WJ Job No.	J1727		
Contract	Cannon Lane, Hampstead		
Client	MY Construction		
		Name	**Signature**
Method Statement Briefing given by			
I have been briefed on this Method Statement and understand the contents			
Name	**Signature**	**Name**	**Signature**

WJ Groundwater Ltd
Bournehall House
Bushey
Hertfordshire
WD23 3HP
t+44 (0)20 8950 7256
f+44 (0)20 8950 7959

einfo@wjgl.com
wwww.wjgl.com

WJ Groundwater Ltd
Unit H
Mansfield Road
Clipstone Village
Mansfield
Nottinghamshire
NG21 9AP
t+44 7909 992712

WJ GROUNDWATER LIMITED

Groundwater control
Geotechnical instrumentation
Geothermal systems
Groundwater remediation
Pumping tests
Well drilling

METHOD STATEMENT

Dewatering by Ejectors

Contract Name: Cannon Lane, Hampstead

Client: MY Construction

Job No: J1727

WJ Document Control				
Document Reference No.	Issued on:	Prepared by:	Checked by:	Approved by (Client):
J1727-001 DRAFT	20/06/2011	OV	PJ	
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WJ Groundwater Ltd
Bournehall House
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wwww.wjgl.com

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Nottinghamshire
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t+44 7909 992712

CONTENTS

1. PROJECT OVERVIEW

1.1. Introduction

The main contract works involves construction of a double basement of plan size 18.5 m by 9.5 m to 15.5 m. The existing ground level slopes across the site from 114.5 mOD to 110.0 mOD. The excavation formation level varies from 104.0 mOD to 106.0 mOD, with a local excavation for a sump down to 103.5 mOD. Excavation side support is by secant piles. The male piles will be installed down to 96.0 mOD and the female piles down to 102.0 mOD.

1.2. Site location and Contacts

The site address:

5 Cannon Lane,

Hampstead,

London

NW3 1EL

Site Contact: Charles Mackay (0208 450 5747)

Map showing location of site (Source Google Maps):

The Client's address:

MY Construction,
Unit 5,
Sayer House,
Oxgate Lane,
London.
NW2 7JN

1.3. Scope of Works

The works covered in this method statement are as follows:

- Rotary drilling
- Development by air lifting
- Commissioning of the ejector system

Works procedures and risk assessments for these activities are included in the Appendices.

1.4. Programme

The works are due to commence T.B.C.. It should take a day to drill and install each well, with the drilling being complete T.B.C.. Installation of the dewatering system will occur progressively as the wells are drilled. The installation of the dewatering system will be completed T.B.C.. The system will remain in place as long as required by the Main Contractor. Removal of the system will take 1 week.

1.5. Ground Conditions

The site investigation information provided (MRH Geotechnical, Job No 291110 and the GCG Geotechnical report, Rev. 1 dated 26/10/2010) indicates the following sequence of stratification;

	Top level (mOD) (based on drawing no TM02)	**Top level of stratum (mbgl)**
Topsoil	113.2	0.0
Sand - Bagshot Beds	112.3	0.9
Clay – Bagshot Beds	111.0	2.2
Sand – Bagshot Beds	109.5	3.7
Clay – Claygate Beds	106.5	6.7
Sand – Claygate Beds	101.0	12.2
(Probable) London Clay	98.0	15.2

The groundwater was encountered during drilling within the lower sand layer of the Bagshot Beds at approximately 109.5 mOD. Groundwater monitoring indicates that groundwater is up to 108.13 mOD (5.07 m depth). It is anticipated that water will be present in the sand layer of the Claygate Beds.

The in situ (horizontal) mass permeability of the lower part of the Bagshot Beds sand (between 5 m and 6.6 m depth) was found to be about 3 x 10^{-7} m/sec.

The site is bordered by Cannon Lane to the North and West and by residential properties to the Southeast and East. External installation is not possible along the adjoining residential properties.

1.6. Dewatering Outline

In order to control groundwater levels and pore pressures in the Bagshot and Claygate Beds we propose the installation of an array of inclined ejector wells which will provide vacuum assisted drainage and a ring of internal passive wells which will form a part of the permanent drainage system as follows:

	Ejector Wells	Passive Wells	Piezometers
No. of wells	Up to 20 No.	Up to 10 No.	2 No. Double Installation
Well location	External	Internal	External
Borehole Depth	~114.0 to 97.0 mOD (up to 17 m depth, 1 m into top of clay)	~113.0 to 97.0 mOD (up to 16 m depth, 1 m into top of clay)	~114.0 to 97.0 mOD (up to 17 m depth, 1 m into top of clay)
Bore size	200 mm nominal	200 mm nominal	200 mm nominal
Bore Method	Rotary / Cable Percussion	Rotary / Cable Percussion	Cable Percussion
Incline	Up to 7 degrees off vertical	Vertical	Vertical
Liner size	113 mm lined with 60 mm liner	113 mm lined with 60 mm liner	Up to 50 mm
Filter / Response Zone	110.5 to 97.0 mOD	110.5 to 97.0 mOD	110.5 to 105.5 mOD and 102 to 97.0 mOD
Slotted Screen	109.5 to 98.0 mOD	109.5 to 98.0 mOD	109.5 to 106.5 mOD and 101.0 to 98.0 mOD
Bentonite Seal	112.5 to 110.5	112.5 to 110.5	112.5 to 110.5 mOD and 105.5 to 102.0 mOD

The layout of the well and piezometer array is shown in Drawing J1727-001 and 002. The Installations details for the wells and piezometers are shown in Drawing J1727-003.

It is proposed that the ejector wells shall be installed around the perimeter of the proposed excavation. The base of the wells shall be inclined away from the secant piled walls up to an angle of 7 degrees from vertical. The top of the wells will be as close as possible to the proposed capping beam and the supply and return mains will run along the edge of the pile caps.

The dewatering will aim to maintain the following groundwater levels during the temporary works:

- External groundwater levels at or below 106.0 mOD; and
- Internal groundwater levels at or below formation level which varies between 104.0 mOD and 106.0 mOD.

It is understood that any 'perched' water will not present a problem to the structural integrity of the piles. It is anticipated that any perched or residual water shall be controlled by the Main Contractor using conventional sump pumping techniques.

1.7. Monitoring System

A data logger system will be installed. It will monitor the following parameters:

- Water level in 2 No piezometers
- Discharge flow
- System pressure
- Pump operation

Once the system has been commissioned, trigger values will be set for the above parameters. These will be used to set alarms which will contact nominated personnel if these values are exceeded.

In addition to the data logger system a WJ site operator shall attend site once a week to monitor groundwater levels on site. Assuming that access is available this will include a minimum of 2 No. internal wells next to the neighbouring property (4 Cannon Lane) and 2 No. internal wells on the western section of the basement.

Groundwater monitoring data shall be collated and reported in a factual email report that will be emailed to the Main Contractor on a weekly basis.

1.8. Personnel

The following WJ personnel will be involved in this project:

	Position	**Name**
Drilling phase	Drilling & Operations Manager (part time on site)	TBC
	Project Manager (part time on site)	Paul Judge
	Health & Safety Advisor	Steve Cooke
	Lead Driller	TBC
	Second Man	TBC
Commissioning Phase	Project Manager (part time on site)	Paul Judge
	Operatives	TBC
	Monitoring Technician	Paul Beacham
Running phase	Site Operator – Call out only	TBC

1.9. Health, Safety and the Environment

All operatives will attend the site induction before commencing work.

All operatives will have appropriate training, experience and CSCS/CPCS cards.

All equipment (such as drilling rigs, rough terrain forklifts etc) will be certified and tested as appropriate. All operatives will hold CPCS cards for the plant being operated.

The WJ Project Manager will be responsible for giving a method statement briefing to WJ operatives before commencing work. A copy of this briefing record will be given to the Main Contractor.

Before any drilling or excavation work takes place a relevant, up to date permit to dig must be issued by the Main Contractor and all personnel involved in the operation must sign it to state they have been briefed and understand its contents.

All WJ equipment will be delivered on a flatbed vehicle, packaged on or fitted with forklift lifting points and unloaded from delivery vehicles by a 3t rough terrain forklift. Some equipment may be offloaded with a Hi-Ab. The Hi-Ab driver carries a generic lift plan which covers the use of the Hi-Ab.

All operatives have received manual handling training.

It is not anticipated that contaminated ground will be a problem on this site. However, if the drillers encounter anything that may be contaminated whilst drilling, they will stop work and inform the project team.

A copy of the Main Contractor Emergency Procedures will be attached to the RAMS.

The Main Contractor will be responsible for providing shared welfare facilities.

In the event of an emergency, the nearest Accident and Emergency Hospital is as follows:

Local A&E address and contact details:

Royal Free Hospital,

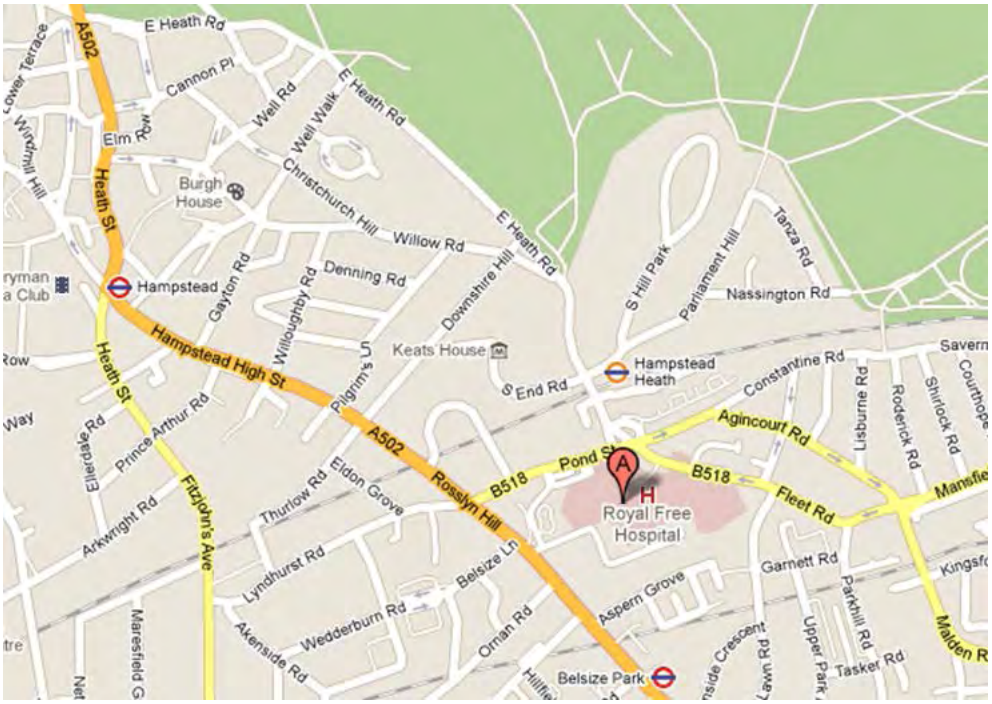
Pond Street

London

NW3 2QS

Tel: 02077940500

Map showing location of Royal Free Hospital (Source Google Maps):



Environmental protection measures include:

Use the most acoustically silenced diesel plant available

Control water generated during installation activities to avoid contaminating water courses

Use self bunded static diesel pumps

Ensure discharge water is clean and free of suspended solids

1.10. Attendances Required from Main Contractor

It has been agreed that the following attendances will be provided free of charge by the Main Contractor:

Item	Description
1.	Permissions, permits and consents for abstraction and discharge of groundwater.
2.	Cranage; loading/unloading; movement of equipment and installation/removal of pumps and pipework. Access to pump locations.
3.	Setting out of borehole locations, provide as-built coordinates and reduced levels. Provide levels of wells at each stage of construction to enable water levels to be calculated.
4.	Breaking out of hard superficial layers at well locations.
5.	Site to be secure with access for installation plant and dewatering equipment; adequate headroom; surface conditions for wheeled vehicles; and flat stable area at each well location. A suitable secure lay down area will be required for temporary storage of materials prior to installation. A piling platform suitable for a 12 tonne drilling rig shall be provided across site including all well locations.
6.	Diesel fuel and lubricating oil for generators, diesel dewatering pumps and installation plant. All equipment and plant supplied with fuel to be returned with fuel.

7. Clean water supply for installation/jetting (hydrant supply at mains pressure) to within 50 m of each well location.

8. Provide appropriate flat stable areas (including access) for our control cabins, plant and materials. For environmental protection a lined area is required for diesel pumps, generators and diesel fuel tanks. Rates for the provision of drip trays for diesel plant for short term use are given in our quotation. The Main Contractor will be responsible for emptying and cleaning bunded areas and drip trays.

9. Provide support, ducting and/or protection for pipework and power cables as necessary (i.e. at access points and around cofferdams).

10. Provide drainage channels, sumps and pumps for the control of all overbleed and surface water at the site, including water discharged during drilling and development operations.

11. Carry out reinstatement work on completion of the dewatering works, including backfilling or plugging holes at each well location.

12. Provide shared welfare facilities and other services as necessary to maintain safe working environment in accordance with current Health and Safety legislation.

13. Provide and connect duty and standby electric power (3 phase, 415 v, 3P+N+E) to each electrical control unit/pumping station (2 No. locations) including provision of appropriate test certification for the supply and connection. Distribution from control unit to pumps by WJ (22 kW pump, 43 amps running, 103 amps start up).

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2. DRAWINGS AND FIGURES

Drawing J1727/001 – Plan View of Site (with indicative well locations)

Drawing J1727/002 – Cross Section of Site (with indicative well installations)

Drawing J1727/--3 – Installation details

3. WORKS PROCEDURE FOR ROTARY DRILLING

3.1. Introduction

This document describes the works procedure for the drilling techniques utilised when installing deepwells, ejector wells or other boreholes by rotary drilling methods in accordance with WJ Groundwater Limited (WJGL) standard procedures.

Rotary Drilling Rig

3.2. Equipment

Drilling Equipment

- Hydraulic rotary drilling rig (Soilmec 400 or similar)
- Diesel powered mud flushing pump (Selwood 80AH or similar)
- Diesel powered mud recirculation pump (Selwood 100SH or similar)
- High pressure hoses (50 mm dia. armoured rubber flexibles c/w BSP type connectors)
- Low pressure hoses (100 mm dia. armoured rubber flexibles c/w bauer type connectors)
- Mud recirculation tanks (up to 9 m3 capacity)
- Drilling rods 3 m long, 90 mm dia. (3.5 reg API)
- Temporary casings up to 300 mm dia., 1 m long
- Rod and casing stillages and trestles

- Soft formation drill bits (drag bits, rock roller)
- Tools (heavy duty Stilson wrenches, chain wrenches)
- Bio-degradable drilling polymer
- Drilling zone marker tape, warning signs

Support Equipment

- Transit van (containing tools, spares, PPE, first aid kit, fire extinguisher)
- JCB 926 3.5 t capacity rough terrain forklift (or similar)

Well Installation Materials

- Upvc wellscreen and casing (up to 200 mm dia., 5 m long, 40 kg approx)
- Filter gravel in 1 tonne bulk bags
- Bentonite pellets in 40 kg bags

3.3. Personnel

- Drill Rig Operator ('Foreman Driller') will drive the rig and RTFL; holds current CPCS cards for both pieces of plant.
- Drill Rig Assistant ('2nd Man'), will also drive the RTFL and holds a current CPCS card

3.4. Safety Procedures

Personal Protective Equipment

- Hard hat
- Hi vis waistcoat or jacket
- Suitable gloves (e.g. pvc)
- Steel toe capped boots
- Overalls
- Safety glasses
- Waterproof over trousers (optional)
- In hot weather minimum tee shirt and long trousers – no shorts

Safety Documentation to be carried

- Drill rig Certificate of Thorough Examination
- Winch rope certificate
- Certification for other lifting equipment (shackles etc)
- Operators certification

- Weekly Plant Inspection checklist
- Copies site specific Risk Assessment and Procedures (Method Statement)
- Rig set up layout drawing

Safety Equipment

- High pressure hose whip inhibitors
- Fire extinguishers
- First Aid kit
- Eye wash kit

Drilling Safety Procedures

- Carry out Method Statement induction at start of each project and frequent tool box talks
- Foreman Driller to carry out daily site inspections – review every set up prior to commencing drilling
- Set rig up on flat, stable ground
- Access to the rotating drill string is restricted by the interlocked cage.
- Use plant to lift heavy items (drill rods, casings). Take extra care when guiding rods into position
- When using rig as a crane, ensure exclusion zone extends to cover the area of the lift
- The mast will be lowered for servicing if required.

3.5. Transport

Transport of rig and equipment to / from site

- Rig to be carried on appropriate vehicle
- Rig to be loaded by authorised personnel
- Rig to be securely restrained on vehicle by suitably qualified person
- Rig to be cleaned prior to transportation to remove excess spoil / gravel
- Plant delivered by Hiab vehicle to be unloaded only by authorised personnel, trained, competent banksman must be used
- Ensure surfaces suitable for heavy vehicles
- When tracking rig use trained, competent banksman

Access to drilling locations

Typical Site Layout

Site preparation carried out by main contractor / client:

- Flat, stable, free of trip hazards area 5 m x 14 m at each well location
- Ensure each location is free of buried services,
- Set out the location of each well,
- Provide suitable clear firm unobstructed drive on access for the rig and RTFL (piling platform suitable for a 12 tonne drilling rig)
- Adequate headroom for the drilling rig (9 m)
- Remove/breakout all tarmac, concrete and other hard superficial layers
- A permit to dig will be issued by the Main Contractor prior to drilling.
- Stack casings / rods in suitable, secure trestles or racks.
- Provide suitable boarding or temporary road surface for tracking over at and between locations to minimise damage to road surface by drilling rig's metal tracks.

3.6. Drilling

Water supply and spoil disposal

- Main Contractor to provide hydrant (or similar) within 50 m of the drilling location
- Main Contractor shall arrange for this supply including obtaining any permissions or permits, hydrant standpipes or keys required
- The recirculation tanks will be filled with clean water or polymer and arranged in a weir formation. Main contractor to provide suitable covers (ply, heras type fencing) to cover tanks at end of shift

- The pumps and tanks to be set up to allow ease of access to empty the tanks by a vacuum tanker
- Hoses are to be laid to avoid intrusion into drilling exclusion zone

Set up of drill rig

- The drill rig will be located over the marked well location
- Use stabilisers and hydraulic jacks as required.
- The driller will be instructed on the required depth of drilling for the well and given an indication on the levels of the main strata to be drilled through based on details from the nearest site investigation borehole log available.
- Once the drilling rig is sited on the well location, a starter length of temporary drill casing will be drilled into the ground until a suitable seal is formed around the base.
- A sump hole approx 0.5 m x 0.5 m x 0.5 m deep will be excavated adjacent to the well location. The suction of the sludge pump will be placed here

Drilling

- Boring commences through the starter casing with the flushing medium being pumped down the drill rods. Borehole arisings mixed with the flushing medium rises over the starter casing and is pumped to the tanks with the sludge pump. The arisings are settled out in the tanks. Clean mud is picked up by the flushing pump and is recirculated down the borehole. Additional mud is added as required. Should additional borehole support be required temporary casing will be installed.
- If there is any evidence of contaminated material (odours, oils, waste material) drilling will stop and Supervisor contacted
- Drilling will be carried out by direct circulation methods using tricone or drag bits. Rods are added as depth increases.
- As each rod is added the pressure in the rods is allowed to dissipate before breaking the joint.
- Rods and casings are threaded together using (if available) hydraulic clamp and breaker. Final tightening will be with manual rod spanner**. Extra care is required when connecting rods - ensure slow rotation.** At all times the Driller and 2nd Man will remain in visual contact.
- The arisings will be monitored to give an indication of the strata encountered.
- On reaching total depth the well is flushed with clean water or polymer. The drill rods are then removed from the well and installation of the wellscreen and gravel pack commences.

3.7. Installation of Well Materials

- The strata encountered will be recorded on the borehole record sheet. The driller will advise his Supervisor if the strata encountered is different from that expected and the installation specification amended if required.
- A bottom plug will be attached to the lower screen length to be installed.

- The wellscreen and casing will then be installed as the well installation section drawing. The auxiliary winch will lift and lower the screen and casing and the sections threaded together. The filter gravel/sand will then be introduced by gravity feed down the outer annulus – if utilising bulk bags the rig lifts the bulk bag over the location, or 25 kg sacks may be manually poured.
- Regular dips of the amount of gravel/sand fed will be taken to ensure bridging is not occurring.
- Following completion of filter gravel placement the bentonite seal (if specified) will be placed in the remaining annulus.
- Any temporary casing will be removed by rotation and lifted out with the auxiliary winch.

3.8. Development of Wells

Following well drilling and installation of the well liner and gravel/sand well development procedures will commence.

- A weighted airline will be fed into the well to close to the base. This will be connected to a 250 cfm compressor.
- The well will then be pumped on by airlift for a minimum period of 1 hour or until the discharge water is free of drilling mud and/or fines. The air line will then be lifted in 2.5 m intervals and pumped on for at least 15 minutes at each level to the top of the screened section of the well.
- Well development will be continued for a minimum of two hours, with the airline being raised at intervals over the screened section of the well and alternatively surged and pumped at half hour intervals. Development will only cease when fines removal is negligible.

3.9. Completion

- A temporary top cap will be fitted to the well liner. The well liner will be left approximately 250 mm proud of the surrounding ground. Road pins and bunting will be placed around the completed well to identify it.
- Any open sumps, well annulus or pits adjacent to the well will be backfilled with temporary material, packaging material tidied away.
- Dismantle drilling exclusion zone
- The rig will then move off
- Any permanent reinstatement works shall be undertaken by the main contractor / client.

4. HAZARD & RISK ASSESSMENT FOR ROTARY DRILLING

Contract: **Cannon Lane, Hampstead**

Client: **MY Construction**

To evaluate risk: **Likelihood (Lk) × Severity (Sv) = Risk (R)**

Defined as High (11 - 25), Medium (6 - 10) or Low (1 - 5)

L = Likelihood		S = Severity			
1 Very Unlikely 2 Unlikely 3 Likely 4 Very Likely 5 Certain		1 Minor Injury 2 Lost Time Injury 3 Major Injury 4 Single Fatality 5 Multiply Fatalities			
Assessed by:		Checked by:		Date:	

Activity/ Element	Potential Hazards	Population at Risk	Risk Rating			Control Measures Specified	Residual Risk		
Attending Site	Traffic Interface	Operatives/ Public	3	5	15	• The Main Contractor will provide appropriate traffic management during the works especially at mobilisation and demobilisation stages. • WJ operatives to comply with the Main Contractor traffic management plan. • WJ operatives to be extra vigilant when moving into and out of the site.	1	5	5
General	General site works	Operatives	3	3	9	• Attend site safety induction by the Main Contractor & method statement briefing to be given by WJ Manager. • Comply with site rules and WJ safety policy. • Wear high visibility long sleeved coat/waistcoat and high visibility trousers and PPE • Carry out regular tool box talks for specific tasks. Copies of the signed briefing record will be given to the Main Contractor. • Maintain exclusion zone around working area. • Do not permit public to enter site compound.	1	3	3
General	Plant and equipment	Operatives	3	4	12	• All plant and equipment to be suitably serviced and maintained by competent fitters. • Check all plant certification. • Inspect equipment at the start of each shift. • Secure equipment in the pond area at the end of each shift.	1	4	4

Activity/ Element	Potential Hazards	Population at Risk	Risk Rating			Control Measures Specified	Residual Risk		
General	Trips, Slips and Falls	Operatives	3	3	9	• Keep work area tidy. • Route hoses to minimise trip hazard • Check stability of ground around well head and ask for it to be levelled or backfilled as necessary.	1	3	3
Loading and off loading of equipment	Lifting gear & loads	Operatives	3	4	12	• Check slings, ropes and shackles for damage and capacity (certificates should be available for scrutiny). • Only competent plant operators to use lifting devices. • Slung loads to be secure and balanced, use guide ropes, use hard standing for reception. • Keep clear of slung loads, keep hands away from loads especially at point of landing. • Wear suitable PPE. • Use trained, competent banksman. • Maintain communication between banksman and driver. • Operatives to police the working area and to be aware of movements of public at all times.	1	4	4
Drilling and Installation	Noise	Operatives	5	3	15	• Use ear defenders when running pumps, compressor or rig. • Switch off plant not being used.	2	3	6
Drilling and Installation	Overhead Cables	Operatives	2	5	10	• Ensure rig is clear of HV cables			

Activity/ Element	Potential Hazards	Population at Risk	Risk Rating			Control Measures Specified	Residual Risk		
Drilling	Crushing, trapping, nipping	Operatives	3	3	9	• Operator and Assistant to be trained and qualified • Maintain verbal and visual contact at all times during drilling • Avoid contact with any moving drill parts e.g. casings whilst being knocked in • Use correct manual handling techniques • Use appropriate hand protection	3	2	5
Installing risers	Muscular skeletal injury	Operatives	4	2	8	• Operatives to be trained in manual handling techniques. Copies of training records to be given to the Main Contractor. • Lift only one riser at a time. • Use mechanical lifting gear if possible.	2	2	4
Lay out equipment	Muscular-skeletal injury	Operatives	4	2	8	• Wear suitable PPE. • Tie loose clothing, employ correct lifting techniques and obtain assistance with loads if required. • Use mechanical lifting gear if possible.	2	2	4
Re-fuelling	Diesel fuel	Operatives	3	3	9	• Avoid contact with diesel fuel and wash hands in clean water with soap, use barrier cream prior to commencing work. • No refuelling to take place adjacent to waterways. • Use bunded tanks and drip trays. • Contain any spills immediately using bunds and sand.	1	3	3

Activity/ Element	Potential Hazards	Population at Risk	Risk Rating			Control Measures Specified	Residual Risk		
Re-fuelling	Diesel fuel	Environment	3	2	6	• Refuelling to be performed by trained operatives • Use bunded tanks and drip trays. • Contain any spills immediately using bunds and sand. • Fuel provider to make spill kits available	1	2	2
Maintenance	Trip hazards & holes in ground	Operatives Visitors	4	3	12	• Keep site in a clean and tidy state. • Remove unwanted or unused items as soon as possible. • Do not go on site during the hours of darkness unless adequate lighting available and only if accompanied by another person. • Backfill drilled holes to ground level. • Route any water hoses and pipes in order to minimise crossing of access and egress routes.	3	3	9

Activity/ Element	Potential Hazards	Population at Risk	Risk Rating			Control Measures Specified	Residual Risk		
Soil and Groundwater	Chemical contamination	Operatives	1	3	3	• Contamination not anticipated on this site. If encountered drillers will stop work and notify project team. • Main Contractor will advise of further requirement once nature of any contamination has been established. • Where required ensure that monitoring and observations are made and reported. • Do not wash with groundwater. • Wear standard PPE. • Wash with clean water and soap before eating, drinking or smoking. • Cover cuts and abrasions with waterproof plasters/dressings. • Notify supervisor if any of the following symptoms; nausea, dizziness, headaches or drowsiness are experienced.	1	2	2
Groundwater	Weils disease	Operatives	2	4	8	• Do not wash with groundwater. Use welfare facilities provided • Wear appropriate gloves, wash in clean water with soap before eating, drinking or smoking. • Cover cuts and abrasions with waterproof plasters/dressings. • Notify GP if flu-like symptoms occur.	1	4	4
Environment	Contamination of groundwater or water courses	Wildlife	2	2	4	• Control water generated during installation • Use only self bunded static wellpoint pumps • Avoid spillage during refuelling – install pumps accessible by mechanical plant	1	2	2

5. PROCEDURE FOR COMMISSIONING OF EJECTOR SYSTEM

5.1. Introduction

This document describes the works procedure for the commissioning of the ejector well dewatering system in accordance with WJ Groundwater Limited (WJGL) standard procedures.

A pumped ejector system is to be installed at this site. The system specification is outlined below:

No. of wells:	Up to 20 no. ejector wells
Well depth:	Up to 17 m bgl
Liner diameter:	60 mm outer and 52 mm internal diameter
Supply pumps:	2 no. 22 kW units

5.2. Equipment

Well Equipment (1 no. set per ejector well)

- 1 No. ejector body c/w nozzle and venturi
- uPVC return riser pipe
- Ejector headworks
- Supply swing connection
- Return swing connection

Ejector Pumping Station Equipment

- High pressure supply pumps c/w control valves
- Recirculation tank
- Distribution manifold

Electrical Control Equipment and Power Supply

MAC cabin (electrical control cabin) to contain

- Changeover switches
- RCD trips
- Pump control units
- Power Alarm Units (PAU)
- Audio-visual and radio-pager alarm accessories
- Standby generator power supply

Distribution Pipework

- 150 mm diameter rigid supply header main c/w supply take offs and valves

- 150 mm diameter rigid return header main c/w return take offs and valves

Monitoring Equipment

- Dipmeter
- Steel rule (metric)
- Alarm pager unit

5.3. Personnel

- Dewatering Supervisor
- Dewatering Electrician - as required
- Up to 2 no. labourers

5.4. Installation and Development of the Wells

The installation and development of the ejector wells has been described above in this document.

5.5. Installation of Ejector Well Equipment

The ejector body will be attached to the return riser and lowered down each well. When the ejector is at the required depth the riser will be cut off above ground level and the ejector headworks fitted. Supply and return flexible swing connections will be attached to the headworks.

The ejectors will generally be lowered into the wells by hand. If the ejectors need to be removed for maintenance or other reasons they may need to be removed with the assistance of a crane, excavator or other suitable lifting equipment provided by the Main Contractor.

5.6. Connection of Supply and Return Pipework

Rigid 150 mm diameter pipework will be laid to form a supply header main (feeding high pressure water from the ejector station to each well) and a return header main (carrying low pressure water from the wells back to the ejector station). Valved take offs on each main will be connected to the supply and return swings from each well. The Main Contractor will provide and install adequate ducting where they require the headermains to be buried for access purposes. This is anticipated to be initially along the edge of the pile caps.

5.7. Assembly of Ejector Pumping Station

The ejector pumping station, each consist of duty and standby supply pumps, manifold, recirculation tank and MAC cabin with pump controls, will be located at agreed locations adjacent to the header mains. If generators are used for power supply these are to be located adjacent to the MAC cabin. The pumps and tanks will be connected into the header mains. The Main Contractor is to provide a flat stable area for the pumping station. A bunded area is to be

provided for generators and fuel tanks to contain any minor fuel spillages. A gravity flow discharge pipe will be laid from each station to the agreed discharge point. The recirculation tank will normally be arranged so the discharge passes over a V-notch weir.

5.8. Electrical Connection of the System

The electrical controls and protection for the pumping system will be located in the MAC cabin(s). The WJGL Electrician will connect the changeover switch in each MAC cabin to the Main Contractor's power supply or generators.

5.9. Testing and Monitoring of Ejector Wells

The system will be primed with clean water (provided by the Main Contractor) and the supply pumps started and adjusted to operate at a suitable supply pressure. The initial system will be pumped on a continuous basis with flowrates monitored in the V-notch tanks (Calibration chart for V-notch weirs given as Figure 2) and water levels monitored in selected wells and piezometers. The results of the monitoring will be examined to confirm that the installed system will achieve the target drawdown. The monitoring results will be recorded on a data sheet as shown in Figure 3.

At specified intervals groundwater samples will be recovered from the V-notch tank and standpipe piezometers for laboratory testing. The precise sampling period, locations and determinands to be tested will be agreed with the Main Contractor.

At a convenient point during the commissioning period a switch-off test will be carried out to estimate the rate of recovery of piezometric levels. This will involve switching the well system off for a period of up to a few hours and monitoring groundwater levels in the wells and piezometers. The alarm unit will be tested for correct functioning and to ensure that the radio pager unit is receiving adequate signal strength. Knowledge of the rate of recovery is important to allow confirmation that the proposed back-up and standby facilities are adequate.

5.10. Handover to Running Period

Once the commissioning period is complete the dewatering system will be monitored by the Main Contractor's site staff or, if requested, by a WJGL resident site operator.

The nominated person must carry out DAILY ESSENTIAL MAINTENANCE. This involves:

- Checking the supply pressure is maintained
- Recording well and piezometer drawdowns on the sheet provided (daily)
- Recording pumped flowrate (at V-notch) on the sheet provided (daily)
- Ensuring discharge lines and tanks do not become blocked or damaged
- Test running standby pumps and generators periodically

6. DATA SHEETS

Driller's Record Sheet

Dewatering Record Sheet

COSHH Sheet – Diesel

COSHH Sheet – Bentonite

COSHH Sheet – Filter Sand

Tool Box Talk Form

COSHH ASSESSMENT

Product Name	Diesel	COSHH #	9
Description of Substance	Straw/red coloured liquid	Assessed by	PR
Composition	Mixture of hydrocarbons in C10-C28 range witch improver additives	Date	Oct 2009
Task/Activity	Refuelling of plant	Risk Phrases	R40,R65,R66,R51/53
		Safety Phrases	S2,S43,S45,S36/37S61
Suppliers Details	Crown Oil/Total/Team Flitwick/Husk Oil	Telephone #	1923 694 000
		MSDS Attached	No

SUBSTANCE PROPERTIES							
							
Flammable	Oxidising	Explosive	Harmful	Toxic	Irritant	Dangerous to Environment	Corrosive
Yes/~~No~~	~~Yes~~/No	~~Yes~~/No	Yes/~~No~~	~~Yes~~/No	Yes/~~No~~	Yes/~~No~~	~~Yes~~/No

ROUTE OF EXPOSURE					
Skin	M	Eyes	L	Inhalation	L
Ingestion	L	Cuts/ Abrasions	M	Injection	M

PERSONS AT RISK					
Users of Product	Y	Members of Public	N	Visitors	N
Other Workers	Y	Young Persons	N		

PPE REQUIREMENTS							
						Other:	Other:
Gloves (Nitrile or similar)	Face Shield	Goggles	Apron/ Overalls	Dust Mask	Respirator		
Yes/~~No~~	~~Yes~~/No	Yes/~~No~~	Yes/~~No~~	~~Yes~~/No	~~Yes~~/No	Yes/No	Yes/No

ADDITIONAL CONTROL MEASURES	
General Precautions	Control Measures
Prolonged/repeated skin exposure to diesel will cause dryness and dermatitis.	Maintain good hygiene facilities Use specified PPE.
First Aid/Hygiene Arrangements	Fire Precautions
Inhalation: Remove casualty to fresh air. Get medical advice if symptoms continue. Skin: Wash skin thoroughly. Remove contaminated clothing. If injected under skin get medical advice URGENTLY. Eye: Wash eye with copious amounts of water. Seek medical advice if irritation continues. Ingestion: Wash mouth with water and give water to drink. If large amount, seek medical attention. DO NOT INDUCE VOMITING	Use dry powder, foam or water fog. Small fires – CO2 DO NOT USE WATER JETS Fires in enclosed spaces should only be tackled by trained personnel using SCBA.
LEV Requirements (Local Exhaust & Ventilation)	Monitoring Requirements
Use in well ventilated area. Avoid low spots where fumes/vapour could accumulate.	
Transport Arrangements	Storage Requirements
Hazchem code 3/Z Symbol: Flammable Liquid UN ID #: 1202	Store in approved bunded tanks as per BSI, IoP and HSE guidance.
Spillage Procedures	Disposal Requirements
Treat as a fire hazard. Prevent spillage entering watercourse or drainage system. May cause surfaces to become slippery Absorb onto absorbent clay or clean up using dedicated spill kits	Dispose of via incineration or methods approved by Local Authority. DO NOT discharge to water courses or public drainage system
Comments	

COSHH ASSESSMENT

Product Name	Bentonite Powder	COSHH #	38
Description of Substance	Creamy, free flowing powder	Assessed by	
Composition	Clay mix with sodium carbonate, calcium montmorillonite clay and magnetite	Date	August 2010
Task/Activity	A bentonite sealant for creating impermeable seal in completed boreholes.	Risk Phrases	
		Safety Phrases	
Suppliers Details	Geothermal Supplies Ltd, 92a Wheat St, Nuneaton, Warwickshire, CV11 4BH	Telephone #	024 7632 8900
		MSDS Attached	No

SUBSTANCE PROPERTIES							
							
Flammable	Oxidising	Explosive	Harmful	Toxic	Irritant	Dangerous to Environment	Corrosive
~~Yes~~/No	~~Yes~~/No	~~Yes~~/No	~~Yes~~/No	~~Yes~~/No	~~Yes~~/No	~~Yes~~/No	~~Yes~~/No

ROUTE OF EXPOSURE					
Skin	L	Eyes	L	Inhalation	L
Ingestion	L	Cuts/ Abrasions	L	Injection	L

PERSONS AT RISK					
Users of Product	Y	Members of Public	N	Visitors	N
Other Workers	Y	Young Persons	N		

PPE REQUIREMENTS							
						Other:	Other:
Gloves	Face Shield	Goggles	Apron/ Overalls	Dust Mask	Respirator		
Yes/~~No~~	~~Yes~~/No	Yes/~~No~~	Yes/~~No~~	~~Yes~~/No	~~Yes~~/No	Yes/No	Yes/No

ADDITIONAL CONTROL MEASURES	
General Precautions	Control Measures
Dust may cause an irritation.	Maintain good hygiene procedures. Wear correct PPE
First Aid/Hygiene Arrangements	Fire Precautions
Inhalation: Remove casualty to fresh air. Perform artificial respiration if breathing stopped. Get immediate medical aid Skin: Remove contaminated clothing, wash skin. Eye: Flush eye with copious amounts of clean water. Ingestion: Seek medical attention.	Material is non combustible. Select fire-fighting media appropriate for surrounding materials.
LEV Requirements (Local Exhaust & Ventilation)	Monitoring Requirements
No special requirements.	No special requirements under normal usage. Follow doctors advice following abnormal exposure.
Transport Arrangements	Storage Requirements
Not classified for transport.	Store in original packaging. Store in a dry cool environment. Prevent contact with water.
Spillage Procedures	Disposal Requirements
Sweep spilt product into a pile. Keep dust production to a minimum. May be re-used if uncontaminated.	Maybe disposed of as a solid non-hazardous waste.
Comments	

COSHH ASSESSMENT

Product Name	Silica Sand (All Grades)	COSHH #	5
Description of Substance	Orange granular sand sized particles	Assessed by	PR
Composition	Various minerals grains	Date	11/09/09
Task/Activity	Backfill of boreholes and use in filter vessels	Risk Phrases	R36, R37, R38
		Safety Phrases	S22, S36, S37
Suppliers Details	Universal Minerals Ltd 14a Middlewich Road Industrial Estate Middlewich Cheshire CW10 9NX	Telephone #	01606 834 723
		MSDS Attached	

SUBSTANCE PROPERTIES							
							
Flammable	Oxidising	Explosive	Harmful	Toxic	Irritant	Dangerous to Environment	Corrosive
~~Yes~~/No	~~Yes~~/No	~~Yes~~/No	Yes/~~No~~	~~Yes~~/No	Yes/~~No~~	~~Yes~~/No	~~Yes~~/No

ROUTE OF EXPOSURE					
Skin	M	Eyes	M	Inhalation	M
Ingestion	L	Cuts/ Abrasions	L	Injection	L

PERSONS AT RISK					
Users of Product	Y	Members of Public	N	Visitors	N
Other Workers	Y	Young Persons	N		

PPE REQUIREMENTS							
						Other:	Other:
Gloves	Face Shield	Goggles	Apron/ Overalls	Dust Mask	Respirator		
Yes/~~No~~	~~Yes~~/No	Yes/~~No~~	Yes/~~No~~	~~Yes~~/No	~~Yes~~/No	Yes/No	Yes/No

ADDITIONAL CONTROL MEASURES	
General Precautions	Control Measures
Long term exposure to crystalline silica may cause silicosis in the lungs. Contact with the skin, eyes, mucous membranes may cause irritation by abrasion.	Use PPE as specified above. Minimise dust creation. Use mechanical lifting where possible
First Aid/Hygiene Arrangements	Fire Precautions
Inhalation: Remove casualty from area. Seek medical advice if irritation continues. Skin: Remove contaminated clothing and wash area with soap and water Eye: Flush eye with clean water, Ingestion: Give casualty water, seek medical advice	Material is non-flammable. Select media to fight surrounding material. Wear self contained BA and full protection.
LEV Requirements (Local Exhaust & Ventilation)	Monitoring Requirements
Use in well ventilated area.	None required during routine use.
Transport Arrangements	Storage Requirements
Classified as not dangerous for transport.	Store in dry, well ventilated area.
Spillage Procedures	Disposal Requirements
Sweep up spillage. Material may still be used if not contaminated by soil or other materials	In accordance with local regulations
Comments	

KEY

E01 Ejector well

P01 Passive well

M01 Monitoring well

Supply main

Return main

standby generator

duty generator

Midi MAC cabin

Bunded fuel cube

2 No. Ejector pumps

V-notch tank

To discharge point (tank to be above discharge point as gravity fed)

E19

E20

E18

E17

E16

M02

E15

E14

E13

E01

E02

E03

E04

E05

E06

E07

M01

E08

E09

E10

E11

E12

P01

P02

P03

P04

P05

P06

P07

P08

P09

P10

Contingency wells

SSL: 110.065

200thk RC floor slab

275thk RC floor slab

108.565 TPC

Service Void

SSL: 110.140

SITE ENTRANCE

Wells installed at edge of entrance to be inclined towards each other

High pressure armored hose and connectors to be used where pipework to be buried

Well location and installation details are indicative only. Main contractor to set out locations.

Project: Cannon Lane, Hampstead		
Title: Plan View		
Drawing No: J1727/001	Rev: 2	By: OV
Scale: 1:100@A3	Date: 03/05/2012	Chk: PJ

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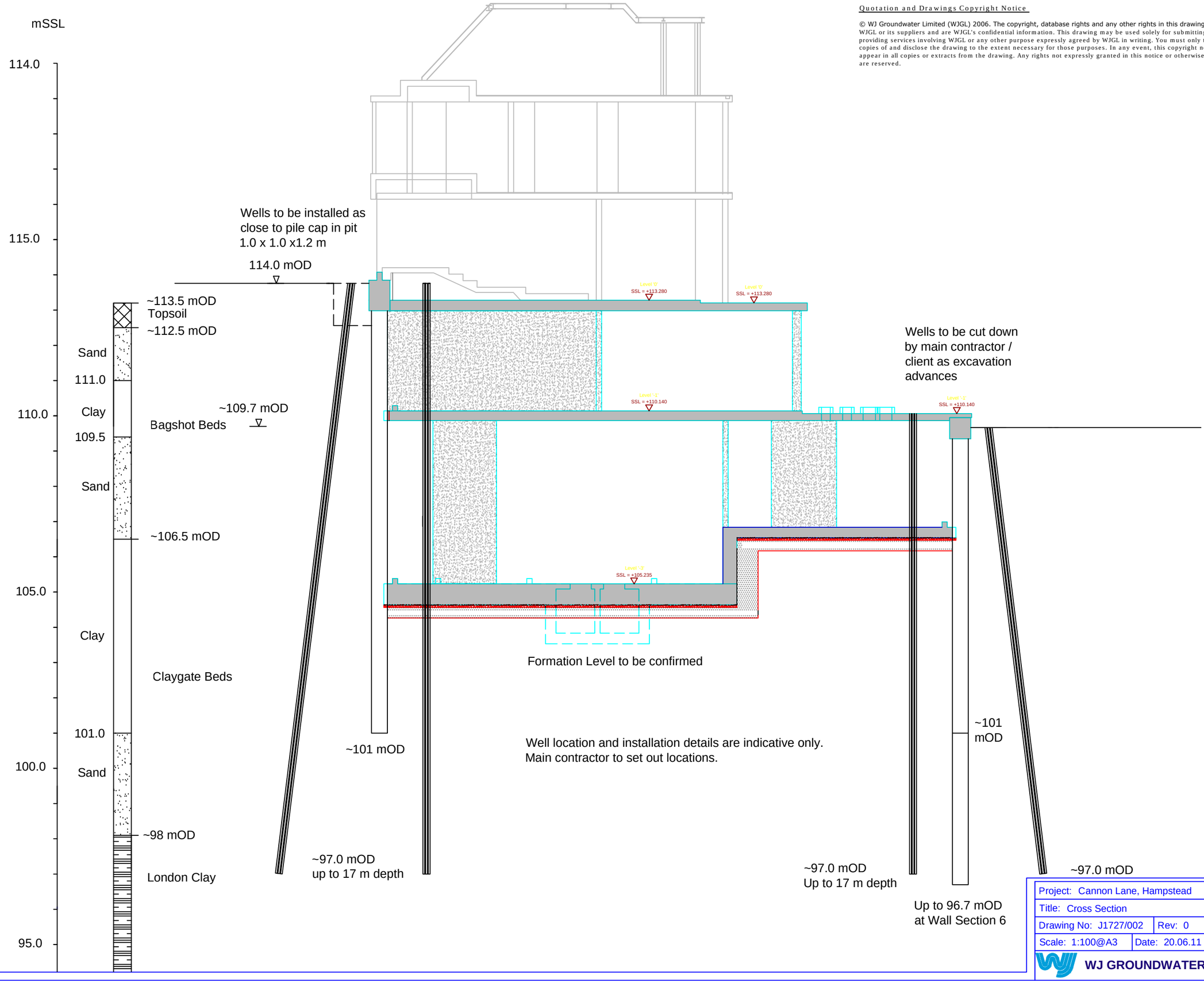

Project: Cannon Lane, Hampstead			
Title: Cross Section			
Drawing No: J1727/002	Rev: 0	By: OV	
Scale: 1:100@A3	Date: 20.06.11	Chk: PJ	

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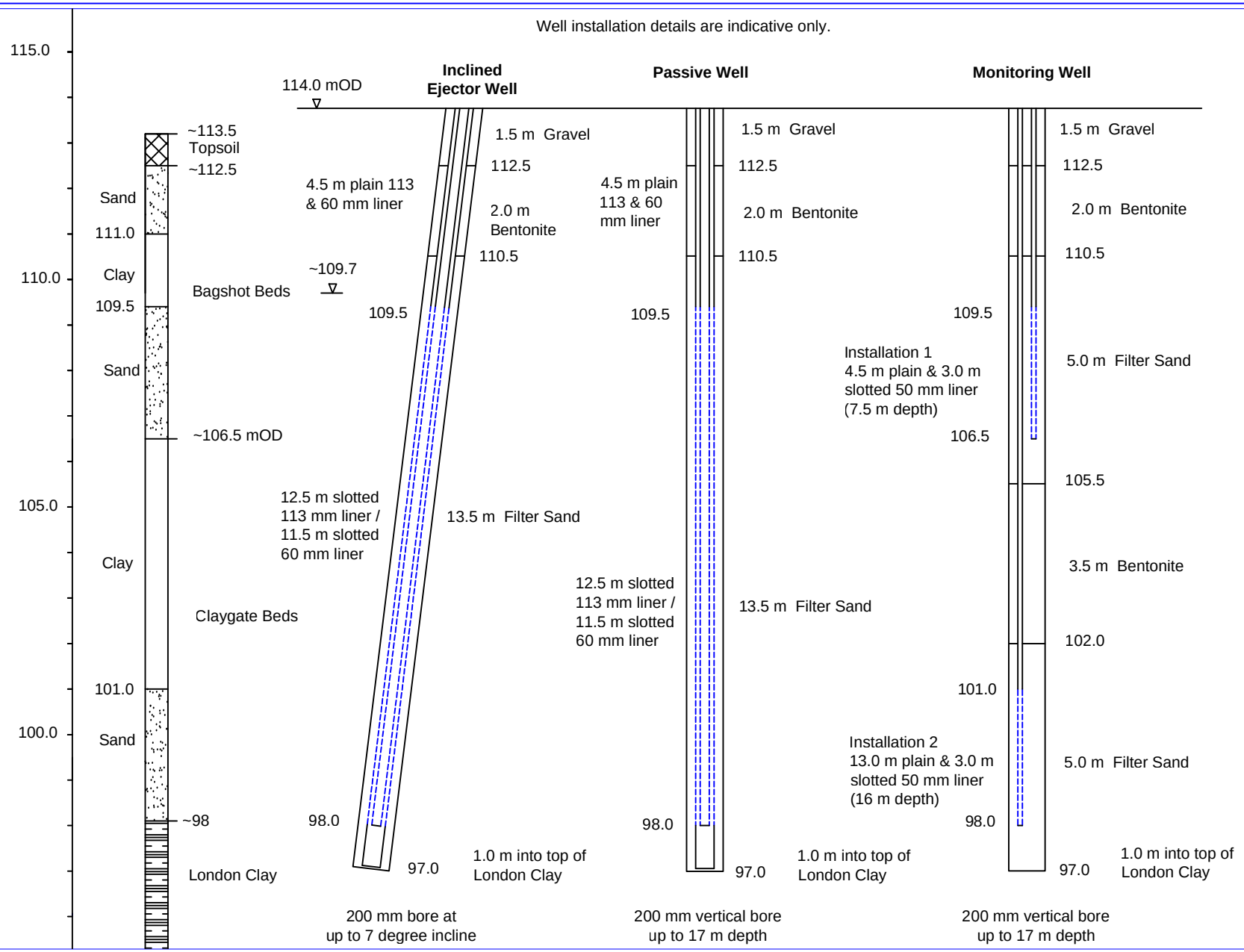

Project: Cannon Lane, Hampstead		
Title: Installation Details		
Drawing No: J1727/003	Rev: 0	By: OV
Scale: N.T.S	Date: 20.06.11	Chk: PJ

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