4-4 テクニカルノート（現地調査 I）

TECHNICAL NOTES

PREPARATORY SURVEY （FIELD SURVEY 1）
ON
THE PROJECT FOR IMPROVEMENT OF PRIMARY AND SECONDARY SCHOOLS IN ULAANBAATAR CITY
IN MONGOLIA

After signing of the Minuit of Discussions dated December 6, 2016, the Consultant's team (the Team) continued the field survey and had discussions on the technical matters of the Project with the Education Department of Ulaanbaatar City (UBC-ED). The followings are the points which are confirmed by both sides:

(1) Project Sites

1) Preliminary screening of the candidate sites

Based on the statistical and general information, the Team identified 7 sites to be excluded from the list (original list of 28 candidate sites which was submitted by UBC-ED during the official mission) in the light of the agreed criteria. The name of sites are as follows:

• Nalaikh	No. 4 Khoroo	: Permafrost soil is common in Nalaikh area
• Nalaikh	Erdmin orgil C.S.	: Ditto
• Nalaikh	Terelj School	: Ditto
• Chingeltei	No. 112 School	: Not a general school (religious school)
• Songinokhairkhan	No. 121 School	: Not so much demand expected
• Bagakhangai	No. 2 Khoroo	: Canceled by UBC-ED
• Baganur	New residential area	: Location of the site is uncertain

2) Result of site investigations

The Team visited all the existing schools and 3 new school sites in the revised list of 10 schools which was submitted at Dec. 8, 2016 by UBC-ED to JICA Mongolian Office, and made a preliminary evaluation on each site. The result of the evaluation is described in ANNEX I attached hereto.

After explanation of the result, the Team made a recommendation to UBC-ED to replace 3 sites which do not meet the minimum requirements with other candidates having positive evaluation.

3) Selection of the site will be finalized after the field survey 2, among 10 candidate sites finally listed in the revised list.

(2) Basic Conditions for Facility Planning

Through the discussion, both sides confirmed the items shown on ANNEX II as basic conditions for facility planning. The Team will develop a schematic plan of the Project facilities based on the agreed conditions for further discussions during the field survey 2.

(3) Documents and Information to be submitted by Mongolian side

UBC-ED promised to submit the following documents and information requested by the Team by e-mail or other measures to the address below:

Tomohiro Osawa

osawa@matsucon.co.jp

- Breakdown of construction cost for recent construction project, such as School No.3, School and School No. 125.

END

Ulaanbaatar, December 13, 2016

Mr. J. Gantulga	Mr. Tomohiro Osawa
Director, Education Department of Ulaanbaatar City Mongolia	Managing Director Matsuda Consultants International Co., Ltd.

ANNEX-I Preliminary Result of the site investigations

10 Sites with first priority selected by UBC Education Department

No.	District	Site	Request for:	Preliminary evaluation	
1	Chingeltei	No. 7 Khoroo	New school	○	The proposed land is moderately sloped and reclamation will be necessary for construction, located in the edge of ger area being not far from city center. Enough enrollment will be expected by the current number of children who attend the kindergarten next to the site. No public utility is available besides electricity.
2	Khan-Uul	No. 75 School	Re-build after demolition of existing buildings	△	Demolition of existing building which were built in 1959, including its substructure, will be required to be done by the Mongolian side before the notice of tender for construction. Capital budget needs to be secured for the demolition work in the budget for FY2018.
3	Songinokhairkhan	No. 32 Khoroo	New school	○	The proposed land is located in the Khoroo at the west end of UBC. It will be good for establishment of new school with sufficient flat land alongside the national road in spite of being far from the city center. High growth will be expected even though current population is not sufficient. No public utility is available besides electricity.
4	Khan-Uul	No. 10 Khoroo	New school	×	The proposed land occupies one of the plot in the new housing development area called "New Yarmag" where houses for 2,910 families are under development by the private investment company jointly funded by the Chinese bank. No inhabitant is in the area that means the planned school will be dedicated only for the development. It is not appropriate for Japan's Grant Aid. In addition, it is less likely to be filled with new inhabitants considering current economic situation in Mongolia.
5	Khan-Uul	No. 59 School	Transfer to the new plot by building a school with full-grades	△	The school's main building was built originally for a kindergarten and accommodates middle and high grades. Branch building was built for primary grades in the place approximately 3km from the main building this year as a complex with a kindergarten. The proposed land, just opposite to the current plot, is far from the city center and no public utility is available besides electricity though it is flat with sufficient area. Careful analysis will be required for future enrollment considering the branch school.
6	Bayanzurkh	No. 53 School	Expansion	○	No major obstacle is expected.
7	Songinokhairkhan	No. 42 School	Expansion	○	Demolition of an existing building has been ordered by the specialized agency and will be required before the notice of the tender for the Project. Current enrollment is not so much in average but

					from the municipal network. Heating is supplied from the private boiler behind the school. The school has football court which is served for community use as well as for evacuation place.
17	Chingeltei	No. 112 School	Expansion	×	It is specialized religious school.
18	Songinokhairkhan	No. 29 Khoroo	New school		Not visited.
19	Songinokhairkhan	No. 121 School	Expansion	×	The school was built by Japan's Grant Aid and has enough classrooms for the target area.
21	Bagakhangai	No. 2 Khoroo	New school	×	Canceled by UBC-ED
22	Songinokhairkhan	No. 1 Khoroo	New school		Not visited.
25	Khan-Uul	No. 118 School	Expansion	△	The school was built by Japan's Grant Aid
26	Baganur	New residential area	New school	×	The request is based on future development of new housing zone. Under recent difficult condition of Mongolian economy, such a development will not likely be realized as planned.
27	Bayanzurkh	No. 14 Khoroo	New school		Not visited.
28	Songinokhairkhan	No. 28 Khoroo	New school		Not visited.

Recommendation:

In order to widen range of site selection at the time of the Field Survey 2, we recommend UBC Education Department to replace the following sites from the list of top 10 sites with the site of more positive evaluation.

1) Khan-Uul No. 10 Khoroo
2) Bayanzurkh Bayanzurkh C.S (Primary branch school).
3) Bayanzurkh No. 120 School

					increasing rapidly. Private boiler system is available for heating. Special classroom for students with disabilities had been in operation for 6 years, 3 years by World Vison's assistance and 3 years upon their parents' request, with 10 to 8 students.
8	Bayanzurkh	Bayanzurkh C.S (Primary branch school).	Re-build after demolition of existing buildings	×	The area of the school plot is approximately 2,600 sq.m, which is too small for a school building with full grades, for example, the minimum type with full grades of standard design occupies more than 2,000 sq.m of land. Therefore, it is impossible to build a full grade school.
9	Chingeltei	No. 61 School	Expansion	△	The school's main building was built by Japan's Grant Aid (Phase III). Gym and kitchen/cafeteria block is under construction and will be opened next academic year. Only narrow space after demolition of the old classrooms is available for construction.
10	Bayanzurkh	No. 120 School	Expansion	×	The school was established by Japan's Grant Aid Project (Phase IV). The plot is surrounded by residential lots some of them being inhabited, excluding the military compound in the north of the school. It is likely impossible to extend the land without resettlement.

Other 18 sites nominated in the original list

No.	District	Site	Request for:	Preliminary evaluation	
4	Songinokhairkhan	No. 7 Khoroo	New school		Not visited.
6	Bayangol	No. 1 Khoroo	New school		Not visited.
7	Nalaikh	No. 4 Khoroo	New school	×	In Nalaikh, construction of buildings needs special attention to permafrost soil which are common in the area.
8	Nalaikh	Erdmin orgil C.S.		×	
9	Nalaikh	Terelj School		×	
12	Bayangol	No.11/12 Khoroo	New school		Not visited.
13	Bayanzurkh	No. 21 School	Re-build after demolition of existing buildings	△	Demolition of existing building built in 1958 will be required to be done by the Mongolian side before the notice of tender for construction. Although the situation of overcrowding is serious with 3 sift classes in primary section, existing buried pipes makes construction difficult.
15	Sukhbaatar	No. 16 School	Expansion	△	One of the target for START project. Overcrowding is moderate. Main part of the existing building is single story so that it can make barrier-free condition easily. Space is available for expansion.
16	Chingeltei	No. 57 School	Expansion	△	Overcrowding is moderate. Located in the middle of ger area, electricity, water, sewage is available

ANNEX-II Basic conditions for planning

1) Standard size of a classroom: 35-40 students per classroom
   Size of a classroom: 56-60 sq.m

2) Number of classrooms
   For new schools: 2 stream: 12 grades x 2 classes = 24 classrooms x 40=960 seats
   or 2 stream for basic, 1 stream for high grades:
   9 grades x 2 + 3 grades x 1 21 classrooms x 40=840 seats
   For expansion basically new building will be designed to accommodate primary section

3) Components
   Principle to design the project components:
   - To keep necessary function while pursuing efficiency as much as possible,

   General classrooms

   Special classrooms

   - Following functions (activities) will be taken into account for designing special classrooms
     Science laboratory for physics and chemistry
     Technical subject for male and female students
     Informatics and computer technology
     Music room (to store music instruments)
     * Preparation room will be attached to each of the room

   Teachers' and staff's room

   - Following rooms will be designed as a separate room:
     Teachers' room
     Education manager's office (for primary/secondary grades)
     Social worker's office
     Doctor's office
     Principal's office
     Accountant's office
     Maintenance staff's room (cleaner, plumber, electrician, etc.)

   Cloak

   - Cloak is not necessary in case lockers for storing cloths are provided in each classroom

   Gymnasium

   Library

   - Following functions will be taken into account for Library space
     Librarian's work space
     Book store
     Reading space

Kitchen/Pantry and Cafeteria (Dining Hall)

- Following functions will be taken into account for kitchen and cafeteria
  To cook hot meals for primary students which will be served at each classroom
  To cook and serve meals for teaching/supporting staff
  To cook and serve light meals for secondary students
- Cafeteria is mainly designed for staff and students of upper grades (G9-G12)
- Kitchen and cafeteria will be designed to be outsourced to a private firm.
- UBC-ED may provide kitchen equipment as a apart of the recipient's work.

Other components to be taken into consideration:

- Children development center: the room may be designed as a place to develop each children's talents to provide individual guidance to their special needs under management by a social worker.
- The function to promote community's use of school facilities may be taken into consideration.

4) Principles for the outline design
   - Construction system
     : External wall insulation system will be applied to external walling.
   - Stories
     : Buildings will be designed with 4 stories and a basement for efficient use of the land.
   - Structural design
     : Structural design will be in accordance with the revised standards and regulation in Mongolia which scheduled to be published at January, 2017.

5) Request from Mongolian side
   UBC-ED requested following items to be considered in the facility design.
   - To provide space for cultural and extra-curricular activities
   - To improve acoustic environment of classrooms and gymnasium
   - To follow UBC's policy of "ECO Buildings" to save the cost for maintenance by use of natural energy and/or reuse of resources.

4-5 テクニカルノート（現地調査 III）

TECHNICAL NOTES

PREPARATORY SURVEY （FIELD SURVEY 3）
ON
THE PROJECT FOR IMPROVEMENT OF PRIMARY AND SECONDARY SCHOOLS
IN ULAANBAATAR CITY
IN MONGOLIA

From April 10, 2017, the Consultant's team (the Team), to whom Japan International Cooperation Agency (JICA) entrusted implementation of a preparatory survey on the captioned project, has conducted the Field Survey 3 (the FS3) for the purpose of technical surveys on the candidate sites for the project and other incidental surveys including a series of discussions with concerned officials from the Education Department of Ulaanbaatar City (UBC). The followings are the points which are confirmed by both sides through discussions:

(1) Equipment

1) Items, quantities and specifications
Mongolian side confirmed the items, their specifications and quantities to be distributed to each site, as listed in "ANNEX-1" attached hereto.

(2) Soft-component

1) Outline of planned "soft-component"
The Mongolian side basically agreed with the contents of the soft-component, explained by the Team. The outline of the component's plan is as attached in "ANNEX-2".

(3) Facility plan

The preliminary plan for outline design of the facilities was explained by the Team to UBC Education Department as well as other regulatory authorities. The followings are major instructions and/or requests which will be incorporated in the outline design:

1) Instructions by UBC Fire Department
- Between the first basement floor and the first floor shall be a fireproof compartment, and fire doors must be installed for that staircase.
- External escape stairs should be provided that can be accessed directly from the first basement floor to the first floor.
- Smoke exhaust system should be provided.

(4) Documents and Information to be submitted by Mongolian side

UBC Education Development promised to submit the following documents and information requested by the Team by e-mail or other measures to the address below by the end of April:

Tomohiro Osawa
osawa@matsucon.co.jp

- Land use permit and registration drawing for No. 75 school.
- Registration drawing for No. 53 school.

(5) Schedule of the Survey

After this Field Survey 3, the Team will continue to develop the outline design, to estimate the project cost, and prepare a draft Preparatory Survey Report by the end of August, 2017. The fourth survey mission to Mongolia will be dispatched around September, 2017 to explain the contents of the draft Preparatory Survey Report for finalizing the Survey with the consent of the Government of Mongolia.

END

Ulaanbaatar, April 25, 2017

Mr. J. Gantulga

Director,
Education Department of Ulaanbaatar City
Mongolia

Tatsuji Tsuchiya

Mr. Tatsuji Tsuchiya

Assistant Chief Consultant
The Preparatory Survey Team
Matsuda Consultants International
Co., Ltd.

ANNEX-1

Equipment List

Category	Item No.	Item Name	Qty. (per 1 room)	Type of Facility				Qty. Total	
				A-1	A-2	B-1	B-2		
Primary Education									
Mathematics	PRM-01	Abacus for demonstrating	1	5	4	4	4	17	
	PRM-02	Geometric block models set	18	90	72	72	72	306	
	PRM-03	Measurement set for students	18	90	72	72	72	306	
	PRM-04	Time teaching set	1	5	4	4	4	17	
	PRM-05	Abacus for students	18	90	72	72	72	306	
	PRM-06	Scales set for teacher	1	5	4	4	4	17	
Mongolian Language	PRM-07	CD Audio system	1	5	4	4	4	17	
Human Environment	PRM-08	Zoological Map and Botanical Map of Mongolia	1	5	4	4	4	17	
	PRM-09	World Geographic Map	1	5	4	4	4	17	
Common Equipment	PRM-10	Chess set for demonstrating	1	5	4	4	4	17	
	PRM-11	Checker set for demonstrating	1	5	4	4	4	17	
	PRM-12	Chess set for students	9	45	36	36	36	153	
	PRM-13	Checker set for students	9	45	36	36	36	153	
Secondary Education									
Equipment for Gymnasium	GYM-01	Hurdle	20	20	20	20	0	60	
	GYM-02	Traffic cone	1	1	1	1	0	3	
	GYM-03	Basketball balls (Size 7)	9	9	9	9	0	27	
	GYM-04	Basketball balls (Size 6)	9	9	9	9	0	27	
	GYM-	Basket ball goal set	1	1	1	1	0	3	*1
	GYM-05	Movable scoreboard	1	1	1	1	0	3	
	GYM-06	Volleyball Balls	18	18	18	18	0	54	
	GYM-07	Volley ball pole set	1	1	1	1	0	3	
	GYM-08	Volley ball net	1	1	1	1	0	3	
	GYM-09	Gymnastics mat	6	6	6	6	0	18	
	GYM-10	Ropes for tug-of-war	1	1	1	1	0	3	
	GYM-11	CD Audio system	1	1	1	1	0	3	
	GYM-	Wall Bars	1	1	1	1	0	3	*1
	GYM-12	Futsal Balls	18	18	18	18	0	54	
	GYM-13	Table tennis table set	2	2	2	2	0	6	
	GYM-14	Table tennis racket	8	8	8	8	0	24	
	GYM-15	Badminton Shuttle	18	18	18	18	0	54	
	GYM-16	Badminton rackets	18	18	18	18	0	54	
	GYM-17	Badminton pole set	1	1	1	1	0	3	
	GYM-18	Badminton net	1	1	1	1	0	3	
Mongolian Language	MGL-01	CD Audio system	1	1	1	1	1	4	
Foreign Language	FLG-01	CD Audio system	1	1	1	1	1	4	
Physics Lab. Equipment	PHY-01	Experimental apparatus for dynamics	6	6	6	6	6	24	
	PHY-02	Pulley set	6	6	6	6	6	24	
	PHY-03	Mass with hanger	6	6	6	6	6	24	
	PHY-04	Dynamics movement apparatus	6	6	6	6	6	24	
	PHY-05	Spring set	6	6	6	6	6	24	
	PHY-06	Photovoltaic experiment set	6	6	6	6	6	24	
	PHY-07	Hand generator	6	6	6	6	6	24	
	PHY-08	Air column resonance apparatus	1	1	1	1	1	4	
	PHY-09	Light for learning three primary colors of light	6	6	6	6	6	24	
	PHY-10	Optical experiment set	1	1	1	1	1	4	
	PHY-11	DC low voltage power supply	6	6	6	6	6	24	
	PHY-12	Digital multi tester	6	6	6	6	6	24	
	PHY-13	Slide rheostat	6	6	6	6	6	24	
	PHY-14	Leads and crocodile clip	6	6	6	6	6	24	
	PHY-15	Oscilloscope	1	1	1	1	1	4	
	PHY-16	Magnet set	6	6	6	6	6	24	
Chemistry Lab. Equipment	CHE-	Fume hood (Lab Ductless Fume Hood)	1	1	1	1	1	4	*1
	CHE-01	Burette	12	12	12	12	12	48	
	CHE-02	Retort stand set	12	12	12	12	12	48	
	CHE-03	Watch glass	36	36	36	36	36	144	
	CHE-04	Molecular model set	6	6	6	6	6	24	
	CHE-05	Bulb pipette with teat	36	36	36	36	36	144	
	CHE-06	Measuring pipette	36	36	36	36	36	144	
	CHE-07	Digital pH meter	12	12	12	12	12	48	
	CHE-08	Thermometer	12	12	12	12	12	48	
	CHE-09	Crucible Tongues	12	12	12	12	12	48	
	CHE-10	Crucible with lid	12	12	12	12	12	48	
	CHE-11	Mortar set	12	12	12	12	12	48	
	CHE-12	Evaporating basin	12	12	12	12	12	48	
	CHE-13	Drying chamber	1	1	1	1	1	4	
	CHE-14	Test tube set	1	1	1	1	1	4	
	CHE-15	Volumetric flask, 1000ml	6	6	6	6	6	24	
	CHE-16	Volumetric flask, 100ml	6	6	6	6	6	24	
	CHE-17	Volumetric flask, 500ml	6	6	6	6	6	24	
	CHE-18	Measuring cylinder, 10 ml	6	6	6	6	6	24	

Category	Item No.	Item Name	Qty. (per 1 room)	Type of Facility				Qty. Total
				A-1	A-2	B-1	B-2	
	CHE-19	Measuring cylinder, 50 ml	6	6	6	6	6	24
	CHE-20	Measuring cylinder, 100 ml	6	6	6	6	6	24
	CHE-21	Measuring cylinder, 500 ml	6	6	6	6	6	24
	CHE-22	Centrifuge	1	1	1	1	1	4
	CHE-23	Beaker, 50ml	12	12	12	12	12	48
	CHE-24	Beaker, 100ml	12	12	12	12	12	48
	CHE-25	Beaker, 250ml	12	12	12	12	12	48
	CHE-26	Beaker, 500ml	12	12	12	12	12	48
	CHE-27	Conical beaker, 500ml	12	12	12	12	12	48
	CHE-28	Desiccator	1	1	1	1	1	4
	CHE-29	Electronic balance	1	1	1	1	1	4
	CHE-30	Conical flask (Erlenmeyer flask), 100ml	12	12	12	12	12	48
	CHE-31	Conical flask (Erlenmeyer flask), 300ml	12	12	12	12	12	48
	CHE-32	Funnel, caliber 75mm	12	12	12	12	12	48
	CHE-33	Funnel, caliber 120mm	12	12	12	12	12	48
Biology Lab.	BIO-01	Compound microscope	18	18	18	18	18	72
Equipment	BIO-02	Hand lens	18	18	18	18	18	72
	BIO-03	Water distiller	1	1	1	1	1	4
	BIO-04	Water bath	1	1	1	1	1	4
	BIO-05	Various thermometers	6	6	6	6	6	24
	BIO-06	Dissecting kit	12	12	12	12	12	48
	BIO-07	Petri dish	36	36	36	36	36	144
	BIO-08	Syringes set	36	36	36	36	36	144
	BIO-09	Immersion specimen	1	1	1	1	1	4
	BIO-10	Anatomical model of human body	1	1	1	1	1	4
	BIO-11	Human skeleton	1	1	1	1	1	4
	BIO-12	Prepared slide set	1	1	1	1	1	4
	BIO-13	Various specimens	1	1	1	1	1	4
	BIO-14	Skeletal of vertebrate	1	1	1	1	1	4
	BIO-15	DNA model	1	1	1	1	1	4
	BIO-16	Human brain and head models	1	1	1	1	1	4
	BIO-17	Human eye model	1	1	1	1	1	4
	BIO-18	Human ear model	1	1	1	1	1	4
	BIO-19	Human teeth model	1	1	1	1	1	4
	BIO-20	Human heart model	1	1	1	1	1	4
	BIO-21	Lung model with larynx	1	1	1	1	1	4
Technology								
① Sewing	WTE-01	Electric sewing machine	9	9	9	0	9	27
	WTE-02	Over locker sewing machine	1	1	1	0	1	3
	WTE-03	Steam iron	2	2	2	0	2	6
	WTE-04	Ironing board	2	2	2	0	2	6
	WTE-05	Shears for sewing	18	18	18	0	18	54
	WTE-06	Crochet hook set for knitting	18	18	18	0	18	54
	WTE-07	Embroidery frame	18	18	18	0	18	54
② Metal work	MET-01	Metal cutting saw	18	18	18	0	18	54
	MET-02	Vernier calliper	9	9	9	0	9	27
	MET-03	Metallic file	9	9	9	0	9	27
	MET-04	Cold chisel for metalwork	9	9	9	0	9	27
	MET-05	Center punch	9	9	9	0	9	27
	MET-06	Pliers	9	9	9	0	9	27
	MET-07	End Cutting Nippers	9	9	9	0	9	27
	MET-08	Longnose pliers	9	9	9	0	9	27
	MET-09	Vise	12	12	12	0	12	36
	MET-10	Soldering iron	9	9	9	0	9	27
	MET-11	Digital multi tester	3	3	3	0	3	9
	MET-12	Metal lathe	1	1	1	0	1	3
	MET-13	Grinder	1	1	1	0	1	3
	MET-14	Compressor airbrush set	1	1	1	0	1	3
③ Wood work	WOD-01	Plane	9	9	9	0	9	27
	WOD-02	Chisel set	9	9	9	0	9	27
	WOD-03	Saw for woodwork	9	9	9	0	9	27
	WOD-04	Wooden hammer	9	9	9	0	9	27
	WOD-05	Clamp	6	6	6	0	6	18
	WOD-06	Small axe	6	6	6	0	6	18
	WOD-07	Cross slot screwdriver	9	9	9	0	9	27
	WOD-08	Tape measure	6	6	6	0	6	18
	WOD-09	Hammer	9	9	9	0	9	27
	WOD-10	Thicknesser (Planer)	1	1	1	0	1	3
	WOD-11	Drill press	1	1	1	0	1	3
	WOD-12	Wood lathe	1	1	1	0	1	3
	WOD-13	Scroll saw	1	1	1	0	1	3
	WOD-14	Hammer drill	1	1	1	0	1	3

Category	Item No.	Item Name	Qty. (per 1 room)	Type of Facility A-1	A-2	B-1	B-2	Qty. Total	
	WOD-15	Electric drill	1	1	1	0	1	3	
	WOD-16	Power planer	1	1	1	0	1	3	
	WOD-17	Orbit sander	1	1	1	0	1	3	
	WOD-18	Jig saw	1	1	1	0	1	3	
	WOD-19	Milling machine (Router)	1	1	1	0	1	3	
	WOD-20	Electric circular saw	1	1	1	0	1	3	
④ Fine Art	ART-01	Wood chisel	36	36	36	0	0	72	
	ART-02	Clay scraper spatula	36	36	36	0	0	72	
	ART-03	Easel	36	36	36	0	0	72	
	ART-04	Portable drawing board	36	36	36	0	0	72	
Music	MUS-01	Smart board for music	1	1	1	0	0	2	
	MUS-02	Stereo system	1	1	1	0	0	2	
	MUS-03	Morin khuur	9	9	9	0	0	18	
	MUS-04	Yatga 120cm	5	5	5	0	0	10	
	MUS-05	Yatga 180cm	5	5	5	0	0	10	
	MUS-06	Shanz 110cm	3	3	3	0	0	6	
	MUS-07	Shanz 140cm	3	3	3	0	0	6	
	MUS-08	Khuuchir	2	2	2	0	0	4	
	MUS-09	Flute (Bamboo)	1	1	1	0	0	2	
	MUS-10	Flute (Iron)	1	1	1	0	0	2	
	MUS-11	Yoochin	3	3	3	0	0	6	
	MUS-12	Electronic keyboard	1	1	1	0	0	2	
	MUS-13	Keyboard harmonica	36	36	36	0	0	72	
ICT	ICT-01	Desk top computer	37, 19	37	37	19	37	130	
	ICT-02	Complex type printer, monochrome	1	1	1	1	1	4	
	ICT-03	Switching hub 24 ports	1	1	1	1	1	4	
Kitchen Equipment	KIT-	Electric Steam Oven, 8 level trays	1	1	1	0	0	2	*1
	KIT-	Electric oven, 2 Comparments	2	2	2	0	0	4	*1
	KIT-	Electric 4-Hot plate Cooker with Oven	2	2	2	0	0	4	*1
	KIT-	Electric Indirect Jacketed Boiling Pan	1	1	1	0	0	2	*1
	KIT-	Electric Tilting Braising Pan	1	1	1	0	0	2	*1
	KIT-	Electric Instant storage water heater /geyser	1	1	1	0	0	2	*1
	KIT-	Electric Rice Cooker	1	1	1	0	0	2	*1
	KIT-	4-Door Fan cooling reach-In Kitchen refrigerator	1	1	1	0	0	2	*1
	KIT-	360L Single Door Upright Cooler	1	1	1	0	0	2	*1
	KIT-	8kg Potato Peeler	1	1	1	0	0	2	*1
	KIT-	Fruit and Vegetable Cutter	1	1	1	0	0	2	*1
	KIT-	Mincer	1	1	1	0	0	2	*1
	KIT-	Chest Freezer	1	1	1	0	0	2	*1
	KIT-	Dough Mixer	1	1	1	0	0	2	*1
	KIT-	Electric sterilizer	1	1	1	1	1	4	*1
	KIT-	700mm Triple Sinks Bench	1	1	1	1	1	4	*1
	KIT-	700mm Single Sink Bench With Under Shelf	1	1	1	0	0	2	*1
	KIT-	700mm Work Bench With Splashback	3, 1	3	3	1	1	8	*1
	KIT-	1.8m Work Bench With Slotted Undershelf	2	2	2	2	2	8	*1
	KIT-	Water Filter Dispenser RO Purification System	1	1	1	1	1	4	*1
	KIT-	Water Filter Dispenser RO Purification System	1	1	1	0	0	2	*1
	KIT-	4-Layer Shelf	4, 1	4	4	1	1	10	*1
Equipment for Medical office	DOC-01	UV lam disinfection trolley	1	1	1	1	1	4	
	DOC-02	Weight scale	1	1	1	1	1	4	
	DOC-03	Height measuring scale	1	1	1	1	1	4	
	DOC-04	Sphygmomanometer	1	1	1	1	1	4	
	DOC-05	Spirometer	1	1	1	1	1	4	
Equipment for CWDs	CWD-01	Book stand (book holder)	5	5	5	5	5	20	
	CWD-02	Desktop electronic magnifier for reading assistance	5	5	5	5	5	20	
	CWD-	Partition wall	2	2	2	2	2	8	*1
	CWD-	White board small	5	5	5	5	5	20	*1
	CWD-	Cushion Chair	2	2	2	2	2	8	*1
	CWD-03	Triangle Cushion	2	2	2	2	2	8	
	CWD-04	Mat	2	2	2	2	2	8	
Common	COM-01	Projector 1 (fixed)	2	2	2	2	2	8	
	COM-02	Projector 2 (fixed)	1	1	1	0	0	2	
	COM-03	Screen	1	1	1	0	0	2	
	COM-04	Sound equipment	1	1	1	0	0	2	
	COM-05	Portable projector (Portable)	2	2	2	2	2	8	

*1: These items are included in "Building work"

Preparatory Survey on the Project for
Improvement of Primary and Secondary Schools in Ulaanbaatar City

Soft Component Plan

1. Background

This project aims at constructing quality schools, as models for new schools to be constructed by the Government of Mongolia (GoM) in future, with due consideration of children with disabilities (CWD) and the issue of Disaster Prevention based on principles of "universal design". To achieve such an aim, two prerequisite must be emphasized, i.e., 1) school staff should use the facilities properly and effectively according to its purpose, with full understanding on what the point of the design is and why it is adopted there, 2) the design, accompanying technical information, should be disseminated into persons who concern to improve physical school environment in Mongolia, by whom an element of the design may be introduced and materialized. This "soft component" is to assist the initial stage of dissemination to make sure that the project contribute to improvement of the quality in school construction in Mongolia.

2. Purpose of the Component

The purpose of the soft component is to improve educational environment by increase of quality schools with "consideration of disabilities" and "consideration of disaster prevention" in Mongolia.

3. Planned Activities

Activities of assistance by the soft component will be the following three (3) items:

1) To prepare and distribute the booklet and other material for publicity.

To compile the following publicity material as handouts of the seminars and guided tour of the new facilities. The material also will be used as tools for continuous activities for dissemination by the implementing agency in Mongolia:

a. Booklet to introduce the points of universal designs incorporated in the facility design in view of "consideration of disabilities" and "consideration of disaster prevention". Items for school-level activities are to be distinguished.

- Mongolian edition, printed and bound, approx. 40 pages
- Japanese or English edition, simplified using photocopy, approx. 40 pages

To be distributed to:

- Concerned sections of MECSS, UBC Education Department,
- Governmental organs responsible for construction, urban planning, disaster prevention and persons with disabilities,
- Schools (Directors of public schools in Ulaabaatar),
- Non-governmental organizations such as union for disables, parents, etc., and

- Private firms who are concerning to school constructions.

b. Leaflet, a summary of the booklet, which gives more concise explanations for the public

- Mongolian edition, in folio, 8 pages
- Japanese or English edition, using photocopy, 8 pages

To be distributed to participants of the workshop, seminars and guided tours in addition to the above.

c. Presentation slides for Powerpoint

2) Workshop to introduce the new facilities to the staff at the target schools

To hold a workshop for teachers at the target schools on how to use the new facility effectively upon sound comprehension of basic points of considerations.

- Participants: Directors, training managers, social workers and general teachers. Selected members (approx. 15 persons per school, i.e. 60 persons in total) will be invited
- Program: Introduction, presentation of the Project, lectures from the facility designers, session to experience completed facility and discussions (a half day for the whole program)
- Place: the art hall of the new school (A-1 type)

3) Seminar to introduce the new facilities to whom concerned to school construction

To hold the seminar for the persons concerned to school construction in Mongolia. Two seminars, which have the same program for a half day will be held one for persons in education sector and another for persons in construction sector as the target. The aim is to achieve wide recognition on the design and the function of the model which will be constructed by the Project focusing on "consideration of disabilities" and "consideration of disaster prevention." Tours guided by the project's consultants also will be planned.

- Participants: [For persons in education fields] Officials from MECSS/UBC Education Department, persons concerned to inclusive education and directors in the public schools, [For persons in building/construction fields] Officials in charge of construction and in charge of disaster prevention and private consulting firms having records of school construction.
- Program: Introduction, explanation of the Project, presentation by the facility designers, guided tours of the completed facility, presentation by a party related to person with disabilities and an officer in charge of disaster management (a half day for the whole program)
- Place: the art hall of the new school (A-1 type)

4. Implementation Schedule

Activity 1). 10 weeks for compiling, translating, printing and binding of material

Activity 2). and 3). 2 weeks for preparation and implementation of seminars and a workshop

モンゴル国
ウランバートル市初等・中等教育施設整備計画
協力準備調査

ソフトコンポーネント計画書

2017 年 8 月

株式会社マツダコンサルタンツ

株式会社コーエイリサーチ＆コンサルティング

1. ソフトコンポーネントを計画する背景

モンゴル国では既に高い就学率が達成されているものの、都市部への人口集中が進み、首都ウランバートル市では都市域の拡大と児童生徒数の増加によって教育環境の悪化が深刻となっている。それに対し、モンゴル国政府は教育施設の量的拡大を図りながら質の高い教育環境の実現を目指す取り組みを進めている。また、障害を持つ児童（CWD）に対する配慮や防災、あるいは環境問題といった分野横断的課題に対する社会的要求の高まりを受けて、それらに配慮した学校づくりが新たな課題となっている。

本プロジェクトは、こうした背景の下、ユニバーサルデザインに基づき、CWD 及び防災に配慮した、今後モンゴル国政府が学校建設を行っていくときのモデルとなる質の高い学校建設を行うことを目的としている。そのためには 1) 設計・建設に当たって工夫したポイントが学校側関係者によってその意味を正しく理解され、目的に沿って効果的に利用されること、2) 完成した施設における工夫点とその効果が、技術的な情報とともにモンゴル国の学校建設に関わる多様な関係者に紹介され、具体的な施設改善に導入されて、学校施設の質の向上に貢献することが必要となる。

また、本プロジェクトでは「グリーン開発」を推進するモンゴル国側の要望に基づき、これからのモデルとなる学校の重要な性能として環境に対する配慮、特に維持管理費の低減につながる省エネルギー・省資源への取組みを組込んでいる。異なるインフラ条件のサイトでの最適な設備システムの提案が 4 つのモデルを示す大きな理由となっている。学校施設についてはモンゴル国内でも高断熱化、省エネルギー機器、再生可能エネルギーの導入を推進するガイドライン整備が進められており、本プロジェクトでの取組みの効果を定量的に示すことがモデルとしての価値を高めることになる。そのためには計測データに基づくエネルギー管理手法を確立し、実践において活用していく必要がある。

今回テーマとして取り組む「障害配慮」あるいは「防災配慮」については近年モンゴル国でも社会的な課題として知られるようになったテーマであり、本プロジェクトで建設される施設の運営を担う一般学校の教職員にとっては比較的新しい課題であって、それぞれについて十分な理解が得られている状況にはない。「障害配慮」については対象の既存 3 校のいずれも CWD を普通学級に受け容れているが、インクルーシブ教育の専門教員はおらず、CWD の指導法について知識と理解が不足していると考えられる。改善された施設環境を活用して他のモデルとなるような教育を実現していくためには、教員が基本的知識を身に着けた上で、本計画で取り入れられた工夫の意味と目的を理解することが必要である。また、「防災配慮」については、現在は非常事態省－危機管理局の主導で進められ、災害時の学校の役割は必ずしも関係者に理解されていない。導入した防災時の備えが有効に機能するためには、同様に基礎的な知識と理解を得て、災害時に的確な対応を行うことが肝要となる。「環境配慮」に関しても導入されるシステムは近年開発・導入されたもので、それらの効果を十分発揮させるには機器類の運転指導に留まらず、関係者の省エネルギーに関する理解を深めて、担当者がシステムを効果的に運用していくための実践的な方策を学ぶ必要がある。

また、上記テーマを廻る社会的な理解、認知度は高まりつつあるものの、学校建設に関わる技術者、行政職員、学校関係者についても同様に核心の理解を欠き、車椅子で登れないスロープや出入口が通れず使われない障害者便所等、ポイントを外した実施例が多く見られる。省エネルギーについても一般的に意識は低く、暖房時の室内温度調整を窓の開閉によって行う等、熱量の無駄遣いが指摘されている。本プロジェクトではモデルとして統一性のある「事例」を示すことで、正しい手法を提示し、関係者が実感をもって他の学校での導入促進を図れるよう、初期段階での理解促進の活動をソフトコンポーネントとして支援する。

なお、対象校関係者（校長他の管理職員、教員）のインクルーシブ教育に関する基礎的な知識と理解を育てるため、ソフトコンポーネントでは困難な継続的な研修等による能力強化を実施中の技術協力プロジェクト「障害児のための教育改善プロジェクト」（～2019 年 7 月）との連携で実施する予定である。

2. ソフトコンポーネントの目標と成果

目標　：対象校関係者が通常の施設の保守点検等、学校の運営・維持管理に加え、「障害配慮」、「防災配慮」及び「環境配慮」を取り入れた学校施設・設備について十分に理解し、同取組みが教育関係者に共有され、関係者各々が置かれている教育環境において提案される。

成果 1 ：対象校関係者が導入されたユニバーサルデザイン及び「障害配慮」、「防災配慮」の各工夫点の意図と目的を理解する。

成果 2 ：政策担当者・学校建設関係者が導入されたユニバーサルデザイン及び「障害配慮」、「防災配慮」、「環境配慮」」の各工夫点のポイントと価値を理解するためのきっかけとなるブックレットが作成され、配布される。また、実例に触れることで、今後の業務に活用する用意ができる。

成果 3 ：対象校関係者が各々の設備システムを用いて維持管理費低減につながる効果的な省エネルギーの実施方策を習得し、「総合運転マニュアル」に反映させる。

成果 4 ：政策担当者・対象校関係者が実施した省エネ活動の定量的成果の確認を通じ、省エネ及び同実施方策の理解を深める。

3. 成果達成度の確認方法

成果 1 ：新たに導入する「子ども発達センター」「防災用備蓄倉庫」「ノード（結節空間）」「省エネ型暖房設備」等が計画の意図に沿って使用される、または使用が計画されることを対象校関係者へのヒアリング及びアンケートにより確認する。

成果 2：各配慮を導入した質の高い学校の認知度を高めるツールとしてブックレットその他の資料が作成され、関係各所に配布されることを確認。またブックレット配布先・

セミナー参加者・見学者へのアンケートにより、今後の業務に参考になった程度を確認する。

成果 3 ：各学校で定量化された省エネ効果とその実施方策がとりまとめられた「総合運転マニュアルが作成される。

成果 4 :対象校関係者及び「実証セミナー」参加者に対するヒアリング及びアンケートにより、定量化された手法による省エネ活動の理解が得られ、その継続的な実施が計画されることを確認する。

4. ソフトコンポーネントの活動（投入計画）

ソフトコンポーネントによる支援活動は、1) 学校関係者に対する各学校で導入する事例（工夫点）の意図と活用方法を実感的に理解するための講習の実施、2) 学校建設関係者に対する、各学校で導入する事例（工夫点）の目的や技術的なポイントを紹介するセミナーの開催、及び 1)、2) の資料となり、2) の活動（モデル校の広報）の継続のためのツールとなるブックレットの作成、3) 各学校の設備管理者・運転担当者に対するエネルギー管理の手法と実践に関する講習の実施と省エネルギー効果の定量的評価で構成する。いずれも先方実施機関が今後の学校建設のテーマとして取入れていくことが期待される配慮事項について実例をベースに普及を図るため、先方実施機関が主催する広報活動、検証活動を支援するものとする。

(1) ブックレットの作成・配布

上記 1)、2) の活動に使用するとともに、先方実施機関による継続的な広報・普及活動での活用を目的に、以下の広報用資料を作成する。

a. ブックレット（本案件のユニバーサルデザインに基づく「障害配慮」、「防災配慮」及び「環境配慮」のポイントをまとめた工夫集、学校建設に関わる人々を主な対象とする。）‐モンゴル語及び日本語又は英語

b. リーフレット（上記の簡易版、配慮事項の概要が手早く理解できるよう留意、一般教員等、学校建築に専門的な関りが薄い人々も対象とする。）‐同上

c. プレゼンテーション用 PPT スライド‐同上

なお、印刷版はモンゴル語のみとし、日本語又は英語版はカラーコピー簡易製本とする。編集は設計者の意図と共に、先方実施機関、各テーマに関連した諸団体・機関のコメントを取り入れる等、モンゴル側のオーナーシップに配慮したものとする。

■ 詳細内容

【対象範囲】		
a. ブックレット	MECSS[1]、UBC[2]教育局関連部局へ送付	20 部

[1] Ministry of Education, Culture, Science and Sports (教育・文化・科学・スポーツ省)

[2] Ulaanbaatar City(ウランバートル市)

	建築・建設、障害者、防災関係機関へ送付 UBC 各公立学校校長宛て送付 見学会・セミナー参加者に配布	30 部 130 部 120 部　＋200 部　計 500 部
b. リーフレット	上記同数とし、必要に応じて先方負担での増刷を計画する。	計 500 部
c. PPT スライド	MECSS、UBC 教育局学校建設関連部局へデータを配布	DVD－R 5 部
【内容構成】		
a. ブックレット	・ プロジェクト概要（障害、防災、環境に関する基礎情報を含む） ・ ユニバーサルデザインの思想 ・ 工夫集 (1) （比較的大きなコストを必要とするもの） ・ 工夫集 (2) （学校レベルで実現が可能なもの） （留意点） ・ ビジュアル素材を中心にした直感的に分かりやすい構成とする。 ・ 実施例に基づき、技術的なポイント・工夫点が分る内容とする。 ・ モンゴル側のオーナーシップを高めるため、作成段階でモンゴル側実施機関の確認を得つつ、MECSS 事務次官に巻頭の言を頂くなどの工夫を行う。	
b. リーフレット	・ より平易に「障害配慮」「防災配慮」「環境配慮」の事例について説明。 ・ 4つのモデル別のシートとする。	

■ 実施リソース

【邦人コンサルタント】		
・国内作業 －総括（建築計画） －建築設計 －編集	 構成立案、原稿作成 素材収集、ビジュアル編集 版下データ、PPT スライド作成	 5 人日 （40p×1h/p＝40 時間） 10 人日 （40p×2h/p＝80 時間） 5 人日 （40p×0.5h/p＋0.5h/p＝40 時間）
・現地作業 －常駐監理 －	* 現地作業は日本人常駐監理者の指導の下、実施機関である UBC 教育局が行うこととし、邦人経費は計上しない。 調達・発注管理指導 検収・配本手配指導	 （計上無し） （計上無し）
【現地委託】		
・翻訳	A4 20p（40p 中半分程度） 日本語又は英語→ モンゴル語	
・印刷・製本 委託先／調達方法	現地印刷・製本会社（JICA ないしは他国際機関との業務経験を軸にショートリストを作成、3 社以上の見積り競争にて調達予定）	
委託内容	1) ブックレット（モンゴル語版） A4 変形版中綴じ 40p　500 部、フルカラー 2) ブックレット（日本語又は英語版） カラーコピー、簡易製本 30 部 3) リーフレット（モンゴル語版） A4 版二つ折 8p　500 部、フルカラー 4) リーフレット（日本語又は英語版） カラーコピー、二つ折り 30 部 5) 送付用封筒印刷	
【現地リソース】	調達・発注管理：UBC 教育局 検収・配本手配：UBC 教育局 関係者への送付：UBC 教育局	

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(2) 対象校での事例（工夫点）講習会の実施

対象校の管理職、教員、スタッフが基本的な配慮事項の意味を正しく理解し、施設を効果的に活用できるようになることを目的に、以下の構成、内容で講習会を実施する。講習は実施機関である UBC 教育局主催とし、実現された施設を使って機能を実体験することを主体に、参加者自らの学びの支援を中心とする。

■ 詳細内容

【対象範囲】	対象校の校長、学習マネージャー、ソーシャルワーカー、一般教員	各校 15 名、計 60 名程度
【構成概要】	・今回完成したモデルが目指すもの ・ユニバーサルデザインの原則 ・障害配慮、防災配慮、環境配慮（省エネルギー）の手法 ・実例を見ながらの解説・ディスカッション	設計担当日本人コンサルタント 先方実施機関関係者 資料：広報用リーフレット 見学は各 20 人×3 グループ
【場所・日程】	プロジェクトによる新設校（A-1 を想定） －講義：芸術ホール －見学：各所	全体で半日程度

■ 実施リソース

【邦人コンサルタント】		
・現地作業 －総括（建築計画）	研修計画管理・講師	活動(2)-(3)共通の日程 10 人日、渡航 1 回 （活動(3)を含む。また渡航は完工検査と併せて行う計画とし、旅費等は計上せず、宿泊費は 10 日分の計上とする。） 【内訳】 調整・進捗確認（1 日） 現場準備・段取り確認（1 日） 講習会管理（司会）、セミナー管理（司会）、見学案内（6 日、うち 3 日はセミナー等兼任） 報告・総括（1 日） 休日（1 日）
－建築設計	司会・講師	12 人日、渡航 1 回 （活動(3)を含む） 【内訳】 移動(1 日)＋調整・進捗確認（1 日） 会場設営指導、発表者調整（1 日） 講習会発表、セミナー参加・発表、見学案内（6 日、うち 3 日はセミナー等兼任） 報告・総括（1 日）＋移動（1 日） 休日（1 日）
【現地委託】		
・通訳	日本語又は英語→ モンゴル語	7 人日×1 人（活動(3)を含む） 講習通訳 1/2 日
【現地リソース】	主催・全体調整 会場設営・準備	UBC 教育局 対象学校関係者

(3) 学校建設関係者への事例紹介セミナーの開催

モデル校として、本計画で導入した工夫が参考とされ、今後のモンゴル国の学校建設の中に取り入れられ、学校施設の質の向上に貢献していくためには、学校建設に関わる一人でも多くの関係者にその内容を知ってもらい、技術的なポイントを含めて、その目的と効果についての理解を得る必要がある。また、実際の施設を視察してもらい、目指すべき学校像のひとつとして全体のイメージを実感してもらうことも重要である。そうしたモデル校広報活動の初期段階の支援として、関係者へのブックレット送付と併せて、オープンな形の完成施設見学会と設計者・利用者を含む様々な関係者によるセミナーを以下の構成、内容で実施する。

セミナーは対象者グループを分けて2回実施することとし、一方的な解説とならないよう、モンゴル側関係者（障害者団体関係者、防災行政関係者）による評価を交えて、質の高い教育環境の実現に向けてモンゴル国内での展開を図るきっかけとする。また、(2)(3)の活動期間中は施設を一般公開し、幅広い関係者に自由な見学の機会を提供するとともに、日本人設計者を含むガイドを配して設計のポイントを説明、見学者の意見を聴取する。

■ 詳細内容

【対象範囲】	教育関係者:MECSS、UBC 教育局関係行政官、障害者教育関係者、UBC 公立学校校長 建築・建設、防災関係行政官、学校建設に関わる民間コンサルタント	各回 60 名程度×2 回 延べ 120 人程度
【構成概要】	・完成施設見学・体験（共通） ・プロジェクト全体の説明(共通) ・環境配慮のポイント(省エネルギー)(共通) ・障害配慮のポイント紹介 ① ・障害者側からの評価 ① ・防災配慮のポイント説明 ② ・防災マネジメントからの評価 ② ・意見交換(共通)	最大 20 人×3～4 グループ 資料:広報用ブックレット 講師: 設計担当日本人コンサルタント 障害者団体関係者、防災行政関係者、MECSS・UBC 教育局関係者
【場所・日程】	プロジェクトによる新設校(A-1 を想定) －セミナー:芸術ホール －見学:各所	2 日間(セミナー) 6 日間(見学会)

■ 実施リソース

【邦人コンサルタント】		
・現地作業 －総括(建築計画) －建築設計	 研修計画管理・講師 司会・講師	 (活動(2)に含む) 同上
【現地委託】		
・通訳	日本語又は英語→ モンゴル語	講習通訳 1/2 日×2 日
【現地リソース】	主催・全体調整 会場設営・準備 講師	UBC 教育局 対象学校関係者 現地障害者団体関係者 防災行政(学校防災)関係者

(4) 対象校でのエネルギー管理研修の実施

対象校の設備管理者がデータ計測に基づく暖房設備の省エネルギー運用の手法を習得し、実践をする中で、異なる熱源のシステムにおけるエネルギー管理のモデルが確立され、維持管理費削減の効果が実証されることを目標に、本ソフトコンポーネントではその第一歩として学校関係者の省エネルギー技術及びエネルギー管理に関する理解を深めるとともに、実際のシステム運用の手順・方策を実地にて習得させることを目的として、1) 省エネルギーとエネルギー管理に関する概要を紹介する集合セミナーと 2) 完成した施設を利用した実地研修を計画する。実地研修は熱源やシステムの相違に依らない共通項目の研修と、種類の異なるシステムごとの固有の項目に関する研修、及びシステムを実際に運転しながら行う運転指導で構成し、各学校の設備管理担当者を対象に実践に重点を置いた指導を行う。また、集合セミナーでは施設建設に携わる政策担当者や学校施設管理者を対象に加えて、維持管理費低減と省エネルギーに対する意識の涵養を図る。

■ 詳細内容

【対象範囲】	① 対象校の校長、②設備管理・運転担当者 ③ 学校建設に係る行政担当官	
【構成概要】	[集合セミナー] ①＋②＋③ ・今回完成したモデルが目指すもの ・本プロジェクトにおける省エネルギー対策 ・エネルギー管理の手法とシステム化 [実地研修] ①＋② ・外気温と室内温度の差異、地階と上階での室内温度の差異等を基に、暖房用温水をコントロールする手法	 エネルギー管理日本人専門家 資料:総合運転マニュアル
【場所・日程】	[集合セミナー] プロジェクトによる新設校(A-1 を想定) －講義:芸術ホール [実地研修] 1. 基本事項、共通事項のインストラクション 2. 熱源の異なるサイト別のインストラクション 3. 各校(全 4 校)での暖房運転指導	全体で 1 日程度 共通項目　延べ 2 日間 個別項目　延べ 2 日間 延 6 日間

■ 実施リソース

【邦人コンサルタント】		
・国内作業		
－エネルギー管理	研修用資料作成支援	10 人日 内訳 ・都市部用 5 日(A4 20p) ・地方部用 5 日(A4 20p)
・現地作業		
－エネルギー管理	講師・実地指導	16 人日、渡航 1 回 【内訳】 ・移動、準部・協議:各 1 日 ・計装類の調整:1 日/学校、計 4 日

		・総合運転マニュアルの加筆修正他:1日 ・基本共通事項のインストラクション:1 日 ・各校(全 4 校)での暖房運転指導:計 4 日 ・総括・報告:1 日 ・休日(日):2 日 ・移動:1 日
【機材】	供給側データ記録装置 データ記録装置付き温度計 (室温計測用)	* 新たに必要となる機材は予めシステム(本体工事)に組込んで設置する。
【現地委託】		
・通訳(会議通訳含)	日本語又は英語→ モンゴル語	4.0 人日
・現地エネルギー技師	エネルギー管理資料作成・ セミナー・運転指導	6 人日:邦人技術者の下で資料を作成 8 人日:計装類の調整～各校での運転指導
・翻訳	資料の翻訳(英語→モンゴル語)は現地エネルギー技師が行う。	
【現地リソース】	主催・全体調整 会場設営・準備 発表	UBC 教育局 対象学校関係者 対象校設備管理者

(5) 省エネ活動の実施による維持管理の手法の定着と成果の視覚化

活動（4）で習得する省エネ手法では、寒暖差の大きいモンゴル国に対応する季節ごとの暖房機器の効率的な運転方法の習得が重要となる。このため暖房開始時期の 10 月から終了時期の 5 月の 8 ヶ月間、現地エネルギー技師を通じた適正な運用方法の指導の下、暖房機器の効率的な運用を実践することで手法の定着を図る。また、定着された手法を「総合運転マニュアル」に反映させ、省エネ活動の継続的な実施に向けたマニュアルとして他校への展開も可能な形で整備する。

同時に実践した省エネ活動を通して得られた成果（石炭使用量の削減、ランニングコストの削減、及びコベネフィットである大気汚染物質や温室効果ガスの排出削減）を定量化（見える化）することで、エネルギーの適正利用の重要性について理解を深める。

■ 詳細内容

【対象範囲】	①対象校の校長、②設備管理・運転担当者 ③学校建設に係る行政担当官	
【構成概要】	[実地実証] ①+② 暖房機器運転状況の （定時の外気温・室温・使用熱量)記録指導 データ確認及び効率的な室内温度の管理手法の指導 手法の最適化(効果が大きく、実施しやすい)と継続的な実施に向けたマニュアル化	現地エネルギー技師 資料:総合運転マニュアル
	[実証セミナー]①+②+③ 3) データ解析、省エネ効果の定量化とモデル化した暖房機器の適正運転手法を基に、 省エネ効果の確認セミナーの実施	対象校設備管理者 エネルギー管理日本人専門家 資料:実証結果報告書(スライド)、総合運転マニュアル

【場所・日程】	1) 各校(1 回/隔週、32 週、0.5 日/校 x4 校) 2) 同上 3) 瑕疵検査 1 ヶ月前(暖房終了時期の 6 月) プロジェクトによる新設校(A-1 を想定) ーセミナー:芸術ホール	現地エネルギー技師 現地エネルギー技師 1 日間 エネルギー管理日本人専門家及び現地エネルギー技師

■ 実施リソース

【邦人コンサルタント】		
・国内作業		
ーエネルギー管理	実証データ解析支援	10 人日 【内訳】 ・暖房機器のモニタリング結果及び温度データの整理及び入力:1 日 ・データ解析及び現地への運転指導:5 日 ・実証結果の考察:2 日 ・省エネ効果の確認セミナー資料作成:2 日
・現地作業 ーエネルギー管理	学校関係者との実証結果協議 実証セミナー司会・講師	6 人日、渡航 1 回 【内訳】 ・移動+準備 1 日*、 ・実証セミナー1 日、 ・確認・補足運転指導 2 日:0.5 日 4 校**、 ・UBC 教育局での総括と報告 1 日、 ・移動 1 日**
【現地委託】		
・通訳(会議通訳含)	日本語又は英語→ モンゴル語	2.5 人日 (上記*は 0.5 日、上記**は計上なし)
・現地エネルギー技師	効率的な室温管理指導 データ解析支援 実証セミナー補助	延 32 人日-隔週半日の頻度で各校を廻り、データ品質、効果の分析等を確認、4 校で比較可能なデータを得られるようモニタリング、指導を行う。 (0.5 日/校*4 校*0.5 回/週*32 週) 延 5 人日 3 人日
【現地リソース】	セミナー主催・全体調整 セミナー会場設営・準備 発表	UBC 教育局 対象学校関係者 対象校設備管理者

5. ソフトコンポーネントの実施リソースの調達方法

本ソフトコンポーネントは設計内容の普及、展開を目的とするもので、主要部分は詳細設計を行った邦人コンサルタントが現地のリソースを可能な範囲で活用しながら、先方実施機関の行う広報活動及び省エネルギー実践活動を支援する直接支援型で実施する。それぞれの作業分担は以下の通りとする。

- ブックレット他資料の作成：先方実施機関の知見を入れながら原稿作成までを邦人コンサルタントが行い（モンゴル語翻訳は現地翻訳者に依頼)、版下データ納品後、印刷・

製本は 3 社以上の見積り競争で選定する現地業者に委託する。見積り徴取先は JICA 案件での業務経験を条件に選定する。

- 対象校での事例（工夫点）講習会：先方実施機関主催の下、邦人コンサルタントが共同で全体を管理し、施設見学及び会の進行、発表等を行う。施設見学時は邦人コンサルタントの常駐監理者の支援を得る。
- 学校建設関係者への事例紹介セミナー：先方実施機関主催の下、邦人コンサルタントが共同で全体を管理し、施設見学及び会の進行、発表等を行う。施設見学時は邦人コンサルタントの常駐監理者の支援を得る。
- 対象校でのエネルギー管理研修：邦人コンサルタントが事前の資料作成から実地研修までの全体を実施する。専門性が求められることから、UBC で日本支援により実施されたエネルギー効率化プロジェクトの経験者等を活用することを想定している。
- 省エネ活動の実施及び成果の実証：邦人コンサルタントの指導・監督の下、対象校での実地指導は現地エネルギー技師を活用して行う。現地エネルギー技師は理論のみでなくボイラー熱機器の設置、運転及び保守点検等の実務に関する能力を必要とすることから、類似業務での実地経験を有する人材の登用を計画する。

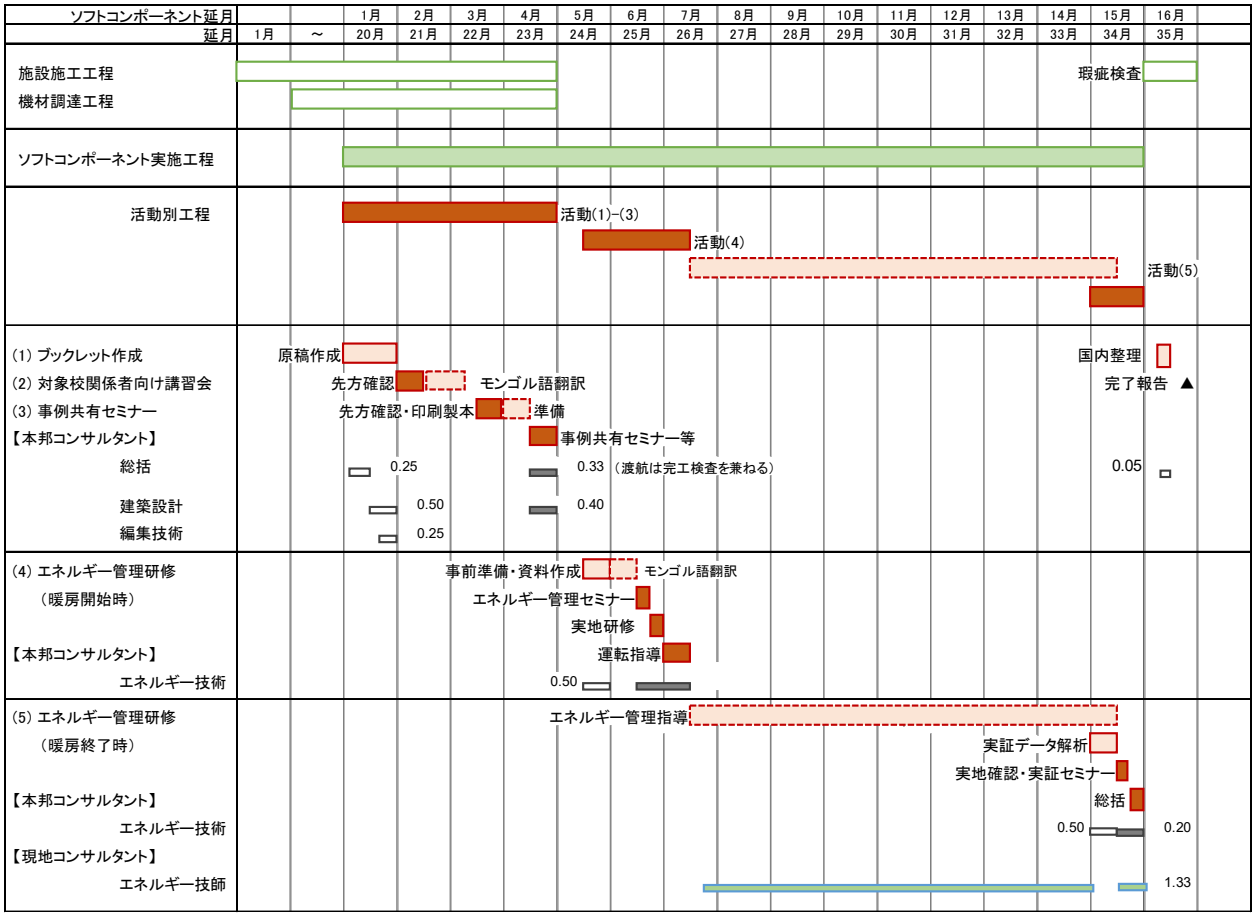
6. ソフトコンポーネントの実施工程（次ページ参照）

本ソフトコンポーネントのうち活動 (1)、(2)、(3) は、事前にブックレット及びそれを加工した成果品（リーフレット及びプレゼンテーション用スライド）を作成し、施設の完工～引渡し前後の期間での実施を想定している。活動 (4) については、地域暖房の供給が開始される 9 月 15 日以降に実地研修を行い、活動 (5) は暖房期の 10 月から 5 月の通年でのモニタリングを終えた後、瑕疵検査 1 か月前の 6 月後半に行うスケジュールとなる。

7. ソフトコンポーネントの成果品

施主及び日本側へのソフトコンポーネント完了報告書に加え、作成したブックレット、リーフレット、プレゼンテーション用 PPT スライド、各イベントの参加者リスト、参加者に対するアンケート結果、エネルギー管理研修用資料（総合運転マニュアル等）、エネルギー管理実証データ、総合運転マニュアル（最終版）など。

ソフトコンポーネント実施工程表



8. 相手国側の責務

MECSS 及びウランバートル市教育局は完成施設を紹介する一連の活動の主催者として、ソフトコンポーネントを実施する邦人コンサルタントに協力し、各セミナー等への参加者の選定、募集を行うとともに、見学者等を積極的に受け入れる体制を構築することが求められる。エネルギー管理・省エネ研修については、得られた成果をベースに効率的なエネルギー管理の手法を他校に展開し、維持管理費の適正化を図っていくことが期待される。

また、本ソフトコンポーネントはモデル校として施設が設計意図に沿って利用され、その存在と意味を広く学校関係者に知ってもらうための最小限の活動として行うもので、モンゴル側実施機関であるウランバートル市教育局は作成されたブックレット等を活用して継続的な広報に努め、特にテーマである「障害配慮」、「防災配慮」及び「環境配慮」については、今後とも学校建設に当たっての主要なポイントとなることを認識し、本計画施設をモデルとして、更に改良を加えていくことが求められる。

6．参考資料

No.	資料名	形態	発行年	発行機関
1	Mongolia Sustainable Development Vision 2030	電子ｺﾋﾟｰ	2016 年	Parliament of Mongolia
2	Action Program of the Government of Mongolia for 2016-2020	電子ｺﾋﾟｰ	2016 年	Parliament of Mongolia
3	State Education Policy 2014-2024 (in Mongolian)	電子ｺﾋﾟｰ	2014 年	Parliament of Mongolia
4	Educational Quality Reform Policy 2012-2016 (in Mongolian)	電子ｺﾋﾟｰ	2013 年	MECS
5	Statistical Yearbook- Eduction and Science 2015-16	印刷物	2016 年	MECS
6	Statistics of General Education Schools 2016-17 (in Mongolian)	電子ｺﾋﾟｰ	2017 年	MECSS
7	UBC Education Statistics 2016-17 (in Mongolian)	電子ｺﾋﾟｰ	2017 年	UBC Education Dept.
8	UBC Education Statistics 2015-16 (in Mongolian)	電子ｺﾋﾟｰ	2016 年	UBC Education Dept.
9	Mongolian Statistical Yearbook 2015	電子ｺﾋﾟｰ	2016 年	NSO
10	Pupulation by district/khoroo and type of dwelling 2016 (in Mongolian)	電子ｺﾋﾟｰ	2017 年	UBC Statistical Division
11	Population by single age 2016 (in Mongolian)	電子ｺﾋﾟｰ	2017 年	UBC Statistical Division
12	Future development challenges in Mongolia: Multi-state population projections by age, sex and education	電子ｺﾋﾟｰ	2013 年	IUSSP-International Population Conference
13	Mongolia State Budget 2017 (in Mongolian)	電子ｺﾋﾟｰ	2016 年	Miinstry of Finance
14	Mongolia State Budget 2016 (in Mongolian)	電子ｺﾋﾟｰ	2015 年	Miinstry of Finance
15	Ulaanbaatar City Budget 2017 (in Mongolian)	電子ｺﾋﾟｰ	2016 年	Miinstry of Finance
16	Needs for new kindergartens, schools, dormitories and gyms and options to meet those needs-Policy Project	印刷物	2012 年	MECS
17	ウランバートル市学校・幼稚園位置図 (in Mongolia)	電子ｺﾋﾟｰ	―	UBC 教育局
18	Model Blueprints of General Education Schools (in Mongolian)	電子ｺﾋﾟｰ	―	MECS
19	IEE - Mongolia: Sustaining Access to and Quality of Education during Economic Dificulties	電子ｺﾋﾟｰ	2017 年	MECSS/ADB
20	Construction Code of Mongolia (CCM) 31-03-03/11, Public and Civil Buildings (in Mongolian)	印刷物	2011 年	MCUD
21	Construction Regulations (CR) 31-113-11 Designing of General Education Institutions (in Mongolian)	印刷物	2011 年	MCUD
22	CCM 52-01-10 Concrete and Reinforced Concrete Structures, Principal Rules (in Mongolian)	印刷物	2010 年	MCUD

No.	資料名	形態	発行年	発行機関
23	CR 31-101-04 Handbook for Barrier-Free Construction-Planning for Handicapped (in Mongolian)	印刷物	2004 年	MCUD
24	CCM 22-101-01/2013 Construction Planning at Seismic Zones of Mongolia	印刷物	2013 年	MCUD
25	Ulaanbaatar City General Development Plan 2030 (in Mongolian)	電子ｺﾋﾟｰ	2014 年	MCUD, UBC
26	Law of Mongolia on the Rights of Persons with Disabilities (Un-authorized translation)	電子ｺﾋﾟｰ	2016 年	Parliament of Mongolia
27	モンゴル国特別支援教育にかかる情報収集・確認調査報告書	電子ｺﾋﾟｰ	2014 年	JICA 人間開発部
28	PPTA- Ensuring inclusiveness and service delivery to persons with disabilities- Poverty and Social Analysis	電子ｺﾋﾟｰ	2016 年	ADB
29	モンゴル国別障害情報	電子ｺﾋﾟｰ	2016 年	UBC における障害者の社会参加促進ﾌﾟﾛｼﾞｪｸﾄ
30	Law of Mongolia on Disaster Protection (Revised, in Mongolian)	電子ｺﾋﾟｰ	2017 年	Parliament of Mongolia
31	モンゴル国防災分野にかかる情報収集・確認調査ファイナルレポート	電子ｺﾋﾟｰ	2016 年	JICA
32	学校の防災マネジメント（モンゴル語）	印刷物	2016 年	MECSS
33	Advancing School Safety in Asia	電子ｺﾋﾟｰ	-	World Vision
34	Environmental Protection Law of Mongolia	電子ｺﾋﾟｰ	1995 年	Parliament of Mongolia
35	Law of Mongolia on Environmental Impact Assessment	電子ｺﾋﾟｰ	2011 年	Parliament of Mongolia
36	Strategies for Development of Green Energy Systems in Mongolia (2013-2035)-Extended Executive Summary	印刷物	2015 年	Global Green Growth Institute
37	Green Public-Private-Partnerships for Public Infrastructure in Mongolia	印刷物	2016 年	Global Green Growth Institute
38	Financing Mechanisms for Green Public Education Buildings in Mongolia	印刷物	2016 年	Global Green Growth Institute
39	Green School- PPT Presentation	電子ｺﾋﾟｰ	-	“N.A.P Group” LLC

7．その他の資料・情報

7-1 敷地測量図

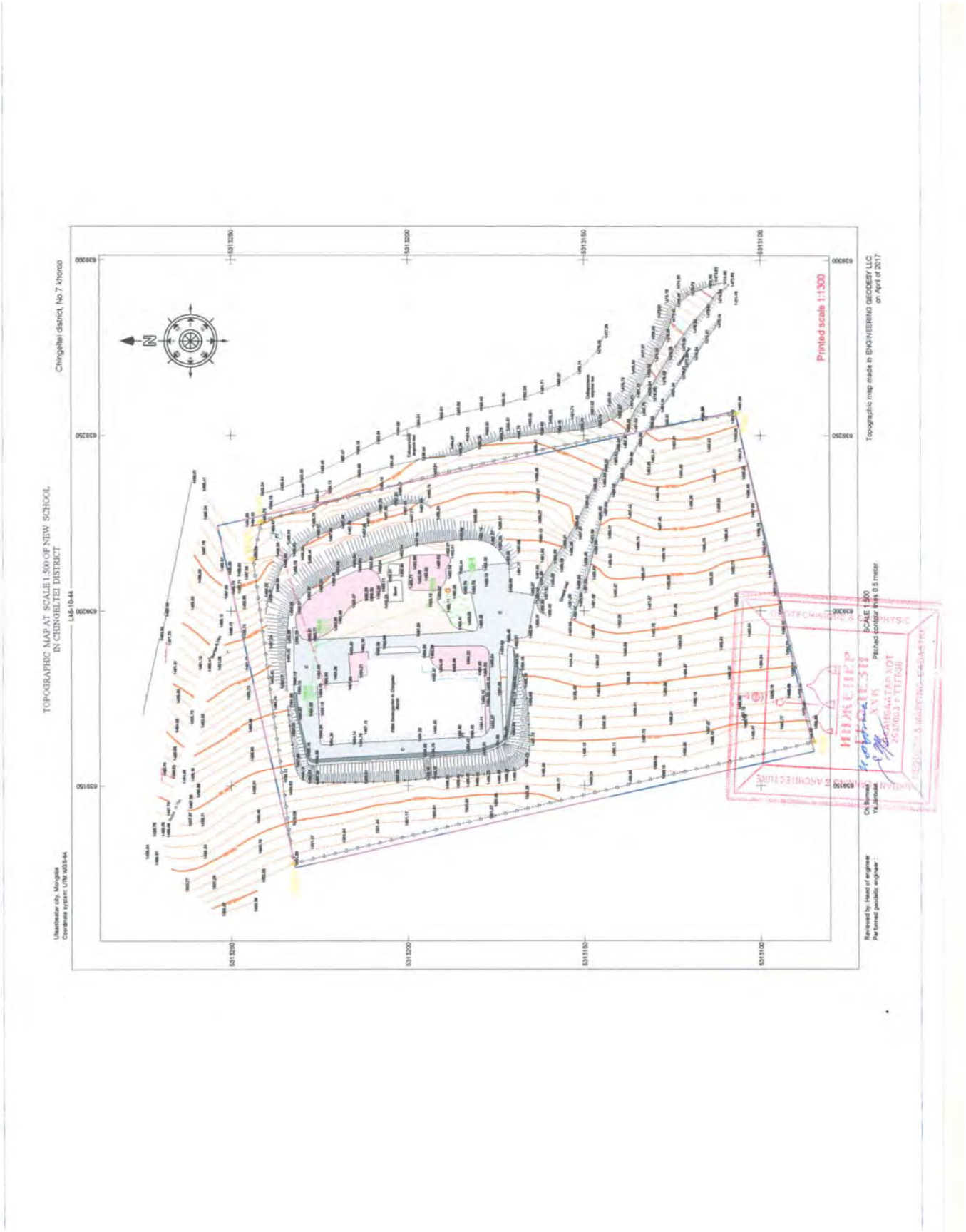
- 75 番学校（A-1）サイト
- チンゲルテイ 7 番ホロー（A-2）サイト
- 53 番学校（B-1）サイト
- 109 番学校（B-2）サイト

・75番学校（A-1）サイト

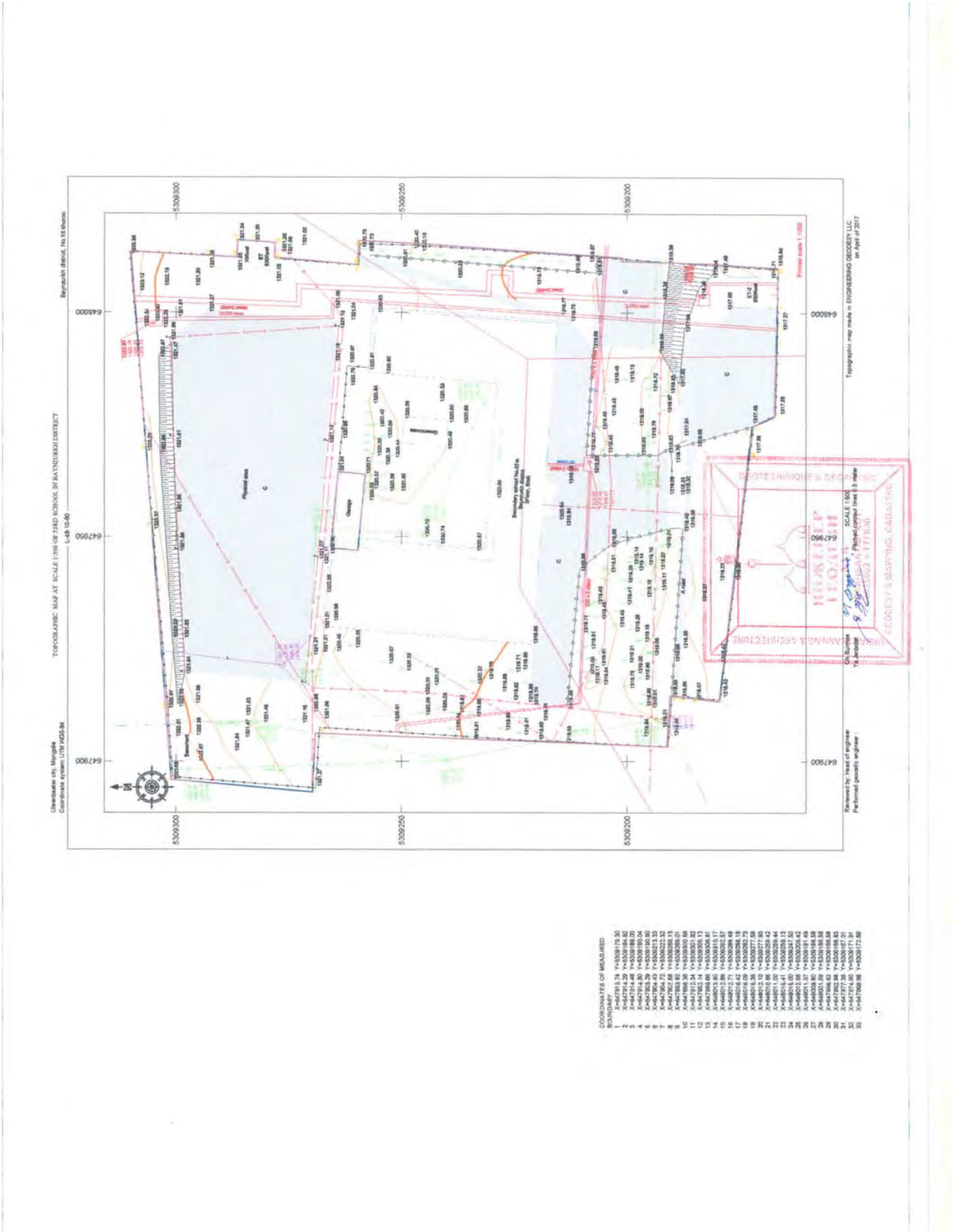
COORDINATES OF CADASTRAL BOUNDARY

1	X=642149.14	Y=5306845.74
2	X=642146.73	Y=5306873.28
3	X=642144.35	Y=5306913.61
4	X=642142.40	Y=5306945.56
5	X=642166.39	Y=5306946.16
6	X=642165.56	Y=5306964.08
7	X=642164.64	Y=5306984.59
8	X=642204.31	Y=5306987.20
9	X=642243.98	Y=5306989.82
10	X=642244.41	Y=5306976.40
11	X=642244.99	Y=5306972.24
12	X=642249.29	Y=5306972.58
13	X=642256.70	Y=5306972.87
14	X=642257.18	Y=5306960.61
15	X=642257.80	Y=5306948.29
16	X=642269.66	Y=5306948.89
17	X=642281.65	Y=5306949.50
18	X=642276.73	Y=5306947.89
19	X=642278.19	Y=5306923.71
20	X=642279.64	Y=5306899.53
21	X=642279.94	Y=5306894.56
22	X=642280.23	Y=5306889.59
23	X=642280.67	Y=5306883.41
24	X=642282.94	Y=5306855.03
25	X=642244.90	Y=5306852.33
26	X=642214.76	Y=5306860.19
27	X=642188.24	Y=5306848.72

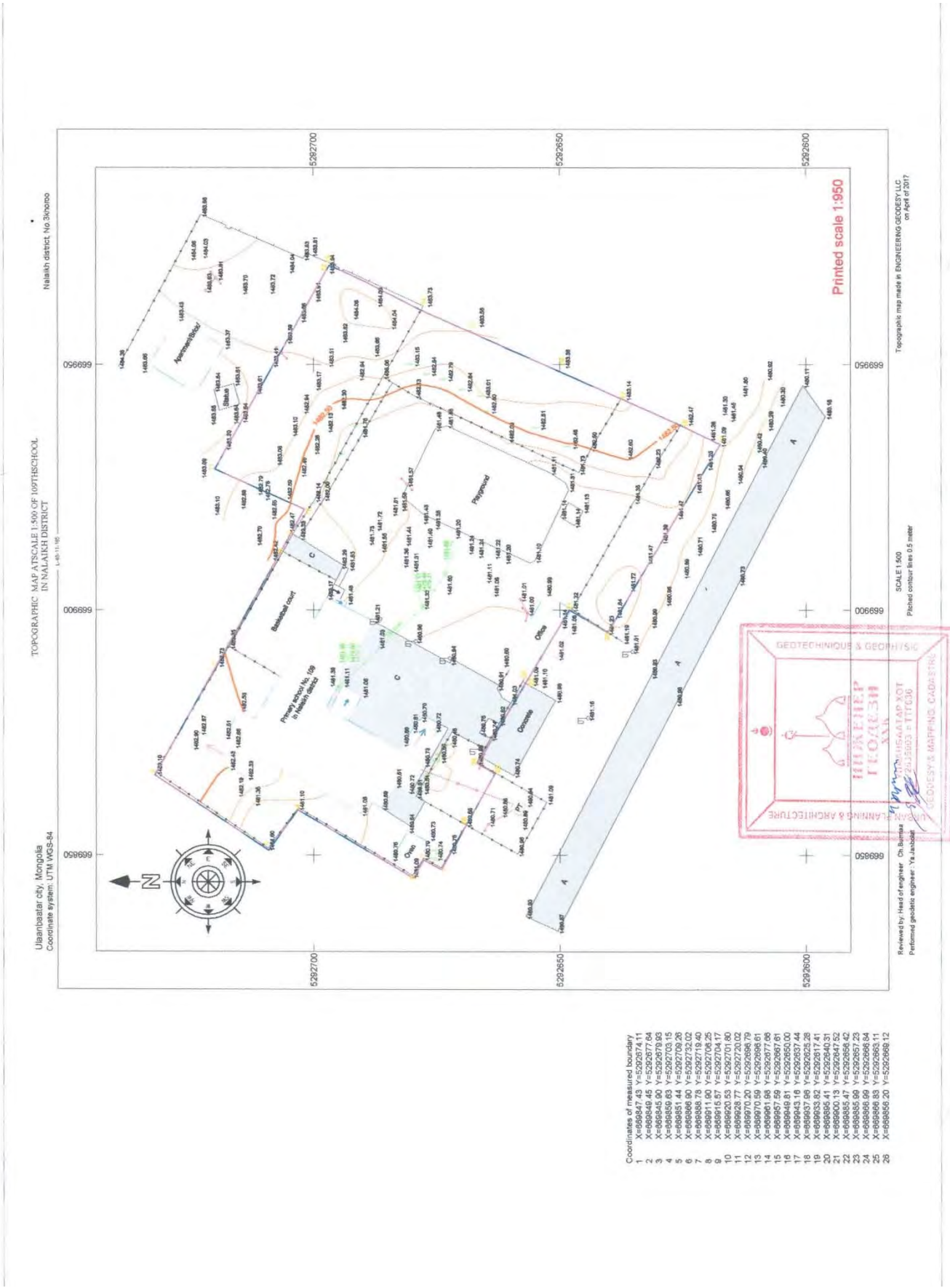
・チンゲルテイ 7 番ホロー（A-2）サイト



・53 番学校（B-1）サイト



・109 番学校（B-2）サイト



7-2 地盤調査結果

- 75 番学校（A-1）サイト
- チンゲルテイ 7 番ホロー（A-2）サイト
- 53 番学校（B-1）サイト
- 109 番学校（B-2）サイト

" ENGINEERING GEODESY" LLC

Ulaanbaatar-16081
Bayangol district , 6-r khoroo
10[A] micro 65[A] building A corpus
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Web: www.geo-mongol.mn

Archive 17/039

ZT19-615/14

Engineering-geological investigation report for new school building area in 2nd micro, Khan-Uul district, Ulaanbaatar city

/Detail design stage/

Approved by:

Director *TS.Bileg*

Prepared by:

Engineer geologist *G.Erdenetsetseg*

Ulaanbaatar city

2017

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2. ENGINEERING-GEOLOGICAL SECTION, APPENDIX №2

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   Vertical 1:1000
3. STANDARD PENETRATION TEST RESULT APPENDIX №4

I. GENERAL INFORMATION

1.1 Survey basis

Engineer Geodesy LLC /Drawing and geological survey company/ completed engineer geological survey work of construction area of 75th school extension in Ulaanbaatar city, han-Uul district, 2nd khoroo by "MECSS" tender in April 19th-28th 2017 and survey planned and completed as their requested.

1.2 Survey technique

Team with drill master Galzagd.Y , assistant worker Byambasuren.G is executed the drill work by UGB-50M equipment, 5 boreholes 10.0 meters depth, 50.0 t/m column drilling, to locate and define underground water depth, characteristics, construction fundament pressure effective soil depth and distribution, according to the plan and SNIP 11-03-01 in survey area engineer geological survey work.

Soil physic and mechanic characteristics been defined by taking 29 pieces of samples from drilled boreholes in soil study laboratory. According to ASTM standard, Tsagaandarkhi.L /laboratory chief/, Ganchimeg.G /laboratory engineer/ are summarized the result and tabled soil analyze in soil study laboratory of Engineer Geodesy LLC /with guaranteed number of TL-78 from Standardization and Metrology department, satisfied the standard of ISO/IEC 17025:2005, MNS ISO/IEC 17025:2005/. Engineer Geologist Erdenetsetseg.G processed the engineer geological report to create procedural plan which is made by comparison of field survey material and laboratory analyze result.

Source materials related to survey work stored in archive of Engineer Geodesy LLC.

II. ENGINEERING GEOLOGICAL INVESTIGATED CONDITION

2.1 Location

Area of re-building where 19th bus station of 2nd khoroo, Han-Uul district and 75th school's new school and planning now.

Drawing №1. Survey area of location

2.2 Climatic conditions

"Buyant-Ukhaa" climate stations indices CCM 23-01-09 standard "Climate and geotechnical indices for the construction work" have been used for the climate indices of this site, and showed in tables

Annual and monthly average air temperature, ^{0}C

Table II-1

Station	Month												Year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Buyant-Ukhaa	-25.7	-21.1	-10.2	-0.8	8.7	15.0	17.2	15.0	7.6	-1.5	-14.1	-23.4	-2.6

Absolute maximum air temperature, ^{0}C

Table II-2

Station	Absolute maximum	Date	July average
Buyant-Ukhaa	39.4	2005.VII.15	-31.4

Absolute minimum air temperature, ^{0}C

Table II-3

Station	Absolute minimum	Date	Jan average
Buyant-Ukhaa	-49.0	1954.VII.30	-39.9

Structure and technical calculation temperature, ^{0}

Table II-4

Station	Calculation temperature, ^{0}C				
	Coldest temperature				One day during hottest temperature
	1 day	3 day	5 day	Airring	
Buyant-Ukhaa	-36.7	-35.3	-34.2	-29.9	25.8

Temperature supply indices for the construction and technical calculation during winter time (^{0}C)

Table II-5

Station	The coldest 5 days temperature supply, %				The coldest 1 day temperature supply, %			
	99.2	99.5	94	92	99.9	99.5	94	92
Buyant-Ukhaa	-41.8	-41.7	-39.4	-39.0	-43.3	-43.2	-41.5	-40.7

Air humidity and precipitation

Table II-6

Station	Precipitation							
	Warm season	Cold season	Annual	In warm season	Maximum of day	Year	Month	Day
Buyant-Ukhaa	50	72	248.8	236.5	74.9	1967	VI	27

Annual and monthly average wind speed

Table II-7

Station	Month, winter, average speed of year, m/sec													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	winter	year
Buyant-Ukhaa	0.7	1.3	2.5	3.7	3.8	3.4	2.9	2.6	2.5	2.1	1.3	0.7	0.9	2.3

2.3 Geological formation

In survey area, from below filled soil upper and modern Quaternary alluvium-proluvium. Equal well graded gravel with sand soil spread equally thickness in survey area until 10 meter deep continued. In survey area, spread soil classified engineering-geological elements that EGE-1, defined characteristics of physics-mechanical and cross section of depth and distribution shown in drawing.

2.4 Geomorphological features ба physic-geological scene and process

Survey area different from geomorphological one element and located in higher river terraces in right hand side of Tuul river. In survey area, soil was generally equal structure and elevation is between 1284.90-1285.50 meter then elevation difference is 0.60 meter.

2.5 Hydro-geological condition

In survey area, soil groundwater has been occurred in 3.60-3.80meter deep by 5 drill holes with 10 meter depth /dated April 19-20th ,2017/. Soil ground water is minimum low level in April and it can be increased by rainfall. Ground water is with free surface and hydraulic related to Tuul river. In summer and autumn, soil ground water level increase about 1.0-1.5meter from current level and it depends on source of water.

III. ENGINEERING-GEOLOGICAL CONDITIONS AND PHYSICAL AND MECHANICAL PROPERTIES

3.1 Soil engineer geological classification and formation

In survey area, soil color was brown yellowish and type was well-graded gravel with sand - GW soil /EGE-1/. Physics and mechanical properties of soil determined and draw cut to spread and thick.

3.2 Soil physics mechanic characteristic

Depending on soil particle structure and physic mechanic characteristic classified to engineer geological 1 element.

EGE-1. Well-graded gravel with sand /GW/

Brown yellowish color, up and modern Quaternary alluvium-proluvium (apQ_{III-IV}), saturation by water and sandy equal gravel soil.

Granulometric composition from the laboratory analysis of these soil samples includes: (%):

- Gravel 63.3
- Sand 32.9
- Silt 3.8
- Clay 3.8

Physical properties indices of the soil:

- Natural moisture content 8.0
- Specific gravity, g/sm^3 2.65
- Wet density g/sm^3 2.28
- Dry density g/sm^3 2.11
- Porocity , % 20.34
- Porocity ratio 0.256
- Moisture content degree 0.83

Normative and calculation indices of the mechanical properties:

According to the norm and regulations to create the construction groundwork - CCM 50-01-16 and Table I:

Normative values:

- Cohesion C_n= 2.0 kPa
- Angle of internal friction φ_n= 40^0
- Deformation modulus E= 45 MPa

Calculation value:

- Cohesion C_{n2}= 1.33 kPa
- Angle of internal friction φ_{n2}= 36.36 ^{0}
- Calculated resistance R_0= 500 kPa

According to CCM 50-01-16 and 5.3.2, well-graded gravel with clay and sand soil is normalize by none swellings.

Silty sand with gravel soil seasonal freezing depth 3.8 m

Earthwork of measuring, dig-up III

IV. CONCLUSION

1. In survey area, low and average blub engineer geological 1 types of element occurred, and there is no swellings, soil ground water detected in 3.60-3.80meter, filled up ground spread vary thickness related to human and engineering process and this area depend on hard condition for engineering geology. For example; underground cable, network (thermal and pure water pipelines), electrical cable (lot of shear), earthquake magnitude is 8 that value is intense range.
2. Parameters of calculation and main soil spread to area physic and mechanic characteristic normative are shown in section of **Engineer Geological classification and soil Physic mechanic characteristic**.
3. Table IV-1 is shown soil blub level and earth work degree for distributed soil in survey area. Earth work degree counted as manually executed.

Table IV-1

Soil type	Earthworks degree	Bulging degree	Specific reactance om, m
Well graded gravel	III	None bulging	Dry condition: 2000-10000 Watery condition: 200-600

4. Survey area is in 8 magnitude earthquake region. (143-190см/с^2 acceleration of top soil)
5. Soil groundwater has not been occurred in 3.60-3.80meter deep by 5 drill holes with 10 meter depth /dated April 19-20th ,2017/. Soil ground water is minimum low level in April and it can be increased by rainfall. Ground water is with free surface and hydraulic related to Tuul river. In summer and autumn, soil ground water level increase about 1.0-1.5meter from current level and it depends on source of water.
6. Soil test is necessary after opening of building fundament galvanized.

Summary is written Erdenetsetseg.G /Engineer-geologist/

V. REFERENCE LIST

1. CCM 2.02.01-94. Construction codes on designing of construction foundation Ulaanbaatar, 1994 y.
2. CCM 23-01-09. Climate and geotechnical indices for the construction work Ulaanbaatar, 2009 y.
3. CCM 22.01.01/2006. Construction codes on constraction planning at seismic zones of Mongolia Ulaanbaatar, 2006 y
4. "CG 11-107-11. Guideline of engineering geologic report and summary
5. "CCM 11-03-01 Contruction norm and regulation
6. Инженерные изыскания встройтельсве (Спаровочныk) страниц таблиц -131, 1975года., зав.редакций Е.А.Ларина "Земляные работы" / СНИП-IV-5/
7. ASTM D 2487

A-121

V. BOREHOLE LOGS

BOREHOLE-1

Depth ,m	10.00	Elevation, m	1284.93
Diameter,mm	168	Drilling date:	2017.04.19

1. Filled up soil color is dark gray and contained building waste.	0.00-1.30	1.30
2. Well-graded gravel with sand soil color is brown yellowish.	1.30-10.0	8.70

Soil groundwater detected at 3.60m.
/Current date April 19th,2017 /

BOREHOLE -2

Depth ,m	10.00	Elevation, m	1285.0
Diameter,mm	168	Drilling date:	2017.04.19

1. Filled up soil color is dark gray and contained building waste.	0.00-1.40	1.40
2. Well-graded gravel with sand soil color is brown yellowish.	1.40-10.0	8.60

Soil groundwater detected at 3.70m.
/Current date April 19th,2017 /

BOREHOLE -3

Depth ,m	10.00	Elevation, m	1285.08
Diameter,mm	168	Drilling date:	2017.04.20

1. Filled up soil color is dark gray and contained building waste.	0.00-1.70	1.70
2. Well-graded gravel with sand soil color is brown yellowish.	1.70-10.0	8.30

Soil groundwater detected at 3.80m.
/Current date April 19th,2017 /

BOREHOLE -4

Depth ,m	10.00	Elevation, m	1285.50
Diameter,mm	168	Drilling date:	2017.04.20

1. Filled up soil color is dark gray and contained building waste.	0.00-1.20	1.20
2. Well-graded gravel with sand soil color is brown yellowish.	1.20-10.0	8.80

Soil groundwater detected at 3.80m.
/Current date April 19th,2017 /

BOREHOLE -5

Depth ,m	10.00	Elevation, m	1285.30
Diameter,mm	168	Drilling date:	2017.04.20

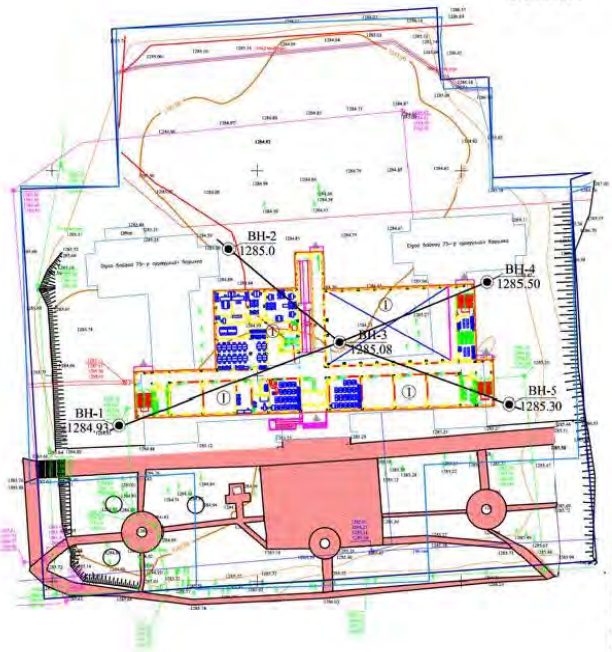
1. Filled up soil color is dark gray and contained building waste.	0.00-1.50	1.50
2. Well-graded gravel with sand soil color is brown yellowish.	1.50-10.0	8.50

Soil groundwater detected at 3.80m.
/Current date April 19th,2017 /

Borehole logs written by: D.Dashzeveg

Appendix-1

LOCATION OF BOREHOLE
SC 1:1000



LEGEND

① Construction area of Rebuild school and current school number 75.

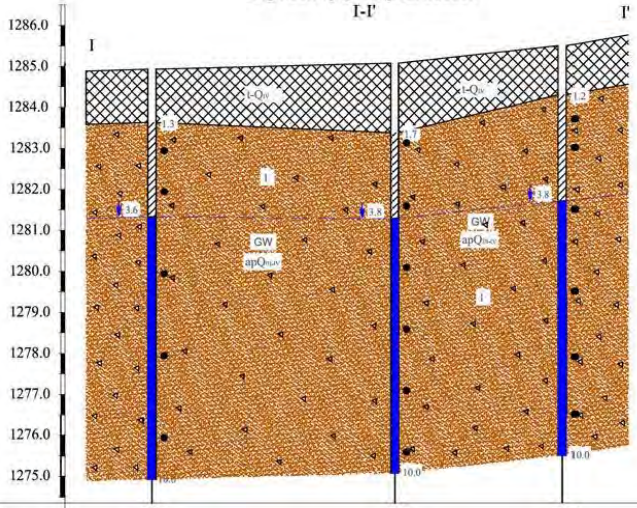
BH-1 1284.93 Drilled borehole number
Elevation, м

Engineering - geological section

	ENGINEERING GEODESY LLC			Stage WD
	CLIENT	MECSS		Page number 1
	OBJECT	Engineering-geological investigation report for new school building area in 2nd micro, Khan-Uul district, Mongolia		
Checked by		G.Erdenetsetseg	Title	Scale
Drawned by		E.Uchral	LOCATION OF BOREHOLE	1:1000

Appendix-2

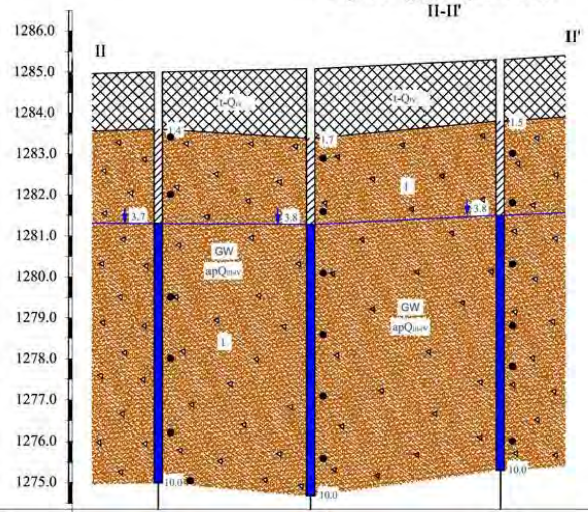
Engineering-geological section
I-I'



Borehole number	BH-1	BH-3	BH-4
Elevation (m)	1284.93m	1258.08m	1285.50m
Borehole distance (m)	57.3m	39.05m	

	ENGINEERING GEODESY LLC			Stage WD
	CLIENT	MECSS		Page number 2
	OBJECT	Engineering-geological investigation report for new school building area in 2nd micro, Khan-Uul district, Mongolia		
Checked by		G.Erdenetsetseg	Title	Scale
Drawned by		E.Uchral	Engineering geological section I-I'	Ver 1:100 Hor 1:1000

Engineering-geological section
II-II'



Borehole number	BH-2	BH-3	BH-5
Elevation (m)	1285.0m	1258.08m	1285.30m
Borehole distance (m)		35.3m	44.3m

LEGEND

- t-Q: Filled up color is dark gray and contained building waste.
- EGE-1 ①: Brown yellowish color, upper and modern quaternary age, origin is alluvium-proluvium, humidity and sandy equal gravel soil.
- ①: Number of Engineering geological element
- apQ: Soil index of origin and age

Soil conditions

- Sandy soil
- Moistly
- Saturation by water

- Surface
- 1.30 Boundary of soil layer
- Soil samples from depths (m)
- 3.6 Ground water detected depth (m)
- 10.0 Depth (m)

	ENGINEERING GEODESY LLC		Stage W/D
CLIENT	MECSS		Page number 3
OBJECT	Engineering-geological investigation report for new school building area in 2nd micro, Khan-Uul district, Mongolia		
Checked by	G.Erdenetsetseg	Title	Scale
Drawned by	E.Uchral	Engineering geological section II-II'	Ver 1:100 Hor 1:1000

ENGINEERING GEODESY LLC

ACCREDITED LABORATORY OF SOIL RESEARCH
TABLE OF LABORATORY TEST RESULT

TL-78
MNS ISO/IEC 17025:2007

Object: Engineering-geological investigation report for new school building area in 2nd khoroo, Khan-Uul district, Ulaanbaatar city

Start date: 2017.04.20
Finish date: 2017.04.24

№	Borehole number	depth of sample [m]	Grain size analysis, [mm]										Hydrometr, [mm]%						%	Gravel	Sand	Silt/Clay	Soil type / ASTM D 2487/	Plastic index /MNS ASTM D 4318-2005/			Cu	CC	Natural moisture content(W), %	Specific gravity G_s, t/m³	Wet density, ρ, t/m³	Dry density, ρ_d, t/m³	Porosity, n, %	Porosity ratio, e	Saturation degree, Sr
			37.5	25.0	19	12.5	9.5	4.75	2.36	0.600	0.425	0.300	0.075	0.055	0.022	0.012	0.008	0.006	0.003	0.001						LL	PL	PI									
EGE-2 Well-graded gravel with sand /GW/																																				
1	1	9.0	6.9	7.9	9.7	6.2	15.7	16.9	14.4	6.9	3.6	3.8	3.9	0.4	0.8	0.7	1.2	0.8	0.1	0.1	100.0	63.3	32.6	4.1	GW	well-graded gravel with sand	inelastic	32	24.22	10.2	2.67	2.29	2.08	22.17	0.285	0.96
2	3	9.5	6.3	7.5	9.2	7.0	16.1	16.4	15.9	6.3	3.2	3.3	4.1	0.9	1.1	0.5	0.4	0.5	0.2	0.3	100.0	63.3	32.8	3.9	GW	well-graded gravel with sand	inelastic	32	25.92	8.9	2.67	2.28	2.09	20.39	0.256	0.91
3	2	3.0	7.1	6.9	8.6	7.9	15.4	17.2	14.2	6.5	4.5	4.6	3.3	0.5	0.6	0.9	0.8	0.4	0.5	0.1	100.0	63.1	33.1	3.8	GW	well-graded gravel with sand	inelastic	45	36.4	7.8	2.65	2.28	2.12	20.19	0.253	0.82
4	5	4.0	6.2	7.2	9.4	8.8	15.0	16.2	14.5	7.2	5.4	4.0	3.8	0.8	1.0	0.4	0.3	0.7	0.2	0.3	100.0	63.4	32.9	3.7	GW	well-graded gravel with sand	inelastic	45	40.6	6.8	2.66	2.29	2.14	19.39	0.241	0.75
5	1	2.0	5.9	8.1	8.8	9.3	16.0	16.1	14.1	6.8	3.5	3.7	4.0	0.8	0.7	0.6	0.5	0.3	0.4	0.2	100.0	64.4	32.1	3.5	GW	well-graded gravel with sand	inelastic	50	45.1	5.4	2.67	2.29	2.17	18.63	0.229	0.63
6	5	2.3	6.6	7.7	8.6	8.0	15.2	16.7	15.9	7.0	4.1	3.6	3.0	0.4	0.9	0.6	0.7	0.4	0.5	0.1	100.0	62.8	33.6	3.6	GW	well-graded gravel with sand	inelastic	22.5	21.1	7.9	2.64	2.23	2.10	20.31	0.255	0.82
7	1	3.0	7.0	7.4	9.0	5.9	15.8	17.2	15.8	6.1	3.7	4.1	3.7	0.7	1.2	0.5	0.3	0.7	0.8	0.1	100.0	62.3	33.4	4.3	GW	well-graded gravel with sand	inelastic	20	14.46	6.1	2.63	2.25	2.12	19.37	0.240	0.67
8	2	1.6	6.4	6.8	8.4	9.1	16.3	16.8	13.9	7.3	4.0	4.3	3.1	0.8	0.7	0.6	0.8	0.5	0.4	0.2	100.0	63.8	32.6	3.6	GW	well-graded gravel with sand	inelastic	30	28.8	7.4	2.64	2.26	2.10	20.29	0.255	0.77
9	1	5.0	5.5	7.0	8.9	8.5	15.7	17.5	16.0	6.8	3.8	3.2	3.9	0.3	1.1	0.4	0.6	0.4	0.1	0.3	100.0	63.1	33.7	3.2	GW	well-graded gravel with sand	inelastic	37.5	30.3	7.2	2.63	2.28	2.13	19.13	0.237	0.80
10	5	5.5	5.7	7.3	9.2	9.7	15.0	16.5	14.8	7.1	3.4	4.4	3.8	0.7	0.8	0.5	0.4	0.6	0.5	0.2	100.0	63.4	33.1	3.5	GW	well-graded gravel with sand	inelastic	38.3	33.05	8.0	2.65	2.27	2.10	20.68	0.261	0.83
11	2	5.5	6.3	9.4	11.2	5.8	13.4	17.3	13.0	8.1	4.2	4.0	3.2	0.9	1.2	0.5	0.6	0.3	0.2	0.4	100.0	63.4	32.5	4.1	GW	well-graded gravel with sand	inelastic	50	36.9	7.7	2.66	2.29	2.13	20.06	0.251	0.82
12	3	3.5	7.0	7.0	8.2	8.6	15.8	17.0	14.9	7.5	4.2	2.3	3.0	1.0	0.9	0.7	0.3	0.5	0.8	0.3	100.0	63.6	31.9	4.5	GW	well-graded gravel with sand	inelastic	25	22.5	7.3	2.65	2.28	2.12	19.82	0.247	0.78
13	4	6.0	5.0	9.0	6.5	9.7	14.3	18.7	13.5	6.9	4.7	5.1	2.8	0.8	0.6	0.5	0.6	0.7	0.4	0.2	100.0	63.2	33.0	3.8	GW	well-graded gravel with sand	inelastic	45	32.5	8.0	2.64	2.26	2.09	20.74	0.262	0.81
14	3	6.5	8.4	7.0	7.4	10.8	13.9	19.1	13.7	8.2	3.0	3.7	3.7	0.4	1.0	0.4	0.7	0.3	0.2	0.1	100.0	64.6	32.3	3.1	GW	well-graded gravel with sand	inelastic	24.6	24	8.1	2.63	2.27	2.10	20.16	0.252	0.84
15	4	4.0	6.3	7.9	7.5	9.8	17.1	15.9	13.7	8.5	3.7	3.1	3.9	0.5	0.7	0.5	0.3	0.4	0.1	0.1	100.0	64.3	32.9	2.8	GW	well-graded gravel with sand	inelastic	25	24	7.4	2.64	2.28	2.12	19.59	0.244	0.80
16	2	7.0	5.6	8.7	9.1	7.8	16.6	14.5	12.1	10.8	3.2	4.1	3.5	0.7	1.2	0.7	0.5	0.8	0.2	0.3	100.0	61.9	33.7	4.4	GW	well-graded gravel with sand	inelastic	40	25.6	8.1	2.65	2.27	2.10	20.76	0.262	0.82
17	4	2.5	7.5	6.8	8.4	7.8	16.0	15.8	16.3	7.4	2.7	3.4	3.2	1.0	1.4	0.3	0.9	0.8	0.1	0.2	100.0	62.3	33.0	4.7	GW	well-graded gravel with sand	inelastic	42	26.80	7.1	2.66	2.29	2.14	19.62	0.244	0.77
18	3	5.0	6.1	7.2	9.0	8.8	14.8	17.2	16.8	9.3	3.7	3.8	3.4	0.7	1.0	0.6	0.7	0.2	0.3	0.1	100.0	63.1	32.4	4.5	GW	well-graded gravel with sand	inelastic	40	25.6	8.1	2.64	2.28	2.11	20.11	0.252	0.85
19	1	7.0	4.5	6.1	9.2	7.8	16.5	16.8	15.4	7.7	4.1	3.6	3.6	1.1	1.5	0.7	0.3	0.5	0.4	0.2	100.0	60.9	34.4	4.7	GW	well-graded gravel with sand	inelastic	40	24.3	7.7	2.63	2.27	2.11	19.86	0.248	0.82
20	5	7.0	6.0	8.1	8.2	10.2	14.8	17.3	15.6	5.7	2.6	3.4	3.9	0.9	1.1	0.5	0.7	0.4	0.3	0.3	100.0	64.6	31.2	4.2	GW	well-graded gravel with sand	inelastic	45	36.5	8.1	2.64	2.27	2.10	20.46	0.257	0.83
21	2	10.0	7.8	7.4	9.2	8.7	12.4	19.5	14.7	6.4	3.5	3.2	3.2	0.5	0.9	0.3	0.8	0.7	0.6	0.3	100.0	65.0	31.0	4.0	GW	well-graded gravel with sand	inelastic	45.4	36.8	9.4	2.65	2.28	2.08	21.35	0.272	0.92

22	4	9.0	4.9	6.9	10.9	3.6	12.6	15.1	16.4	7.2	5.1	4.1	2.9	0.8	1.5	0.7	0.3	0.5	0.3	0.2	100.0	60.0	35.7	4.3	GW	well-graded gravel with sand	inelastic	50	32	9.6	2.64	2.29	2.09	20.86	0.264	0.96
23	2	8.8	8.8	8.5	8.7	10.2	14.4	12.8	13.6	6.8	4.7	3.6	3.0	1.1	1.00	0.6	0.5	0.9	0.7	0.1	100.0	63.4	31.7	4.9	GW	well-graded gravel with sand	inelastic	50	40.5	8.9	2.63	2.27	2.08	20.74	0.262	0.89
24	5	9.6	6.9	7.8	9.4	8.9	16.8	16.9	13.8	3.9	3.9	2.8	3.6	0.7	0.8	0.3	0.4	0.3	0.4	0.4	100.0	66.7	30.0	3.3	GW	well-graded gravel with sand	inelastic	25	25	9.6	2.63	2.28	2.08	20.90	0.264	0.96
25	3	2.2	5.8	6.9	10.9	9.4	13.6	15.2	15.1	8.0	4.7	3.5	3.1	1.3	0.7	0.6	0.3	0.5	0.3	0.1	100.0	61.8	34.4	3.8	GW	well-graded gravel with sand	inelastic	50	40.5	7.8	2.66	2.25	2.09	21.53	0.274	0.76
26	4	1.8	8.7	8.4	9.1	8.7	14.3	14.3	15.0	6.8	5.2	2.6	3.5	1.2	0.6	0.4	0.2	0.1	0.6	0.3	100.0	63.5	33.1	3.4	GW	well-graded gravel with sand	inelastic	25	20.25	7.2	2.65	2.27	2.12	20.09	0.251	0.76
27	3	8.0	6.1	7.7	8.4	7.9	15.0	19.2	13.0	7.2	6.6	2.1	3.8	0.9	0.5	0.2	0.5	0.4	0.3	0.2	100.0	64.3	32.7	3.0	GW	well-graded gravel with sand	inelastic	20	16.2	8.4	2.67	2.29	2.11	20.88	0.264	0.85
28	5	8.0	5.8	6.9	7.8	8.4	15.1	17.4	16.1	7.8	5.1	3.0	2.6	1.00	1.2	0.6	0.1	0.7	0.1	0.1	100.0	61.6	34.6	3.8	GW	well-graded gravel with sand	inelastic	20	14.45	9.1	2.64	2.27	2.08	21.19	0.269	0.89
29	4	7.6	8.7	9.0	6.9	10.4	12.9	16.0	15.2	6.5	5.7	3.4	2.2	0.7	0.9	0.4	0.3	0.2	0.4	0.2	100.0	63.9	33.0	3.1	GW	well-graded gravel with sand	inelastic	27.5	24.5	8.5	2.65	2.28	2.10	20.20	0.261	0.86
Average			6.5	7.6	8.8	8.6	15.1	16.7	14.5	7.3	4.1	3.6	3.4	0.8	1.0	0.5	0.5	0.5	0.4	0.2	100.0	63.3	32.9	3.8	GW	well-graded gravel with sand	inelastic	35.9	28.5	8.0	2.65	2.28	2.11	20.34	0.256	0.83
Absolute max.			8.8	9.4	11.2	10.8	17.1	19.5	16.4	10.8	6.6	5.1	4.8	1.3	1.9	0.9	1.2	0.9	0.8	0.4	100.0	66.7	35.7	4.9	GW	well-graded gravel with sand	inelastic	50.0	45.1	10.2	2.67	2.29	2.17	22.17	0.285	0.96
Absolute min.			4.5	6.1	6.5	5.8	12.4	12.8	10.8	5.7	2.6	2.1	2.2	0.3	0.5	0.2	0.1	0.1	0.1	0.1	100.0	60.0	30.0	2.6	GW	well-graded gravel with sand	inelastic	20.0	14.4	5.4	2.63	2.25	2.08	18.63	0.229	0.63

Chief engineer of laboratory L. Tsagaandarkhi Laboratory engineer G. Ganchimeg

Laborant A. Bayarmagnai

STANDARD PENETRATION TEST RESULT /SPT/

Borehole number	Depth of SPT (m)	0-15cm	15-30cm		30-45cm		N
		Blow counts	Real penetration thickness(cm)	Blow counts	Real penetration thickness(cm)	Blow counts	Blow counts
BH-1	2.0	25	15	42	6	50	92/21cм
	3.0	22	15	47	7	50	97/22cм
	4.0	14	15	18	15	22	40
	5.0	17	15	19	15	23	42
	6.0	15	15	17	15	27	44
	7.0	28	15	30	15	32	62
	8.0	29	15	32	15	37	69
	9.0	28	15	31	15	35	66
	10.0	33	15	42	15	48	90
BH-2	2.0	30	15	37	11	50	87/26cм
	3.0	28	15	35	13	50	85/28cм
	4.0	21	15	24	15	26	50
	5.0	24	15	26	15	30	56
	6.0	26	15	27	15	30	57
	7.0	28	15	31	15	33	64
	8.0	32	15	33	15	37	70
	9.0	34	15	38	15	40	78
	10.0	37	15	40	14	50	90/29cм
BH-3	2.0	29	15	42	10	50	92/25cм
	3.0	35	15	49	8	50	99/23cм
	4.0	24	15	26	15	25	51
	5.0	26	15	26	15	27	53
	6.0	25	15	27	15	28	55
	7.0	24	15	25	15	28	53
	8.0	25	15	28	15	30	58
	9.0	27	15	30	15	31	61
	10.0	29	15	30	15	32	62
BH-4	2.0	28	15	39	11	50	89/26cм
	3.0	33	15	46	8	50	96/23cм
	4.0	19	15	20	15	22	42
	5.0	21	15	21	15	25	46
	6.0	20	15	21	15	23	44
	7.0	19	15	22	15	22	44
	8.0	20	15	22	15	24	46
	9.0	22	15	25	15	28	53
	10.0	23	15	26	15	32	58
BH-5	2.0	24	15	42	12	50	92/27cм
	3.0	30	15	45	13	50	95/28cм
	4.0	18	15	21	15	22	43
	5.0	19	15	22	15	24	46
	6.0	20	15	22	15	25	47
	7.0	24	15	24	15	28	52
	8.0	25	15	27	15	28	55
	9.0	34	15	36	15	36	72
	10.0	35	15	38	15	40	78

Prepared by: E.Uchral

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Archive 17/035

3T19-615/14

ENGINEER GEOLOGICAL SURVEY REPORT OF NEW SCHOOL CONSTRUCTION AREA IN 7th KHOROO, CHINGELTEI DISTRICT, ULAANBAATAR CITY

/ Detail design stage /

Approved by:

DIRECTOR *TS.BILEG*

Prepared:

Engineer geologist *E.Uchral*

Ulaanbaatar city

2017

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APPENDIXES

I. GENERAL INFORMATION

1.1 Survey basis

Engineer Geodesy LLC /Drawing and geological survey company/ completed engineer geological survey work of construction area of school extension in Ulaanbaatar city, Chingeltei district, 7th khoroo by MECSS tender in April 17th-27th 2017 and survey planned and completed as their requested.

1.2 Survey technique

Team with drill master Ganbold. B, Byambaa. G, Lhagvatseren. N is executed the drill work by UGB-1BC equipment, POWER4000 drilling machine 5 boreholes 10.0 meters depth, 50.0 t/m column drilling, to locate and define underground water depth, characteristics, construction fundament pressure effective soil depth and distribution, according to the plan and SNIP 11-03-01 in survey area engineer geological survey work.

Soil physic and mechanic characteristics been defined by taking 5 pieces of samples from drilled boreholes in soil study laboratory. According to ASTM standard, Tsagaandarkhi.L /laboratory chief/, Ganchimeg.G /laboratory engineer/ and Bayarmagnai.A /laboratory assistant/ are summarized the result and tabled soil analyze in soil study laboratory of Engineer Geodesy LLC /with guaranteed number of TL-78 from Standardization and Metrology department, satisfied the standard of ISO/IEC 17025:2005, MNS ISO/IEC 17025:2005/. Engineer Geologist Uchral.E processed the engineer geological report to create procedural plan which is made by comparison of field survey material and laboratory analyze result.

Source materials related to survey work stored in archive of Engineering Geodesy LLC.

II. Survey condition of engineer geology

2.1 Location

Ulaanbaatar city, Chingeltei district, 7th khoroo, existent 224th kindergarden school building to front new school construction.

Drawing №1. Survey area of location

2.2 Climatic conditions

MUIS climate stations indices and CCM 23-01-09 standard "Climate and geotechnical indices for the construction work" have been used for the climate indices of this site, and showed in tables

Annual and monthly average air temperature, ^{0}C

Table II-1

Station	Month												Annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
MUIS	-21.2	-14.9	-7.9	1.7	10.0	15.2	17.5	15.4	8.6	0.3	-11.3	-18.8	-0.5

Absolute maximum air temperature, ^{0}C

Table II-2

Station	Absolute max	Date	VII avarege
MUIS	33.8	1997.VII.10	26.5

Absolute minimum air temperature, ^{0}C

Table II-3

Station	Absolute	Date	I avarege
MUIS	-36.0	1988.I.23	-31.9

Structure and technical calculation temperature, ^{0}C

Table II-4

Station	Calculation temperature, ^{0}C				
	Coldest temprature				One day during hottest temperature
	1 day	3 day	5 day	Airring	
MUIS	-31.4	-30.3	-28.9	-25.0	26.4

Temperature supply indices for the construction and technical calculation during winter time (^{0}C)

Table II-5

Station	The coldest 5 days temperature supply, %				The coldest 1 day temperature supply, %			
	99.2	99.5	94	92	99.9	99.5	94	92
Buyant-Ukhaa	-41.8	-41.7	-39.4	-39.0	-43.3	-43.2	-41.5	-40.7

Air humidity and precipitation

Table II-6

Station	Precipitation							
	Warm season	Cold season	Annual	In warm season	Maximum in a day	Year	Month	Day
Buyant-Ukhaa	50	72	248.8	236.5	74.9	1967	VI	27

Annual and monthly average wind speed

Table II-7

Station	Month,winter,annual average speed, m/s													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Winter	Annual
MUIS	0.6	0.9	1.5	2.2	2.1	1.8	1.5	1.2	1.4	1.2	0.9	0.5	0.7	1.3

2.3 Geological formation

In survey area distributed equally well graded gravel with clay and sand soil, weathered sandstone of poured soil from below, up and modern Quaternary eluvial-deluviam. In survey area spread silt soil is classified as a engineer geological element, physic mechanic characteristics defined and depth and distribution cross section shown.

2.4 Geomorphology characteristics and physic geological appearance, process

Survey area's relief is rugged character and general surface elevation between 1487.15-1496.75 m then slope decreased from north west to east south and generally move slowly slope formation. Survey area little bit exposed by engineering process and between current planning object and current kindergarden ravine road made by engineering process. In survey area, linear and field washed process shall be may occur.

2.5 Hydro-geological condition

Soil groundwater has not been occurred by 5 drill holes with 10.0 meter depth in survey area /dated April 17th -19th 2017/. Permeability test was conducted on BH-3 in this site. Permeability K=0.116 cm/sec.

III. ENGINEERING-GEOLOGICAL CONDITIONS AND PHYSICAL ,MECHANICAL PROPERTIES

3.1 Soil engineer geological classification and formation

In survey area well-graded gravel with clay and sand /EGE-1/ distributed equally.

3.2 Soil physic mechanic characteristic

Depending on soil particle structure and physic mechanic characteristic classified to engineer geological 1 elements.

EGE-1. Well-graded gravel with clay and sand

Yellowish, up and modern Quaternary eluvial- deluviam origin /dpQIII-IY/, solid consistency well-graded with clay and sand.

Granulometric composition from the laboratory analysis of these soil samples includes: (%):

- Gravel 67.8%
- Sand 23.3%
- Silt 7.0%
- Clay 1.9%

Physical properties indices of the soil:

- Natural moisture content 5.5
- Liquid limit 25.37
- Plastic limit 18.94
- Plastic indices 6.43
- Specific gravity, g/cм^3 2.69
- Wet density g/cм^3 2.23
- Dry density g/cм^3 2.12
- Porocity, % 21.34
- Porocity ratio 0.272
- Moisture content degree 0.55
- Consistency < 0

Normative and calculation indices of the mechanical properties:

According to the norm and regulations to create the construction groundwork - CCM 50-01-16 and Table I:

Normative value

- Cohesion C_n =14kPa
- Angle of internal friction φ_n =45^0
- Deformation modulus E=49MPa

Calculation value:

- Cohesion C_{n2}=9.33Pa
- Angle of internal friction φ_{n2}=39.13^0
- Calculated resistance R_0=450

According to CCM 50-01-16 and 5.3.6, well graded gravel clay and sand is D=3.50 and saturation of degree is S_r=0.55 which means it can create a weak bulging region.

Well graded gravel clay and sand seasonal freezing depth.

Earthwork of measuring, dig-up III

The rock soil.-Rock/Sandstone /soil weathering zone - / K_1/

In area of Sandstone weathering zone -/ K_1/ distribute widely and stone distribution depth until 7.20-9.20m thickness and it shown in engineer-geological cross section. In survey area most part of color is light green grey and bigger than average unit, distributed mica sandstone weathering zone. Sandstone physics indices:

Weathered rock soil volume weight	2.50-2.62 g/sm^3
None weathered rock soil халтан ул volume weight	2.65 g/sm^3
Rock soil percentage of erosion /%/	33.7-35.6
Quality of interaction with water softened	
Dispersely condition	disperse by hammer
Rock soil earthwork degree dig by manual:	
Soil of weathered rock	Y

IV. Conclusion

1. In survey area low blub engineer geological 1 types of element occurred, situated in one element by geomorphology, soil groundwater is not occurred and human engineering process is effected low grade area counted as a average engineer geological condition area.
2. Parameters of calculation and main soil spread to area physic and mechanic characteristic normative are shown in section of **Engineer Geological classification and soil Physic mechanic characteristic**.
3. Table IV-1 is shown soil blub level and earth work degree for distributed soil in survey area. Earth work degree counted as manually executed.

Table IV-1

Soil type	Earthworks degree	Bulging degree	Specific reactance om, m
Well-graded gravel with clay and sand	III	Weak bulging	4-40

4. Survey area is in 7 magnitude earthquake region.
5. Soil groundwater has not been occurred by 5 drill holes with 10.0 meter depth in survey area /dated April 17th -19th 2017/. Soil ground water is minimum low level in April and it can be increased by rainfall.
6. Soil test is necessary after opening of building fundament galvanized.

Summary is written: E. Uchral /Engineer/

V. Reference list

1. CCM 50-01-16. Construction codes on designing of construction foundation Ulaanbaatar, 2016 y.
2. CCM 23-01-09. Climate and geotechnical indices for the construction work Ulaanbaatar, 2009 y.
3. Seismic zone of Ulaanbaatar city. SC 1:10 000, 2015y.
4. "CG 11-107-11. Guideline of engineering geologic report and summary
5. "CCM 11-03-01 Contruction norm and regulation
6. Инженерные изыскания встройтельсве (Спаровочныk) страниц таблиц -131, 1975года., зав.редакций Е.А.Ларина,
7. "Земляные работы" / СНИП-IV-5/
8. ASTM D 2487

VI. Borehole logs

BOREHOLE-1

Depth , m	10.0	Elevation , m	1496.75
Diameter , mm	168	Drilling date	2017.04.17

1.	Top soil contained root of plant.	0.00-0.20 0.20
2.	Yellowish well-graded gravel with clay and sand.	0.20-0.80 0.60
3.	Grey green sandstone weathering area.	0.80-3.10 2.30
4	Grey green sandstone.	3.10-10.0 6.90

Soil groundwater not detected.
/current date April 17th 2017/

BOREHOLE-2

Depth , m	10.0	Elevation , m	1496.25
Diameter , mm	168	Drilling date	2017.04.17

1.	Top soil contained root of plant.	0.00-0.20 0.20
2.	Yellowish well-graded gravel with clay and sand.	0.20-1.00 0.80
3.	Grey green sandstone weathering area.	1.00-3.50 2.50
4	Grey green sandstone.	3.50-10.0 6.50

Soil groundwater not detected.
/current date April 17th 2017/

BOREHOLE-3

Depth , m	10.0	Elevation , m	1487.15
Diameter , mm	168	Drilling date	2017.04.18

1.	Filled up soil.	0.00-0.40 0.40
2.	Yellowish well-graded gravel with clay and sand.	0.40-2.80 2.40

3. Grey green sandstone weathering area.	2.80-5.00	
	2.20	
4 Grey green sandstone.	5.00-10.0	
	5.00	

Soil groundwater not detected.
/current date April 18th 2017/

BOREHOLE-4

Depth , m	10.0	Elevation , m	1493.25
Diameter , mm	168	Drilling date	2017.04.18

1. Top soil contained root of plant.	0.00-0.20	
	0.20	
2. Yellowish well-graded gravel with clay and sand.	0.20-1.20	
	1.00	
3. Grey green sandstone weathering area.	1.20-3.80	
	2.26	
4 Grey green sandstone.	3.80-10.0	
	6.20	

Soil groundwater not detected.
/current date April 18th 2017/

BOREHOLE-5

Depth , m	10.0	Elevation , m	1490.25
Diameter , mm	168	Drilling date	2017.04.19

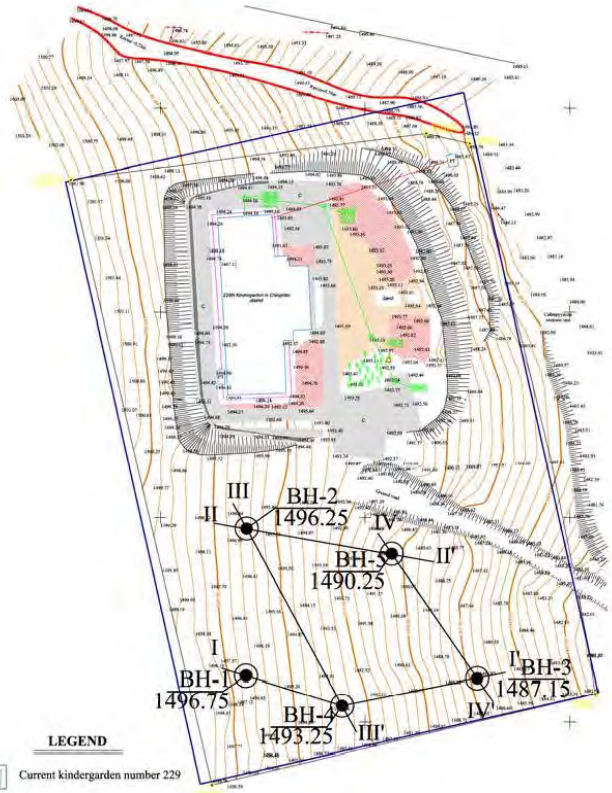
1. Filled up soil.	0.00-0.40	
	0.40	
2. Yellowish well-graded gravel with clay and sand.	0.40-2.00	
	1.60	
3. Grey green sandstone weathering area.	2.00-4.60	
	2.60	
04 Grey green sandstone.	4.60-10.0	
	5.40	

Soil groundwater not detected.
/current date April 19th 2017/

Borehole logs written by: D. Dashzeveg

LOCATION OF BOREHOLE SC 1:1000

Appendix-1



LEGEND

- Current kindergarden number 229
- Drilled boregole number / Elevation (m)
- Engineering-geological section
- Ground road
- Ravines

	ENGINEERING GEODESY LLC			Stage: WD
	Client	MECSS		Page number: 1
	Object	Engineer geological survey of new school construction area in 7th khoroo, Chingeltei district, Ulaanbaatar city		
Checked by		G.Erdenetsetseg	Title	Scale
Drawned by		E.Uchral	Location of borehole	Ver 1:100 Hor 1:1000

ACCREDITED LABORATORY OF SOIL RESEARCH

TABLE OF LABORATORY TEST RESULT

ENGINEERING GEODESY LLC

TL-78

MNS ISO/IEC 17025:2007

Object: Engineer geological survey report of construction area of school extension construction in 7th khoroo, Chingeltei district, Ulaanbaatar

Start date: 2017.04.17

Finish date: 2017.04.23

№	Borehole number	depth of sample [m]	Grain size analysis, [mm]											Hydromet, [mm]%						Gravel	Sand	Silt	Clay	Plastic index			Cu	CC	Natural moisture content W_0, %	Specific gravity G_s, t/cm³	Wet density, ρ, t/cm³	Dry density, ρ_d, t/cm³	Porosity, n, %	Porosity ratio, e	Saturation degree, Sr	Consistency, I_c
			710	475	19	9.5	4.75	2.36	1.18	0.60	0.300	0.150	0.075	0.035	0.022	0.012	0.009	0.006	0.003	0.001															
1	4	1.0	0.0	0.0	24.1	21.0	18.5	13.8	3.4	4.7	3.1	1.4	1.1	1.7	1.5	1.2	1.1	1.0	0.6	0.8	100.0	64.6	27.5	6.5	1.4	26.65	19.81	6.84	37.33	550.50	7.4	2.68	2.25	2.09	21.83	0.279	0.71	-∞
2	3	1.0	0.0	0.0	56.9	9.2	7.1	7.7	2.2	3.3	3.0	1.4	1.2	2.0	1.4	1.3	1.1	1.0	0.7	0.5	100.0	73.2	18.8	6.8	1.2	28.00	21.27	6.73	78.06	3410.80	3.0	2.70	2.11	2.08	24.11	0.318	0.25	-∞
3	2	0.8	0.0	0.0	34.5	26.3	16.1	9.8	2.2	2.5	1.8	0.8	0.7	1.1	1.0	0.9	0.7	0.6	0.5	0.5	100.0	76.9	17.8	4.3	1.0	23.08	17.70	5.38	16.70	716.43	4.6	2.69	2.27	2.17	19.33	0.240	0.52	-∞
4	5	1.2	0.0	0.0	30.4	18.7	12.2	10.4	4.5	5.9	3.6	1.7	2.1	2.5	1.5	1.2	1.5	1.1	1.9	0.8	100.0	61.3	28.2	7.8	2.7	22.70	16.00	6.70	158.42	1189.40	6.9	2.70	2.26	2.11	21.70	0.277	0.67	-∞
5	3	2.0	0.0	5.9	26.6	17.1	13.4	10.9	4.0	3.2	2.6	1.4	2.3	2.9	1.8	2.0	1.8	0.9	1.7	1.5	100.0	63.0	24.4	9.4	3.2	26.40	19.92	6.48	285.71	2817.03	5.5	2.68	2.27	2.15	19.71	0.246	0.60	-∞
Average		0.0	1.2	34.5	18.5	13.7	10.5	3.3	3.9	2.8	1.3	1.5	2.0	1.4	1.3	1.2	0.9	1.1	0.8	100.0	67.8	23.3	7.0	1.9	25.37	18.94	6.43	115.25	1736.83	5.5	2.69	2.23	2.12	21.34	0.272	0.55	-∞
Absolute max		0.0	5.9	56.9	26.3	16.5	13.8	4.5	5.9	3.6	1.7	2.3	2.9	1.8	2.0	1.8	1.1	1.9	1.5	100.0	76.9	28.2	9.4	3.2	28.00	21.27	6.84	285.71	3410.80	7.4	2.70	2.27	2.17	24.11	0.318	0.71	-∞
Absolute min		0.0	0.0	24.1	9.2	7.1	7.7	2.2	2.5	1.8	0.8	0.7	1.1	1.0	0.9	0.7	0.6	0.5	0.5	100.0	61.3	17.8	4.3	1.0	22.70	16.00	5.38	16.70	550.50	3.0	2.68	2.11	2.05	19.33	0.240	0.25	-∞

EGE-1: Well-graded gravel with clay and sand

Chief engineer of laboratory L. Tsagaanderkhi

Laboratory engineer: G. Ganzhmeg

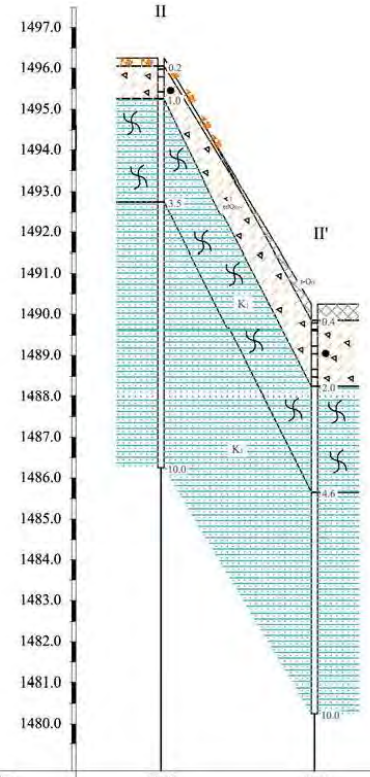
Laborant: A. Bayarmagnai

Appendix-2

ENGINEERING GEODESY LLC				Stage: WD
	Client	MECSS		Page number: 2
	Object	Engineer geological survey of new school construction area in 7th khoroo, Chingeltei district, Ulaanbaatar city		
Checked by		G.Erdenetsetseg	Title	Scale
Drawned by		E.Uchral	Engineering-geological section I-I'	Ver 1:100 Hor 1:1000

Appendix-2

Engineering-geological section II-II'

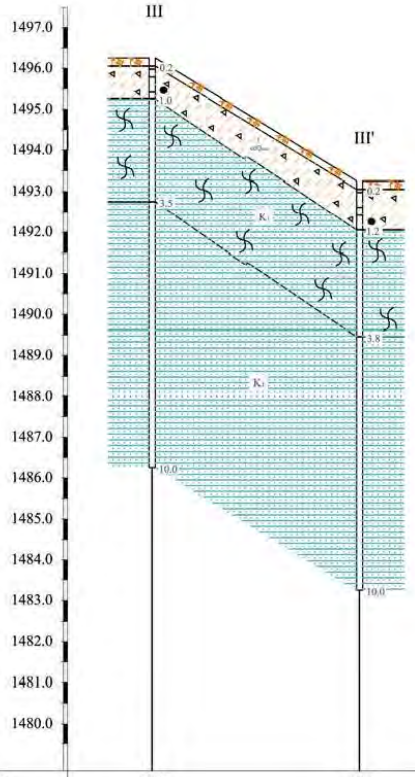


Borehole number	BH-2	BH-5	
Elevation (m)	1496.25	1490.25	
Borehole distance (m)		35.96	

	ENGINEERING GEODESY LLC			Stage: WD
	Client	MECSS		Page number: 3
	Object	Engineer geological survey of new school construction area in 7th khoroo, Chingeltei district, Ulaanbaatar city		
	Checked by	G.Erdenetsetseg	Title	Scale
	Drawned by	E.Uchral	Engineering-geological section II-II'	Ver 1:100 Hor 1:1000

Appendix-2

Engineering-geological section III-III'

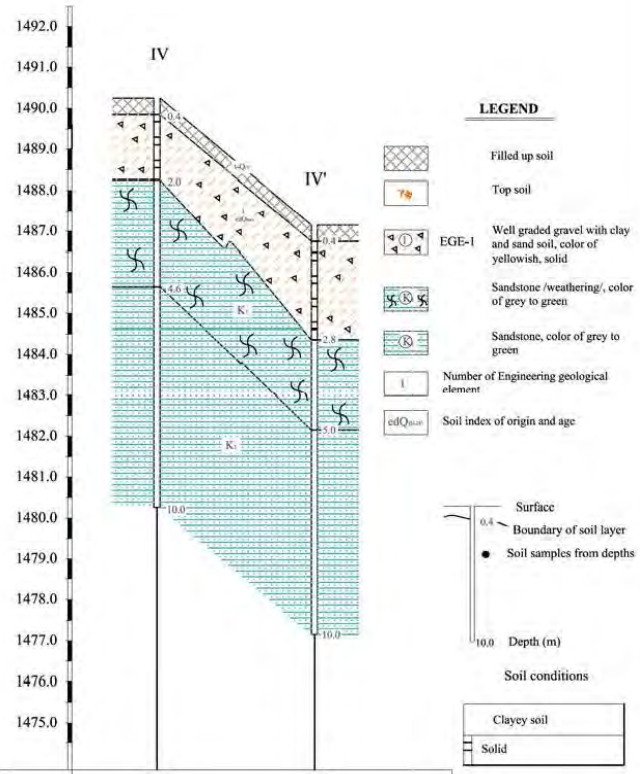


Borehole number	BH-2	BH-4	
Elevation (m)	1496.25	1493.25	
Borehole distance (m)		49.16	

	ENGINEERING GEODESY LLC			Stage: WD
	Client	MECSS		Page number: 4
	Object	Engineer geological survey of new school construction area in 7th khoroo, Chingeltei district, Ulaanbaatar city		
	Checked by	G.Erdenetsetseg	Title	Scale
	Drawned by	E.Uchral	Engineering-geological section III-III'	Ver 1:100 Hor 1:1000

Appendix-2

Engineering-geological section IV-IV'



Borehole number	BH-5	BH-3
Elevation (m)	1490.25	1487.15
Borehole distance (m)	36.91	

	ENGINEERING GEODESY LLC			Stage: WD
	Client	MECSS		Page number: 5
	Object	Engineer geological survey of new school construction area in 7th khoroo, Chingeltei district, Ulaanbaatar city		
Checked by		G.Erdenetsetseg	Title	Scale
Drawned by		E.Uchral	Engineering-geological IV-IV'	Ver 1:100 Hor 1:1000

STANDARD PENETRATION TEST RESULT /SPT/

Borehole number	Depth of SPT (m)	0-15cm	15-30cm		30-45cm		N
		Blow counts	Real penetration thickness(cm)	Blow counts	Real penetration thickness(cm)	Blow counts	Blow counts
BH-3	1.0	27	14	50	5	50	100/19cm
	2.0	30	11	50	4	50	100/15cm
BH-5	1.0	33	10	50	4	50	100/14cm

Prepared by: E. Uchral

ENGINEERING GEODESY" LLC

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Bayangol district , 6-r khoroo
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3T19-615/14

ENGINEER GEOLOGICAL SURVEY REPORT OF 53th SCHOOL EXTENSION CONSTRUCTION AREA IN 16th KHOROO, BAYANZURKH DISTRICT, ULAANBAATAR CITY

/ Detail design stage /

Approved by:

Director *TS.Bileg*

Prepared by:

Engineer geologist *E.Uchral*

Ulaanbaatar city
2017

Table of Contents

APPENDIXES

1. LOCATION OF BOREHOLES, SC 1:1000, APPENDIX №1
2. ENGINEERING-GEOLOGICAL SECTION, APPENDIX №2

SC	Horizontal	1:100
	Vertical	1:1000

3. STANDARD PENETRATION TEST RESULT APPENDIX №4

1. GENERAL INFORMATION

1.1 Survey basis

Engineer Geodesy LLC /Drawing and geological survey company/ completed engineer geological survey work of construction area of 53th school extension in Ulaanbaatar city, Bayanzurkh district, 16th khoroo by MECSS tender in April 13th-26th 2017 and survey planned and completed as their requested.

1.2 Survey technique

Team with drill master Enkh-Amagalan, assistant worker Lkhagvatseren.N is executed the drill work by UGB-1BC equipment, 2 boreholes 10.0 meters depth, 20.0 t/m column drilling, to locate and define underground water depth, characteristics, construction fundament pressure effective soil depth and distribution, according to the plan and SNIP 11-03-01 in survey area engineer geological survey work.

Soil physic and mechanic characteristics been defined by taking 12 pieces of samples from drilled boreholes in soil study laboratory. According to ASTM standard, Tsagaandarkhi.L /laboratory chief/, Ganchimeg.G /laboratory engineer/ and bayarmagnai.A /laboratory assistant/ are summarized the result and tabled soil analyze in soil study laboratory of Engineer Geodesy LLC /with guaranteed number of TL-78 from Standardization and Metrology department, satisfied the standard of ISO/IEC 17025:2005, MNS ISO/IEC 17025:2005/. Engineer Geologist Uchral.E processed the engineer geological report to create procedural plan which is made by comparison of field survey material and laboratory analyze result.

Source materials related to survey work stored in archive of Engineering Geodesy LLC.

II. Survey condition of engineer geology

2.1 Location

Ulaanbaatar city, Bayanzurkh district, 16th khoroo, existing 53rd school building extension construction plan

Drawing №1. Survey area of location

2.2 Climatic conditions

Ulaankhuaran, MUIS climate stations indices and CCM 23-01-09 standard "Climate and geotechnical indices for the construction work" have been used for the climate indices of this site, and showed in tables.

Annual and monthly average air temperature, ^{0}C

Table II-1

Station	Month												Annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Ulaan-khuaran	-21.7	-18.7	-8.0	0.5	8.7	14.7	16.5	14.7	8.2	-0.5	-11.3	-20.1	-1.7

Absolute maximum air temperature, ^{0}C

Table II-2

Station	Absolute max	Date	July avarege
Ulaankhuaran	33.5	1969.VI.20	30.2

Absolute minimum air temperature, ^{0}C

Table II-3

Station	Absolute min	Date	Jan avarege
Ulaankhuaran	-36.0	1988.I.23	-31.9

Structure and technical calculation temperature, ^{0}C

Table II-4

Station	Calculation temperature, ^{0}C				
	Coldest temprature				One day during hottest temperature
	1 day	3 day	5 day	Airring	
Ulaankhuaran	-33.7	-32.7	-31.6	-23.0	24.7

Temperature supply indices for the construction and technical calculation during winter time (^{0}C)

Table II-5

Station	The coldest 5 days temperature supply, %				The coldest 1 day temperature supply, %			
	99.2	99.5	94	92	99.9	99.5	94	92
Buyant-Ukhaa	-41.8	-41.7	-39.4	-39.0	-43.3	-43.2	-41.5	-40.7

Air humidity and precipitation

Table II-6

Station	Precipitation							
	Warm season	Cold season	Annual	In warm season	Maximum in a day	Year	Month	Day
Ulaankhuaran	67	72	245.2	232.5	68.6	1966	VII	11

Annual and monthly average wind speed

Table II-7

Station	Month,winter,annual average speed, m/s													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	winter	Annual
MUIS	0.6	0.9	1.5	2.2	2.1	1.8	1.5	1.2	1.4	1.2	0.9	0.5	0.7	1.3

2.3 Geological formation

In survey area distributed equally silty sand with gravel soil, clayey with sand soil and sandy lean clay origin of filled up soil from below, up and modern Quaternary diluviam-proluvial. In survey area spread silt soil is classified as a engineer geological element, physic mechanic characteristics defined and depth and distribution cross section shown.

2.4 Geomorphology characteristics and physic geological appearance, process

Survey area is located in low height slope of mountain. Survey area is gradually slope from western north to eastern south, average height is 1318.50-1320.00 meters and height difference is 1.50 meter. In survey area much engineering work has been done. Physic Geology appearance, processes are not occurred.

2.5 Hydro-geological condition

Soil groundwater has not been occurred by 2 drill holes with 10.0 metr depth in survey area /dated April 13th 2017/. Soil groundwater is minimum low level in April and it can be increased by rainfall.

III. ENGINEERING-GEOLOGICAL CONDITIONS AND PHYSICAL AND MECHANICAL PROPERTIES

3.1 Soil engineer geological classification and formation

In survey area silty sand with gravel soil /EGE-1/, clayey with sand soil /EGE-2/ and sandy lean clay soil /EGE -3/ distributed equally.

3.2 Soil physic mechanic characteristic

Depending on soil particle structure and physic mechanic characteristic classified to engineer geological 3 elements.

EGE-1. Silty sand with gravel (dpQ_{III-IV}) /SC/

Brownish yellow, up and modern Quaternary diluviam-proluvial origin /dpQ_{III-IV}/, low moist silty sand with gravel soil.

Granulometric composition from the laboratory analysis of these soil samples includes: (%):

- Gravel 17.9
- Sand 66.7
- Silt 13.0
- Clay 2.5

Physical properties indices of the soil:

- Natural moisture content 2.86
- Specific gravity, g/sm^3 2.67
- Wet density g/sm^3 2.25
- Dry density g/sm^3 2.18
- Porocity, % 18.26
- Porocity ratio 0.223
- Moisture content degree 0.342

Normative and calculation indices of the mechanical properties:

According to the norm and regulations to create the construction groundwork - CCM 50-01-16 and Table I:

Normative value

- Cohesion C_n =26kPa
- Angle of internal friction φ_n =40^0
- Deformation modulus E =39MPa

Calculation value:

- Cohesion C_{n2}=5.33Pa
- Angle of internal friction φ_{n2}=30.91^0
- Calculated resistance R_0=250

According to CCM 50-01-16 and 5.3.6, Gravel with clayey is D=14.76 and saturation of degree is S_r=0.342 which means it can create a weak bulging region.

Silty sand with gravel soil seasonal freezing depth 3.1 m

Earthwork of measuring, dig-up I

EGE-2. Clayey with sand soil (dpQ_{III-IV}) /SC/

Clayey with sand soil is red-brown, modern quaternary age, diluviam-proluvial origin (dpQ_{III-IV}) solid consistency.

Granulometric composition from the laboratory analysis of these soil samples includes: (%):

- Gravel 65.1
- Sand 20.3
- Silt 8.4
- Clay 6.2

Physical properties indices of the soil:

- Natural moisture content 7.5
- Liquid limit 27.1
- Plastic limit 15.6
- Plastic indices 11.5
- Specific gravity, g/см^3 2.72
- Wet density g/см^3 2.07
- Dry density g/см^3 1.93
- Porocity, % 29.08
- Porocity ratio 0.411
- Moisture content degree 0.490
- Consistency < 0.0

Normative and calculation indices of the mechanical properties:

According to the norm and regulations to create the construction groundwork - CCM 50-01-16 and Table 1:

Normative value:

- Cohesion C_n =47.0kPa
- Angle of internal friction φ_n =25^0
- Deformation modulus E=47MPa

Calculation value:

- Cohesion C_{n2}=31.33kPa
- Angle of internal friction φ_{n2}=21.74^0
- Calculated resistance R_0=300

According to CCM 50-01-16 and 5.3.5: Clayey with sandy /EGE-2/ is R_f=0.49 which means it can't measurable a bulging freezing region.

Clayley with sand soil seasonal freezing depth 2.6 m

Earthwork of measuring, dig-up I

EGE-3. Sandy lean clay /CL/

Sandy lean clay is red-brown, modern quaternary age, delivuim-proluvial origin (dpQ_{III-IV}) solid consistency.

Granulometric composition from the laboratory analysis of these soil samples includes: (%):

- Gravel 14.0
- Sand 23.8
- Silt 49.9

- Clay 12.4

Physical properties indices of the soil:

- Natural moisture content 21.0
- Liquid limit 37.2
- Plastic limit 19.9
- Plastic indices 17.3
- Specific gravity, g/см^3 2.73
- Wet density g/см^3 1.97
- Dry density g/см^3 1.63
- Porocity, % 40.35
- Porocity ratio 0.680
- Moisture content degree 0.831
- Consistency < 0.0

Normative and calculation indices of the mechanical properties:

According to the norm and regulations to create the construction groundwork - CCM 50-01-16 and Table 1:

Normative value:

- Cohesion C_n =63.0kPa
- Angle of internal friction φ_n =20^0
- Deformation modulus E=23MPa

Calculation value:

- Cohesion C_{n2}=42.0kPa
- Angle of internal friction φ_{n2}=17.39^0
- Calculated resistance R_0=400

According to CCM 50-01-16 and 5.3.5: Clayey with sandy /EGE-3/ is R_f=0.15 which means it can't weak a bulging freezing region.

Sandy lean clay soil seasonal freezing depth 2.6 m

Earthwork of measuring, dig-up I

IV. CONCLUSION

1. In survey area low and average blub engineer geological 3 types of element occurred, situated in one element by geomorphology, groundwater is not occurred and human engineering process is effected pretty much etc area counted as a average engineer geological condition area.
2. Parameters of calculation and main soil spread to area physic and mechanic characteristic normative are shown in section of **Engineer Geological classification and soil Physic mechanic characteristic**.
3. Table IV-1 is shown soil blub level and earth work degree for distributed soil in survey area. Earth work degree counted as manually executed.

Хүснэгт IV-1

Soil type	Earthwork degree	Bulging degree	Spectic reactance om, m
Silty sand with gravel	I	Weak bulging	Dry condition: 2000-10000 Watery condition: 200-600
Clayey with sand	I	Measurable bulging	40-80
Sandy lean clay	I	Weak bulging	4-40

4. Survey area is in 8 magnitude earthquake region.
5. Soil groundwater has not been occurred by 2 drill holes with 10.0 meter depth in survey area /dated April 13th 2017/. Tilt soil ground water is minimum low level in April and it can be increased by rainfall.
6. Soil test is necessary after opening of building fundament galvanized.

Summary is written E. Uchral /Engineer-geologist/

4. REFERENCE LIST

1. CCM 50-01-16. Construction codes on designing of construction foundation Ulaanbaatar, 2016 y.
2. CCM 23-01-09. Climate and geotechnical indices for the construction work Ulaanbaatar, 2009 y.
3. CCM 22.01.01/2006. Construction codes on construction planning at seismic zones of Mongolia Ulaanbaatar, 2006 y
4. "CG 11-107-11. Guideline of engineering geologic report and summary
5. "CCM 11-03-01 Contruction norm and regulation
6. Инженерные изыскания встройтельсве (Спаровочныk) страниц таблиц -131, 1975года., зав.редакций Е.А.Ларина,
7. "Земляные работы" / СНИП-IV-5/
8. ASTM D 2487

5. BOREHOLE LOGS

Borehole-1

Depth , m	10.00	Elevation , m	1318.60
Diametr , mm	168	Drilling date	2017.04.13

1.	Filled up soil.	0.00-0.60	0.60
1.	Brownish color, silty sand with gravel.	0.60-2.30	1.70
2.	Red-brown color, clayey with sand soil.	2.30-3.80	1.50
3.	Red-brown color, sandy lean clay soil.	3.80-10.00	6.20

Soil groundwater not detected.
/current date April 13th 2017/

Borehole-2

Depth , m	10.00	Elevation , m	1319.59
Diametr , mm	168	Drilling date	2017.04.13

1.	Filled up soil.	0.00-0.90	0.90
2.	Red-brown color, clayey with sand soil.	0.90-7.00	6.10
3.	Red-brown color, sandy lean clay soil.	7.00-10.00	3.00

Soil groundwater not detected.
/current date April 13th 2017/

Borehole logs written by: D. Batbayar

Appendix-1

LOCATION OF BOREHOLE
SC 1:1000

IEGEND

Current school number 53

Drilled borehole number
Elevation (m)

Engineering-geological section

ENGINEERING GEODESY LLC

CLIENT

OBJECT

MEGSS
Engineer geological survey report of 53th school extension construction area in 16th khoroo, Bayanzurkh district, Ulaanbaatar city

Stage: WD

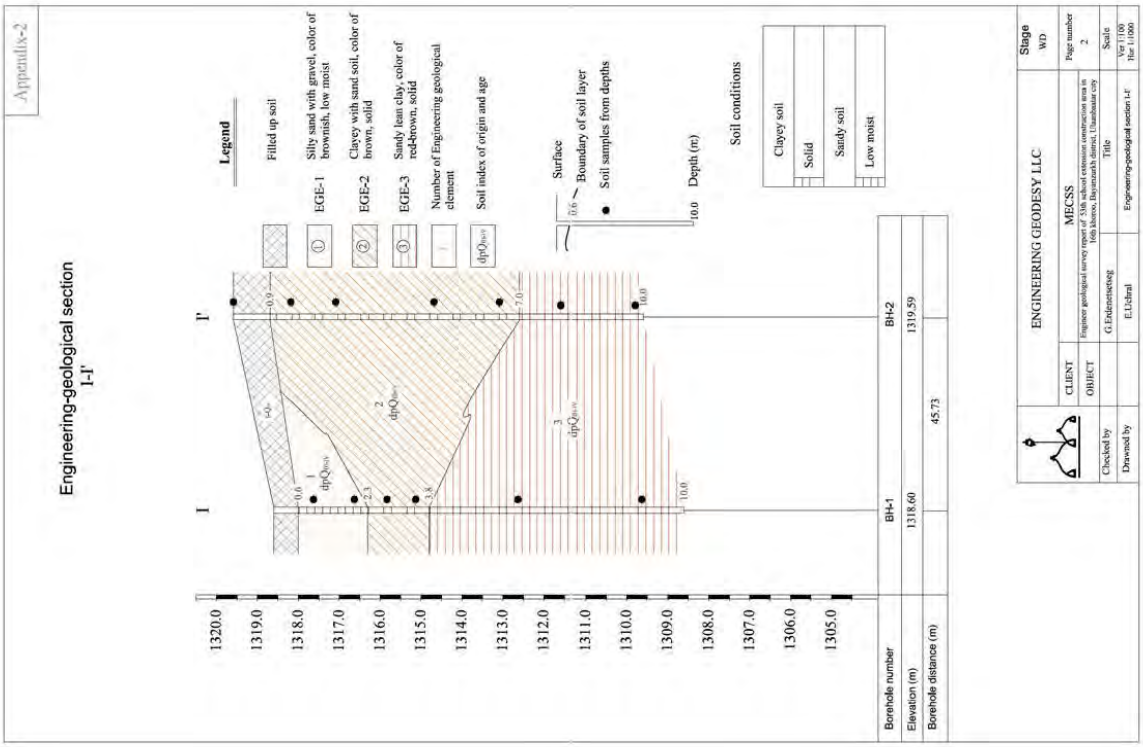
Page number: 1

Scale: 1:1000

Title: LOCATION OF BOREHOLE

Drawned by: E.Uchral

Checked by: G.Erdenetsetseg



ACCREDITED LABORATORY OF SOIL RESEARCH

TABLE OF LABORATORY TEST RESULT

TL-78
MNS ISO/IEC 17025:2007

ENGINEERING GEODESY LLC

Object: **Engineer geological survey report of 53th school extension construction area in 16th khoroo, Bayanzurkh district, Ulaanbaatar city**

Start date: 2017.04.14
Finish date: 2017.04.20

№	Borehole number	depth of sample [m]	Grain size analysis, [mm]										Hydrometr, [mm]%							Gravel	Sand	Silt	Clay	Plastic index			Cu	CC	Natural moisture content(W), %	Specific gravy G_s, t/cm³	Wet density, ρ, t/cm³	Dry density, ρ_d, t/cm³	Porosity, n, %	Porocity ratio, e	Saturation degree, Sr	Consistency, J
			75.0	37.5	19	9.5	4.75	2.36	1.18	0.60	0.300	0.150	0.075	0.035	0.022	0.012	0.009	0.006	0.003	0.001					I.I.	PI.	PI										
EGE-2: Clayey sand /SC/																																			
1	BH-1	2.8	0.0	0.0	0.0	0.0	8.5	13.8	4.5	8.7	10.0	8.1	6.7	7.7	6.9	6.2	5.9	5.2	4.5	3.3	100.0	8.5	51.8	31.9	7.8	27.20	16.41	10.79	59.210	0.037	9.1	2.73	2.05	1.89	30.84	0.446	0.558	<0
2	BH-2	1.4	0.0	0.0	0.0	0.0	14.6	16.6	5.1	9.0	9.5	7.1	6.3	8.5	5.7	5.0	4.5	4.2	3.4	2.5	100.0	14.6	53.6	25.0	5.9	25.04	15.46	9.58	98.913	0.299	5.1	2.70	2.14	2.04	24.55	0.325	0.419	<0
3	BH-2	4.9	0.0	0.0	0.0	0.0	5.2	11.6	3.5	9.0	10.1	9.0	8.7	8.0	7.8	6.8	6.2	5.7	4.8	3.6	100.0	5.2	51.9	34.5	8.4	27.81	15.69	12.12	40.540	0.021	7.1	2.71	2.04	1.90	29.71	0.423	0.455	<0
4	BH-1	3.5	0.0	0.0	0.0	0.0	8.9	14.6	4.8	9.2	9.8	8.6	7.0	7.4	7.0	5.2	4.9	5.3	4.2	3.1	100.0	8.9	54.0	29.8	7.3	28.15	15.79	12.36	70.423	0.0677	9.5	2.73	2.07	1.89	30.75	0.444	0.584	<0
5	BH-2	2.5	0.0	0.0	0.0	0.0	11.9	15.1	4.9	9.4	9.1	7.9	6.4	7.0	6.0	5.8	4.9	4.5	3.5	3.6	100.0	11.9	52.8	28.2	7.1	26.62	14.52	12.10	69.620	0.0953	6.2	2.71	2.05	1.93	28.77	0.404	0.416	<0
6	BH-2	6.5	0.0	0.0	0.0	0.0	10.9	14.2	5.3	8.9	10.6	8.6	7.1	6.9	5.7	5.3	5.1	4.6	3.4	3.4	100.0	10.9	54.7	27.6	6.8	27.65	15.72	11.93	72.500	0.118	8.0	2.72	2.06	1.91	29.87	0.426	0.511	<0
Avarege			0.0	0.0	0.0	0.0	10.0	14.3	4.7	9.0	9.9	8.2	7.0	7.3	6.5	5.7	5.3	4.9	4.0	3.3	100.0	10.0	53.1	29.7	7.2	27.08	15.60	11.48	68.534	0.106	7.5	2.72	2.07	1.93	29.08	0.411	0.490	<0
Absolute max			0.0	0.0	0.0	0.0	14.6	16.6	5.3	9.4	10.6	9.0	8.7	8.0	7.8	6.8	6.2	5.7	4.8	3.6	100.0	14.6	54.7	34.5	8.4	28.15	16.41	12.36	98.913	0.299	9.5	2.73	2.14	2.04	30.84	0.446	0.584	<0
Absolute min			0.0	0.0	0.0	0.0	5.2	11.6	3.5	8.7	9.1	7.1	6.3	6.5	5.7	5.0	4.5	4.2	3.4	2.5	100.0	5.2	51.8	25.0	5.9	25.04	14.52	9.58	40.540	0.021	5.1	2.70	2.04	1.89	24.55	0.325	0.416	<0

Chief engineer of laboratory: L. Tsegsandakhi

Laboratory engineer: G. Ganchimeg

Laborant: A. Bayarmagnai

ENGINEERING GEODESY LLC

ACCREDITED LABORATORY OF SOIL RESEARCH

TABLE OF LABORATORY TEST RESULT

TL-78
MNS ISO/IEC 17025:2007

Object: **Engineer geological survey report of 53th school extension construction area in 16th khoroo, Bayanzurkh district, Ulaanbaatar city**

Start date: 2017.04.14
Finish date: 2017.04.20

№	Borehole number	depth of sample [m]	Grain size analysis, [mm]											Hydrometr, [mm]%								Gravel	Sand	Silt	Clay	Plastic index			Cu	CC	Natural moisture content W, %	Specific gravy G_s t/m^3	Wet density, ρ, t/m^3	Dry density, ρd, t/m^3	Porosity, n, %	Porosity ratio, e	Saturation degree, Sr
			75.0	37.5	19	9.5	4.75	2.36	1.18	0.60	0.300	0.150	0.075	0.035	0.022	0.012	0.009	0.006	0.003	0.001						LL	PL	PI									
EGE-1. Silty sand with gravel																																				
1	BH-1	1.0	0.0	0.0	0.0	0.0	18.3	28.8	7.5	11.1	9.9	5.8	3.7	3.4	2.8	2.3	2.1	1.8	1.4	1.1	100.0	18.5	66.8	12.4	2.5	inelastic			107.69	3.887	2.87	2.67	2.24	2.18	18.45	0.226	0.339
2	BH-1	2.0	0.0	0.0	0.0	0.0	17.5	27.8	7.3	12.1	9.2	6.0	4.1	4.0	3.0	2.6	2.0	1.9	1.5	1.0	100.0	17.5	66.5	13.5	2.5	inelastic			121.74	14.91	2.85	2.67	2.25	2.19	18.07	0.220	0.345
Avarege			0.0	0.0	0.0	0.0	17.9	28.3	7.4	11.6	9.6	5.9	3.9	3.7	2.9	2.5	2.1	1.9	1.5	1.1	100.0	17.9	66.7	13.0	2.5	inelastic			114.72	9.40	2.86	2.67	2.25	2.18	18.26	0.223	0.342
Absolute max			0.0	0.0	0.0	0.0	18.3	28.8	7.5	12.1	9.9	6.0	4.1	4.0	3.0	2.6	2.1	1.9	1.5	1.1	100.0	18.3	66.8	13.5	2.5	inelastic			121.74	14.91	2.87	2.67	2.25	2.19	18.45	0.226	0.345
Absolute min			0.0	0.0	0.0	0.0	17.5	27.8	7.5	11.1	9.2	5.8	3.7	3.4	2.8	2.3	2.0	1.8	1.4	1.0	100.0	17.5	66.5	12.4	2.5	inelastic			107.69	3.89	2.85	2.67	2.24	2.18	18.07	0.220	0.339

Chief engineer of laboratory L. Tsogsandarkhi

Laboratory engineer: G. Ganchimeg

Laborant: A. Bayarmagnai

ENGINEERING GEODESY LLC

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TABLE OF LABORATORY TEST RESULT

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Start date: 2017.04.14
Finish date: 2017.04.20

№	Borehole number	depth of sample [m]	Grain size analysis, [mm]											Hydrometr, [mm]%								Gravel	Sand	Silt	Clay	Plastic index			Cu	CC	Natural moisture content W, %	Specific gravy G_s t/m^3	Wet density, ρ, t/m^3	Dry density, ρd, t/m^3	Porosity, n, %	Porosity ratio, e	Saturation degree, Sr	Consistency, I$_c$
			75.0	37.5	19	9.5	4.75	2.36	1.18	0.60	0.300	0.150	0.075	0.035	0.022	0.012	0.009	0.006	0.003	0.001						LL	PL	PI										
EGE-3. Sandy lean clay																																					
1	BH-1	6.0	0.0	0.0	0.0	0.0	14.0	5.3	1.7	2.5	2.9	3.3	3.9	12.1	11.3	10.4	9.9	8.9	7.7	6.1	100.0	14.0	19.6	52.6	13.8	32.40	18.25	14.15	9.57	0.001	29.8	2.74	1.96	1.51	44.89	0.815	1.002	<0
2	BH-1	9.0	0.0	0.0	0.0	0.0	11.5	5.5	1.4	3.7	5.1	5.6	6.5	11.7	10.5	9.3	8.7	7.9	6.9	5.7	100.0	11.5	27.8	48.1	12.6	42.00	19.30	22.70	14.04	0.002	17.5	2.72	1.97	1.68	38.34	0.622	0.764	<0
3	BH-2	8.0	0.0	0.0	0.0	0.0	15.1	6.0	1.3	3.0	4.3	4.5	5.3	10.6	10.9	9.9	9.5	8.1	6.0	5.5	100.0	15.1	24.4	49.0	11.5	35.6	21.5	14.10	14.80	0.0025	16.9	2.72	1.97	1.69	38.04	0.614	0.749	<0
4	BH-2	10.0	0.0	0.0	0.0	0.0	15.3	5.2	1.6	3.6	3.3	5.1	4.6	10.9	11.5	10.2	8.6	8.5	6.3	5.3	100.0	15.3	23.4	49.7	11.6	38.9	20.6	18.30	15.00	0.0029	19.9	2.73	1.96	1.63	40.12	0.670	0.811	<0
Avarege			0.0	0.0	0.0	0.0	14.0	5.5	1.5	3.2	3.9	4.6	5.1	11.3	11.1	10.0	9.2	8.4	6.7	5.7	100.0	14.0	23.8	49.9	12.4	37.2	19.9	17.3	13.35	0.002	21.0	2.73	1.97	1.63	40.35	0.680	0.831	<0
Absolute max			0.0	0.0	0.0	0.0	15.3	6.0	1.7	3.7	5.1	5.6	6.5	12.1	11.5	10.4	9.9	8.9	7.7	6.1	100.0	15.3	27.8	52.6	13.8	42.0	21.5	22.7	15.00	0.003	29.8	2.74	1.97	1.69	44.89	0.815	1.002	<0
Absolute min			0.0	0.0	0.0	0.0	11.5	5.2	1.3	2.5	2.9	3.3	3.9	10.6	10.5	9.3	8.6	7.9	6.0	5.3	100.0	11.5	19.6	48.1	11.5	32.4	18.3	14.1	9.57	0.001	16.9	2.72	1.96	1.51	38.04	0.614	0.749	<0

Chief engineer of laboratory L. Tsogsandarkhi

Laboratory engineer: G. Ganchimeg

Laborant: A. Bayarmagnai

STANDARD PENETRATION TEST RESULT /SPT/

Borehole number	Depth of SPT (m)	0-15cm	15-30cm		30-45cm		N
		Blow counts	Real penetration thickness(cm)	Blow counts	Real penetration thickness(cm)	Blow counts	Blow counts
BH-1	1.0	25	15	31	15	42	73
	2.0	28	15	36	15	46	82
	3.0	15	15	18	15	22	40
	4.0	17	15	18	15	23	41
	5.0	14	15	16	15	20	36
	6.0	18	15	21	15	23	44
	7.0	12	15	14	15	15	29
	8.0	10	15	13	15	15	28
	9.0	14	15	17	15	21	38
	10.0	15	15	16	15	15	31
BH-2	2.0	14	15	17	15	18	35
	3.0	16	15	19	15	23	42
	4.0	11	15	14	15	13	27
	5.0	12	15	16	15	19	35
	6.0	15	15	18	15	20	38
	7.0	9	15	13	15	14	27
	8.0	7	15	10	15	12	22
	9.0	8	15	11	15	11	22
	10.0	10	15	12	15	14	26

Prepared by: E.Uchral

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Archive 17/034

ZT19-615/14

ENGINEER GEOLOGICAL SURVEY REPORT OF CONSTRUCTION AREA OF 109th SCHOOL EXTENSION CONSTRUCTION IN 3rd KHOROO, NALAIKH DISTRICT, ULAANBAATAR CITY

/ Detail design stage /

Approved by:

Director *TS.Bileg*

Prepared by:

Engineer geologist *E.Uchral*

Ulaanbaatar city
2017

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   Vertical 1:1000
3. SOIL PHYSIC MECHANIC CHARACTERISTIC GENERAL TABLE (APPENDIX №3)
4. STANDARD PENETRATION TEST RESULT (APPENDIX №4)

I. GENERAL INFORMATION

1.1 Survey basis

Engineer Geodesy LLC /Drawing and geological survey company/ completed engineer geological survey work of construction area of 109th school extension in Ulaanbaatar city,Bayanzurkh district, 3rd khoroo by MECSS tender in April 17th-28th 2017 and survey planned and completed as their requested.

1.2 Survey technique

Team with drill master Enkh-Amagalan, assistant worker Lkhagvatseren.N is executed the drill work by UGB-1BC equipment, 2 boreholes 10.0 meters depth, 40.0 t/m column drilling,to locate and define underground water depth, characteristics, construction fundament pressure effective soil depth and distribution, according to the plan and SNIP 11-03-01 in survey area engineer geological survey work.

Soil physic and mechanic characteristics been defined by taking 24 pieces of samples from drilled boreholes in soil study laboratory. According to ASTM standard, Tsagaandarkhi.L/laboratory chief/, Ganchimeg.G /laboratory engineer/ and bayarmagnai.A /laboratory assistant/ are summarized the result and tabled soil analyze in soil study laboratory of Engineer Geodesy LLC /with guaranteed number of TL-78 from Standardization and Metrology department, satisfied the standard of ISO/IEC 17025:2005, MNS ISO/IEC
17025:2005/. Engineer Geologist Uchral.E processed the engineer geological report to create procedural plan which is made by comparison of field survey material and laboratory analyze result.

Source materials related to survey work stored in archive of Engineer Geodesy LLC.

II. ENGINEERING GEOLOGICAL INVESTIGATED CONDITION

2.1 Location

The extension construction of school 109 was planned by connect to the construction of 109th school's left side which located in 3rd khoroo, Nalaikh district, Ulaanbaatar .

Drawing *1. Survey area of location*

2.1 Climatic conditions

Khurel-togoot, Terelj climate stations indices and CCM 23-01-09 standard "Climate and geotechnical indices for the construction work" have been used for the climate indices of this site, and showed in tables.

Annual and monthly average air temperature, ^{0}C

Table II-1

Station	Month												Annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Terelj	-24.1	-18.2	-11.6	-1.3	6.8	11.8	13.9	11.9	5.3	-3.0	-14.4	-21.6	-3.7

Absolute maximum air temperature, ^{0}C

Table II-2

Station	Absolute maximum	Date	July average
Khurel-togoot	31.3	1975.VIII.19	26.1

Absolute minimum air temperature, °C

Table II-3

Station	Absolute minimum	Date	Jan average

Khurel-togoot	-36.7	1966.L16	-30.3

Structure and technical calculation temperature, ^{0}

Table II-4

Station	Calculation temperature _ °C				
	Coldest temprature				One day during hottest temperature
	1 day	3 day	5 day	Airring	
Terelj	-34.8	-33.1	-31.5	-26.7	23.9

Air humidity and precipitation

Table II-5

Station	Precipitation							
	Warm season	Cold season	Annual	In warm season	Maximum in a day	Year	Month	Day
Terelj	56	75	372.9	354.9	55.5	1994	VIII	04

Annual and monthly average wind speed

Table II-6

Station	Month, winter, average speed of year, m/s													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	winter	annual
Terelj	0.8	1.2	1.8	2.6	2.3	1.5	1.2	1.2	1.6	1.5	1.1	0.8	0.9	1.5

2.3 Geological formation

In survey area distributed equally silty sand with gravel soil, clayey with sand soil and sandy lean clay origin of filled up soil from below, up and modern Quaternary diluviam-proluvial. In survey area spread silt soil is classified as a engineer geological element, physic mechanic characteristics defined and depth and distribution cross section shown.

2.4 Geomorphology characteristics and physic geological appearance, process

Survey area is located on the geomorphology's one element and surface's elevation is 1481.04-1481.85 meters, height difference is 0.81 meter. The survey area is went down from eastern north to western south and it's surface is being generally flat. In survey area permafrost soil was spreaded , because seasonal melting process is being dominated.

2.5 Hydro-geological condition

Survey area is located on the geomorphology's one element and surface's elevation is 1481.04-1481.85 meters, elevation's difference is 0.81 meters. /April, 17th, 2017/. Soil ground water is minimum low level in April and it can be increased by rainfall. And soil ground water increase depends on seasonal melting process. Permeability test was conducted on BH-4 in this site. Permeability K=7.1*10^{-3}cm/sec.

2.6 Permafrost /PFT/

Nalaikh district belong in zone which discontinuities distribution permafrost soil. In planning building area, permafrost soil depth started from 4 meter and Silty sand with gravel soil is permafrost then with solid texture, low ice form hard to dry permafrost. Permafrost soil 10 meter's depth temperature is (-0,5^{0}c). Top boundary of permafrost soil connect to directly depth of freezing and melting. Freezing temperature of soil is -0.1^{0}C.

III. ENGINEERING-GEOLOGICAL CONDITIONS AND PHYSICAL, MECHANICAL PROPERTIES

3.1 Soil engineer geological classification and formation

In survey area, from light yellowish to brown yellow color silty sand with gravel soil /EGE-1/distributed. Soil physical mechanical properties determined and shown by drawing section of distribution and thickness. Then soil type is 2 class which first class is seasonal freezing and melting silty sand with gravel soil, second class is permafrost soil and determined physical mechanical properties indices one by one.

3.2 Soil physic mechanic characteristic

Depending on soil particle structure and physic mechanic characteristic classified to engineer geological 1 elements.

EGE-1. Silty sand with gravel soil /seasonal freezing and melting/

From light yellowish to brown color, top and modern quaternary age, delivuim-proluvial origin (dpQIII-IV) solid consistency, with moisture and this soil that silty sand with gravel soil. Brown color clay sand with gravel soil lens layer 4.80-5.00 meter.

Granulometric composition from the laboratory analysis of these soil samples includes: (%):

- Gravel 39.4
- Sand 44.6
- Silt 13.5
- Clay 2.6

Physical properties indices of the soil:

- Natural moisture content 7.8
- Specific gravity, g/sm3 2.67
- Wet density g/sm3 2.26
- Dry density g/sm3 2.10
- Porocity, % 21.47
- Porocity ratio 0.275
- Moisture content degree 0.719

According to the norm and regulations to create the soil mechanical properties - BNaR 50-01-16 and Table I

Normative value

- Cohesion C_n = 2.0 кПа
- Angle of internal friction $\varphi_n = 40^0$
- Deformation modulus E= 45MIIa

Calculation value:

- Cohesion C_{n2}= 1.33 kPa
- Angle of internal friction φ_{n2}= 36.0 ^{0}
- Calculated resistance R_0= 500 kPa

According to CCM 50-01-16 and 5.3.2, Silty sand with gravel soil is normalize by none swellings. Silty sand with gravel soil merge directly upper boundary of PFT soil's seasonal melting depth .

Earthwork grade dig by manually III

IGE-1a. Silty sand with gravel soil **/with PFT /**

From light yellowish to brown color, top and modern quaternary age, delivuim-proluvial origin(dpQIII-IV) solid consistency, saturated with water this soil that silty sand with gravel soil.

Granulometric composition from the laboratory analysis of these soil samples includes: (%):

- Gravel 38.6
- Sand 45.1
- Silt 13.5
- Clay 2.8

Physical properties of PFT soil:

1. Total moisture $W_c=W_f$ 0.121
2. Permafrost soil's pore filled grade by water and ice 0.93
3. Sum of ice – same of sum moisture $W_c=JI_c$
4. Melting factor A=0.0099

IV. CONCLUSION

1. In survey area low and average blub engineer geological 1 types of element occurred, groundwater not detected, filled up ground spread vary thickness, permafrost /PFT/ soil is same and it is related to hard condition area for engineer-geology
2. Base soil in area which physics and mechanical properties indices of calculation and norm is shown in **"ENGINEERING GEOLOGICAL CLASSIFICATION AND PHYSICAL-MECHANICAL PROPERTIES OF SOIL"** chapter.
3. Table IV-1 is shown soil blub level and earth work degree for distributed soil in survey area. Earth work degree counted as manually executed.

Table IV-1

Soil type	Earthrocks degree	Bulging degree	Specific reactance om, m
Silty sand with gravel soil	III	None swellings	Dry condition: 2000-10000 Wet condition: 200-600

4. Survey area is in 7 magnitude earthquake region.
5. In survey area, soil groundwater has been occurred in 4 drill holes with 10 meter depth /dated April 17th ,2017/. Soil ground water is minimum low level in April and it can be increased by rainfall. And soil ground water increase depends on seasonal melting process.
6. Soil test is necessary after opening of building fundament galvanized.

Summary is written: Uchral.E / Engineer-geologist/

V. REFERENCE LIST

1. CCM 50-01-16. Construction codes on designing of construction foundation Ulaanbaatar, 2016 y.
2. CCM 23-01-09. Climate and geotechnical indices for the construction work Ulaanbaatar, 2009 y.
3. Seismic zones of Nalaikh. SC 1:34000, 2015y.
4. "CG 11-107-11. Guideline of engineering geologic report and summary
5. "CCM 11-03-01 Contruction norm and regulation
6. Инженерные изыскания встройтельсве (Спаровочныk) страниц таблиц - 131,1975года., зав.редакций Е.А.Ларина,
7. "Земляные работы" / СНИП-IV-5/
8. ASTM D 2487

VI. BOREHOLE LOGS

Borehole-1

Depth , m	10.00	Elevation , m	1481.85
Diameter , mm	168	Drilling date	2017.04.17

1.	Filled up soil color is dark gray and contained building waste.	0.00-0.50 0.50
2.	From light yellowish to brown color with moisture and this soil that silty sand with gravel soil	0.50-10.0 9.50

Soil groundwater not detected.
PFT soil detected at 4.00 meter.
/current date April 17th 2017/

Borehole-2

Depth , m	10.00	Elevation , m	1481.15
Diameter , mm	168	Drilling date	2017.04.17

1.	Filled up soil color is dark gray and contained building waste.	0.00-0.60 0.60
2.	From light yellowish to brown color with moisture and this soil that silty sand with gravel soil.	0.60-10.0 9.40

Soil groundwater not detected.
PFT soil detected at 4.00 meter.
/current date April 17th 2017/

Borehole-3

Depth , m	10.00	Absolute elevation , m	1481.04
Diameter , mm	168	Drilling date	2017.04.17

1.	Filled up soil color is dark gray and contained building waste	0.00-0.60 0.60
2.	From light yellowish to brown color with moisture and this soil that silty sand with gravel soil	0.60-10.0 9.40

Soil groundwater not detected.
PFT soil detected at 4.00 meter.
/current date April 17th 2017/

Borehole-4

Depth , m	10.00	Elevation , m	1481.32
Diameter , mm	168	Drilling date:	2017.04.17

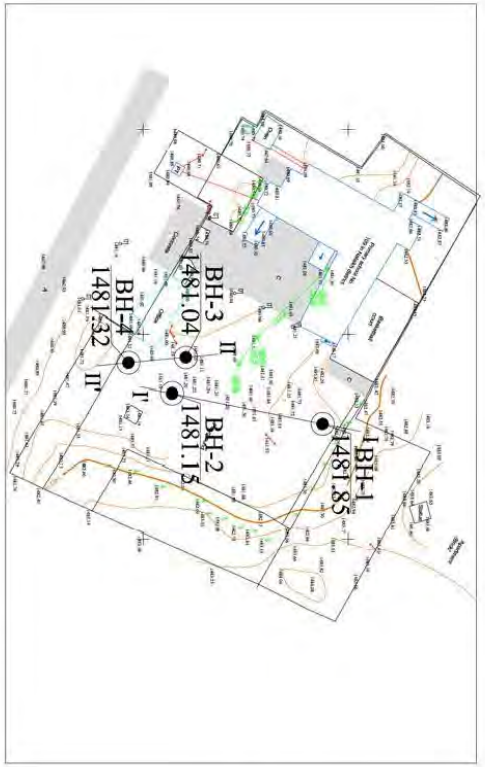
1.	Filled up soil color is dark gray and contained building waste.	0.00-0.70 / 0.70
2.	From light yellowish to brown color with moisture and this soil that silty sand with gravel soil.	0.70-4.80 / 4.10
3.	Brown color clay sand with gravel soil lens layer.	4.80-5.10 / 0.30
4.	From light yellowish to brown color with moisture and this soil that silty sand with gravel soil.	5.10-10.0 / 4.90

Soil groundwater not detected.
PFT soil detected at 4.00 meter.
/current date April 17th 2017/

Borehole logs written by: E.Uchral

Appendix-1

LOCATION OF BOREHOLE
SC1:1000

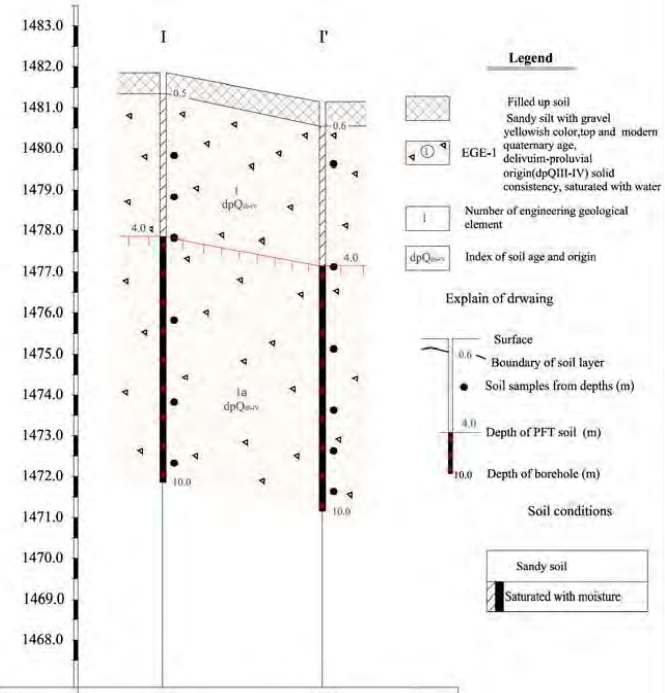


Legend

- Current school number 109
- Drilled borehole number / Elevation (m)
- Engineering- geological section

ENGINEERING GEODESY LLC	Stage: WD
Client: JICA	Page number: 1
Object: Engineer geological survey report of construction areaof 109th school extension construction in 3rd khoroo,Nalaikh district, Ulaanbaatar city	Scale: 1:1000
Checked by: Erdenetsetseg.G	Title: LOCATION OF BOREHOLE
Drawned by: Uchral.E	

Engineering-geological section
I-I' linear

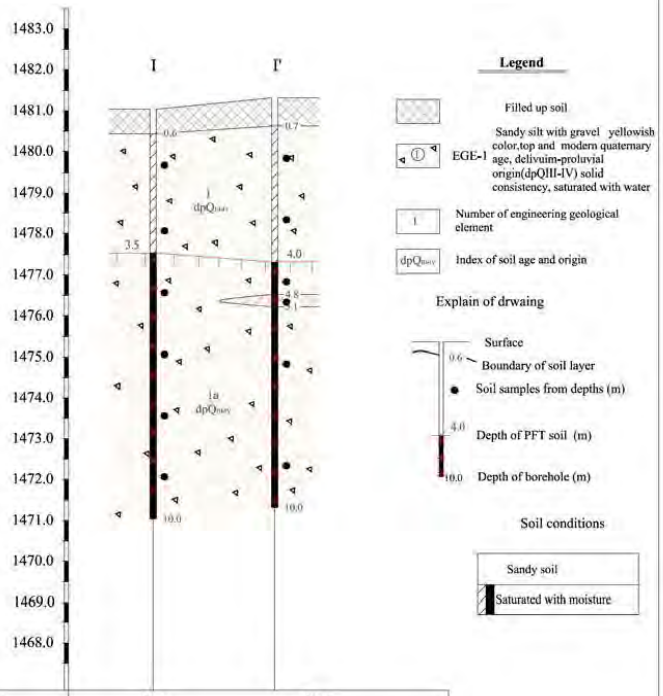


Borehole number	BH-1	BH-2
Elevation (m)	1481.85	1481.15
Borehole distance (m)	37.43	

	ENGINEERING GEODESY LLC			Stage WD
	Client	JICA		Page number 2
	Object	Engineer geological survey report of construction aeasof 109th school extension construction in 3rd khoroo,Nalaikh district, Ulaanbaatar city		
	Checked by	Erdenetsetseg.G	Title	Scale
	Drawned by	Uchral.E	Engineering-geological section, I-I' linear	Vertical 1:100 Horizontal 1:1000

Appendix-2

Engineering-geological section
I-I' linear



Borehole number	BH-1	BH-2
Elevation (m)	1481.04	1481.32
Borehole distance (m)	14.06	

	ENGINEERING GEODESY LLC			Stage WD
	Client	JICA		Page number 2
	Object	Engineer geological survey report of construction aeasof 109th school extension construction in 3rd khoroo,Nalaikh district, Ulaanbaatar city		
	Checked by	Erdenetsetseg.G	Title	Scale
	Drawned by	Uchral.E	Engineering-geological section, II-II' linear	Vertical 1:100 Horizontal 1:500

ACCREDITED LABORATORY OF SOIL RESEARCH

TABLE OF LABORATORY TEST RESULT

TL-78
MNS ISO/IEC 17025:2007

ENGINEERING GEODESY LLC

Object: Engineer geological survey report of construction areaof 109 th school extension construction in 109th khoroo, Nalaikh district, Ulaanbaatar

Start date: 2017.04.17
Finish date: 2017.04.23

№	Borehole number	Depth of sample, m	Grain size analysis											Hydrometr, [mm]%								Gravel	Sand	Silt	Clay	Plastic index		Cu	CC	Natural moisture content(W), %	Specific gravity Gs, g/sm³	Wet density, ρ, g/sm³	Dry density, ρd, g/sm³	Porosity, n, %	Porosity ratio, e	Saturation degree, Sr
			75.0	37.5	19	9.5	4.75	2.36	1.18	0.60	0.300	0.150	0.075	0.035	0.022	0.012	0.009	0.006	0.003	0.001						LL	PL									
EGE-1. Silty sand with gravel / permafrost condition/																																			
1	1	6.0	0.0	0.0	9.8	13.2	15.3	14.9	4.1	6.5	9.7	7.6	5.8	3.2	2.4	2.8	1.7	1.5	1.2	1.0	100.0	38.3	48.6	10.9	2.2	inelastic		110.83	16.943	6.0	2.68	2.27	2.14	20.09	0.251	0.639
2	1	4.0	0.0	0.0	1.1	9.5	14.7	18.7	2.7	6.1	10.5	11	9.2	4.1	3.1	2.6	2.1	1.9	1.6	1.1	100.0	23.3	58.2	13.8	2.7	inelastic		101.79	4.618	21.9	2.67	2.25	1.85	30.87	0.447	1.309
3	4	6.5	0.0	0.0	6.1	10.7	13.1	15.6	4.3	6.5	9.3	9.4	8.1	3.7	3.2	3.0	2.3	1.9	1.6	1.2	100.0	29.9	53.2	14.1	2.8	inelastic		128.20	6.782	7.6	2.68	2.26	2.10	21.63	0.276	0.738
4	2	4.0	0.0	0.0	20.4	10.4	6.3	17.2	2.9	3.2	6.7	7.8	3.2	4.8	4.3	3.6	2.9	2.5	2.1	1.7	100.0	37.1	41.0	18.1	3.8	inelastic		686.16	42.542	36.4	2.66	2.27	1.66	37.44	0.598	1.618
5	1	9.5	0.0	0.0	15.5	11.2	12.8	15.2	3.2	7.0	5.2	7.2	5.6	4.2	3.1	2.8	2.2	2.0	1.7	1.1	100.0	39.5	43.4	14.3	2.8	inelastic		198.31	20.434	12.4	2.67	2.25	2.00	25.03	0.334	0.992
6	1	2.0	0.0	0.0	11.2	15.0	15.4	12.8	5.0	6.7	8.2	6	8.5	3.2	3.0	2.3	1.9	2.1	1.4	1.3	100.0	41.6	43.2	12.5	2.7	inelastic		205.64	36.270	7.1	2.66	2.26	2.11	20.67	0.261	0.725
7	2	8.5	0.0	0.0	17.4	9.2	13.9	10.1	6.2	7.8	9.0	5.5	5.3	2.9	3.2	2.5	2.2	1.9	2.0	0.9	100.0	40.5	43.9	12.7	2.9	inelastic		172.31	27.370	6.9	2.68	2.26	2.11	21.11	0.268	0.691
8	3	7.5	0.0	0.0	11.0	14.1	16.8	12.9	3.8	7.0	8.5	6.2	5.2	3.1	3.1	2.2	2.3	1.7	1.9	1.1	100.0	41.9	42.7	12.4	3.0	inelastic		221.21	34.340	7.2	2.67	2.25	2.10	21.39	0.272	0.706
9	2	6.0	0.0	0.0	5.9	16.9	17.1	14.5	3.8	6.9	7.8	6.9	6.2	3.6	2.8	2.3	2.8	1.6	1.2	0.8	100.0	39.9	45.2	12.9	2.0	inelastic		176.46	26.419	8.5	2.67	2.26	2.08	21.99	0.282	0.805
10	1	8.0	0.0	0.0	14.2	12.2	14.9	13.9	4.6	5.2	6.6	6.5	6.6	4.2	3.2	2.5	1.9	1.5	1.3	0.7	100.0	41.3	43.4	13.3	2.0	inelastic		183.45	22.730	15.0	2.66	2.28	1.98	25.47	0.342	1.168
11	3	9.0	0.0	0.0	12.5	11.2	16.8	15.2	4.3	4.9	5.8	8.7	4.8	3.6	2.9	2.2	2.2	2.1	1.7	1.1	100.0	40.5	43.7	13.0	2.8	inelastic		213.95	23.158	9.5	2.66	2.27	2.07	22.07	0.283	0.893
12	4	4.5	0.0	0.0	9.5	15.1	16.7	12.6	5.2	3.9	9.5	6.3	5.2	3.9	2.5	2.4	2.3	1.9	1.8	1.2	100.0	41.3	42.7	13.0	3.0	inelastic		210.97	29.038	21.6	2.67	2.26	1.86	30.39	0.437	1.321
13	2	7.5	0.0	0.0	11.1	15.2	14.9	13.6	4	5.2	8.6	6.4	4.8	4.0	3.1	2.3	1.9	2.2	2.0	0.9	100.0	41.2	42.6	13.3	2.9	inelastic		204.00	29.924	8.1	2.66	2.28	2.11	20.71	0.261	0.825
14	3	6.0	0.0	0.0	12.5	9.8	18.2	10.8	5.9	6.6	6.9	7.4	5.3	3.5	2.8	3.2	2.3	1.7	1.8	1.2	100.0	40.6	42.9	13.5	3.0	inelastic		235.88	23.257	10.8	2.66	2.25	2.03	23.66	0.310	0.927
15	4	9.0	0.0	0.0	9.1	11.8	16.9	16.1	4.1	5.9	8	6.2	4.8	3.3	3.2	2.9	2.5	2.0	1.6	1.3	100.0	37.8	45.1	13.9	3.2	inelastic		232.63	31.332	9.9	2.67	2.26	2.06	22.98	0.298	0.886
16	3	4.5	0.0	0.0	5.0	16.2	17.2	14.3	4.5	6.4	7.4	7.6	4.3	4.2	3.9	2.2	1.9	1.8	2.0	1.1	100.0	38.4	44.5	14.0	3.1	inelastic		183.33	19.245	7.1	2.66	2.27	2.12	20.32	0.255	0.741
17	2	9.5	0.0	0.0	11.5	14.5	14.8	13	4.5	5.6	6.6	7.4	4.9	3.9	3.3	2.7	2.4	1.9	1.9	1.1	100.0	40.8	42.0	14.2	3.0	inelastic		217.39	23.388	8.9	2.67	2.29	2.10	21.24	0.270	0.881
Aswrege			0.0	0.0	10.8	12.7	15.0	14.1	4.3	6.0	7.9	7.2	5.5	3.7	3.1	2.6	2.2	1.9	1.7	1.1	100.0	38.6	45.1	13.5	2.8	inelastic		216.615	24.588	12.1	2.67	2.26	2.03	23.94	0.320	0.933
Absolute max			0.0	0.0	20.4	16.9	18.2	18.7	6.2	7.8	10.5	11.0	9.2	4.8	4.3	3.6	2.9	2.5	2.1	1.7	100.0	41.9	58.2	18.1	3.8	inelastic		686.160	42.542	36.4	2.68	2.29	2.14	37.44	0.598	1.618
Absolute min			0.0	0.0	1.1	9.2	6.3	10.1	2.7	3.2	5.2	5.5	3.2	2.9	2.4	2.1	1.7	1.5	1.2	0.7	100.0	25.3	41.0	10.9	2.0	inelastic		101.790	4.618	6.0	2.66	2.25	1.66	20.09	0.251	0.639

Chief engineer of laboratory: L. Tsagaandarkhi Laboratory engineer: G. Ganchimeg

STANDARD PENETRATION TEST RESULT /SPT/

Borehole number	Depth of SPT (m)	0-15cm	15-30cm		30-45cm		N
		Blow counts	Real penetration thickness(cm)	Blow counts	Real penetration thickness(cm)	Blow counts	Blow counts
BH-1	1.0	29	15	48	8	50	98/23cm
	2.0	32	15	45	10	50	95/25cm
	3.0	35	15	44	8	50	94/23cm
	4.0	28	15	46	11	50	96/26cm
	5.0	33	15	49	9	50	99/24cm
	6.0	28	15	42	13	50	92/28cm
	7.0	24	15	36	14	50	86/29cm
	8.0	28	15	40	12	50	90/27cm
	9.0	30	15	46	9	50	96/24cm
	10.0	34	15	47	7	50	97/22cm
BH-2	1.0	33	15	46	9	50	96/24cm
	2.0	30	15	41	11	50	91/26cm
	3.0	28	15	42	13	50	92/28cm
	4.0	35	15	48	8	50	98/23cm
	5.0	31	15	47	7	50	97/22cm
	6.0	28	15	44	10	50	94/25cm
	7.0	30	15	45	9	50	95/24cm
	8.0	32	15	43	11	50	93/26cm
	9.0	29	15	46	8.8	50	96/23.8cm
	10.0	36	15	50	6	50	100/21cm
BH-3	2.0	31	15	44	8	50	94/23cm
	3.0	35	15	48	6.5	50	98/21.5cm
	4.0	37	15	50	6	50	100/21cm
	5.0	32	15	49	7	50	99/22cm
	6.0	29	15	45	10	50	95/25cm
	7.0	27	15	40	8	50	90/23cm
	8.0	31	15	47	9	50	97/24cm
	9.0	33	15	45	8	50	95/23cm
	10.0	30	15	42	10.5	50	92/25.5cm
BH-4	1.0	33	15	47	7	50	97/22cm
	2.0	31	15	44	10	50	94/25cm
	3.0	36	15	47	9.3	50	97/24.3cm
	4.0	35	15	49	8	50	99/23cm
	6.0	30	15	45	12	50	95/27cm
	7.0	29	15	41	11	50	91/26cm
	8.0	30	15	46	9	50	96/24cm
	9.0	34	15	48	7	50	98/22cm
	10.0	33	15	47	9	50	97/24cm

Prepared by: E.Uchral

ENGINEERING GEODESY LLC

ACCREDITED LABORATORY OF SOIL RESEARCH

TABLE OF LABORATORY TEST RESULT

TL-78
MNS ISO/IEC 17025:2007

Object: Engineer geological survey report of construction areaof 109th school extension construction in 109th khoroo, Nalaikh district, Ulaanbaatar

Start date: 2017.04.17
Finish date: 2017.04.23

№	Borehole number	Depth of sample, m	Grain size analysis										Hydrometr, [mm]%								Gravel	Sand	Silt	Clay	Plasticity index		Cu	CC	Natural moisture content(W), %	Specific gravity Gs, g/cm3	Wet density, ρ, g/cm3	Dry density, ρd, g/cm3	Porosity, n, %	Porosity ratio, e	Saturation degree, Sr	Konsistens, k
			75.0	37.5	19	9.5	4.75	2.36	1.18	0.60	0.300	0.150	0.075	0.035	0.022	0.012	0.009	0.006	0.003	0.001					LL	PL										
Clay sand with gravel /lens ayer/																																			
1	4	5.0	0.0	0.0	2.2	3.3	11.0	9.0	3.9	6.2	7.8	8.3	8.4	9.7	7.5	6.3	5.1	4.8	3.8	2.7	100.0	16.5	43.6	33.4	6.5	28.80	19.16	51.34	0.050	4.6	2.74	2.07	1.98	27.77	0.384	0.327	<0

ENGINEERING GEODESY LLC

ACCREDITED LABORATORY OF SOIL RESEARCH

TABLE OF LABORATORY TEST RESULT

TL-78
MNS ISO/IEC 17025:2007

Object: Engineer geological survey report of construction areaof 109th school extension construction in 109th khoroo, Nalaikh district, Ulaanbaatar

Start date: 2017.04.17
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№	Borehole number	Depth of sample, m	Grain size analysis										Hydrometr, [mm]%								Gravel	Sand	Silt	Clay	Plasticity index		Cu	CC	Natural moisture content(W), %	Specific gravy Gs, g/cm3	Wet density, ρ, g/cm	Dry density, ρd, g/cm3	Porosity, n, %	Porosity ratio, e	Saturation degree, Sr
			75.0	37.5	19	9.5	4.75	2.36	1.18	0.60	0.300	0.150	0.075	0.035	0.022	0.012	0.009	0.006	0.003	0.001					LL	PL										
EGE-1a. Silty sand with gravel / seasonal freezing and melting/																																			
1	1	3.0	0.0	0.0	10.7	15.4	14.5	12.0	4.7	7.1	7.9	5.6	4.8	3.7	3.3	2.9	2.4	2.1	1.8	1.1	100.0	40.6	42.1	14.4	2.9	inelastic		265.070	37.078	5.2	2.67	2.24	2.13	20.24	0.254	0.545
2	3	1.4	0.0	0.0	16.0	10.2	15.2	16.6	5.2	7.4	7.1	5.5	4.9	2.6	2.6	1.3	1.9	1.6	1.2	1.0	100.0	41.4	46.4	10.0	2.2	inelastic		78.443	678.030	6.6	2.68	2.26	2.12	20.86	0.264	0.667
3	2	1.5	0.0	0.0	8.6	16.5	15.0	17.2	4.9	6.2	5.3	5.1	4.7	4.4	3.5	2.6	2.1	1.7	1.4	0.8	100.0	40.1	43.4	14.3	2.2	inelastic		180.278	47.628	4.4	2.67	2.25	2.16	19.27	0.239	0.491
4	4	1.5	0.0	0.0	7.9	14.8	15.8	12.9	4.1	6.4	13.2	5.2	4.2	3.3	2.9	2.4	2.4	1.9	1.4	1.2	100.0	38.5	46.0	12.9	2.6	inelastic		204.09	32.818	16.9	2.68	2.27	1.94	27.54	0.380	1.198
5	4	3.0	0.0	0.0	6.0	15.9	17.1	13.5	6	6.5	7.2	5.2	5.2	3.7	3.5	3.2	2.0	2.2	1.9	0.9	100.0	39.0	43.6	14.6	2.8	inelastic		211.00	32.259	6.5	2.67	2.25	2.11	20.87	0.264	0.658
6	3	3.0	0.0	0.0	8.5	12.4	15.8	12.5	4.2	6.8	7.3	9.1	5.9	4.2	3.2	2.9	2.6	1.9	1.3	1	100.0	36.7	45.8	14.8	2.7	inelastic		177.28	31.168	7.2	2.66	2.28	2.13	20.04	0.251	0.764
Average			0.0	0.0	9.6	14.2	15.0	14.1	4.9	6.7	8.0	6.0	5.0	3.7	3.2	2.6	2.2	1.9	1.6	1.0	100.0	39.4	44.6	13.5	2.6	inelastic		186.03	139.830	7.8	2.67	2.26	2.10	21.47	0.275	0.719
Absolute max			0.0	0.0	16.0	16.5	17.1	17.2	6.0	7.1	13.2	9.1	5.9	4.4	3.5	3.2	2.6	2.2	1.9	1.2	100.0	41.4	46.4	14.8	2.9	inelastic		265.08	678.030	16.9	2.68	2.28	2.16	27.54	0.380	1.198
Absolute min			0.0	0.0	6.0	10.2	14.5	12.0	4.1	6.2	5.3	5.1	4.2	2.6	2.6	1.3	1.9	1.6	1.2	0.8	100.0	36.7	42.1	10.0	2.2	inelastic		78.44	31.168	4.4	2.66	2.24	1.94	19.27	0.239	0.491

7-3 調査対象校運営状況等

(1) 調査対象学区の社会条件

カテゴリー	優先順位	区	学校/サイト	ホロー学区	人口 2015*	担当エリア 案分比	担当エリア 人口	世帯数 2015*	ゲル地区 人口	ゲル地区 比率	人口 2014	人口 2013	人口増加 2014-15	人口増加 2013-14
新設	1	CH	Khoroo No. 7	CH-7他	7,278		7,278	1,911	7,278	100.0%	7,593	7,296	-4.1%	4.1%
				CH-7	12,827	0.30	3,848	3,369	12,827		13,657	13,129		
				CH-12	14,691	0.10	1,469	3,773	14,691		15,647	15,018		
				CH-16	12,614	0.10	1,261	3,441	12,614		12,210	11,923		
				SO-28	6,990	0.10	699	1,793	6,990		7,098	6,631		
	2	KU	No. 75 school	KU-2他	12,737		12,737	3,296	145	1.1%	11,428	10,718	11.5%	6.6%
				KU-2	10,549	1.00	10,549	2,670	121		9,530	9,113		
				KU-3	13,929	0.05	696	3,918	451		12,240	10,888		
				KU-15	20,468	0.05	1,023	6,052	30		17,126	14,054		
				BY-3	9,357	0.05	468	2,555	8		8,594	7,160		
	3	SO	Khoroo No. 32	SO-32他	8,227		8,227	2,538	8,227	100.0%	7,878	7,432	4.4%	6.0%
				SO-32	3,260	1.00	3,260	1,243	3,260		3,384	2,977		
				SO-31	12,417	0.40	4,967	3,237	12,417		11,235	11,138		
	5	KU	No. 59 school	KU-14	4,710		4,710	1,666	4,710	100.0%	4,329	4,223	8.8%	2.5%
				KU-14	4,710	1.00	4,710	1,666	4,710		4,329	4,223		
増設	4	CH	No.57 School	CH-11	6,040		6,040	1,553	6,040	100.0%	6,185	6,227	-2.3%	-0.7%
				CH-11	6,040	1.00	6,040	1,553	6,040		6,185	6,227		
	6	BZ	No.53 School	BZ-16他	15,539		15,539	4,876	4,694	30.2%	15,671	16,794	-0.8%	-6.7%
				BZ-16	16,418	0.60	9,851	4,845	518		15,779	17,749		
				BZ-8	11,559	0.25	2,890	4,955	9,142		14,750	14,693		
				BZ-19	13,772	0.10	1,377	3,222	8,962		11,296	10,831		
				BZ-24	9,428	0.05	471	2,863	9,428		9,455	10,179		
				BZ-13	9,496	0.10	950	2,647	7,297		9,134	8,790		
	7	SO	No.42 School	SO-2他	17,665		17,665	4,923	17,152	97.1%	15,991	15,277	10.5%	4.7%
				SO-2	14,343	0.90	12,909	4,123	14,343		12,617	12,199		
				SO-3	10,942	0.10	1,094	2,601	10,942		10,372	10,327		
				SO-1	14,745	0.20	2,949	3,736	14,399		14,481	13,063		
				SO-20	7,130	0.10	713	2,054	2,692		7,027	6,527		
	8	CH	No.61 School	CH-12	11,753		11,753	1,242	11,753	100.0%	12,518	12,014	-6.1%	4.2%
				CH-12	14,691	0.80	11,753	1,553	14,691		15,647	15,018		
	9	KU	No.118 School	KU-8他	11,996		11,996	3,500	10,811	90.1%	11,502	11,636	4.3%	-1.2%
				KU-8	11,266	0.80	9,013	3,345	11,266		11,030	11,268		
				KU-10	9,304	0.20	1,861	2,432	5,227		9,011	8,885		
				KU-16	11,226	0.10	1,123	3,376	7,532		8,756	8,444		
	10	NA	No.109 School	NA-03	12,221		12,221	3,201	3,201	26.2%	11,969	11,704	2.1%	2.3%
				NA-03	5,614	1.00	5,614	1,490	1,490		5,358	5,282		
				NA-04	6,607	1.00	6,607	1,711	1,711		6,611	6,422		

* UBC 統計局発表の 2016 年 1 月 1 日付の人口

(2) 調査対象学校の運営状況

カテゴリー	優先順位	区	学校/サイト	生徒数 (AY2016-17) 計	女子割合 %	初等	前期中等	後期中等	クラス数 (AY2016-17) 計	二部	三部	生徒/クラス数	初等	生徒数増加率 (2015→16)	初等
新設	1	CH	No. 7 Khoroo	新設											
	2	KU	No. 75 School	1287	49.9	650	342	295	41	20	0	28.6	31.0	10.9%	17.1%
	3	SO	No. 32 Khoroo	新設											
	5	KU	No.59 School	730	43.2	417	236	77	24	11	0	30.4	34.8	12.0%	7.8%
増設	4	CH	No.57 School	1341	49.5	669	438	234	0	0	0	31.2	30.4	-0.8%	0.8%
	6	BZ	No.53 School	1991	50.2	1081	567	343	57	30	0	34.9	37.3	9.9%	15.9%
	7	SO	No.42 School	1963	48.9	1183	563	217	46	35	0	35.1	37.0	9.2%	13.6%
	8	KU	No.118 School	1115	52.7	647	270	198	33	15	0	33.8	34.1	18.5%	28.4%
	9	CH	No.61 School	958	52.6	376	404	178	28	12	0	34.2	37.6	-19.7%	-39.5%
	10	NA	No.109 School	392	50.4	392	0	0	12	6	0	32.7	32.7	1.6%	1.6%

(3) 調査対象校における CWD 配慮・防災配慮の現状

1) CWD 配慮

概況

CWD の通常学校への受入は「インクルーシブ教育」、あるいは「特別支援教育」という概念で、比較的早い時期から教育分野の政策文書に位置付けられており、障害の程度の問題はあるものの、学校での理解は一定水準で進んでいるように見える。MECSS においても専任の担当官を置いて、政策の立案、実現に注力している。国家レベルの具体的な取り組みとして、施設計画基準における CWD 対応基準策定や屋内外の障害者アクセスの計画基準等も整備されつつあり、新設校では特に建物出入口のスロープと車椅子対応トイレの設置は必須となりつつある。直近に建設されたいくつかの学校では床段差を解消し、ほぼバリアフリーを実現しているものもある。一方、基準はあっても理解不足から目的とする機能が果たされない例が多く、新設校であっても、勾配や手摺が無いことで介助なしでは車椅子が移動できない斜路や、扉幅が狭く車椅子では使えない多目的トイレ、また設計上容易に改善可能なサインの位置のずれや手摺高さ等、改善を要する部分も多い。

ソフト面で必要な障害に関する知識を兼ね備えた教員についても現在は個々人の経験・能力に頼る状態にあるが、必要な知識を身に着ける研修等の機会は増えており、概ね学習マネージャークラスでは基礎的な研修の機会を得ている。ただ、モンゴル国では、クラスの試験の成績が教員の評価に反映されるため、CWD の学力評価をどのように行うかが十分に検討されていない。特に通常のカリキュラムで学習することのできない知的障害のある子どもや重度の肢体不自由児については、学力試験によらない評価方法を導入するなど、柔軟な対応が求められているところである。

調査対象の既存 8 校の在籍 CWD 数は 135 人、全生徒数の 1.3%である。学校別では 0.1%から 3.5%で、UBC 全体の障害者数 2.5%（2015 年）の半分ほどになっている。

調査対象校の在籍 CWD 内訳

区	学校名	視覚	聴覚	言語	肢体	知的	重複	合計
KU	75 番学校	17	0	0	2	0	0	12
CH	57 番学校	12	3	3	1	0	0	19
KU	59 番学校	6	3	8	3	1	1	22
BZ	53 番学校	11	2	1	11	1	1	27
SO	42 番学校	0	1	0	4	1	0	6
KU	118 番学校	0	0	0	0	1	0	1
CH	61 番学校	27	0	2	4	1	0	34
NA	109 番学校	3	2	4	3	2	0	14

出典:調査団　　* No.109 校は初等のみ。

調査対象校における障害配慮に関するヒアリング結果

区	学校名	CWD への配慮・課題等	教員の特別支援教育研修状況
KU	75 番学校	➢ 学習に遅れのある子どもには補習を実施。できるだけ他の子どもたちと一緒の活動に参加させるようにしている。 ➢ ノンフォーマル教育（夜間学校）を実施している。	29 番特別学校での研修（聴覚障害） ADRA の特別支援教育関連研修
CH	57 番学校	➢ 聴覚と視覚の障害のある子どもはできるだけ前の席に座らせるようにしている。 ➢ 子ども発達センターは主に一般の課外活動に使われている。	UBC 教育局の特別支援教育関連研修（学習マネージャー3 名が参加）

区	学校名	CWD への配慮・課題等	教員の特別支援教育研修状況
KU	59 番学校	➢ クラスで差別がないように理解促進している。 ➢ クラスメートが送り迎えや板書の支援をしている。 ➢ CWD や学習に遅れがある子どもには補習を実施。	担当教員が区で実施している CWD との接し方に関する研修に参加している。
BZ	53 番学校	➢ 以前玄関にスロープを作ったが、急こう配だったため廃止。 ➢ 学習に遅れがある子どもは 1 クラス平均 2 人程度。補習は教員の時間と教室が確保できず未実施。 ➢ ノンフォーマル教育センターに場所を提供している。 ➢ 近くに児童養護施設が数か所あるため、孤児や親が一時的にいない子どもも多く受け入れている。	国立教育大と兵庫教育大による特別支援教育のセミナー（2016 年） 教員研修所の特別支援教育関連研修。
SO	42 番学校	➢ World Vision の支援を受けて 6 年間特別学級を設置していたが、生徒数が減り、教育省から継続を認めてもらえなかったためなくなった。教員の専門知識も十分でなかった。	なし
KU	118 番学校	➢ クラスで差別がないように理解促進している。 ➢ クラスメートが送り迎えや板書の支援をしている。 ➢ CWD や学習に遅れがある子どもには補習を実施。	なし
CH	61 番学校	➢ 学習に遅れのある子どもに対して補習をやっている。教室があいていないので、土日や授業開始前の時間を活用。 ➢ 区では CWD を受持つ教員に給与補助を出すことを検討中。 ➢ 車いすの子どもは教員用の洋式トイレを使用している。	UBC 教育局の特別支援教育関連研修に学習マネージャーが参加した。
NA	109 番学校	➢ 学習に遅れのある子どもには補習を実施。差別がないように、他の子どもたちと一緒の活動に参加させるようにしている。	29 番特別学校での研修（聴覚障害）。 ADRA の特別支援教育関連研修。

2) 防災配慮

概況

防災に関しては 2004 年に設立された NEMA（国家危機管理庁）あるいは UBC については EMDC（UBC 非常事態局）が危機管理の主体となって一元管理する体制であり、基本政策においても実際の活動においても教育機関・教育行政ともに受身の状態にある。地域防災にとって学校施設の果たす役割は大きいと考えられるが、既存建物の多くの耐震性に懸念があるため、NEMA/EMDC では第一に耐震性の評価、確認が必要としている。地震防災については近年災害発生の可能性が広く行きわたるようになり、ようやく具体的な活動が始まった状況である。UBC では地域防災計画の中で避難所や一時避難場所の指定も行われ、これまでに学校のグラウンド等を含む 111 か所が一時避難場所に指定されている。その他、EMDC の指導で各学校で防災責任者（副校長又は高校学習マネージャー）を定めて防災計画の策定が行われ（1 年ごとの見直し）、市区レベルの避難訓練が年 1～2 回学校をベースに実施される等、学校関係者の防災意識は高まっている。学校においてはモンゴル赤十字を始めとする幾つかの NGO が防災教育や安全教育についての活動をおこなっている。

調査対象校における防災配慮に関するヒアリング結果

区	学校名	防災配慮・安全教育等	防災計画	避難訓練
KU	75 番学校	➢ 赤十字が実施している研修に校医と SW が、区の非常事態課が実施している研修に校長と学習マネージャーが参加して、研修内容を子どもたちに教えている。	策定済み	区と合同で年 1 回

		➢ 備蓄品なし。		
CH	57 番学校	➢ グラウンドが市の一時避難場所に指定されている。 ➢ 防火用品は直ぐに使用可能となるよう収納されている。 ➢ 備蓄品なし。	策定済み	区と合同で年 1 回 市と合同で年 1 回
KU	59 番学校	➢ 学校単独の避難訓練は防災チームの教師を中心に年 4 回実施している。	策定済み	区と合同で年 1 回 学校独自年 4 回
BZ	53 番学校	➢ 北側の校庭が市の一時避難場所に指定されている。 ➢ 建物の出入口や階段が狭く、スムースな避難が難しい。	策定済み	年 1 回実施
SO	42 番学校	➢ 校舎の南側の校庭が市の一時避難場所に指定されている。 ➢ USAID(World Vision)による防災教育プログラムの対象校。防災の室を設け、課外活動で防災を取り上げている。 ➢ 廊下には防災に関する掲示がなされている。 ➢ 避難訓練時に配布する備蓄品リストに沿って、職員が個人で備蓄品（非常食、水、懐中電灯、くすり、包帯、トイレットペーパーなど）を準備している。	策定済み	区レベル年 1 回 学校独自年 2 回
KU	118 番学校	➢ 防災の知識を身に着ける教室（兼用）を設け、生徒・地域住民に防災教育を行っている。 ➢ 簡易ﾍﾞｯﾄﾞ、毛布、懐中電灯などの避難ｸﾞｯｽﾞｾｯﾄを地下倉庫で備蓄している。赤十字支援によるもので防災教育にも活用。 ➢ 数量は、簡易ベッドと毛布が各 150 組。懐中電灯などの避難グッズセットが 30 セット。	策定済み	区・赤十字合同で年 1 回・
CH	61 番学校	➢ 地域の学校合同で災害救助コンテストを開催、生徒が参加した。 ➢ 備蓄品なし。	策定済み	区と合同で年 1 回 学校独自年 2 回
NA	109 番学校	➢ 避難訓練時に配布する備蓄品リストに沿って、職員が個人で備蓄品（非常食、水、懐中電灯、くすり、包帯、トイレットペーパーなど）を準備している。	策定済み	区と合同で年 1 回