Cambrige Northern Fringe Development

McGee Group has undertaken review of demolition and site remediation requirements for the Cambridge Northern Fringe Development. We believe the programme for the works is achievable, the contamination testing to date appears to show fairly low levels of contamination but insufficient testing has been carried out to confirm that this is reflective of the whole site.

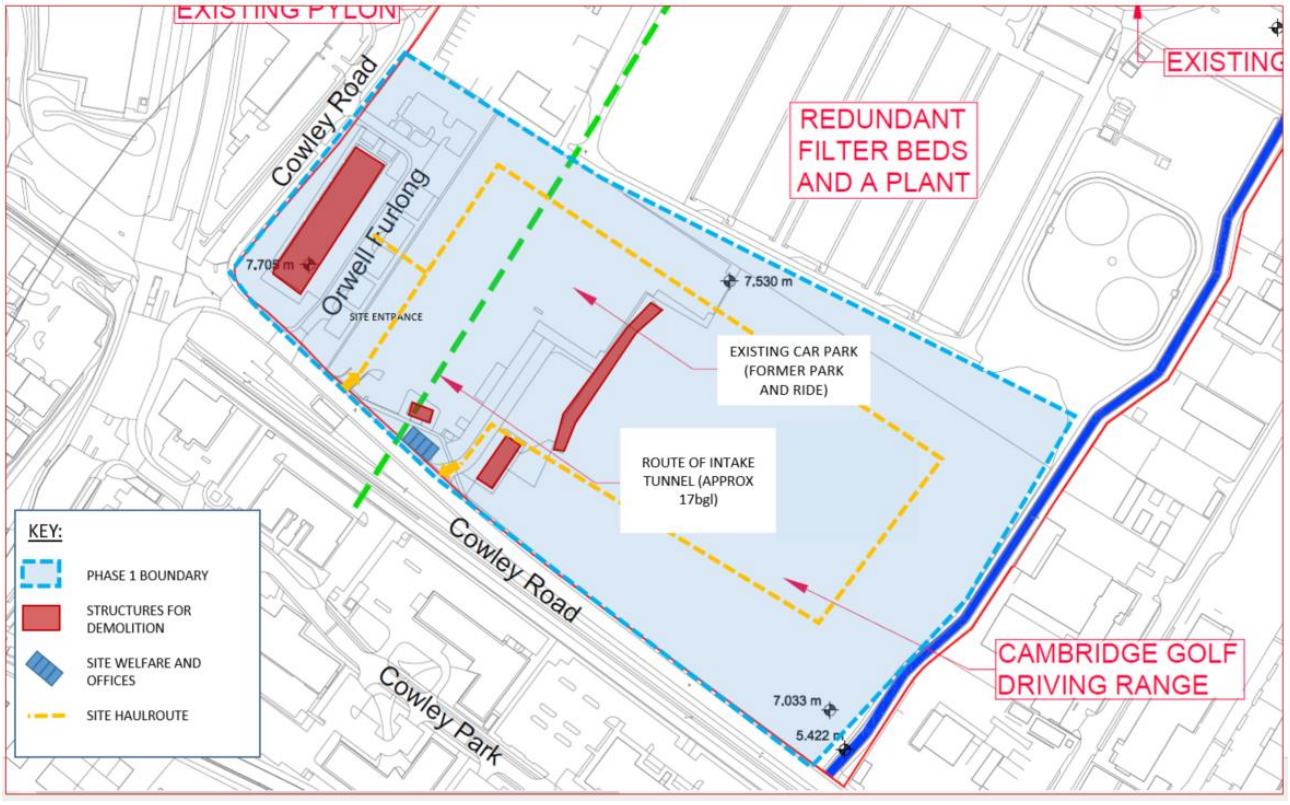
Logistics

The proposed logistics plans for each phase of works are identified below, further work needs to be carried to coordinate with the planned build out sequence.

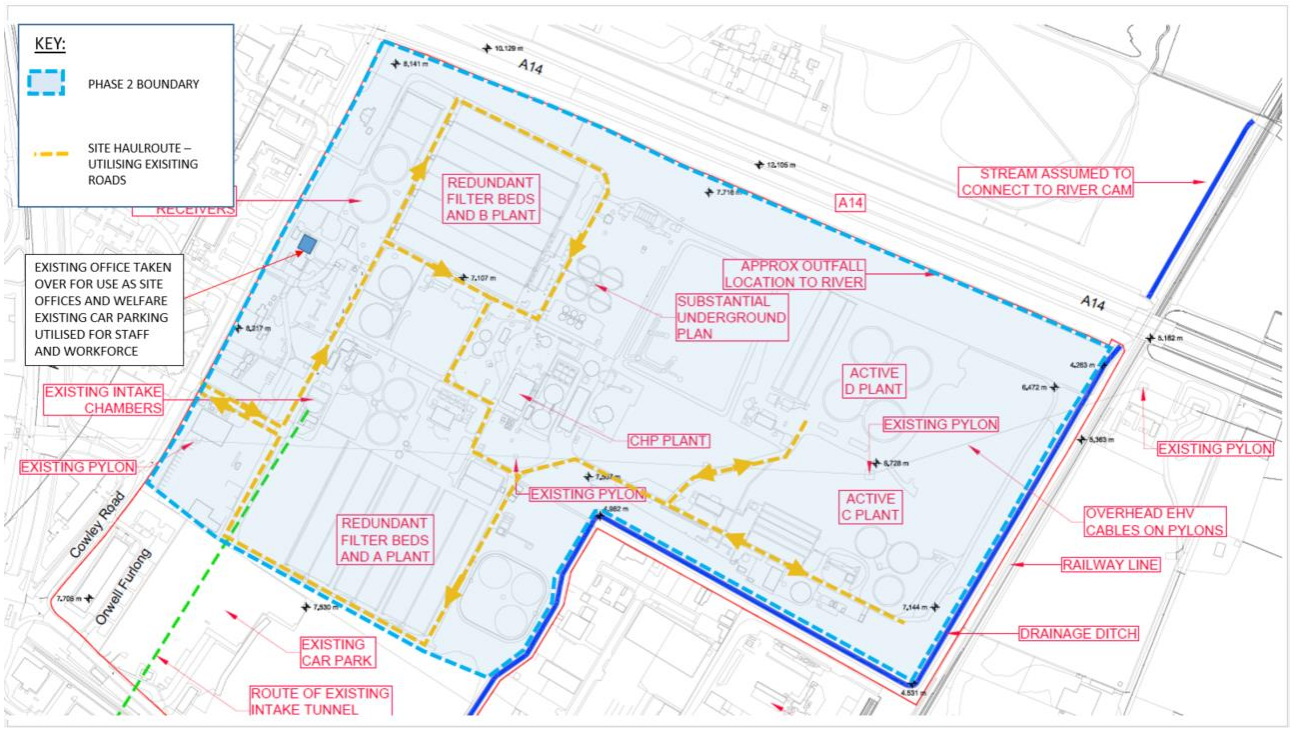
Phase 1

An outline plan has been developed to demonstrate the logistic requirements for the phase 1 works. The first activity will be to secure the site, erect site offices and welfare facilities and establish haul routes within the site.

Existing accesses from Cowley Road will be used as the main access and exit points to the phase 1 site. The proposed layout of site haul roads is shown below, existing hardstanding will be used where possible.



Phase 2



Programme

Phase 1

The programme allowance for demolition and site remediation is [redacted] ([redacted] months). Based on the information we have reviewed there are no concerns with this duration.

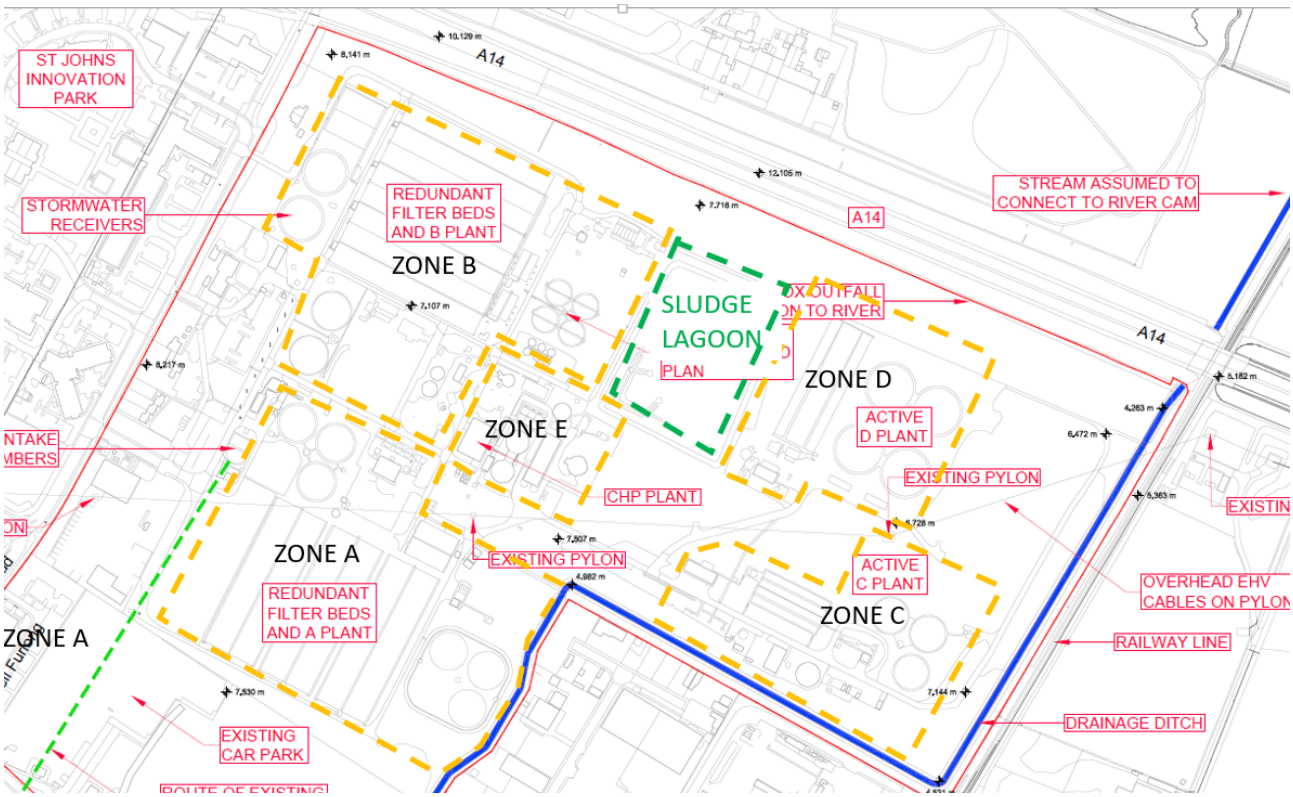
The outline durations for each activity are as follows

- Site establishment; [redacted]
- Demolition
    - Orwell House soft strip – [redacted]
    - Demolition Orwell House – [redacted]
- Top Soil Strip (stockpile on site) – [redacted]
- Car park removal – [redacted]
- Import capping to full footprint of site (600mm deep) – 30 weeks of import which can be commence early in the programme to ensure sufficient supply.
- Site remediation (Subject to ground investigation.

Phase 2

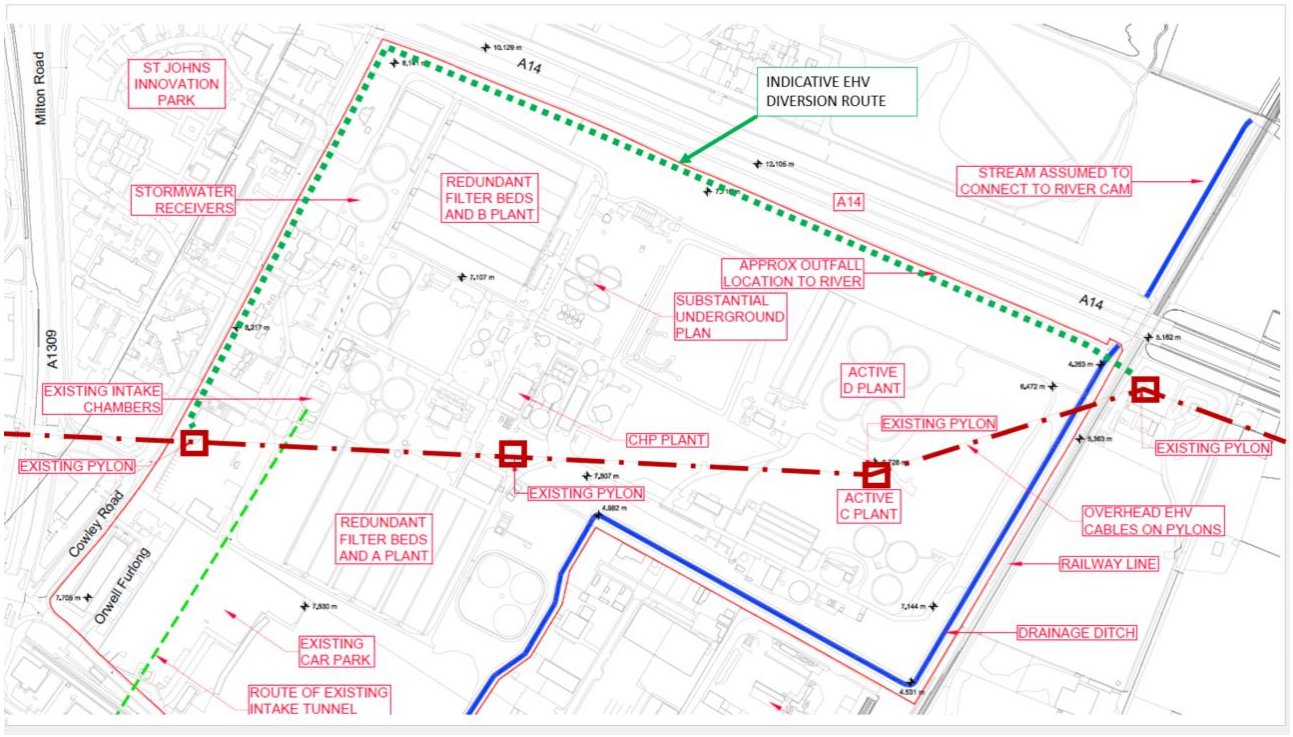
The advised programme for demolition and site remediation is [redacted] There is a significant amount of work to be carried out in a relatively short period of time, and three is a degree of uncertainty regarding the scope (based on the information provided to date). However, the layout of the site will allow multiple work fronts to be opened up and to run concurrently. The demolition will form a large part of the programme duration, with the remediation duration subject to contamination encountered.

The key demolition work fronts are shown below, in order to meet the programme each area would need to be worked on concurrently. It is noted that a number of the structures are redundant, if there is any opportunity to commence demolition works on redundant structures in advance of the proposed start date the programme would be significantly de-risked.



Overhead Cable Diversiona

Overhead EHV cables cross the phase 2 site with two pylons located within the site boundary. It is understood that these lines are to be undergrounded on the Northern and Western boundary of the site. It appears that the cable route will require tree removal on the northern boundary to maximize development footprint. The it is thought that the cable diversion be direct buried cable for the most part with ducting only installed at road crossings.



A number of constraints are likely to affect the timing of this diversion

- Nesting birds season will affect tree clearance to the northern boundary
- The cable diversion will likely need to be carried out during the summer months when power demand is reduced
- The site remediation will need to be complete within the service corridor
- Ducting will need to be installed at road crossings
- Directional drilling or similar will need to be carried out to provide a crossing under the railway line and stream to the east side of the site. The approvals process for this is likely to be significant

The diversion can be significantly de-risked by undertaking the enabling works early, there is no apparent reason why the vegetation clearance, ground remediation, duct crossings and railway crossing cannot be carried out during the phase1 works or earlier.

Site Remediation

The Mott MacDonald 'Geo-environmental Preliminary Risk Assessment' has been reviewed to understand the extent of testing undertaken and the extent and type of contamination encountered to date. The report summarises previous site investigations carried out over a number of years, only 27No samples have been tested across the site and none in the driving range.

Previous Investigation Results

The soil contamination identified is detailed in table 3 below extracted from the document. The majority of contamination is within the made ground, the majority is heavy metal exceedances with some hydrocarbons.

Table 3: Summary of main soil exceedances above residential assessment criteria

Contaminant	Made ground exceedances	River Terrace Deposit exceedances	Maximum recorded value (mg/kg)	Assessment criteria value (mg/kg)	Assessment criteria source
Cadmium	6 out of 27	0 out of 8	180	85	S4UL
Chromium	1 out of 27	0 out of 8	1014	910	S4UL
Lead	11 out of 27	1 out of 8	658	310	Category 4 Screening Levels for 6% SOM
Cyanide (free)	1 out of 4	-	20	12	Calculated from Environment Agency CLEA Model
Benz(a)anthracene	1 out of 27	0 out of 8	22.2	11	S4UL
Benzo(b)fluoranthene	1 out of 27	0 out of 8	15.6	3.9	S4UL
Benzo(a)pyrene	1 out of 27	0 out of 8	19.2	3.2	S4UL
Dibenz(ah)anthracene	1 out of 27	0 out of 8	2.9	0.31	S4UL

Source: (@one Alliance , 2014)

*Above: Locations where **soil contamination** has been identified in previous site investigations*

Table 4: Summary of exceedances of assessment criteria from leachate

Contaminant	Made ground exceedances	River Terrace Deposit exceedances	Maximum recorded value	EQS	DWS
Cadmium (µg/l)	6 out of 12	3 out of 7	25.4	0.25	5
Copper (µg/l)	2 out of 12	0 out of 7	160	112	2000
Nickel (µg/l)	3 out of 12	0 out of 7	82	20	20
PAH (total) (µg/l)	11 out of 12	6 out of 7	5.3	-	0.1

Source: (@one Alliance , 2014)

*Above: Locations where **soil leachate** contamination has been identified in previous site investigations*

Table 5: Summary of exceedances of assessment criteria from groundwater

Contaminant	No. of EQS exceedances	No of DWS exceedances	No. of MDL exceedances	Maximum recorded value	EQS	DWS	MDL
Arsenic** (µg/l)	0 out of 16	3 out of 16	4 out of 16	30.8	50	10	5
Chromium** (µg/l)	-	-	4 out of 16	51.8	-	-	5
Lead** (µg/l)	5 out of 16	5 out of 16	5 out of 16	175.3	7.2	10	10
Nickel (µg/l)	5 out of 16	5 out of 16	-	79	20	20	-
Ammonia as N (mg/l)	6 out of 16	8 out of 16	-	5.1	0.78	0.5	-
Nitrate as N (mg/l)	-	3 out of 11	-	110	-	11.3	-
Naphthalene (µg/l)	1 out of 16	-	-	7.5	2.4	-	-
Anthracene** (µg/l)	1 out of 16	-	6 out of 16	1.7	0.1	-	0.01
Fluoranthene** (µg/l)	4 out of 16	-	11 out of 16	21	0.1	-	0.01
Benzo(a)pyrene** (µg/l)	2 out of 16	4 out of 16	4 out of 16	0.17	0.05	0.01	0.01
Benzo(b)fluoranthene** (µg/l)	4 out of 16	1 out of 16	4 out of 16	1.3	0.015	0.2	0.01
Benzo(k)fluoranthene** (µg/l)	0 out of 16	0 out of 16	3 out of 16	0.13	-	-	0.01
Benzo(ghi)perylene** (µg/l)	4 out of 16	-	4 out of 16	0.15	0.001	-	0.01
Ideno(123cd)pyrene** (µg/l)	-	-	4 out of 16	0.14	-	-	0.01
PAH (total)** (µg/l)	-	11 out of 16	-	130	-	0.1	-
TPH** by GC (>C6 - C40) (µg/l)	-	2 out of 11	-	74000	-	10*	-

Source: (@one Alliance , 2014) Note: Groundwater samples do not represent any single strata. *value now revoked. **Hazardous.

*Above: Locations where **groundwater contamination** has been identified in previous site investigations*

Remediation

The requirement to remove contamination depends on the end use and the depth to contamination. There should be no reason to remove contamination at depth unless that is a risk to the aquifer.

Heavy Metals – Heavy metals can be detected on site with hand held instrumentation, as such the extent is relatively easy to define. It is most likely that contaminated materials will be removed from site. If significant quantiles are identified there are some on site treatment techniques that could be considered.

Hydrocarbons – As above, hydrocarbons can be identified by site testing. There were relatively few instances hydrocarbon contamination. Dependant on the level of contamination the material could be treated on site by aerating stockpiled material.

Biological Contamination – There may be areas which have been contaminated with sewage in particular the overflow pond. Any biological contamination would be treated with an on-site soil hospital where chemicals are added to the soil to accelerate the breakdown of biological contaminants and the stockpile regular turned over to promote treatment.

Principal Risks

Risk	Comment
EHV Diversion	The diversion will only be carried out during the summer period. If a window is missed it is likely to cause a 9month delay. Approval for and installation of a crossing beneath the railway should be prioritised and carried out as early as possible.
Capping Material Availability	If 600mm is applied to the whole site sourcing in required time frame may be problematic. Consider re-use over the site as development is built out
Contamination	Site contamination does not appear to be wide spread on site based on testing to date. The limited nature of site investigation however is a significant risk. At present there is one sample per 1.5ha and the testing to date may not be representation of the whole site. We would recommend additional trial holes are carried out and samples tested within the made ground in addition to the testing proposed.
Plant Availability	Significant amount of plant likely to be needed for demolition
Asbestos	Cost associate with disposal and potential for programme delay to undertake controlled removal and disposal.
Statutory Utilities	Disconnection of utilities Identification of utilities