мұндағы $\frac{K_u}{K_n}$ – қатнасы оптикалық жүйенің көрнісін салу кезіндегі объектінің модуляция тереңдігінің (контраст) өзгеру деңгейін сипаттайды.

Спектриалды диапазонда жұмыс істейтін оптико-электронды түрлендіргіш оптикалық жүйенің қызметтік сипаттамасын,яғни линзалы, айна-лизалы немесе айналы болуын анықтайды. Өзінің масса – көлемдік өлшемінің үлкендігіне байланысты үлкен ғарыштық аппараттарда линзалы оптикалық жүйе пайдаланылмайды. Мультиспектриалды арна бір мезгілде спектрдің тар (жіңішке) төрт диапазонында жұмыс істей алады. Барлығы да ғарыш аппаратының мүмкіндігі мен Жерге ақпарат беретін радиоарнаның мүмкіндігіне байланысты болады.

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Этапы развития и физические основы дистанционного зондирования Земли

Резюме. На сегодняшний день вовсем мире мониторинг Земной поверхности через дистанционное зондирование Земли получил широкое распространения, в котором активно участвуют и Казахстанские космические аппараты «KazEOSat-1» и «KazEOSat-2». Также в этой статье имеет место физические основы дистанционного зондирования Земли.

Ключевые слова. Космические аппараты, дистанционного зондирования Земли, разрешение, фокусное расстояние, полоса захвата, цифровой тракт.

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Stages of development of the remote sensing of Earth and physical bases of the remote sensing of Earth

Summary. To date the вовсем world, monitoring of the Earth surface through the remote sensing of Earth got wide distribution in that the Kazakhstan space vehicles of «KazEOSat-1» participate actively, «KazEOSat-2». Also in this article takes place physical bases of.

Key words. Space vehicles, remote sensing of Earth, permission, focal distance, stripe of capture, digital highway.

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EVALUATION OF ENGINEERING GEOLOGICAL CHARACTERISTICS FOR THE DAHANE DARA DAM SITE, AFGHANISTAN

Abstract: An evaluation of the geologic and geotechnical characteristics of the proposed Dahane Dara Dam site, located in the Faryab Province of northern Afghanistan, was undertaken as part of a water resource project feasibility study. The dam is proposed to be built on the Maymana River, near Maymana City. The dam would be founded on marlstone rock of Miocene and Eocene age. Geological engineering and geotechnical information were obtained from field and laboratory analyses, respectively. This paper presents the engineering geological parameters based on a review of the initial engineering geological and desk studies. Based on the obtained results, the permeability of the rock mass is very high in the dam site. According to the results of Lugeon test and borehole log, the assessment of the relation between Lugeon and RQD were performed. Obtained results showed that there is a meaningful relationship between Lugeon unit and the RQD parameter.

Keyword: Dahane Dara Dam, Marlstone, Engineering Geological, RQD, Lugeon Test

1) GEOGRAPHICAL LOCATION OF THE PROJECT AREA

The proposed dam site is situated on the Maymana River, approximately 12 km south of Maymana City, Faryab province, Afghanistan.

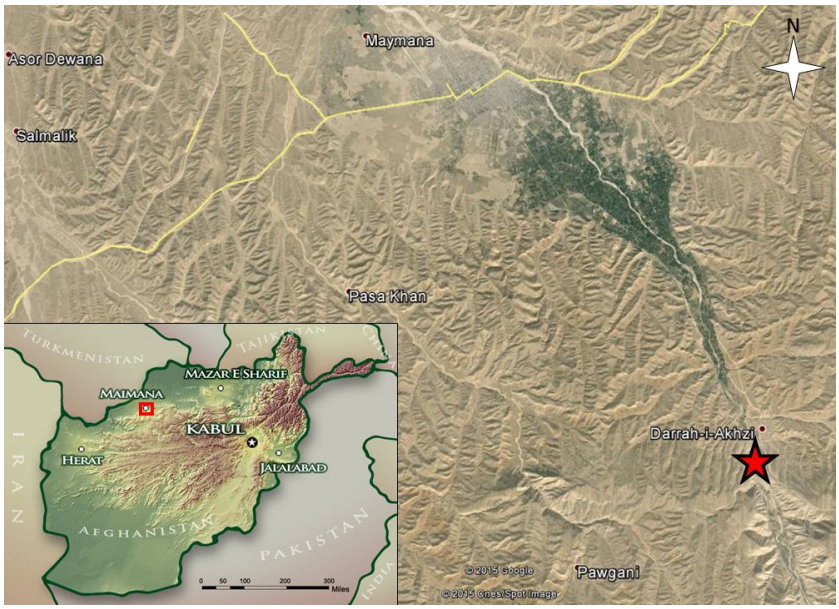

Fig. 1. Satellite imagery map showing approximate location of the proposed Dahane Dara Dam site (red star outlined in black). Boundary of the satellite image is shown as a red rectangle outline in the inset physiographic map of Afghanistan.

2) GEOLOGY OF THE STUDY AREA

The proposed Dahane Dara dam site is situated on the Maymana River, approximately 12 km south of Maymana City, Faryab province, Afghanistan. Based on surface studies and the data obtained from probe drillings as well as from microscopic studies, the rock units which form the dam foundation include marl, siltstone and marlstone layers of Miocene and Eocene age. The Quaternary depositional sediments at the dam site consist of riverbed alluvium, alluvial terraces and residual soils. These deposits generally include river deposits well rounded of gravels and cobbles. The maximum thickness of overburden around the proposed dam axis is about 15 meters.

From tectonic view the project area is located on the northern part of domain 4 from Afghanistan Quaternary faults (USGS, 2007). Domain 4 encompasses a region that is interpreted as being deformed primarily by transtensional forces in the Trans-Himalayan orogenic belt. Large east west trending, right lateral, strike-slip fault zones (for example, the Hari Rud, and Andarab fault systems) are key structures that have played an important role in the westward-extrusion of the Northern Afghan Platform. The Hari Rud (also known as the Herat) fault system is a major continental-scale suture that coincides with the boundary between the relatively stable, mildly deformed Eurasian (Laurasia) continent to the north and the extensively deformed, accreted terrains to the south (Tapponnier and others, 1981). The fault has been a major tectonic boundary since early Mesozoic time and may have originated as a north-dipping suture. In Tertiary time, motion on the fault was mainly dextral slip. The presence of elongate fault basins filled with Oligocene and Miocene sediment suggests that strike-slip motion was most active during this time (Tapponnier and others, 1981). The geological map of Dahane Dara dam is shown in Figure 2.

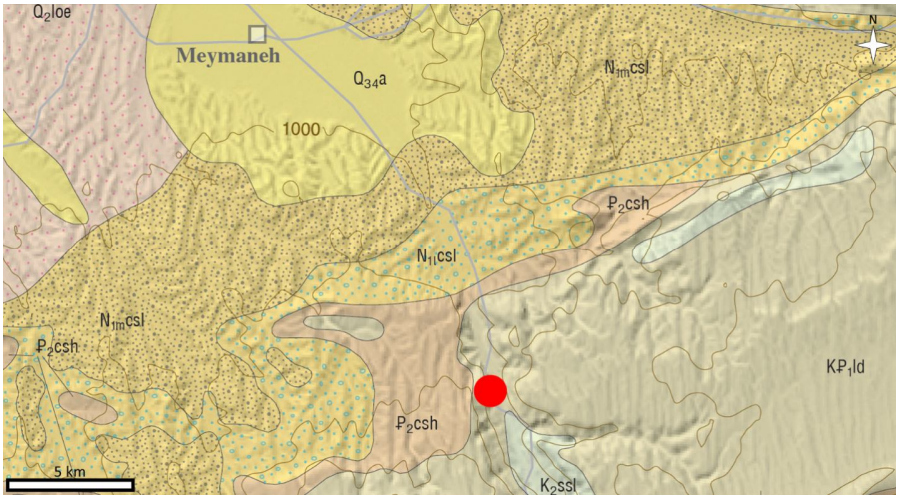

Fig. 2. Regional geologic map, adapted from McKinney and Sawyer (2005).

Red dot shows approximate location of Dan Dara Dam site. Thin, light brown lines are topographic (100 meter contour interval). Light grey lines are roadways. Displayed geologic units: $Q_{34}a$ = conglomerate and sandstone (Holocene and late Pleistocene); Q_2loe = loess (middle Pleistocene); $N_{1m}csl$ = conglomerate and siltstone (middle Miocene); $N_{11}csl$ = conglomerate and siltstone (early Miocene); $₱_2csh$ = clay and shale (Eocene); and, $K₱_1ld$ = limestone and dolomite (Palaeocene and late Cretaceous); K_2ssl = sandstone and siltstone (late Cretaceous).

3) GEOLOGICAL ENGINEERING INVESTIGATION

Engineering geological investigations mainly include core drilling, borehole logs, rock quality designation measurements and in-situ and laboratory tests.

4) DRILLING

In order to verify foundation conditions and to obtain rock samples for laboratory testing, boring were made at the Dahane Dara dam site. Based on these studies, 5 boreholes, totalling 300 meters are drilled in marlstone rock and the depth of each borehole was 60 meters. The boreholes No. 01, 03 & 05 were drilled along the axis of the proposed dam site and two additional boreholes, No. 02 and 04, were drilled upstream and downstream, respectively. The geological cross section and boreholes of No 1, 3 & 5 is shown in figure 3.

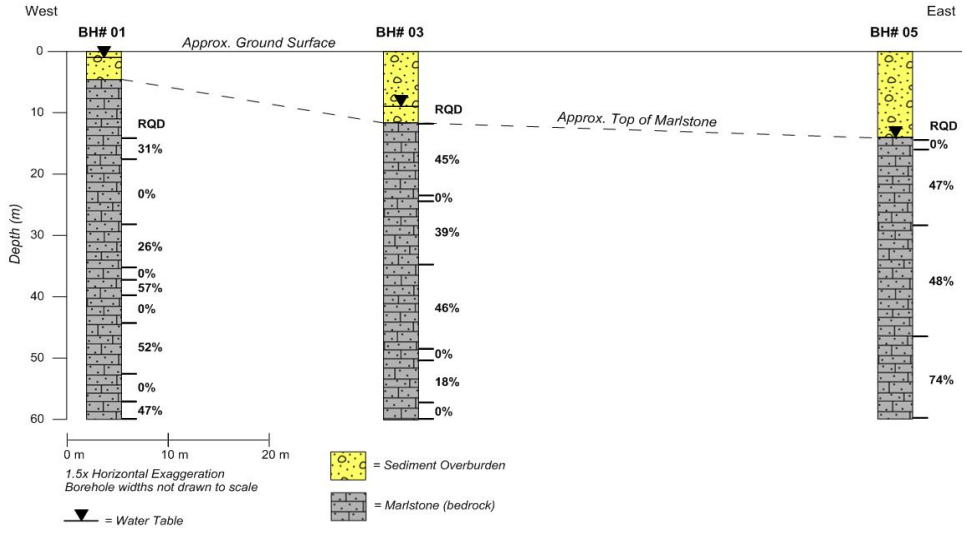

Fig. 3. Geological section and boreholes location of Dahane Dara dam

5) **ROCK QUALITY DESIGNATION (RQD)**

The rock quality designation, RQD, was initially proposed by Deere (1963), and it has since then been the topic of various assessments (e.g., Deere et al. 1967; Deere and Deere, 1988; Deere 1989), manily for civil engineering projects. Its application has also been quickly extended to other areas of rock mechanics, and it has become a fundametal parameter in geotechnical engineering (e.g., Hoek & Brown 1980; Hoek and Bray 1981). Many researchers have done studies on this relationship such as: Palmstrom, 2005; Choi and Park 2004; Zhang et al, 2012. Nowadays it is used as standard parameters in drill core loning, together with other parameters such as: number of joints per linear meter, percentage of recovery of singular core runs, degree of alteration. Furthermore, it forms a basic element of several rock mass classifications and tunnel support estimate systems. The index quality, RQD, expresses the ratio of the cumulative length of drill core fragments more than 100 mm long as a percentage of total length of a measured run of core. Reduced core recovery is indirectly dependent on the degree of weakening of the rock mass, the state of stress and fracturing, the abundance of joints and other factors affecting the coherence and isotropy of the rock environment.

Based on geotechnical report of dam, RQD of rock core of boreholes are measured in categories as very poor to fair, but most part of boreholes length has RQD values can be categorized in range of 0 – 25% very poor.

Table 1. **Results of rqd of drilled boreholes at dahane dara dam**

BH№	Depth (m)	Rock Type	RQD%	Classification of Rock Quality
01	13.8 – 17.5	Marlstone	31.00	Poor
	17.5 – 28.0	Marlstone	0.00	Very Poor
	28.0 – 35.0	Marlstone	25.60	Poor
	35.0 – 37.0	Marlstone	0.00	Very Poor
	37.0 – 39.7	Marlstone	56.65	Fair
	39.7 – 44.0	Marlstone	0.00	Very Poor
	44.0 – 52.4	Marlstone	52.20	Fair
	52.4 – 57.0	Marlstone	0.00	Poor
	57.0 – 60.0	Marlstone	47.00	Poor
02	7.0 – 20.0	Marlstone	45.40	Poor
	20 – 40.0	Marlstone	19.74	Very Poor
	40 – 60.0	Marlstone	17.50	Very Poor
03	11.6 – 23.0	Marlstone	45.36	Poor
	23.0 – 24.0	Marlstone	0.00	Very Poor
	24.0 – 34.3	Marlstone	39.45	Poor
	34.3 – 48.0	Marlstone	45.65	Poor
	48.0 – 50.0	Marlstone	0.00	Very Poor
	50.0 – 57.0	Marlstone	18.40	Very Poor
	57.0 – 60.0	Marlstone	0.00	Very Poor
04	4.20 – 32.0	Marlstone	32.25	Poor
	32 – 60.0	Marlstone	28.15	Poor
05	14.0 – 15.6	Marlstone	0.00	Very Poor
	15.6 – 28.0	Marlstone	47.03	Poor
	28.0 – 46.0	Marlstone	47.80	Poor
	46.0 – 60.0	Marlstone	73.58	Fair

3.3. IN-SITU PERMEABILITY TEST

In rock masses the conductivity depends on the aperture, spacing and infilling characteristics of its discontinuities. Discontinuity aperture plays a particularly important role in the hydraulic conductivity of a rock mass. Consequently changes in the stress condition of the rock mass can produce significant changes on its hydraulic conductivity. The most commonly in-situ test used to estimate hydraulic conductivity of rock masses is the Lugeon test, also called the packer test.

3.3.1. THE LUGEON TEST

The most commonly in-situ test used to estimate hydraulic conductivity of rock masses is the Lugeon test also called the packer test. The test, which derives its name from Maurice Lugeon (1933), is a constant head type test that takes place in an isolated portion of boreholes. Water at constant pressure is injected into the rock mass through a slotted pipe bounded by pneumatic packers. A pneumatic packer is an inflatable rubber sleeve that expands radially to seal the annulus space between the drill rods and the boring walls.

The test is conducted in five stages, with a particular water pressure magnitude associated with each stage. The first stage is held at a low water pressure, increasing the pressure in each subsequent stage until reaching P_{max}. Once P_{max} is reached, pressures are decreased following the same pressure stages used on the way up, thus describing a pressure loop. During the execution of each stage, both water pressure (P) and flow rate (q) values are recorded every 5^{th} minute. Eventually, average values for P and q are then used to compute the hydraulic conductivity for each stage.

The geotechnical report, which was prepared by Omran Geotechnical Company, indicated that Lugeon tests were conducted in different depth interval of each borehole, but because of high permeability of ground the performer team of Lugeon test could not even reach to first stage of pressure (2.5 bars) in all tests. In other word using the existing facilities they were not able to inject such a flow rate that can exceed primary absorption capacity of study area that produce desired pressure and then they could not perform even one stage of the Lugeon test. Based on characteristics of the encountered rocks in boreholes and RQD values this circumstance is acceptable. Therefore, obtained results from RQD measurements and conducted Lugeon tests showed that there is a meaningful relationship between Lugeon unit and the RQD parameter.

LABORATORY TEST RESULTS

Laboratory experiments were carried out mainly on the marlstone from the dam site in order to determine physical and mechanical properties of intact rocks including, specific gravity, porosity, absorption, uniaxial compressive strength, triaxial comprehensive strength, direct shear, modulus of elasticity. Test results are summarized and presented in table III.

Table II. **Labotatory tests results of rock at dahane dara dam site**

Borehole No.	Rock Type	Specific Gravity(gr/cm^3)	Absorption%	Durability index (Id) (%)	Point load Index		UCS (MPa)	Modulus of elasticity (GPa)	Direct Shear		TCS	
					UCS (MPa)	Is (50) (MPa)			Cohesion (MPa)	Fraction Angle(ϕ)	Cohesion (MPa)	Fraction Angle(ϕ)
BH-1	Marlstone	1.96	13.74	85.80	16.90	0.73	19.00	3.31	0.00	28.00	8.38	48.80
BH-2	Marlstone	1.95	13.35	94.46	21.03	0.90	15.24	3.28	0.00	29.68	4.56	32.59
BH-3	Marlstone	1.92	12.86	94.22	5.67	0.22	4.58	1.13	0.00	30.28	3.74	34.40
BH-4	Marlstone	2.02	10.41	89.47	12.19	0.47	10.18	1.76	0.00	31.50	4.16	36.67
BH-5	Marlstone	1.95	11.25	92.41	22.51	0.90	20.74	3.10	0.00	33.74	10.33	44.20
Average		**1.96**	**12.32**	**91.27**	**15.66**	**0.644**	**13.95**	**2.52**	**0.00**	**30.64**	**6.23**	**39.33**

CONCLUSION AND RECOMMENDATION

According to surface studies, probe drilling and microscopic studies, it was concluded that the rock unit constituting the dam site included marl, siltstone and marlstone layers of Miocene and Eocene age. The proposed Dahane Dara dam site is located in relatively narrow valley formed by tectonic activity and erosion of marlstone and limestone. RQD of rock core of boreholes are measured in categories as very poor to fair, but most part of boreholes length has RQD values can be categorized in range of 0 – 25% very poor.

Based on geotechnical report, the Lugeon tests were conducted in different depth interval of each borehole, but because of high permeability of ground the performer team of Lugeon test could not even reach

to first stage of pressure (2.5 bars) in all tests. Obtained results from RQD measurements and conducted Lugeon tests shows that there is a meaningful relationship between Lugeon unit and the RQD parameter.

The conducted investigations were just a preliminary investigations and it is not enough, required additional geotechnical and geophysical investigations, especially seismic refraction and borehole seismic surveys.

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ҚАЗАҚСТАН ТОПЫРАҚТАРЫНЫҢ ЖАМЫЛҒЫСЫНЫҢ СОР ЖӘНЕ СОРТАҢДАНҒАН ЖЕРЛЕРІ

Аңдатпа: Бұл жұмыста сор сортаңданған жерлерге жаңа заманауй әдістерді қолдана отырып жақсарту жұмыстарын жүргізуге және ауылшаруашылығына пайдалануға болатыны көрсетілген.

Кілт сөздер: Агрохимиялық мелиорация, Фитохимиялық мелиорация, сортаңданған жерлер.

Елуінші жылдары басталған тың игеру эпопеясынан кейін Қазақстанда бос игерілмей жатқан жақсы жерлер қалмады. Ал қосымша күш жұмсап, жерді жақсартып пайдалануға болатындай етіп игеретін жерлер жеткілікті. Сондай жерлердің бірі – сортаңданған жерлер. [1]

Сортаңданған жерлер – тұзданған жерлердің бір түрі. Бұл жерлердің шын мәнісінде сорланған топырақтарға қарағанда жоғары кабаттарында өсімдіктердің өсуіне зиян келтіретін ащы тұздары жоқ, олар кезінде бар болғанымен, кейін жауын-шашынмен жуылып, топырақтың төменгі қабаттарына шайылып сіңіп кеткен. Дегенмен, кезінде суға ерігіш тұздардың құрамындағы натрий катионы топырақтың құрамына еніп, барынша қанығып, сіңіп қалған. Бұл жерлерде топырақтың сіңіру құрамының 20%-дан астамы осы натрий катионының үлесіне тиеді. Мұндай жерлерді егістікке игеруге қиындық келтіріп тұрған – осы натрий катионы. Құрамында натрийі мол топырақтарда органикалық және коллоидты минералды бөліктер бірігіп, байланысу орнына, ылғалдан ісініп, ыдырап, сумен төмен шайылады. Осының нәтижесінде топырақтың жоғары қабатындағы құнарлы заттар төмен ығысып, жоғары қабаттың түсі кремнийге байығандықтан бозғылт тартады, оның есесіне топырақтын төменгі қабаты ұнтақталған коллоидты және органикалық қосылыстарға қанығып, түсі қара қоңырға айналады, ал оның реакциясы сілтілі болады. Су тиген кезде бұл қабаттың көлемі ісініп, жібіп, батпаққа айналады, ал кепкен кезде құрылымы ірі кесекті, бағаналы болып, қатып қалады. Бұл қабатта суға ерігіш тұздар жоқ, ал төменгі қабатта жоғарыдан шайылып сіңген тұздар жеткілікті. Осы тұздардан жоғары жатқан сорланған қабаттың физикалық қасиеттерін