in the Cobra Creek zone of the Apapam concession follows a NNE _SSW pattern similar to the Ashanti Style mineralization.

5.2 Recommendations

It is therefore recommended that;

- A detail surface structural mapping should be carry out by mapping and sampling exposed outcrops and structures in the Kibi Gold Belt to help define the current gold pattern in the Kibi Gold district.

- Trenches should be excavated such that, the impact it poses on the environment would

be minimal

- The Earth Science Department of the University of Ghana should laisse with the junior mining and exploration companies in the Kibi Gold Belt to use their sites for Structural training for graduate students.
    - A detailed investigation should be conducted in the Cobra creek zone to help to help understand the source of the mineralize fluid and to trace the extent of mineralization in relation to the economic evaluation of gold potential in the Kibi Gold district.

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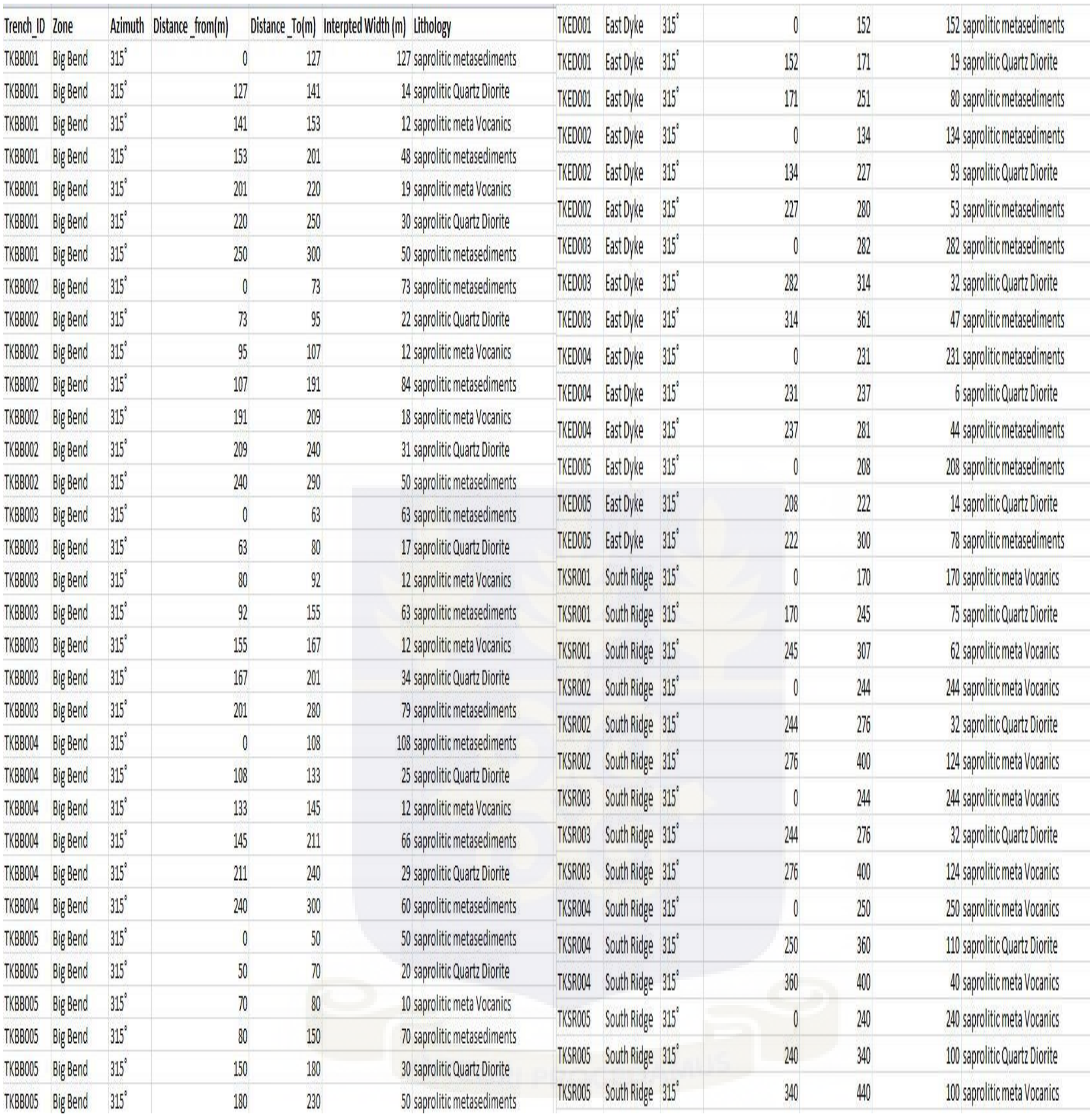
APPENDIX A
A SUMMARY OF TERNCH GEOLOGY LOGS



Trench_ID	Zone	Azimuth	Distance_from(m)	Distance_To(m)	Interpted Width (m)	Lithology
TKBB001	Big Bend	315°	0	127	127	saprolitic metasediments
TKBB001	Big Bend	315°	127	141	14	saprolitic Quartz Diorite
TKBB001	Big Bend	315°	141	153	12	saprolitic meta Vocanics
TKBB001	Big Bend	315°	153	201	48	saprolitic metasediments
TKBB001	Big Bend	315°	201	220	19	saprolitic meta Vocanics
TKBB001	Big Bend	315°	220	250	30	saprolitic Quartz Diorite
TKBB001	Big Bend	315°	250	300	50	saprolitic metasediments
TKBB002	Big Bend	315°	0	73	73	saprolitic metasediments
TKBB002	Big Bend	315°	73	95	22	saprolitic Quartz Diorite
TKBB002	Big Bend	315°	95	107	12	saprolitic meta Vocanics
TKBB002	Big Bend	315°	107	191	84	saprolitic metasediments
TKBB002	Big Bend	315°	191	209	18	saprolitic meta Vocanics
TKBB002	Big Bend	315°	209	240	31	saprolitic Quartz Diorite
TKBB002	Big Bend	315°	240	290	50	saprolitic metasediments
TKBB003	Big Bend	315°	0	63	63	saprolitic metasediments
TKBB003	Big Bend	315°	63	80	17	saprolitic Quartz Diorite
TKBB003	Big Bend	315°	80	92	12	saprolitic meta Vocanics
TKBB003	Big Bend	315°	92	155	63	saprolitic metasediments
TKBB003	Big Bend	315°	155	167	12	saprolitic meta Vocanics
TKBB003	Big Bend	315°	167	201	34	saprolitic Quartz Diorite
TKBB003	Big Bend	315°	201	280	79	saprolitic metasediments
TKBB004	Big Bend	315°	0	108	108	saprolitic metasediments
TKBB004	Big Bend	315°	108	133	25	saprolitic Quartz Diorite
TKBB004	Big Bend	315°	133	145	12	saprolitic meta Vocanics
TKBB004	Big Bend	315°	145	211	66	saprolitic metasediments
TKBB004	Big Bend	315°	211	240	29	saprolitic Quartz Diorite
TKBB004	Big Bend	315°	240	300	60	saprolitic metasediments
TKBB005	Big Bend	315°	0	50	50	saprolitic metasediments
TKBB005	Big Bend	315°	50	70	20	saprolitic Quartz Diorite
TKBB005	Big Bend	315°	70	80	10	saprolitic meta Vocanics
TKBB005	Big Bend	315°	80	150	70	saprolitic metasediments
TKBB005	Big Bend	315°	150	180	30	saprolitic Quartz Diorite
TKBB005	Big Bend	315°	180	230	50	saprolitic metasediments
TKED001	East Dyke	315°	0	152	152	saprolitic metasediments
TKED001	East Dyke	315°	152	171	19	saprolitic Quartz Diorite
TKED001	East Dyke	315°	171	251	80	saprolitic metasediments
TKED002	East Dyke	315°	0	134	134	saprolitic metasediments
TKED002	East Dyke	315°	134	227	93	saprolitic Quartz Diorite
TKED002	East Dyke	315°	227	280	53	saprolitic metasediments
TKED003	East Dyke	315°	0	282	282	saprolitic metasediments
TKED003	East Dyke	315°	282	314	32	saprolitic Quartz Diorite
TKED003	East Dyke	315°	314	361	47	saprolitic metasediments
TKED004	East Dyke	315°	0	231	231	saprolitic metasediments
TKED004	East Dyke	315°	231	237	6	saprolitic Quartz Diorite
TKED004	East Dyke	315°	237	281	44	saprolitic metasediments
TKED005	East Dyke	315°	0	208	208	saprolitic metasediments
TKED005	East Dyke	315°	208	222	14	saprolitic Quartz Diorite
TKED005	East Dyke	315°	222	300	78	saprolitic metasediments
TKSR001	South Ridge	315°	0	170	170	saprolitic meta Vocanics
TKSR001	South Ridge	315°	170	245	75	saprolitic Quartz Diorite
TKSR001	South Ridge	315°	245	307	62	saprolitic meta Vocanics
TKSR002	South Ridge	315°	0	244	244	saprolitic meta Vocanics
TKSR002	South Ridge	315°	244	276	32	saprolitic Quartz Diorite
TKSR002	South Ridge	315°	276	400	124	saprolitic meta Vocanics
TKSR003	South Ridge	315°	0	244	244	saprolitic meta Vocanics
TKSR003	South Ridge	315°	244	276	32	saprolitic Quartz Diorite
TKSR003	South Ridge	315°	276	400	124	saprolitic meta Vocanics
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TKSR004	South Ridge	315°	250	360	110	saprolitic Quartz Diorite
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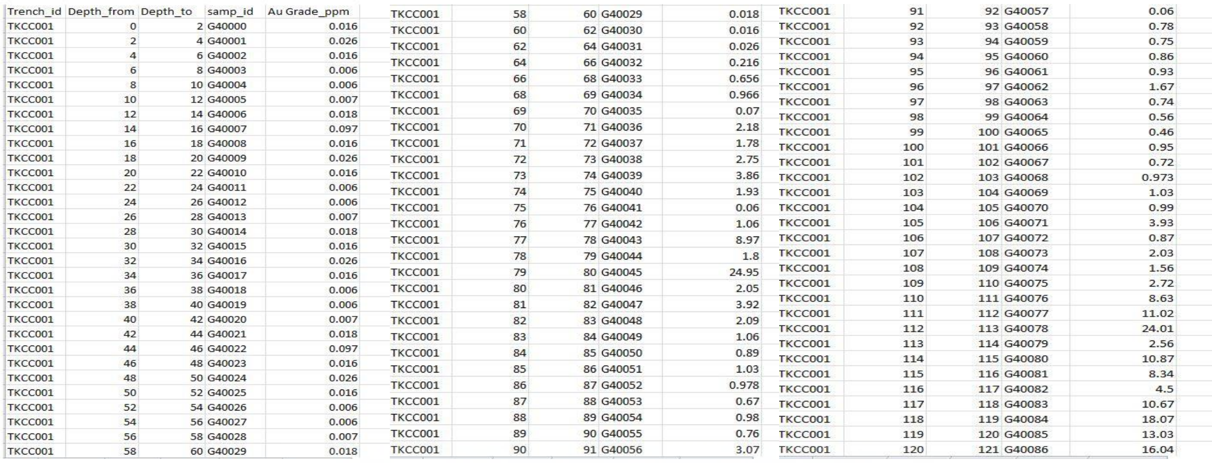
TKSR005	South Ridge	315°	0	240	240	saprolitic meta Vocanics
TKSR005	South Ridge	315°	240	340	100	saprolitic Quartz Diorite
TKSR005	South Ridge	315°	340	440	100	saprolitic meta Vocanics

APPENDIX B
ASSAY RESULTS OF TRENCH SAMPLES



Trench_id	Depth_from	Depth_to	samp_id	Au Grade_ppm
TKCC001	0	2	G40000	0.016
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TKCC001	4	6	G40002	0.016
TKCC001	6	8	G40003	0.006
TKCC001	8	10	G40004	0.006
TKCC001	10	12	G40005	0.007
TKCC001	12	14	G40006	0.018
TKCC001	14	16	G40007	0.097
TKCC001	16	18	G40008	0.016
TKCC001	18	20	G40009	0.026
TKCC001	20	22	G40010	0.016
TKCC001	22	24	G40011	0.006
TKCC001	24	26	G40012	0.006
TKCC001	26	28	G40013	0.007
TKCC001	28	30	G40014	0.018
TKCC001	30	32	G40015	0.016
TKCC001	32	34	G40016	0.026
TKCC001	34	36	G40017	0.016
TKCC001	36	38	G40018	0.006
TKCC001	38	40	G40019	0.006
TKCC001	40	42	G40020	0.007
TKCC001	42	44	G40021	0.018
TKCC001	44	46	G40022	0.097
TKCC001	46	48	G40023	0.016
TKCC001	48	50	G40024	0.026
TKCC001	50	52	G40025	0.016
TKCC001	52	54	G40026	0.006
TKCC001	54	56	G40027	0.006
TKCC001	56	58	G40028	0.007
TKCC001	58	60	G40029	0.018
TKCC001	58	60	G40029	0.018
TKCC001	60	62	G40030	0.016
TKCC001	62	64	G40031	0.026
TKCC001	64	66	G40032	0.216
TKCC001	66	68	G40033	0.656
TKCC001	68	69	G40034	0.966
TKCC001	69	70	G40035	0.07
TKCC001	70	71	G40036	2.18
TKCC001	71	72	G40037	1.78
TKCC001	72	73	G40038	2.75
TKCC001	73	74	G40039	3.86
TKCC001	74	75	G40040	1.93
TKCC001	75	76	G40041	0.06
TKCC001	76	77	G40042	1.06
TKCC001	77	78	G40043	8.97
TKCC001	78	79	G40044	1.8
TKCC001	79	80	G40045	24.95
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TKCC001	81	82	G40047	3.92
TKCC001	82	83	G40048	2.09
TKCC001	83	84	G40049	1.06
TKCC001	84	85	G40050	0.89
TKCC001	85	86	G40051	1.03
TKCC001	86	87	G40052	0.978
TKCC001	87	88	G40053	0.67
TKCC001	88	89	G40054	0.98
TKCC001	89	90	G40055	0.76
TKCC001	90	91	G40056	3.07
TKCC001	91	92	G40057	0.06
TKCC001	92	93	G40058	0.78
TKCC001	93	94	G40059	0.75
TKCC001	94	95	G40060	0.86
TKCC001	95	96	G40061	0.93
TKCC001	96	97	G40062	1.67
TKCC001	97	98	G40063	0.74
TKCC001	98	99	G40064	0.56
TKCC001	99	100	G40065	0.46
TKCC001	100	101	G40066	0.95
TKCC001	101	102	G40067	0.72
TKCC001	102	103	G40068	0.973
TKCC001	103	104	G40069	1.03
TKCC001	104	105	G40070	0.99
TKCC001	105	106	G40071	3.93
TKCC001	106	107	G40072	0.87
TKCC001	107	108	G40073	2.03
TKCC001	108	109	G40074	1.56
TKCC001	109	110	G40075	2.72
TKCC001	110	111	G40076	8.63
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TKCC001	112	113	G40078	24.01
TKCC001	113	114	G40079	2.56
TKCC001	114	115	G40080	10.87
TKCC001	115	116	G40081	8.34
TKCC001	116	117	G40082	4.5
TKCC001	117	118	G40083	10.67
TKCC001	118	119	G40084	18.07
TKCC001	119	120	G40085	13.03
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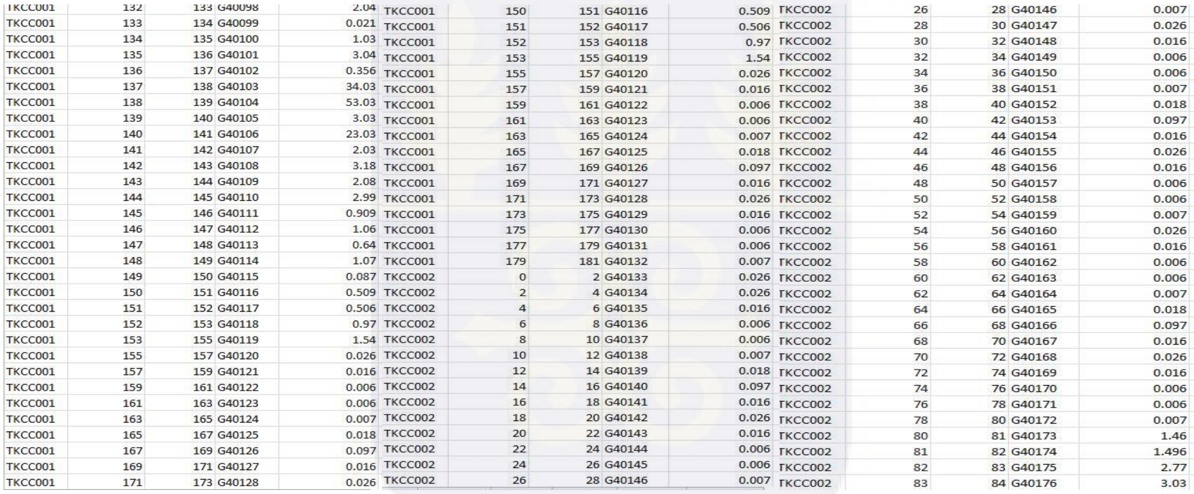

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TKCC001	136	137	G40102	0.356
TKCC001	137	138	G40103	34.03
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TKCC001	140	141	G40106	23.03
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TKCC001	143	144	G40109	2.08
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TKCC001	146	147	G40112	1.06
TKCC001	147	148	G40113	0.64
TKCC001	148	149	G40114	1.07
TKCC001	149	150	G40115	0.087
TKCC001	150	151	G40116	0.509
TKCC001	151	152	G40117	0.506
TKCC001	152	153	G40118	0.97
TKCC001	153	155	G40119	1.54
TKCC001	155	157	G40120	0.026
TKCC001	157	159	G40121	0.016
TKCC001	159	161	G40122	0.006
TKCC001	161	163	G40123	0.006
TKCC001	163	165	G40124	0.007
TKCC001	165	167	G40125	0.018
TKCC001	167	169	G40126	0.097
TKCC001	169	171	G40127	0.016
TKCC001	171	173	G40128	0.026
TKCC001	150	151	G40116	0.509
TKCC001	151	152	G40117	0.506
TKCC001	152	153	G40118	0.97
TKCC001	153	155	G40119	1.54
TKCC001	155	157	G40120	0.026
TKCC001	157	159	G40121	0.016
TKCC001	159	161	G40122	0.006
TKCC001	161	163	G40123	0.006
TKCC001	163	165	G40124	0.007
TKCC001	165	167	G40125	0.018
TKCC001	167	169	G40126	0.097
TKCC001	169	171	G40127	0.016
TKCC001	171	173	G40128	0.026
TKCC001	173	175	G40129	0.016
TKCC001	175	177	G40130	0.006
TKCC001	177	179	G40131	0.006
TKCC001	179	181	G40132	0.007
TKCC002	0	2	G40133	0.026
TKCC002	2	4	G40134	0.026
TKCC002	4	6	G40135	0.016
TKCC002	6	8	G40136	0.006
TKCC002	8	10	G40137	0.006
TKCC002	10	12	G40138	0.007
TKCC002	12	14	G40139	0.018
TKCC002	14	16	G40140	0.097
TKCC002	16	18	G40141	0.016
TKCC002	18	20	G40142	0.026
TKCC002	20	22	G40143	0.016
TKCC002	22	24	G40144	0.006
TKCC002	24	26	G40145	0.006
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TKCC002	26	28	G40146	0.007
TKCC002	28	30	G40147	0.026
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TKCC002	36	38	G40151	0.007
TKCC002	38	40	G40152	0.018
TKCC002	40	42	G40153	0.097
TKCC002	42	44	G40154	0.016
TKCC002	44	46	G40155	0.026
TKCC002	46	48	G40156	0.016
TKCC002	48	50	G40157	0.006
TKCC002	50	52	G40158	0.006
TKCC002	52	54	G40159	0.007
TKCC002	54	56	G40160	0.026
TKCC002	56	58	G40161	0.016
TKCC002	58	60	G40162	0.006
TKCC002	60	62	G40163	0.006
TKCC002	62	64	G40164	0.007
TKCC002	64	66	G40165	0.018
TKCC002	66	68	G40166	0.097
TKCC002	68	70	G40167	0.016
TKCC002	70	72	G40168	0.026
TKCC002	72	74	G40169	0.016
TKCC002	74	76	G40170	0.006
TKCC002	76	78	G40171	0.006
TKCC002	78	80	G40172	0.007
TKCC002	80	81	G40173	1.46
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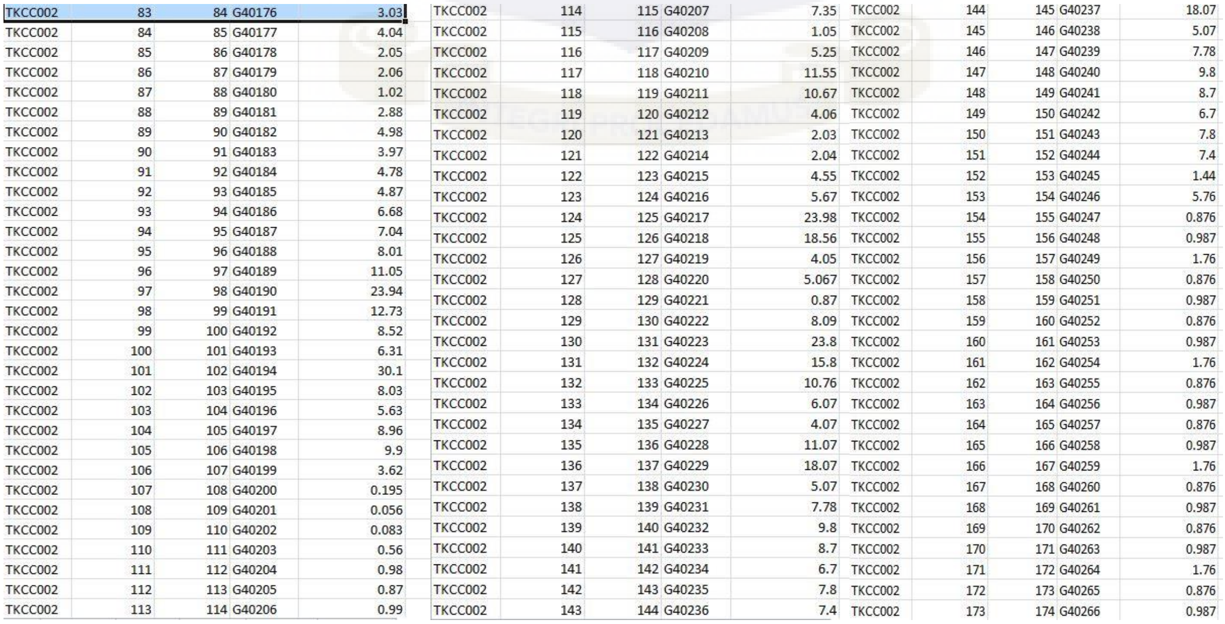
TKCC002	82	83	G40175	2.77
TKCC002	83	84	G40176	3.03



TKCC002	83	84	G40176	3.03
TKCC002	84	85	G40177	4.04
TKCC002	85	86	G40178	2.05
TKCC002	86	87	G40179	2.06
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TKCC002	96	97	G40189	11.05
TKCC002	97	98	G40190	23.94
TKCC002	98	99	G40191	12.73
TKCC002	99	100	G40192	8.52
TKCC002	100	101	G40193	6.31
TKCC002	101	102	G40194	30.1
TKCC002	102	103	G40195	8.03
TKCC002	103	104	G40196	5.63
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TKCC002	105	106	G40198	9.9
TKCC002	106	107	G40199	3.62
TKCC002	107	108	G40200	0.195
TKCC002	108	109	G40201	0.056
TKCC002	109	110	G40202	0.083
TKCC002	110	111	G40203	0.56
TKCC002	111	112	G40204	0.98
TKCC002	112	113	G40205	0.87
TKCC002	113	114	G40206	0.99
TKCC002	114	115	G40207	7.35
TKCC002	115	116	G40208	1.05
TKCC002	116	117	G40209	5.25
TKCC002	117	118	G40210	11.55
TKCC002	118	119	G40211	10.67
TKCC002	119	120	G40212	4.06
TKCC002	120	121	G40213	2.03
TKCC002	121	122	G40214	2.04
TKCC002	122	123	G40215	4.55
TKCC002	123	124	G40216	5.67
TKCC002	124	125	G40217	23.98
TKCC002	125	126	G40218	18.56
TKCC002	126	127	G40219	4.05
TKCC002	127	128	G40220	5.067
TKCC002	128	129	G40221	0.87
TKCC002	129	130	G40222	8.09
TKCC002	130	131	G40223	23.8
TKCC002	131	132	G40224	15.8
TKCC002	132	133	G40225	10.76
TKCC002	133	134	G40226	6.07
TKCC002	134	135	G40227	4.07
TKCC002	135	136	G40228	11.07
TKCC002	136	137	G40229	18.07
TKCC002	137	138	G40230	5.07
TKCC002	138	139	G40231	7.78
TKCC002	139	140	G40232	9.8
TKCC002	140	141	G40233	8.7
TKCC002	141	142	G40234	6.7
TKCC002	142	143	G40235	7.8
TKCC002	143	144	G40236	7.4
TKCC002	144	145	G40237	18.07
TKCC002	145	146	G40238	5.07
TKCC002	146	147	G40239	7.78
TKCC002	147	148	G40240	9.8
TKCC002	148	149	G40241	8.7
TKCC002	149	150	G40242	6.7
TKCC002	150	151	G40243	7.8
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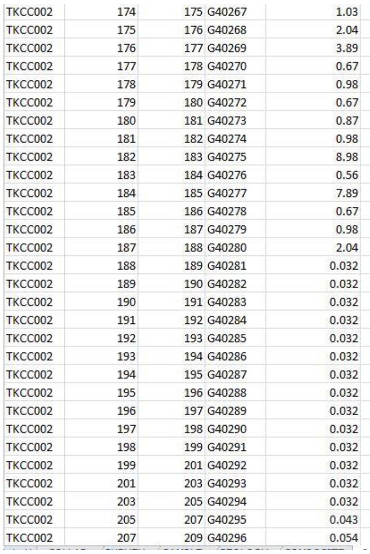
TKCC002	152	153	G40245	1.44
TKCC002	153	154	G40246	5.76
TKCC002	154	155	G40247	0.876
TKCC002	155	156	G40248	0.987
TKCC002	156	157	G40249	1.76
TKCC002	157	158	G40250	0.876
TKCC002	158	159	G40251	0.987
TKCC002	159	160	G40252	0.876
TKCC002	160	161	G40253	0.987
TKCC002	161	162	G40254	1.76
TKCC002	162	163	G40255	0.876
TKCC002	163	164	G40256	0.987
TKCC002	164	165	G40257	0.876
TKCC002	165	166	G40258	0.987
TKCC002	166	167	G40259	1.76
TKCC002	167	168	G40260	0.876
TKCC002	168	169	G40261	0.987
TKCC002	169	170	G40262	0.876
TKCC002	170	171	G40263	0.987
TKCC002	171	172	G40264	1.76
TKCC002	172	173	G40265	0.876
TKCC002	173	174	G40266	0.987

APPENDIX B
ASSAY RESULTS OF TRENCH SAMPLES



TKCC002	174	175	G40267	1.03
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TKCC002	178	179	G40271	0.98
TKCC002	179	180	G40272	0.67
TKCC002	180	181	G40273	0.87
TKCC002	181	182	G40274	0.98
TKCC002	182	183	G40275	8.98
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TKCC002	184	185	G40277	7.89
TKCC002	185	186	G40278	0.67
TKCC002	186	187	G40279	0.98
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TKCC002	196	197	G40289	0.032
TKCC002	197	198	G40290	0.032
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TKCC002	199	201	G40292	0.032
TKCC002	201	203	G40293	0.032
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TKCC002	205	207	G40295	0.043
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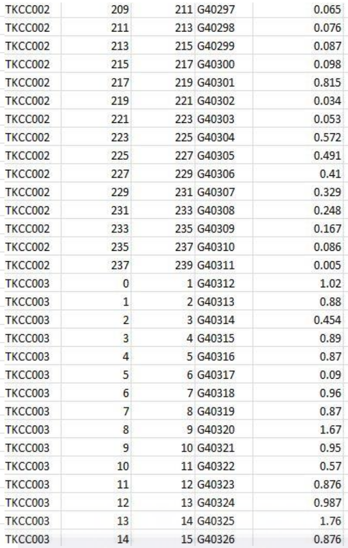
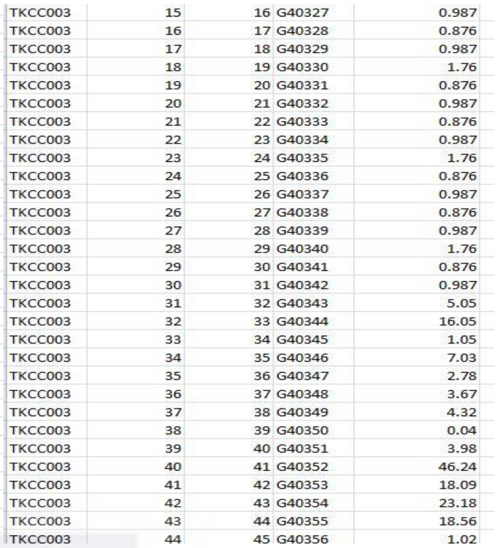
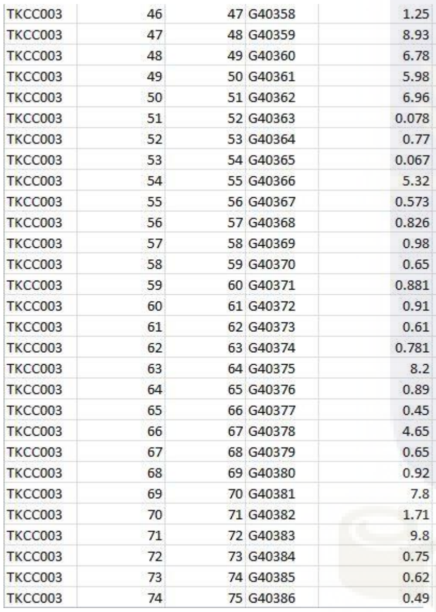


TKCC002	209	211	G40297	0.065
TKCC002	211	213	G40298	0.076
TKCC002	213	215	G40299	0.087
TKCC002	215	217	G40300	0.098
TKCC002	217	219	G40301	0.815
TKCC002	219	221	G40302	0.034
TKCC002	221	223	G40303	0.053
TKCC002	223	225	G40304	0.572
TKCC002	225	227	G40305	0.491
TKCC002	227	229	G40306	0.41
TKCC002	229	231	G40307	0.329
TKCC002	231	233	G40308	0.248
TKCC002	233	235	G40309	0.167
TKCC002	235	237	G40310	0.086
TKCC002	237	239	G40311	0.005
TKCC003	0	1	G40312	1.02
TKCC003	1	2	G40313	0.88
TKCC003	2	3	G40314	0.454
TKCC003	3	4	G40315	0.89
TKCC003	4	5	G40316	0.87
TKCC003	5	6	G40317	0.09
TKCC003	6	7	G40318	0.96
TKCC003	7	8	G40319	0.87
TKCC003	8	9	G40320	1.67
TKCC003	9	10	G40321	0.95
TKCC003	10	11	G40322	0.57
TKCC003	11	12	G40323	0.876
TKCC003	12	13	G40324	0.987
TKCC003	13	14	G40325	1.76
TKCC003	14	15	G40326	0.876



TKCC003	15	16	G40327	0.987
TKCC003	16	17	G40328	0.876
TKCC003	17	18	G40329	0.987
TKCC003	18	19	G40330	1.76
TKCC003	19	20	G40331	0.876
TKCC003	20	21	G40332	0.987
TKCC003	21	22	G40333	0.876
TKCC003	22	23	G40334	0.987
TKCC003	23	24	G40335	1.76
TKCC003	24	25	G40336	0.876
TKCC003	25	26	G40337	0.987
TKCC003	26	27	G40338	0.876
TKCC003	27	28	G40339	0.987
TKCC003	28	29	G40340	1.76
TKCC003	29	30	G40341	0.876
TKCC003	30	31	G40342	0.987
TKCC003	31	32	G40343	5.05
TKCC003	32	33	G40344	16.05
TKCC003	33	34	G40345	1.05
TKCC003	34	35	G40346	7.03
TKCC003	35	36	G40347	2.78
TKCC003	36	37	G40348	3.67
TKCC003	37	38	G40349	4.32
TKCC003	38	39	G40350	0.04
TKCC003	39	40	G40351	3.98
TKCC003	40	41	G40352	46.24
TKCC003	41	42	G40353	18.09
TKCC003	42	43	G40354	23.18
TKCC003	43	44	G40355	18.56
TKCC003	44	45	G40356	1.02



TKCC003	46	47	G40358	1.25
TKCC003	47	48	G40359	8.93
TKCC003	48	49	G40360	6.78
TKCC003	49	50	G40361	5.98
TKCC003	50	51	G40362	6.96
TKCC003	51	52	G40363	0.078
TKCC003	52	53	G40364	0.77
TKCC003	53	54	G40365	0.067
TKCC003	54	55	G40366	5.32
TKCC003	55	56	G40367	0.573
TKCC003	56	57	G40368	0.826
TKCC003	57	58	G40369	0.98
TKCC003	58	59	G40370	0.65
TKCC003	59	60	G40371	0.881
TKCC003	60	61	G40372	0.91
TKCC003	61	62	G40373	0.61
TKCC003	62	63	G40374	0.781
TKCC003	63	64	G40375	8.2
TKCC003	64	65	G40376	0.89
TKCC003	65	66	G40377	0.45
TKCC003	66	67	G40378	4.65
TKCC003	67	68	G40379	0.65
TKCC003	68	69	G40380	0.92
TKCC003	69	70	G40381	7.8
TKCC003	70	71	G40382	1.71
TKCC003	71	72	G40383	9.8
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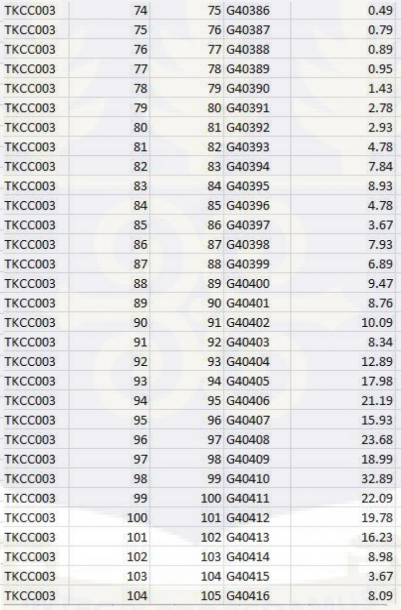
TKCC003	74	75	G40386	0.49



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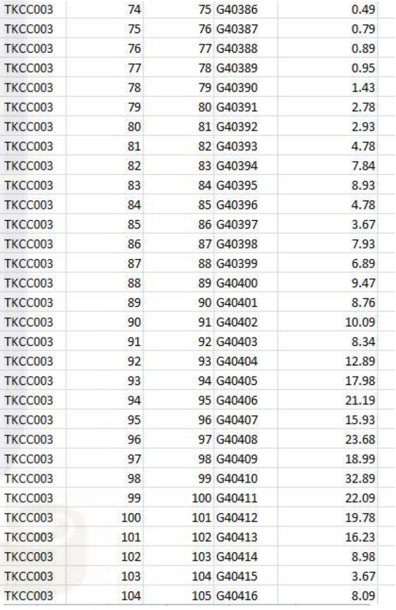
TKCC003	78	79	G40390	1.43
TKCC003	79	80	G40391	2.78
TKCC003	80	81	G40392	2.93
TKCC003	81	82	G40393	4.78
TKCC003	82	83	G40394	7.84
TKCC003	83	84	G40395	8.93
TKCC003	84	85	G40396	4.78
TKCC003	85	86	G40397	3.67
TKCC003	86	87	G40398	7.93
TKCC003	87	88	G40399	6.89
TKCC003	88	89	G40400	9.47
TKCC003	89	90	G40401	8.76
TKCC003	90	91	G40402	10.09
TKCC003	91	92	G40403	8.34
TKCC003	92	93	G40404	12.89
TKCC003	93	94	G40405	17.98
TKCC003	94	95	G40406	21.19
TKCC003	95	96	G40407	15.93
TKCC003	96	97	G40408	23.68
TKCC003	97	98	G40409	18.99
TKCC003	98	99	G40410	32.89
TKCC003	99	100	G40411	22.09
TKCC003	100	101	G40412	19.78
TKCC003	101	102	G40413	16.23
TKCC003	102	103	G40414	8.98
TKCC003	103	104	G40415	3.67
TKCC003	104	105	G40416	8.09



TKCC003	74	75	G40386	0.49
TKCC003	75	76	G40387	0.79
TKCC003	76	77	G40388	0.89
TKCC003	77	78	G40389	0.95
TKCC003	78	79	G40390	1.43
TKCC003	79	80	G40391	2.78
TKCC003	80	81	G40392	2.93
TKCC003	81	82	G40393	4.78
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TKCC003	83	84	G40395	8.93
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TKCC003	87	88	G40399	6.89
TKCC003	88	89	G40400	9.47
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TKCC003	90	91	G40402	10.09
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TKCC003	93	94	G40405	17.98
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TKCC003	95	96	G40407	15.93
TKCC003	96	97	G40408	23.68
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TKCC003	100	101	G40412	19.78
TKCC003	101	102	G40413	16.23
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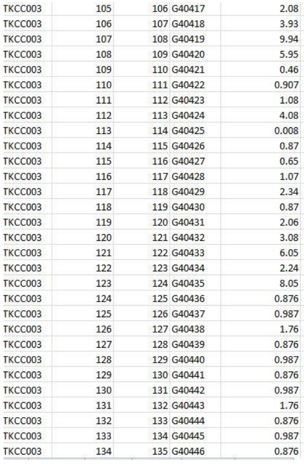
TKCC003	103	104	G40415	3.67
TKCC003	104	105	G40416	8.09



TKCC003	105	106	G40417	2.08
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TKCC003	107	108	G40419	9.94
TKCC003	108	109	G40420	5.95
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TKCC003	110	111	G40422	0.907
TKCC003	111	112	G40423	1.08
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TKCC003	113	114	G40425	0.008
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TKCC003	115	116	G40427	0.65
TKCC003	116	117	G40428	1.07
TKCC003	117	118	G40429	2.34
TKCC003	118	119	G40430	0.87
TKCC003	119	120	G40431	2.06
TKCC003	120	121	G40432	3.08
TKCC003	121	122	G40433	6.05
TKCC003	122	123	G40434	2.24
TKCC003	123	124	G40435	8.05
TKCC003	124	125	G40436	0.876
TKCC003	125	126	G40437	0.987
TKCC003	126	127	G40438	1.76
TKCC003	127	128	G40439	0.876
TKCC003	128	129	G40440	0.987
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TKCC003	130	131	G40442	0.987
TKCC003	131	132	G40443	1.76
TKCC003	132	133	G40444	0.876
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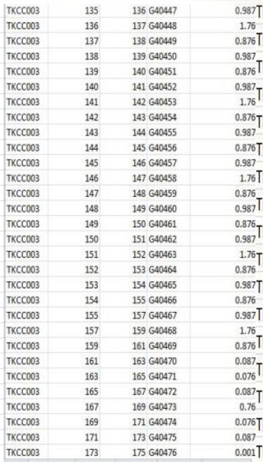

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TKCC003	147	148	G40459	0.876
TKCC003	148	149	G40460	0.987
TKCC003	149	150	G40461	0.876
TKCC003	150	151	G40462	0.987
TKCC003	151	152	G40463	1.76
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TKCC003	153	154	G40465	0.987
TKCC003	154	155	G40466	0.876
TKCC003	155	157	G40467	0.987
TKCC003	157	159	G40468	1.76
TKCC003	159	161	G40469	0.876
TKCC003	161	163	G40470	0.087
TKCC003	163	165	G40471	0.076
TKCC003	165	167	G40472	0.087
TKCC003	167	169	G40473	0.76
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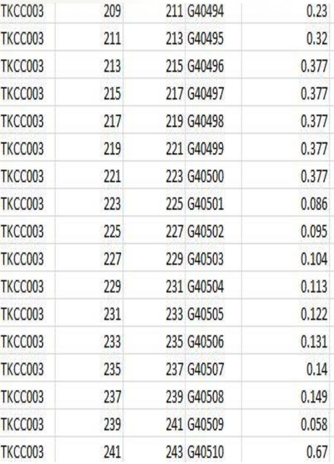

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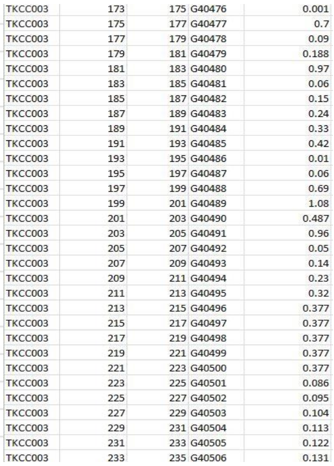
TKCC003	215	217	G40497	0.377
TKCC003	217	219	G40498	0.377
TKCC003	219	221	G40499	0.377
TKCC003	221	223	G40500	0.377
TKCC003	223	225	G40501	0.086
TKCC003	225	227	G40502	0.095
TKCC003	227	229	G40503	0.104
TKCC003	229	231	G40504	0.113
TKCC003	231	233	G40505	0.122
TKCC003	233	235	G40506	0.131
TKCC003	235	237	G40507	0.14
TKCC003	237	239	G40508	0.149
TKCC003	239	241	G40509	0.058
TKCC003	241	243	G40510	0.67



TKCC003	173	175	G40476	0.001
TKCC003	175	177	G40477	0.7
TKCC003	177	179	G40478	0.09
TKCC003	179	181	G40479	0.188
TKCC003	181	183	G40480	0.97
TKCC003	183	185	G40481	0.06
TKCC003	185	187	G40482	0.15
TKCC003	187	189	G40483	0.24
TKCC003	189	191	G40484	0.33
TKCC003	191	193	G40485	0.42
TKCC003	193	195	G40486	0.01
TKCC003	195	197	G40487	0.06
TKCC003	197	199	G40488	0.69
TKCC003	199	201	G40489	1.08
TKCC003	201	203	G40490	0.487
TKCC003	203	205	G40491	0.96
TKCC003	205	207	G40492	0.05
TKCC003	207	209	G40493	0.14
TKCC003	209	211	G40494	0.23
TKCC003	211	213	G40495	0.32
TKCC003	213	215	G40496	0.377
TKCC003	215	217	G40497	0.377
TKCC003	217	219	G40498	0.377
TKCC003	219	221	G40499	0.377
TKCC003	221	223	G40500	0.377
TKCC003	223	225	G40501	0.086
TKCC003	225	227	G40502	0.095
TKCC003	227	229	G40503	0.104
TKCC003	229	231	G40504	0.113
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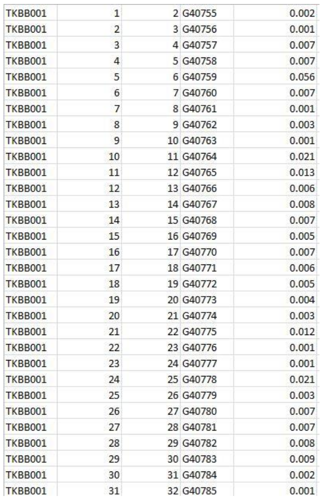
TKCC003	233	235	G40506	0.131

APPENDIX B

ASSAY RESULTS OF TRENCH SAMPLES



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TKBB001	6	7	G40760	0.007
TKBB001	7	8	G40761	0.001
TKBB001	8	9	G40762	0.003
TKBB001	9	10	G40763	0.001
TKBB001	10	11	G40764	0.021
TKBB001	11	12	G40765	0.013
TKBB001	12	13	G40766	0.006
TKBB001	13	14	G40767	0.008
TKBB001	14	15	G40768	0.007
TKBB001	15	16	G40769	0.005
TKBB001	16	17	G40770	0.007
TKBB001	17	18	G40771	0.006
TKBB001	18	19	G40772	0.005
TKBB001	19	20	G40773	0.004
TKBB001	20	21	G40774	0.003
TKBB001	21	22	G40775	0.012
TKBB001	22	23	G40776	0.001
TKBB001	23	24	G40777	0.001
TKBB001	24	25	G40778	0.021
TKBB001	25	26	G40779	0.003
TKBB001	26	27	G40780	0.007
TKBB001	27	28	G40781	0.007
TKBB001	28	29	G40782	0.008
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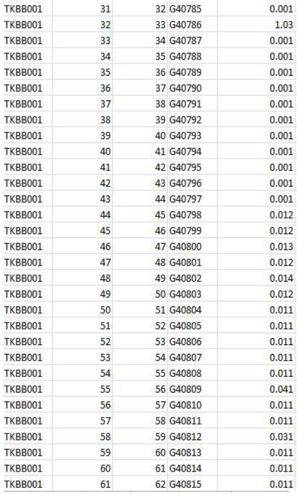
TKBB001	31	32	G40785	0.001



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TKBB001	35	36	G40789	0.001
TKBB001	36	37	G40790	0.001
TKBB001	37	38	G40791	0.001
TKBB001	38	39	G40792	0.001
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TKBB001	43	44	G40797	0.001
TKBB001	44	45	G40798	0.012
TKBB001	45	46	G40799	0.012
TKBB001	46	47	G40800	0.013
TKBB001	47	48	G40801	0.012
TKBB001	48	49	G40802	0.014
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TKBB001	55	56	G40809	0.041
TKBB001	56	57	G40810	0.011
TKBB001	57	58	G40811	0.011
TKBB001	58	59	G40812	0.031
TKBB001	59	60	G40813	0.011
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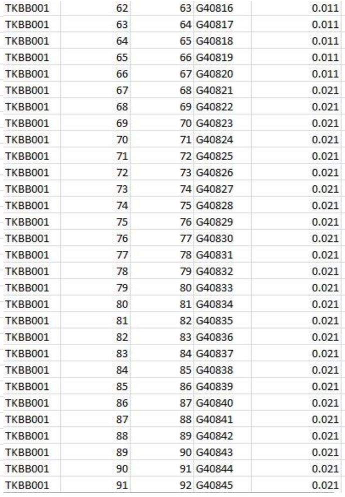
TKBB001	61	62	G40815	0.011



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TKBB001	66	67	G40820	0.011
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TKBB001	71	72	G40825	0.021
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TKBB001	73	74	G40827	0.021
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TKBB001	77	78	G40831	0.021
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TKBB001	80	81	G40834	0.021
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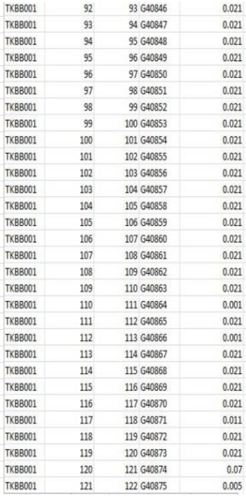

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TKBB001	117	118	G40871	0.011
TKBB001	118	119	G40872	0.021
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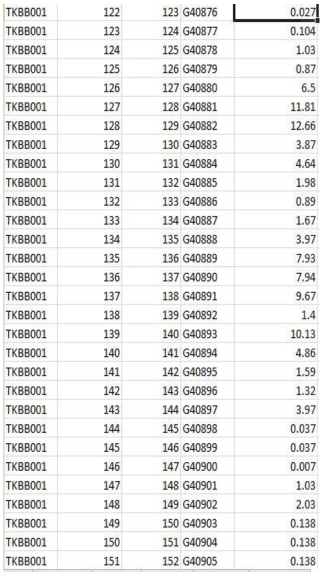

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TKBB001	126	127	G40880	6.5
TKBB001	127	128	G40881	11.81
TKBB001	128	129	G40882	12.66
TKBB001	129	130	G40883	3.87
TKBB001	130	131	G40884	4.64
TKBB001	131	132	G40885	1.98
TKBB001	132	133	G40886	0.89
TKBB001	133	134	G40887	1.67
TKBB001	134	135	G40888	3.97
TKBB001	135	136	G40889	7.93
TKBB001	136	137	G40890	7.94
TKBB001	137	138	G40891	9.67
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TKBB001	139	140	G40893	10.13
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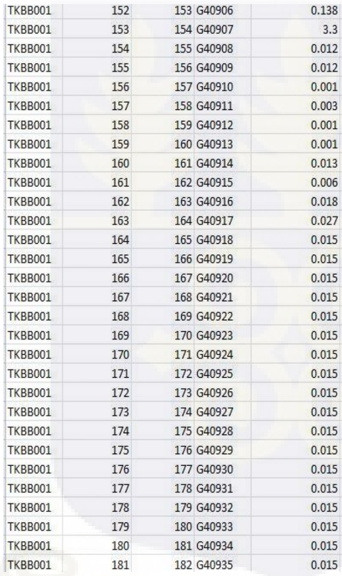
TKBB001	141	142	G40895	1.59
TKBB001	142	143	G40896	1.32
TKBB001	143	144	G40897	3.97
TKBB001	144	145	G40898	0.037
TKBB001	145	146	G40899	0.037
TKBB001	146	147	G40900	0.007
TKBB001	147	148	G40901	1.03
TKBB001	148	149	G40902	2.03
TKBB001	149	150	G40903	0.138
TKBB001	150	151	G40904	0.138
TKBB001	151	152	G40905	0.138



TKBB001	152	153	G40906	0.138
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TKBB001	155	156	G40909	0.012
TKBB001	156	157	G40910	0.001
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TKBB001	158	159	G40912	0.001
TKBB001	159	160	G40913	0.001
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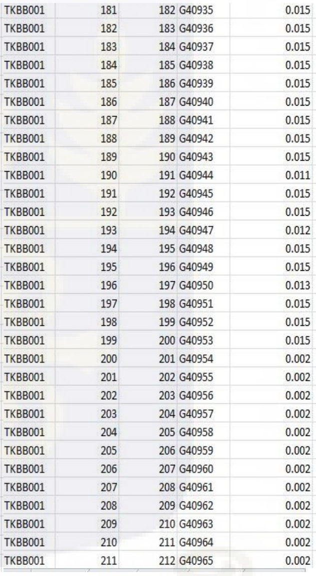

TKBB001	181	182	G40935	0.015
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TKBB001	189	190	G40943	0.015
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TKBB001	207	208	G40961	0.002
TKBB001	208	209	G40962	0.002
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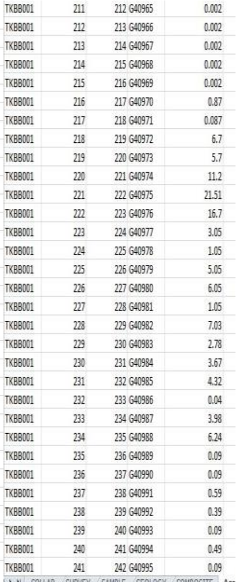

TKBB001	211	212	G40965	0.002
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TKBB001	214	215	G40968	0.002
TKBB001	215	216	G40969	0.002
TKBB001	216	217	G40970	0.87
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TKBB001	220	221	G40974	11.2
TKBB001	221	222	G40975	21.51
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TKBB001	224	225	G40978	1.05
TKBB001	225	226	G40979	5.05
TKBB001	226	227	G40980	6.05
TKBB001	227	228	G40981	1.05
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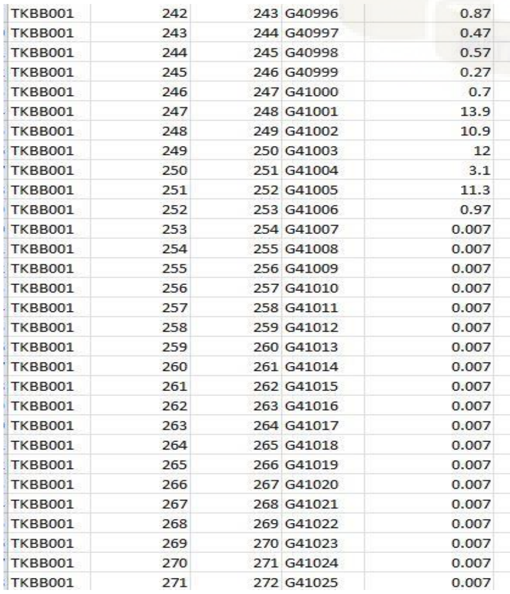

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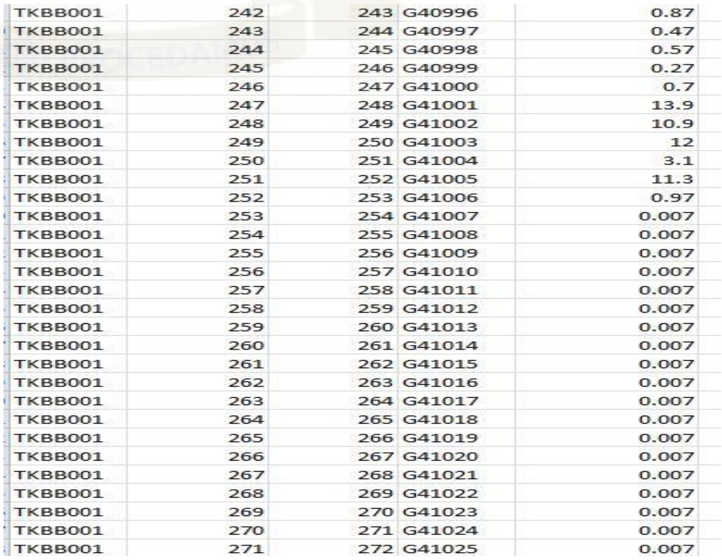
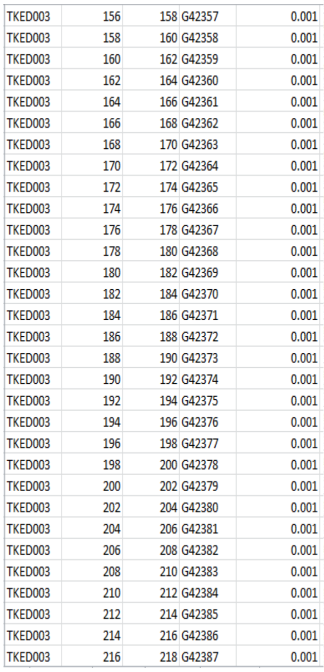
TKBB001	248	249	G41002	10.9
TKBB001	249	250	G41003	12
TKBB001	250	251	G41004	3.1
TKBB001	251	252	G41005	11.3
TKBB001	252	253	G41006	0.97
TKBB001	253	254	G41007	0.007
TKBB001	254	255	G41008	0.007
TKBB001	255	256	G41009	0.007
TKBB001	256	257	G41010	0.007
TKBB001	257	258	G41011	0.007
TKBB001	258	259	G41012	0.007
TKBB001	259	260	G41013	0.007
TKBB001	260	261	G41014	0.007
TKBB001	261	262	G41015	0.007
TKBB001	262	263	G41016	0.007
TKBB001	263	264	G41017	0.007
TKBB001	264	265	G41018	0.007
TKBB001	265	266	G41019	0.007
TKBB001	266	267	G41020	0.007
TKBB001	267	268	G41021	0.007
TKBB001	268	269	G41022	0.007
TKBB001	269	270	G41023	0.007
TKBB001	270	271	G41024	0.007
TKBB001	271	272	G41025	0.007



TKBB001	242	243	G40996	0.87
TKBB001	243	244	G40997	0.47
TKBB001	244	245	G40998	0.57
TKBB001	245	246	G40999	0.27
TKBB001	246	247	G41000	0.7
TKBB001	247	248	G41001	13.9
TKBB001	248	249	G41002	10.9
TKBB001	249	250	G41003	12
TKBB001	250	251	G41004	3.1
TKBB001	251	252	G41005	11.3
TKBB001	252	253	G41006	0.97
TKBB001	253	254	G41007	0.007
TKBB001	254	255	G41008	0.007
TKBB001	255	256	G41009	0.007
TKBB001	256	257	G41010	0.007
TKBB001	257	258	G41011	0.007
TKBB001	258	259	G41012	0.007
TKBB001	259	260	G41013	0.007
TKBB001	260	261	G41014	0.007
TKBB001	261	262	G41015	0.007
TKBB001	262	263	G41016	0.007
TKBB001	263	264	G41017	0.007
TKBB001	264	265	G41018	0.007
TKBB001	265	266	G41019	0.007
TKBB001	266	267	G41020	0.007
TKBB001	267	268	G41021	0.007
TKBB001	268	269	G41022	0.007
TKBB001	269	270	G41023	0.007
TKBB001	270	271	G41024	0.007
TKBB001	271	272	G41025	0.007

APPENDIX B
ASSAY RESULTS OF TRENCH SAMPLES



TKED003	156	158	G42357	0.001
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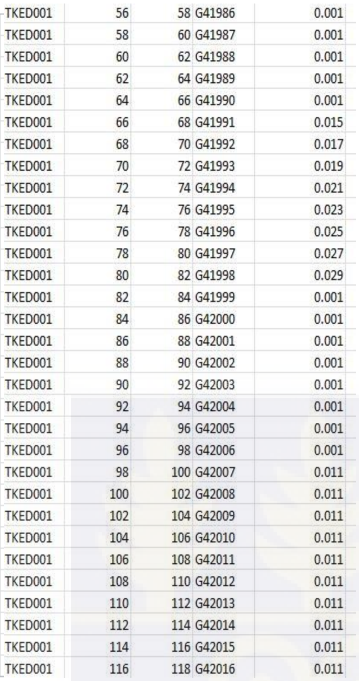
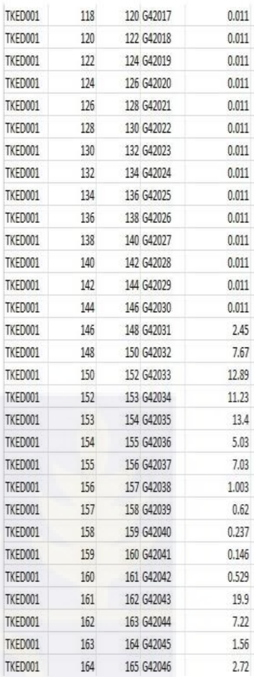
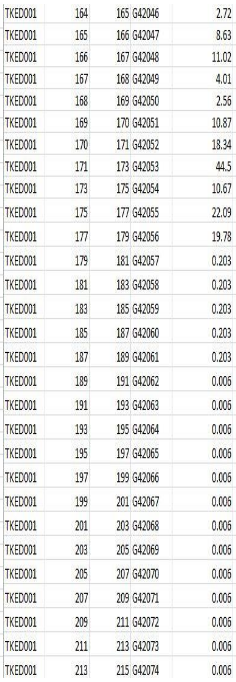
TKED003	160	162	G42359	0.001
TKED003	162	164	G42360	0.001
TKED003	164	166	G42361	0.001
TKED003	166	168	G42362	0.001
TKED003	168	170	G42363	0.001
TKED003	170	172	G42364	0.001
TKED003	172	174	G42365	0.001
TKED003	174	176	G42366	0.001
TKED003	176	178	G42367	0.001
TKED003	178	180	G42368	0.001
TKED003	180	182	G42369	0.001
TKED003	182	184	G42370	0.001
TKED003	184	186	G42371	0.001
TKED003	186	188	G42372	0.001
TKED003	188	190	G42373	0.001
TKED003	190	192	G42374	0.001
TKED003	192	194	G42375	0.001
TKED003	194	196	G42376	0.001
TKED003	196	198	G42377	0.001
TKED003	198	200	G42378	0.001
TKED003	200	202	G42379	0.001
TKED003	202	204	G42380	0.001
TKED003	204	206	G42381	0.001
TKED003	206	208	G42382	0.001
TKED003	208	210	G42383	0.001
TKED003	210	212	G42384	0.001
TKED003	212	214	G42385	0.001
TKED003	214	216	G42386	0.001
TKED003	216	218	G42387	0.001



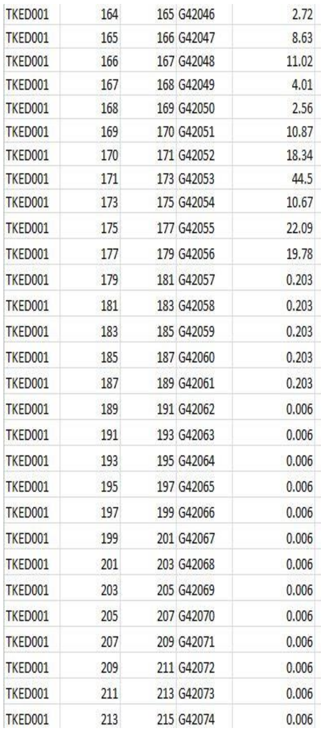
TKED001	56	58	G41986	0.001
TKED001	58	60	G41987	0.001
TKED001	60	62	G41988	0.001
TKED001	62	64	G41989	0.001
TKED001	64	66	G41990	0.001
TKED001	66	68	G41991	0.015
TKED001	68	70	G41992	0.017
TKED001	70	72	G41993	0.019
TKED001	72	74	G41994	0.021
TKED001	74	76	G41995	0.023
TKED001	76	78	G41996	0.025
TKED001	78	80	G41997	0.027
TKED001	80	82	G41998	0.029
TKED001	82	84	G41999	0.001
TKED001	84	86	G42000	0.001
TKED001	86	88	G42001	0.001
TKED001	88	90	G42002	0.001
TKED001	90	92	G42003	0.001
TKED001	92	94	G42004	0.001
TKED001	94	96	G42005	0.001
TKED001	96	98	G42006	0.001
TKED001	98	100	G42007	0.011
TKED001	100	102	G42008	0.011
TKED001	102	104	G42009	0.011
TKED001	104	106	G42010	0.011
TKED001	106	108	G42011	0.011
TKED001	108	110	G42012	0.011
TKED001	110	112	G42013	0.011
TKED001	112	114	G42014	0.011
TKED001	114	116	G42015	0.011
TKED001	116	118	G42016	0.011



TKED001	118	120	G42017	0.011
TKED001	120	122	G42018	0.011
TKED001	122	124	G42019	0.011
TKED001	124	126	G42020	0.011
TKED001	126	128	G42021	0.011
TKED001	128	130	G42022	0.011
TKED001	130	132	G42023	0.011
TKED001	132	134	G42024	0.011
TKED001	134	136	G42025	0.011
TKED001	136	138	G42026	0.011
TKED001	138	140	G42027	0.011
TKED001	140	142	G42028	0.011
TKED001	142	144	G42029	0.011
TKED001	144	146	G42030	0.011
TKED001	146	148	G42031	2.45
TKED001	148	150	G42032	7.67
TKED001	150	152	G42033	12.89
TKED001	152	153	G42034	11.23
TKED001	153	154	G42035	13.4
TKED001	154	155	G42036	5.03
TKED001	155	156	G42037	7.03
TKED001	156	157	G42038	1.003
TKED001	157	158	G42039	0.62
TKED001	158	159	G42040	0.237
TKED001	159	160	G42041	0.146
TKED001	160	161	G42042	0.529
TKED001	161	162	G42043	19.9
TKED001	162	163	G42044	7.22
TKED001	163	164	G42045	1.56
TKED001	164	165	G42046	2.72



TKED001	164	165	G42046	2.72
TKED001	165	166	G42047	8.63
TKED001	166	167	G42048	11.02
TKED001	167	168	G42049	4.01
TKED001	168	169	G42050	2.56
TKED001	169	170	G42051	10.87
TKED001	170	171	G42052	18.34
TKED001	171	173	G42053	44.5
TKED001	173	175	G42054	10.67
TKED001	175	177	G42055	22.09
TKED001	177	179	G42056	19.78
TKED001	179	181	G42057	0.203
TKED001	181	183	G42058	0.203
TKED001	183	185	G42059	0.203
TKED001	185	187	G42060	0.203
TKED001	187	189	G42061	0.203
TKED001	189	191	G42062	0.006
TKED001	191	193	G42063	0.006
TKED001	193	195	G42064	0.006
TKED001	195	197	G42065	0.006
TKED001	197	199	G42066	0.006
TKED001	199	201	G42067	0.006
TKED001	201	203	G42068	0.006
TKED001	203	205	G42069	0.006
TKED001	205	207	G42070	0.006
TKED001	207	209	G42071	0.006
TKED001	209	211	G42072	0.006
TKED001	211	213	G42073	0.006
TKED001	213	215	G42074	0.006



TKED001	164	165	G42046	2.72
TKED001	165	166	G42047	8.63
TKED001	166	167	G42048	11.02
TKED001	167	168	G42049	4.01
TKED001	168	169	G42050	2.56
TKED001	169	170	G42051	10.87
TKED001	170	171	G42052	18.34
TKED001	171	173	G42053	44.5
TKED001	173	175	G42054	10.67
TKED001	175	177	G42055	22.09
TKED001	177	179	G42056	19.78
TKED001	179	181	G42057	0.203
TKED001	181	183	G42058	0.203
TKED001	183	185	G42059	0.203
TKED001	185	187	G42060	0.203
TKED001	187	189	G42061	0.203
TKED001	189	191	G42062	0.006
TKED001	191	193	G42063	0.006
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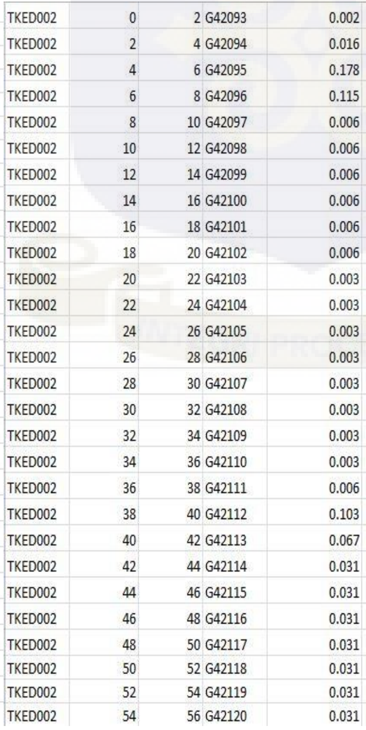
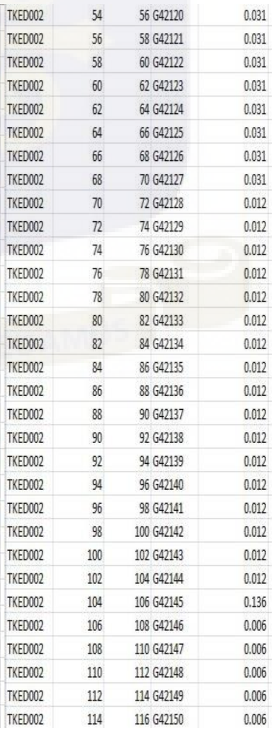
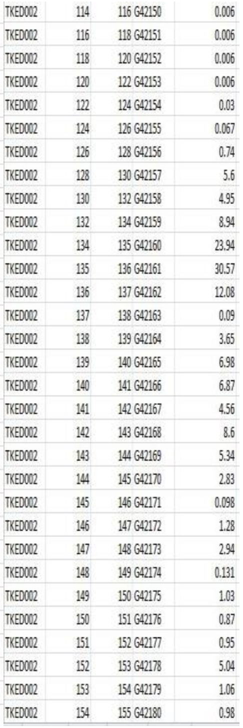
TKED001	195	197	G42065	0.006
TKED001	197	199	G42066	0.006
TKED001	199	201	G42067	0.006
TKED001	201	203	G42068	0.006
TKED001	203	205	G42069	0.006
TKED001	205	207	G42070	0.006
TKED001	207	209	G42071	0.006
TKED001	209	211	G42072	0.006
TKED001	211	213	G42073	0.006
TKED001	213	215	G42074	0.006



TKED002	0	2	G42093	0.002
TKED002	2	4	G42094	0.016
TKED002	4	6	G42095	0.178
TKED002	6	8	G42096	0.115
TKED002	8	10	G42097	0.006
TKED002	10	12	G42098	0.006
TKED002	12	14	G42099	0.006
TKED002	14	16	G42100	0.006
TKED002	16	18	G42101	0.006
TKED002	18	20	G42102	0.006
TKED002	20	22	G42103	0.003
TKED002	22	24	G42104	0.003
TKED002	24	26	G42105	0.003
TKED002	26	28	G42106	0.003
TKED002	28	30	G42107	0.003
TKED002	30	32	G42108	0.003
TKED002	32	34	G42109	0.003
TKED002	34	36	G42110	0.003
TKED002	36	38	G42111	0.006
TKED002	38	40	G42112	0.103
TKED002	40	42	G42113	0.067
TKED002	42	44	G42114	0.031
TKED002	44	46	G42115	0.031
TKED002	46	48	G42116	0.031
TKED002	48	50	G42117	0.031
TKED002	50	52	G42118	0.031
TKED002	52	54	G42119	0.031
TKED002	54	56	G42120	0.031

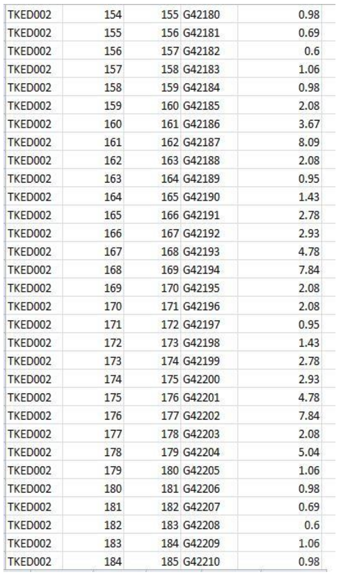


TKED002	54	56	G42120	0.031
TKED002	56	58	G42121	0.031
TKED002	58	60	G42122	0.031
TKED002	60	62	G42123	0.031
TKED002	62	64	G42124	0.031
TKED002	64	66	G42125	0.031
TKED002	66	68	G42126	0.031
TKED002	68	70	G42127	0.031
TKED002	70	72	G42128	0.012
TKED002	72	74	G42129	0.012
TKED002	74	76	G42130	0.012
TKED002	76	78	G42131	0.012
TKED002	78	80	G42132	0.012
TKED002	80	82	G42133	0.012
TKED002	82	84	G42134	0.012
TKED002	84	86	G42135	0.012
TKED002	86	88	G42136	0.012
TKED002	88	90	G42137	0.012
TKED002	90	92	G42138	0.012
TKED002	92	94	G42139	0.012
TKED002	94	96	G42140	0.012
TKED002	96	98	G42141	0.012
TKED002	98	100	G42142	0.012
TKED002	100	102	G42143	0.012
TKED002	102	104	G42144	0.012
TKED002	104	106	G42145	0.136
TKED002	106	108	G42146	0.006
TKED002	108	110	G42147	0.006
TKED002	110	112	G42148	0.006
TKED002	112	114	G42149	0.006
TKED002	114	116	G42150	0.006



TKED002	114	116	G42150	0.006
TKED002	116	118	G42151	0.006
TKED002	118	120	G42152	0.006
TKED002	120	122	G42153	0.006
TKED002	122	124	G42154	0.03
TKED002	124	126	G42155	0.067
TKED002	126	128	G42156	0.74
TKED002	128	130	G42157	5.6
TKED002	130	132	G42158	4.95
TKED002	132	134	G42159	8.94
TKED002	134	135	G42160	23.94
TKED002	135	136	G42161	30.57
TKED002	136	137	G42162	12.08
TKED002	137	138	G42163	0.09
TKED002	138	139	G42164	3.65
TKED002	139	140	G42165	6.98
TKED002	140	141	G42166	6.87
TKED002	141	142	G42167	4.56
TKED002	142	143	G42168	8.6
TKED002	143	144	G42169	5.34
TKED002	144	145	G42170	2.83
TKED002	145	146	G42171	0.098
TKED002	146	147	G42172	1.28
TKED002	147	148	G42173	2.94
TKED002	148	149	G42174	0.131
TKED002	149	150	G42175	1.03
TKED002	150	151	G42176	0.87
TKED002	151	152	G42177	0.95
TKED002	152	153	G42178	5.04
TKED002	153	154	G42179	1.06
TKED002	154	155	G42180	0.98

APPENDIX B
ASSAY RESULTS OF TRENCH SAMPLES



TKED002	154	155	G42180	0.98
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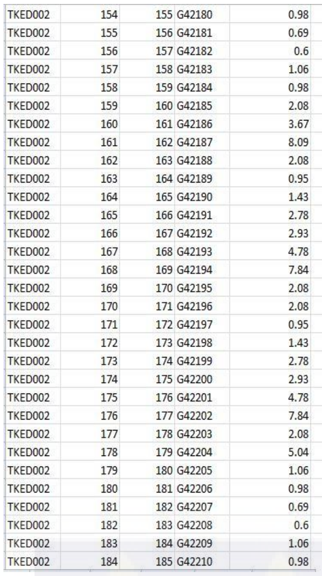
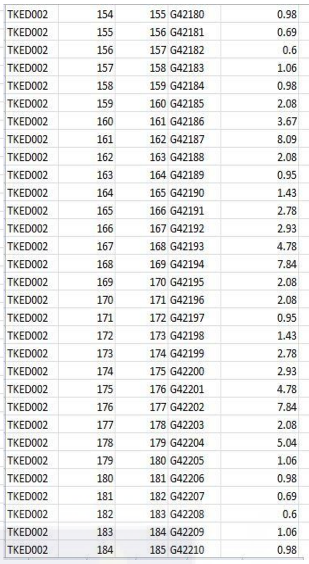
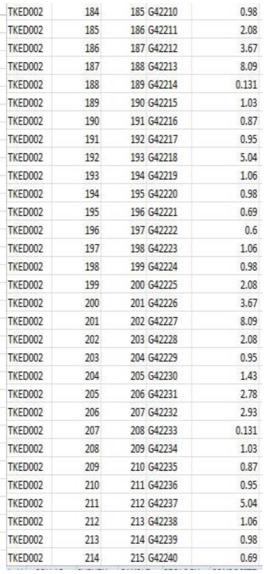
TKED002	156	157	G42182	0.6
TKED002	157	158	G42183	1.06
TKED002	158	159	G42184	0.98
TKED002	159	160	G42185	2.08
TKED002	160	161	G42186	3.67
TKED002	161	162	G42187	8.09
TKED002	162	163	G42188	2.08
TKED002	163	164	G42189	0.95
TKED002	164	165	G42190	1.43
TKED002	165	166	G42191	2.78
TKED002	166	167	G42192	2.93
TKED002	167	168	G42193	4.78
TKED002	168	169	G42194	7.84
TKED002	169	170	G42195	2.08
TKED002	170	171	G42196	2.08
TKED002	171	172	G42197	0.95
TKED002	172	173	G42198	1.43
TKED002	173	174	G42199	2.78
TKED002	174	175	G42200	2.93
TKED002	175	176	G42201	4.78
TKED002	176	177	G42202	7.84
TKED002	177	178	G42203	2.08
TKED002	178	179	G42204	5.04
TKED002	179	180	G42205	1.06
TKED002	180	181	G42206	0.98
TKED002	181	182	G42207	0.69
TKED002	182	183	G42208	0.6
TKED002	183	184	G42209	1.06
TKED002	184	185	G42210	0.98



TKED002	154	155	G42180	0.98
TKED002	155	156	G42181	0.69
TKED002	156	157	G42182	0.6
TKED002	157	158	G42183	1.06
TKED002	158	159	G42184	0.98
TKED002	159	160	G42185	2.08
TKED002	160	161	G42186	3.67
TKED002	161	162	G42187	8.09
TKED002	162	163	G42188	2.08
TKED002	163	164	G42189	0.95
TKED002	164	165	G42190	1.43
TKED002	165	166	G42191	2.78
TKED002	166	167	G42192	2.93
TKED002	167	168	G42193	4.78
TKED002	168	169	G42194	7.84
TKED002	169	170	G42195	2.08
TKED002	170	171	G42196	2.08
TKED002	171	172	G42197	0.95
TKED002	172	173	G42198	1.43
TKED002	173	174	G42199	2.78
TKED002	174	175	G42200	2.93
TKED002	175	176	G42201	4.78
TKED002	176	177	G42202	7.84
TKED002	177	178	G42203	2.08
TKED002	178	179	G42204	5.04
TKED002	179	180	G42205	1.06
TKED002	180	181	G42206	0.98
TKED002	181	182	G42207	0.69
TKED002	182	183	G42208	0.6
TKED002	183	184	G42209	1.06
TKED002	184	185	G42210	0.98



TKED002	154	155	G42180	0.98
TKED002	155	156	G42181	0.69
TKED002	156	157	G42182	0.6
TKED002	157	158	G42183	1.06
TKED002	158	159	G42184	0.98
TKED002	159	160	G42185	2.08
TKED002	160	161	G42186	3.67
TKED002	161	162	G42187	8.09
TKED002	162	163	G42188	2.08
TKED002	163	164	G42189	0.95
TKED002	164	165	G42190	1.43
TKED002	165	166	G42191	2.78
TKED002	166	167	G42192	2.93
TKED002	167	168	G42193	4.78
TKED002	168	169	G42194	7.84
TKED002	169	170	G42195	2.08
TKED002	170	171	G42196	2.08
TKED002	171	172	G42197	0.95
TKED002	172	173	G42198	1.43
TKED002	173	174	G42199	2.78
TKED002	174	175	G42200	2.93
TKED002	175	176	G42201	4.78
TKED002	176	177	G42202	7.84
TKED002	177	178	G42203	2.08
TKED002	178	179	G42204	5.04
TKED002	179	180	G42205	1.06
TKED002	180	181	G42206	0.98
TKED002	181	182	G42207	0.69
TKED002	182	183	G42208	0.6
TKED002	183	184	G42209	1.06
TKED002	184	185	G42210	0.98



TKED002	184	185	G42210	0.98
TKED002	185	186	G42211	2.08
TKED002	186	187	G42212	3.67
TKED002	187	188	G42213	8.09
TKED002	188	189	G42214	0.131
TKED002	189	190	G42215	1.03
TKED002	190	191	G42216	0.87
TKED002	191	192	G42217	0.95
TKED002	192	193	G42218	5.04
TKED002	193	194	G42219	1.06
TKED002	194	195	G42220	0.98
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TKED002	201	202	G42227	8.09
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TKED002	209	210	G42235	0.87
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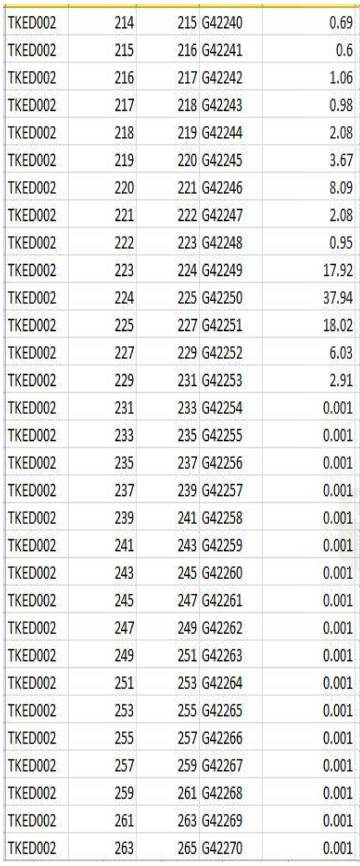

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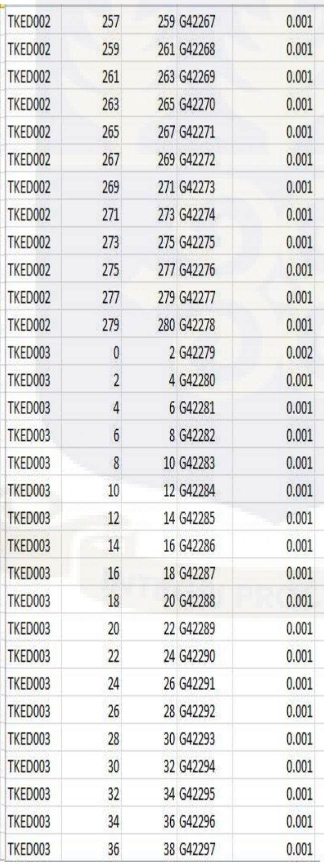

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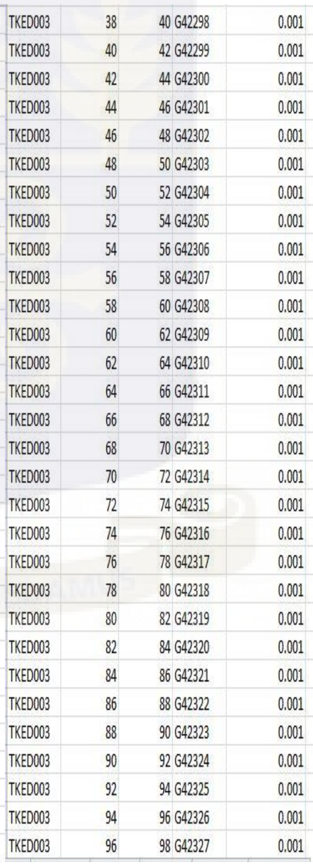

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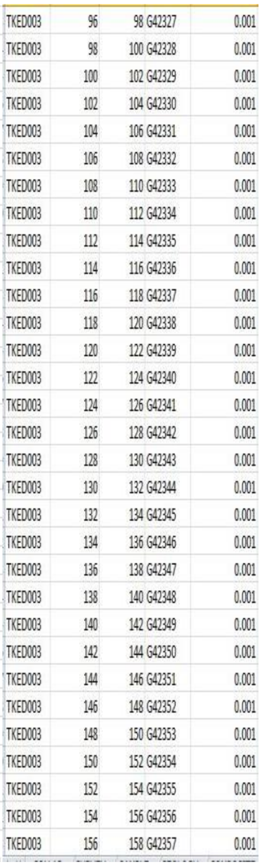

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