APPENDIX C

Responses and Comments from IPD and OCIP Regarding Pilot Test

FACSIMILE TRANSMISSION LEADER PAGE

Faxline No. : 2369 4980

From: PM/K, TDD Peter MOK	To: CES (Attn : Mr Matthew Ko)
Ref. :	Your Fax. No. : 28910305
Date/Time Fax Sent: 1-9-98	This message (including this leader page) consists of 12 page(s)

Please notify _____ on Tel. No. 2301 1
if message received is incompleted

Message/Remarks:

MEMCL					
Rec'd on			1 9 98		
File No.					
	Act	Info	Init	Date	Remarks
HF					
TC					
PO					
PC	/				
MK	✓				

OIL COMPANIES TANK FARM

HONG KONG INTERNATIONAL AIRPORT

A CONSORTIUM OF :
BP Hong Kong Limited;
Caltex Oil Hong Kong Limited.
China Resources Petroleum & Chemicals Co. Ltd.;
Kai Tak Refuellers Company Limited;
Kuwait Petroleum Aviation (Hong Kong) Limited;
Mobil Oil Hong Kong Limited;
Shell Hong Kong Limited (Managers)

7/6/10

KAI TAK OFFICE :
1 Electra Drive,
Hong Kong International Airport,
Kowloon,
Hong Kong.
Telephone : 852-2769-6468
Fax No. : 852-2362-0671

Personal Copy

S21/22

The Project Manager / Kowloon
Territory Development Department
7/F., Empire Centre
68 Mody Road
Tsim Sha Tsui East
Kowloon

Your File : KD2/6/10 Pt5
Our File :
Our Ref. :
Date : 28/08/98

Attn.:Mr. James Chan / Mr. Peter Mok

Re : South East Kowloon Development at Site for Kai Tak Airport ("KTA")

Dear Sirs,

Further to my letter dated (August 25, 1998), attached please find draft (August 25, 1998) letter from XDD-LLC to OCTF giving us their comments on CES's proposed Scope of KTA Remediation Pilot Testing ("SOW") which includes sp
cifications for soil vapour extraction ("SVE"), air sparging ("AS") and combined AS/SVE tests.

As the pilot test is scheduled to commence as early as on September 1, 1998, in order to make sure that you can take into account of the said comments, having checked with XDD-LLC we were told that we can treat their letter as official copy.

We consider that the said comments very important which if not duly taken into account by your Department will put the usefulness of the whole pilot test in serious doubt.

We also urge you that a recognized expert (for such purpose we suggest Mr. Mike Marley from the U.S.A. which consultant's costs we are prepared to contribute or bear) be engaged to carefully monitor on site the pilot test of its actual installation and its performance followed by the evaluation.

Yours faithfully,
For and on behalf of OCTF

Peter YU
General Manager

c.c.	Mr Kim Sulkard	PELB (Env. Div.)	25305264
	Mr Richard Wong	EPD (UAG)	25910558
	Dr. Sarah Liao / Mr Roger Leung	EHS	25072293

PLEASE ADDRESS ALL CORRESPONDENCE TO THE KAI TAK OFFICE

Mr. Peter Yu
General Manager
Oil Companies Tank Farm
1 Electra Drive
Hong Kong International Airport
Kowloon, Hong Kong

Re: Review of Pilot Test Scope of Work
Kai Tak International Airport, Hong Kong
XDD Project No. 28026

Dear Mr. Yu,

At the request of Greg Bill of Mobil Oil Corporation, XDD-LLC (XDD) reviewed the "General Scope for Kai Tak Airport Remediation Pilot Testing" (SOW) prepared by CES (Asia) Ltd. The referenced SOW includes specifications for soil vapor extraction (SVE), air sparging (AS) and combined AS/SVE tests.

Background information indicates that site soils primarily consist of clay with some sand and silt. Ground water elevations at the site range from 0.8 to 3.6 meters below grade. Jet fuel is the primary contaminant, and has been detected in both the vadose zone and the saturated zone soils and ground water (dissolved-phase and NAPL). The overall project objective is to implement a rapid remediation system to allow redevelopment of the site at the earliest opportunity. The SOW was developed by CES as a guidance to conduct AS and SVE pilot tests at the site.

The SOW was reviewed and comments/suggestions were formulated with respect to the various aspects of pilot testing including pilot test design, pilot test operation and monitoring, and data evaluation. The comments presented below were written to provide guidance for the pilot testing in order to obtain pertinent, useful data for the following objectives:

- determine the feasibility of the in-situ remediation technologies (AS and SVE);

and, if applicable,

- design and implement an effective remedial approach to allow rapid development of the Site.

1. **SVE Pilot Test**

A. Test Design

i) The vadose zone monitoring points are spaced relatively far from the SVE well (5, 10 and 20 meters) given the soil types observed from drilling. Although vacuum may be observed at those distances, it will likely be at low levels. By spacing the monitoring points at approximately 1.5, 4 and 7 meters, higher (and more precise) vacuum measurements may be obtained for data evaluation purposes.

will need another sets of gauges that have higher ranges

ii) The proposed test well network does not provide vadose zone monitoring points for data collection with respect to radial direction. Two sets of monitoring points at each distance along the same radial direction were proposed. However, a test well network should be designed to obtain data representative of as many of the site-specific geologic and chemical heterogeneities as possible. Therefore, it is recommended that the vadose zone monitoring points be installed in multiple radial directions to cover as much area as possible.

Double the monitoring well numbers!

iii) The SOW does not indicate if the test well network(s) for each test location will be adjacent to an existing monitoring well. It is recommended that the SVE test well of each network be installed within 1.5 meters of an existing ground water monitoring well in order to monitor ground water mounding as a function of applied vacuum at the SVE well.

iv) The specifications for the vadose zone monitoring point construction indicate that the points will be fitted with airtight pressure/vacuum gages. It is recommended that the points also be constructed with vapor sampling ports as vapor monitoring at the vadose zone monitoring points is a fundamental component of SVE pilot testing.

v) The SOW indicates that the SVE test approach will be to conduct the tests at three different vacuums (1, 2 and 3 inches of mercury) to characterize airflow under varied conditions. Assuming test operation vacuums without prior testing at the site may be problematic. Due to the soil types indicated by previous drilling, producing airflow at the proposed, pre-determined vacuums may not be possible. A vacuum greater than 4 inches of mercury may be required to obtain even a low flow from the SVE well. A more straightforward approach is to determine the maximum allowable flow rate (limited by the physical characteristics of the soil) within the initial five to ten minutes of testing; then select three flow rates within the maximum for the pilot test. Begin with the lowest of the three flow rates to conduct the short-term SVE tests and sequentially work towards the highest flow rate.

Sensible, O.K.

vi) Monitoring ground water elevation changes as a result of SVE activities is [illegible] ground water may cause the vadose zone to become [illegible] mounding ground water may cause [illegible] changes in [illegible] ground water elevations within the SVE well during the tests. Accurately

monitoring ground water elevations within an active SVE well may be problematic since the lithology at the site suggests that a high vacuum system will be necessary for the SVE testing. It is suggested that ground water elevations be measured in an alternate well within the test area network (i.e., an existing monitoring well that is within 1.5 meters of the SVE well). The ground water elevation monitoring well must have an airtight well cap and water sensor assembly so that the well is not exposed to atmospheric conditions.

vii) Based on the site soils, and depending on the magnitude of ground water mounding, a drop tube assembly in the SVE well may be necessary to remove mounding ground water and maintain open wellscreen for vapor extraction.

viii) The SOW proposes to conduct two test runs at each SVE pilot test location. The first test run would consist of a series of three short-term response tests (operated at vacuum of 1, 2 and 3 inches of mercury). The second test run is a long-term response test to operate the SVE pilot system for 72 hours at a vacuum level advised by the Client's Representative. Data collected during short-term response tests (operated until vacuum levels at the monitoring points stabilize, approximately 4 to 6 hours) are adequate to evaluate physical parameters of the vadose zone. The physical measurements from the multiple flow rate tests can then be used to estimate an effective ROI for that particular SVE well, and sufficient chemical data (VOC removal rate versus time) may also be obtained during the short-term response tests. Thus, the short-term SVE response tests will provide all the data necessary to satisfy the objectives presented above, and a long-term SVE response test is not warranted.

B. Test Operation and Monitoring

i) Besides the proposed vacuum measurements, the SOW does not indicate any vapor monitoring at the vadose zone monitoring points. It is critical to measure VOCs, O_2, CO_2 and vacuum at all vadose zone monitoring points. Test parameters at the SVE test well should include O_2 and CO_2, in addition to the proposed parameters (VOCs, flow rate and vacuum).

ii) As discussed in section 1.A.vi) above, ground water levels should be monitored at a monitoring well in close proximity of the SVE well (i.e., within 1.5 meters).

iii) The SOW did not indicate if baseline (prior to any testing) measurements would be collected. All test parameters should be measured before, during and after testing. Each of the test parameters should be monitored as frequently as practically possible over the duration of the test.

O.K.

C. Data Evaluation

[illegible]

any difference?

i) Determine the radial, vertical and surface layer intrinsic permeability of the test area. This is accomplished using the flow and vacuum propagation data of the low flow SVE test and a numerical two-dimensional SVE model (calibration of model).

ii) Using the intrinsic permeabilities from step i) and the flow and vacuum propagation data from the higher flow SVE tests, confirm the permeabilities calculated with the low flow data (verification of model).

iii) Simulate potential flow scenarios for a full-scale SVE system using verified permeabilities. Utilize model to compute vacuum propagation versus radial distance from well and pore volume exchanges (based on subsurface air velocity) versus radial distance from well. → how to measu

iv) The annual pore volume exchange rate is determined from a combination of factors including the duration of remediation time, characteristics of the contaminants and experience of similar sites. Based on the required annual pore volume exchange rate, estimate the effective ROI for the SVE well.

v) Depending on baseline soil vapor composition (VOCs, O2 and CO2), a successful SVE pilot test will provide data that shows a trend of increasing oxygen levels (and corresponding decreasing CO2 levels) at the vapor monitoring points. In some cases, depending if the SVE well is located on a 'hot spot' or adjacent to one, a decrease in VOC concentrations at the vapor monitoring points may also be observed.

This increase of conc may only show up where intake well is sided. AI wells should be the existing monitoring well in vicinity

vi) Given the nature of the site soils (low permeability and shallow water table), vapor extraction may not produce airflow from the well and applying a vacuum to the SVE well will only extract ground water. → allow enough clearance between top of screen and water table

any seasonal variations of the level of water table?

vii) Based on the difficult nature of the soils at the site there is a realistic possibility that SVE will not be suitable, and it is strongly recommended that the pilot test data be critically reviewed by an expert of subsurface remedial technologies.

2. AS Pilot Test

A. Test Design

i) The SOW proposes to conduct an air sparging test in one of the four SVE test areas. In addition, the SOW indicates that AS will be tested in one well within the test area. Results from a single sparging test in the site soils (heterogeneous, clay-rich and fine-grained) may reflect biased performance as a result of local geologic/permeability heterogeneities. Short-term AS tests (1 to 6 hours) in multiple AS wells (at least 2 different wells and at different site locations) are [illegible] single in an AS well, a

single 2 AS wells

saturated zone monitoring point (piezometer) may be used as an additional test well.

What about the pipe dia in large scale contract?

ii) The SOW indicates that the AS test well will have an inside diameter of 50 mm. A smaller diameter AS test well (i.e., 25 mm ID) is recommended since less surface area will require less entry pressure to inject air.

iii) The AS well construction schematic in the SOW indicates a wellscreen length of 0.75 meters and a filter pack that extends approximately 2 meters above the wellscreen. Based on the site soil type(s), it is expected that most of the injected air will enter the saturated zone at the top of the wellscreen and filter pack. Therefore, the wellscreen length should be limited to the lower 0.3 m of the well. In addition, the filter pack thickness should be limited to approximately 0.3 m above the top of the wellscreen. The depth of the well as shown in the schematic (bottom of well installed to approximately 4 meters below the ground water table) provides a good thickness of water column above the wellscreen.

Cost & time implication

iv) The AS well construction schematic in the SOW indicates a 20 slot (0.020-inches) wellscreen size and a No. 2 filter pack size. The average grain size of the filter pack should be as close to the size of the native soils as practical. A filter pack that is more coarse than the native material will act as a conduit for short circuiting of air up through the borehole. Similarly, a filter pack that is significantly finer-grained than native soils may restrict airflow. Therefore, it is recommended that at least a wellscreen size of 10 slot (0.010-inches) and a No. 1 filter pack size be used during the well installation.

v) The proposed piezometers are spaced relatively far from the AS well (2.5 and 5 meters). It is recommended that the piezometers are installed at distances of 1.5 and 4 meters from the AS well. In addition, a third set of piezometers (shallow and deep) should be added at a distance of 7 meters from the AS well. Two sets of piezometers at each distance are suggested.

vi) The proposed test well network does not provide vadose zone or ground water monitoring points for data collection with respect to radial direction. Two sets of vadose zone monitoring points and one set of piezometers at each distance along the same radial direction were proposed. However, the test well network should be designed to obtain data representative of as many of the site-specific geologic and chemical heterogeneities as possible. Therefore, it is recommended that the monitoring points be installed in multiple radial directions to cover as much area as possible.

vii) Piezometer diameters of 25 mm to 50 mm are appropriate. The piezometers should be constructed with discrete wellscreen intervals (i.e., approximately 0.5 meters of wellscreen with filter pack extending to 0.3 meters above the wellscreen). The [illegible] and deep piezometer at each distance may also be installed within the [illegible] also be used as an alternative/second AS test well.

Based on the description in the SOW, the vertical placement of the shallow and deep piezometers is appropriate.

B. Test Operation and Monitoring

i) The SOW does not indicate if the SVE and AS tests will be conducted consecutively (i.e., without any time between the SVE and AS tests). Allow three days to one week to elapse between the SVE testing and the AS testing for the vadose zone to reach a representative equilibrium state. Otherwise, interpretation of AS test results could be unnecessarily complicated.

ii) Besides the proposed vacuum measurements, the SOW does not indicate any vapor monitoring at the vadose zone monitoring points. It is critical to measure VOCs, O_2, CO_2, helium and pressure at all vadose zone monitoring points. As specified in the SOW, test parameters at the piezometers should include dissolved oxygen, pressure, bubbling, and helium (in the headspace of the well, if possible).

iii) As specified in the SOW, ground water elevations (and free product thickness, if present) should also be monitored at the piezometers. This monitoring should be conducted prior to any testing and as frequently as practically possible during the tests. However, the ground water elevation monitoring well(s) must have an airtight well cap and water sensor assembly so that the well is not exposed to atmospheric conditions. Therefore, it may be difficult to monitor numerous piezometers during the testing. Alternatively, an existing monitoring well in close proximity of the test well (within 1.5 meters) and dedicated to monitoring only ground water elevations may be used. At a minimum, ground water elevations should be checked frequently at the closest monitoring point during the first hour of the test (or until mounding subsides) to determine the mounding effects due to the sparging activities.

iv) The SOW did not indicate if baseline (prior to any testing) measurements would be collected. All test parameters should be measured before, during and after testing. Each of the test parameters should be monitored as frequently as practically possible over the duration of the test.

v) The SOW indicates that an injection air pressure of 8 psig is expected. It also indicates that the compressor must be capable of providing pressures of up to 25 psig to allow for local variations in local ground conditions. Based on the thickness of the ground water column and the soil column above the top of the wellscreen, it is critical that the AS well injection pressure not exceed approximately 12 psig in order to avoid fracturing (and subsequent short-circuiting) of the soil.

max. allowable pressure

vi) The SOW indicates that the first AS test will be a helium tracer test and that a [illegible] 100 % [illegible] concentrations at all outlying soil vapor probes remain stable for three consecutive

readings. The SOW does not specify if the helium test will be conducted prior to any injection of air, nor does it specify if air will be injected in conjunction with the helium. Helium injection concentrations in the range of 10-20% are sufficient for tracer testing and the tracer gas should be injected in conjunction with air. Further, the tracer test should be initiated only after the AS test has operated and stabilized at the operating flow rate. The purpose of the tracer is to identify preferential pathways; it may also be used as an indicator (when used in combination of other parameters) of the effective AS test well radius of influence (ROI). Under continuous injection conditions, helium will disperse throughout the vadose zone making ROI determination less definitive. Hence, the helium should be injected as a slug (typically for a period of 15 to 20 minutes), not continuously. By injecting 100% helium continuously until it is equilibrated at all of the monitoring points, the benefits of running a tracer test are negated.

e gas test rts only when e air sparging operating & stabilized

vii) The frequency of helium concentration monitoring was not indicated in the SOW. During and immediately following helium injection, it is very important to obtain as many helium concentration measurements as possible from the monitoring points. The tracer test provides dynamic test operation data and because frequent helium measurements are necessary, monitoring of other parameters may be paused until the helium test is completed.

viii) Because the nature of the helium test as described in the SOW consisted of a continuous injection of helium, more than one helium test was not specified. Multiple helium tests are recommended to assess any changes in air channeling.

ix) The SOW proposes two test runs for the AS pilot testing. The first consists of the continuous helium test and the second is a long-term response test that would be conducted with continuous air injection for a period of 120 hours without SVE. It is recommended that the first test be conducted as a short-term AS response test (1 to 6 hours), which would include at least one helium (injected as a slug with air) tracer test. This short-term test and a long-term combined AS/SVE test (discussed in section 3) will provide all the data necessary to satisfy the objectives presented above. Thus, a long-term AS response test (without SVE) as proposed in the SOW is not warranted and should not be conducted. Caution must be exercised when operating a long-term AS response test without SVE as VOC vapors may build up in the vadose zone. SVE is often used to control the migration of the VOC vapors.

good point →

C. Data Evaluation

i) No information was available in the SOW with respect to the method of evaluating the AS test data. The determination of an effective AS ROI is an empirical process based on air sparging experience and the results from the multiple [illegible] obtained during the pilot test.

[illegible] during the test be used to determine the effective AS well ROI. Parameters including

DO (from long-term combined AS/SVE test), pressure in the ground water monitoring points, bubbling, helium tracer test results, changes in VOCs, O_2 and CO_2 in the vadose zone, and ground water elevation data.

iii) Bubbling that occurs outside of what appears to be the effective ROI based on other measurement parameters should be considered a concern with respect to system design, in particular with respect to the uncontrolled migration of VOC vapors. Because bubbling is a direct sign of the presense of air channels and, depending on the construction of the ground water monitoring point, it may be unclear whether it is one or a number of channels that are intersecting the wellscreen interval, care must be taken in data interpretation.

iv) Evaluation exclusively depending on ground water mounding may overestimate the ROI. Dependent on the soil conductivity and quantity of water displaced by the AS activities, mounding may spread laterally beyond the ROI. Excessive mounding of the ground water has the potential to change the natural ground water flow pattern, resulting in possible lateral spreading of VOCs.

v) Likewise, relying on the propagation of pressure from the AS well may also over estimate the ROI. It should be noted that the propagation data of pressure from an air source in both the vadose and the saturated zones has the potential for recording a false positive with respect to determining feasibility and an effective ROI.

vi) With respect to other potential false positives, it should be noted that observations of increased DO may not be indicative of an increase in DO throughout the ROI, but more a representation of a localized DO increase in the vicinity of a preferred air channel. In addition, changes in VOC concentrations at the vadose zone monitoring points can result, due to contact of sparged air with vadose zone contaminated soils. While this may be an overall benefit to site remediation, it may not be indicative of effective sparging of the saturated zone.

vii) Given the low conductivity of the site soils, applying a pressure to the AS well may not produce airflow into the subsurface. Rather, an injection pressure greater that the recommended maximum pressure may be necessary, possibly resulting in the creation of a secondary permeability (fracturing of the soil).

viii) Due to the difficult nature of the soils at the site with respect to the AS technology, there is a realistic possibility that AS will not be suitable, and it is strongly recommended that the pilot test data be critically reviewed by an expert of subsurface remedial technologies.

FAX MESSAGE

MAUNSELL ENVIRONMENTAL MANAGEMENT CONSULTANTS LIMITED

Room1213-1219, GRAND CENTRAL PLAZA, TOWER 2
138 SHATIN RURAL COMMITTEE ROAD
SHATIN, N.T., HONG KONG
TEL (852) 2893 1551
FAX (852) 2891 0305

Maunsell

→ Richard Wong, EPD, 2591-0558

TO: COMPANY	TDD	DATE	18-9-1998
ATTN OF	- Walter Leung	FAX NO.	2577 1069
FROM	Matthew Ko	SHEET 1 OF	12
REF. NO.	C410\FMK80918.02		
SUBJECT	**Decommissioning of KTA – Pilot Test**		

Dear Sirs,

In reply to EPD's further comments (E-mail dated 18 September 1998) on our response to the OCTF's comments, we have now amended the version sent to you on 17 September 1998. Attached please find the amended version of the response, the up-dated schematic diagrams of the air sparging/ groundwater monitoring wells, and the up-dated soil description for pilot test.

Should you have any queries, please free feel to contact the undersigned.

Regards,

Matthew Ko

Encl. 1. Responses to consolidated comments (with figure showing additional wells at VT3)
2. Up-dated schematic diagrams of air sparging and groundwater monitoring wells
3. Up-dated soil description for pilot test.

cc. EPD (Attn: Mike Tsing) Fax. 2318 1877
MCAL (Attn: Peter Yung) Fax. 2375 6399

CC Richard Wong, EPD
23/9/98
mk

MEMCL					
Rec'd on	18.9.98				
File No.					
	Act	Info	Init	Date	Remarks
HF					
TC					
PO					
PC					
MK	✓				

1 SVE Pilot Test

Section	Issue	Remarks	Accept?	Implication on programme
Ai	Shorter spacing between monitoring points.	*Based on the sandy soils observed during drilling and the previous SVE test results, we have preliminarily chosen 12m as the ROI for the full scale system. Our proposed wider spacing of monitoring points for this test will enable us to check whether our selected ROI is feasible and to estimate the actual ROI in the field. For SVE wells VT3 and VT4, one more monitoring well at 1m away from the venting well will be added since these wells will be used for the AS/SVE test later.*	N	--
ii	Monitoring points in radial directions	Two additional sets of monitoring points that comprises a deep and shallow probes have been installed in different radial directions around VT3. (See attached schematic layout)	Y	significant, but have informed the Contractor to construct the additional points right away.
iii	SVE well installed within 1.5 m of existing monitoring wells	The previous SVE test does not indicate water mounding to be a problem. Also the sandy soils imply that excessive water mounding is unlikely. *Nevertheless*, water level will be monitored in *every* SVE well and in groundwater monitoring wells adjacent to VT3 and VT4.	N	--
iv	Monitoring pts as sampling ports	supported	Y	little

v	Max. allowable flow rate rather than vacuum	The approach is supported. However, previous SVE indicates that 15" water vacuum can produce a flow of 100 cfm. Lower flow rates will also be tested to match the design flow rate of the full-scale operation.	Y	none
vi	Water monitoring well should be air-tight	Groundwater monitoring wells will be air-tight	N	--
vii	Drop tube assembly to maintain open well screen	The mounding water did not block up well screen based on previous experience. The mounding at SVE well will be monitored anyway to verify this point. As noted above, sufficient flow will likely be attained at a low vacuum (< 25" water). Therefore mounding should be minimal.	N	--
viii	Drop the long term test	Long term test is useful to evaluate concentration changes for VOCs and other gases.	N	--
Bi	VOCs, O2, CO2 & pressure to be measured	Parameters have been incorporated in our measurements	Y	little
ii	Water level monitoring at existing water wells in proximity	*Refer to our response on Aiii.*	N	--
iii	Baseline measurements	We will measure parameters before testing	Y	little

C i-vii	Data evaluation	Although we originally envisage evaluating SVE test results empirically, we will now perform some modeling to evaluate flow through the SVE well zone of influence. Pore volume changes will also be calculated.	Y	Yes, depending on the extent of modelling

2 AS Pilot Test

Section	Issue	Remarks	Accept?	Implication
Ai	Additional AS well	A second AS well will be installed adjacent to SVE well VT4, *as it was found to be quite contaminated. Its design is same as that at VT3*	Y	significant, done after contract award as additional
ii	Use test well of smaller dia.	Even with a larger diameter well, the blower has sufficient pressure based on local experience.	N	--
iii	Shorten the length of well screen & filter pack	The design of the AS well has been modified. A 0.3 m screen is now provided as attached. The bottom of the bentonite seal is now 0.3 m above the top of the well screen. (See attached figure)	Y	little
iv	Screen size change from 0.02" to 0.01" and use No.1 sand	Coarse sand would be used to simulate the natural formation.	Y (in principle)	already included

v	Piezometers set closer to AS well	We consider the distance suitable for the soil type considered (sand with some clay)	Y	very little
vi	Monitoring points in radial directions	Additional groundwater and vapour monitoring points have been added in two radial directions around VT3. *Groundwater and vapour monitoring points will also be added in radial directions around VT4 in the same way as VT3.*	Y	significant, but have informed the Contractor to construct the additional points right away.
vii	Extend filter pack to 0.3 m above the well screen of groundwater monitoring well	The design of the groundwater monitoring well has been modified. The filter pack is now extended to 0.3 m above the top of well screen. (See attached figure)	Y	Little
Bi	Allow lapse time between tests	We will allow some lapse time during which D.O. and CO2 will be monitored in the vadose zone following conclusion of the SVE test. Once these parameters have attained steady-state conditions, the AS test will be allowed to proceed.	Y	Extend project by approx. 1 - 2 days
ii	VOC, O2, CO2, He, & pressure measurement	supported	Y	little
iii	Ground water mounding to be monitored at monitoring wells with air-tight caps	The contractor has purchased an ultrasonic water level detector which is able to continuously monitor the water level while the well cap is in place.	Y	--
iv	Baseline measurement	supported	Y	little

v	Pressure not > 12 psi	Noted. A pressure range of 4.5 to 6.5 psi at the well head is expected.	Y	none
vi	He injection as a slug at 10-20%	supported	Y	Time may be needed to modify fittings
vii	Frequency of He measurement	As frequent as possible	Y	little
viii	Multiple He test	Will test at 2 different flow rates	Y	allow lapse time between tests
ix	Drop out the long term test	Agreed. Long term AS test may be less useful. Long term test will be conducted at combined SVE/AS test	Y	shorten programme by 1-2 days
Ci-viii	Data evaluation	As noted in the comment, evaluation of AS test results typically involves empirical analyses of the data. Empirical analyses of the test results, especially the DO and He results will be used to estimate the AS well radius of influence. Pressure versus air injection flow rates will be used to verify the size of the full-scale equipment.	N	--

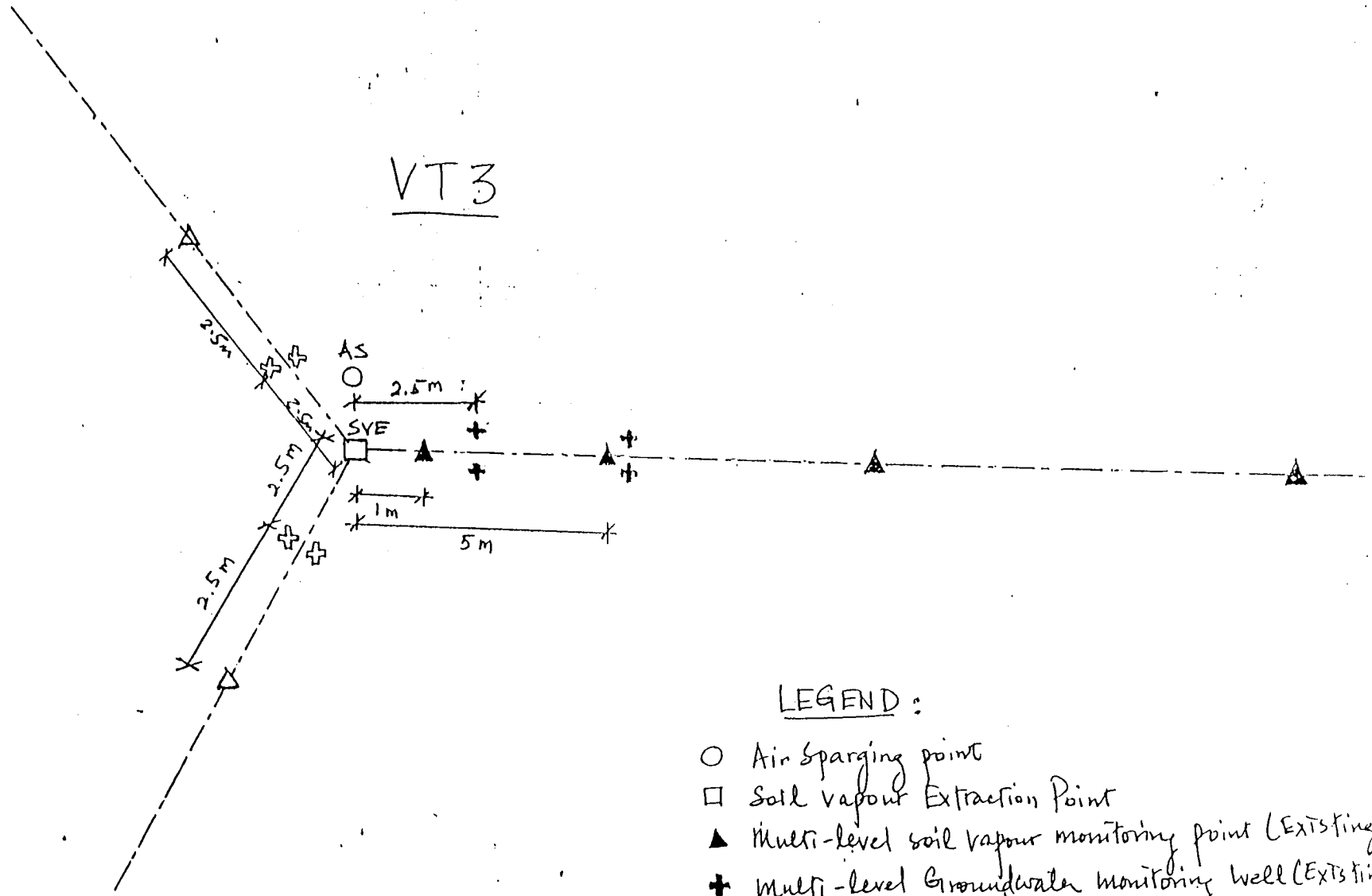
3 Combined AS/SVE Pilot Test

Section	Issue	Remarks	Accept?	Implication on programme

Ai	Additional AS well	As noted above, and additional AS well has been added adjacent to SVE well VT4. Combined AS/SVE tests will be conducted at both AS wells and their adjacent SVE wells (VT3 & VT4).	Y	significant, done after contract award as additional
ii	SVE flow rate 2 times > AS	Noted. The AS and SVE flows for the combined tests will be selected based on the results of the individual AS and SVE tests.	Y	
Bi	Parameters to be measured and measurement frequency	Already included & Noted	Y	maybe 1-2 days longer
ii	Long term SVE/AS combined test	Long term test has been addressed in SOW	Y	already included
iii	Pulse operation	The scope of the pilot test is not sufficient to evaluate effective pulsing parameters. However, it is acknowledged that pulsing may be advantageous. The utility of pulsing and the optimum parameters (time on/ time off) for pulsing will be determined during startup testing of the full-scale system. It should also be noted that continuous injection can also promote mixing through the circulation zones that are generated in the saturated zone influence by the AS wells.	N	--

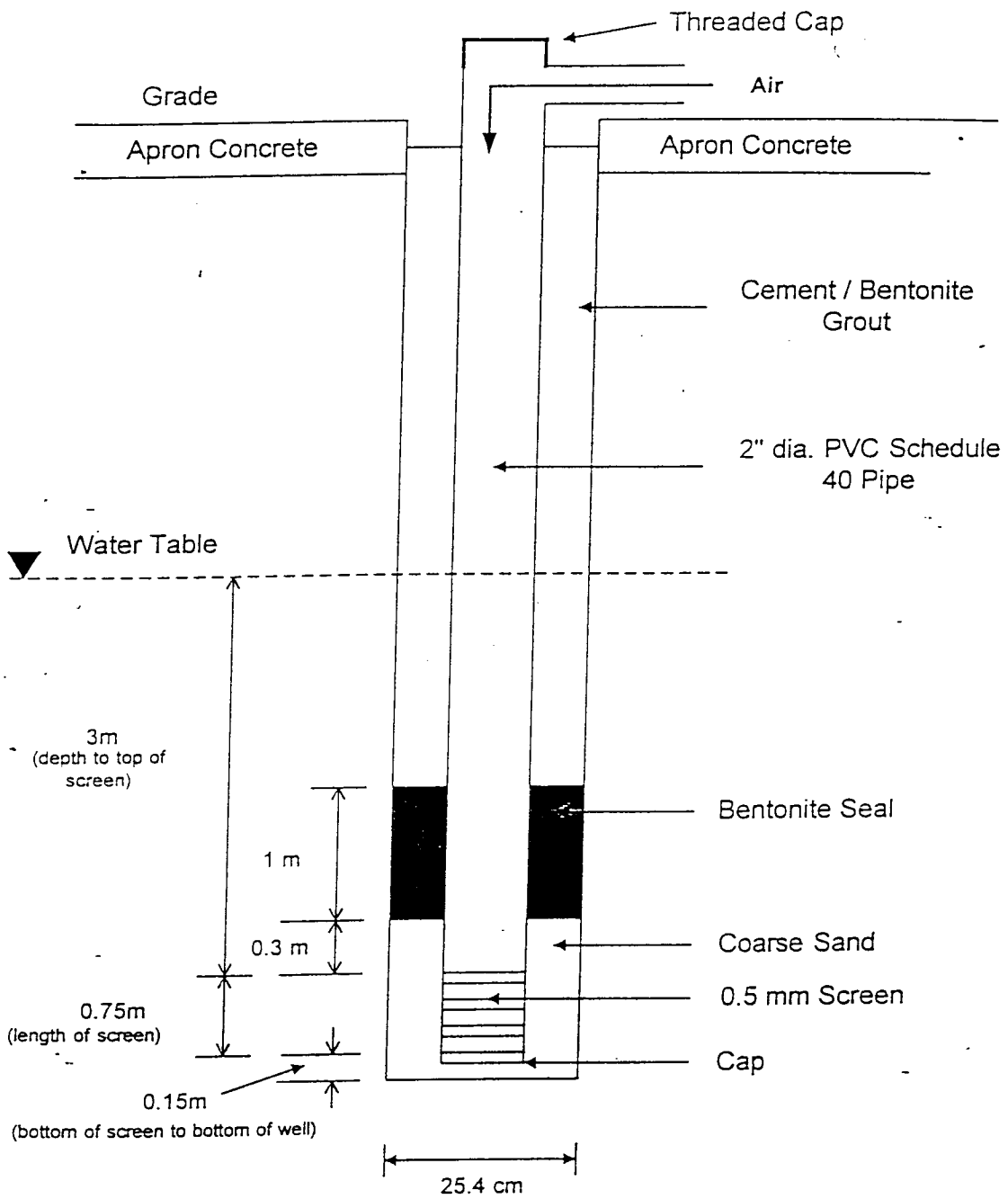
Ci-ii	Data Evaluation	Data will be evaluated in the same manner as for the individual AS and SVE tests. Concerning the site formation, sandy soils have been observed at all of the boreholes advanced for the pilot testing. No clayey or very low permeability layer has been observed.	N	--

VT3



LEGEND:

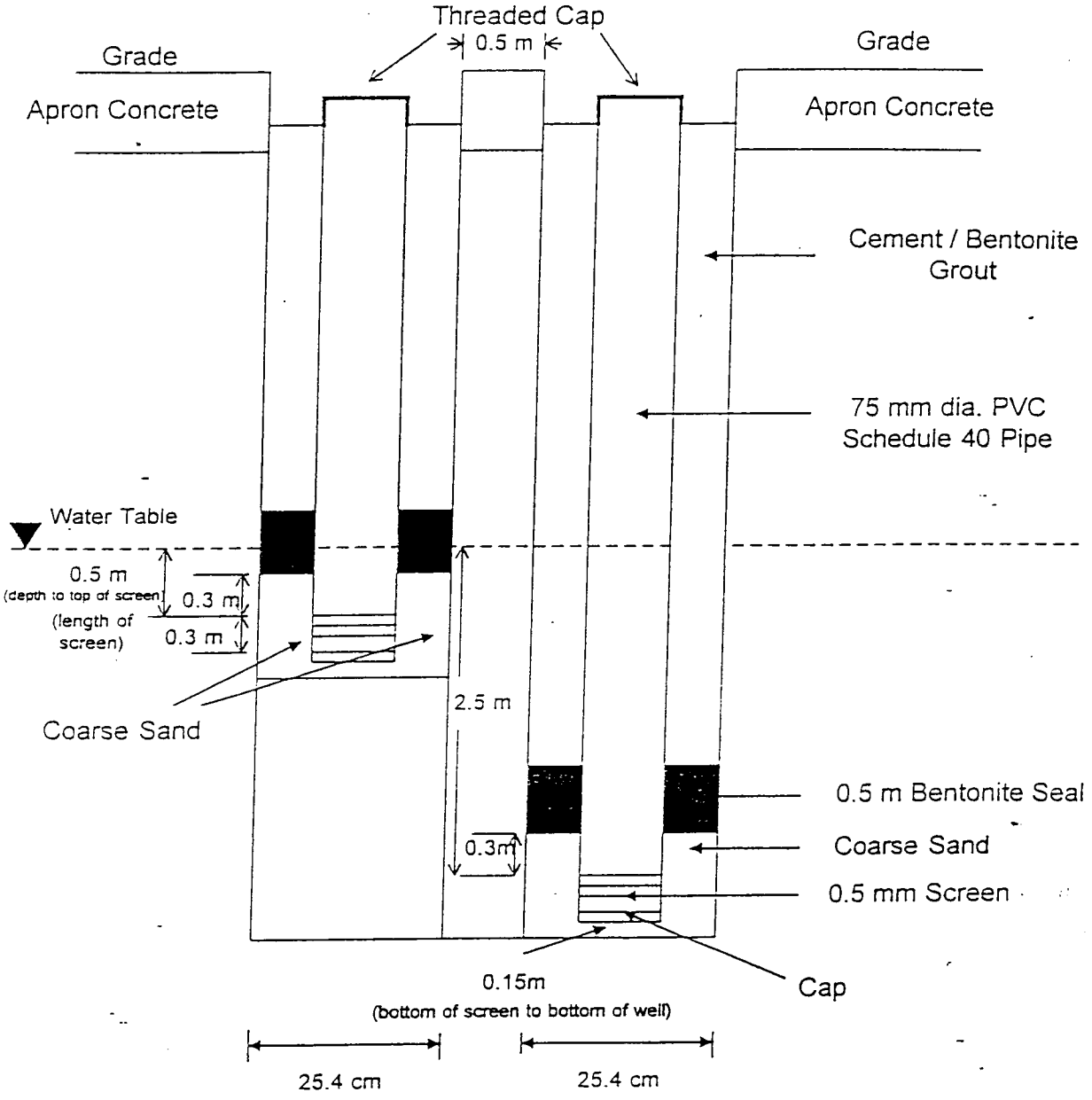
- ○ Air Sparging point
- □ Soil vapour Extraction Point
- ▲ Multi-level soil vapour monitoring point (Existing)
- ✚ Multi-level Groundwater monitoring well (Existing)
- △ ADDITIONAL multi-level SV monitoring point
- ✚ ADDITIONAL multi-level GW monitoring well



Not to Scale

Pilot Test: Air Sparging Well

C410/vsd/pilot/aspilot3.vsd



Not to Scale

Pilot Test: Piezometer Well

C410/vsd/pilot/piezo3.vsd

Soil Description

Depth	VT1	1A	1B	1C
1m	Brown coarse sand (VOC = 1.6 ppm)	Brown coarse sand (VOC = 1.6 ppm)	Brown coarse sand	Brown coarse sand
2m	Brown sand	Brown sand	Brown sand	Brown sand
3m	Brown clayey sand	Brown clayey sand	Brown clayey sand	Brown clayey sand

Depth	VT2	2A	2B	2C
1m	Coarse sand with rock fragment	Coarse sand with rock fragment	Coarse sand with rock fragment	Coarse sand with rock fragment
2m	Grey sea sand	Grey sea sand	Grey sea sand	Grey sea sand
3m	Grey sea sand	Grey sea sand	Grey sea sand	Grey sea sand

Depth	VT4	4A	4B	4C
1m	Coarse sand with rock fragment	Coarse sand with rock fragment	Coarse sand with rock fragment	Coarse sand with rock fragment
2m	Grey sea sand	Grey sea sand	Grey sea sand (VOC = 4.4ppm CO = 2 ppm)	Grey sea sand (VOC > 20ppm methane = 2% LEL)
3m	Grey sea sand	Grey sea sand	Grey sea sand	Grey sea sand

Depth	VT3	3A	3B	3C	3D
1m	Brown coarse sand	Brown coarse sand	Brown coarse sand	Brown coarse sand	Brown coarse sand
2m	Brown sand	Brown sand	Brown sand	Brown sand	Brown sand
3m	Brown clayey sand	Brown clayey sand	Brown clayey sand	Brown clayey sand	Brown clayey sand

BY FAX

拓展署
Territory Development Department, Hong Kong
九龍拓展處
Kowloon Development Office

來文檔號 Your Reference :
本署檔號 Our Reference : (96) in KD 2/16/6 Pt2
電話 Telephone : 2301 1421
圖文傳真 Fax : 2369 4980
日期 Date : 28 September 1998

Maunsell Consultants Asia Ltd.
8/F., Grand Central Plaza, Tower 2,
138 Shatin Rural Committee Road,
Sha Tin, New Territories,
Hong Kong.

(Attn. : Mr. Albert Li)

Dear Sirs,

Agreement No. CE 86/97
South East Kowloon Development at Kai Tak Airport
Decontamination and Site Preparation
DEP's Agreement of Pilot Test Procedures

I enclose for your reference a copy of DEP's letter to this office ref. (93) in EP2/K19/PT2/05 Pt. 3 dated 25 September 1998. DEP has formally agreed the pilot test procedures, and one of the approval conditions of the EIA Report is now fulfilled.

MEMCL					
Rec'd on	28-9-98				
File No.					
	Act	Info	Init	Date	Remarks
HF		/	TM	30/9	
TC					
PO					
PC	/				
MK	/		MK		

Yours faithfully

(P.C. Mok)
for Project Manager/Kowloon

Encl.

c.c. CES (Attn. : Mr. Matthew Ko) - w/e

PCM/scl

(c:\winword\ecp\2-16-6.doc)

(93) in EP2/K19/PT2/05 Pt3

本署參照
OUR REF:
來函請引
YOUR REF:
電話 2835 1122
TEL NO.:
傳真電話 2591 0558
FAX NO.:

Personal Copy

CE/KE

2/16/6

Hong Kong Government
Environmental Protection Department
Headquarters
28th Floor, Southorn Centre,
130 Hennessy Road,
Wan Chai, Hong Kong.

環境保護署
香港灣仔
軒尼詩道
一百三十號
修頓中心廿八樓

25 September 1998

By Fax and Post (Fax: 2369 4980)

Kowloon Development Office
Territory Development Department
7th Floor, Empire Centre,
68 Mody Road, Tsim Sha Tsui East,
Kowloon.

(Attn. : Mr. James S.O. Chan)

Dear Sir,

Re: Environmental Impact Assessment (EIA) Ordinance, Cap 499,
Application for Approval of an EIA Report
Kai Tak Airport North Apron Decommissioning

I refer to our letter dated 4 September 1998 advising you of our conditional approval of the captioned EIA Report.

Further to the meeting on 15 September 1998 between TDD, TDD's consultants and EPD in which an in-principle agreement was reached on the scope and procedure of the pilot test of the Soil Vapour Extraction/Air Sparging (SVE/AS) system, we received from you on 24 September 1998 the revised submission on the pilot test method. We are now satisfied that the pilot test will produce the necessary information to verify the effectiveness of the SVE/AS system in achieving the remediation targets.

Please note that prior to commencement of the decontamination works at Hotspot B using the SVE/AS system, you have to fulfil the EIA Report Approval Conditions 4 and 5, reproduced below :

4. Before starting the decontamination works using the SVE/AS system, the applicant shall submit to the EIA Sub-committee of the Advisory Council on the Environment, a report containing the results of the pilot test on the effectiveness of the SVE/AS system. Any comments raised by the EIA Sub-committee shall be addressed properly by the applicant.

5. The results of the pilot test of the SVE/AS system, and the recommendation, if any, on fall-back option(s) together with the associated method statements and detailed environmental controls, shall be approved by the Director. Before the commencement of the decontamination work at Hotspot B, the applicant must demonstrate to the Director's satisfaction that the proposed method of decontamination is able to achieve the remediation targets. The results of the pilot test shall be made available to the public as specified by the Director.

...../ - 2 -

Should you have any queries concerning the technical aspects of above, please contact Mr Michael Tsing of this Department at tel: 2835 1222.

Yours faithfully,

(Mrs Shirley S.L. Lee)
Principal Environmental Protection Officer
for Director of Environmental Protection

internal

P(WS)
S(WS)2
S(UA)1