



臺中市政府環境保護局

「106年度臺中市土壤及地下水污染調查及查證工作計畫」期末報告

# 摘要

## 執行成果摘要

為掌握土壤及地下水品質現況，臺中市政府環境保護局(以下簡稱環保局)除針對轄區土壤及地下水執行定期監測、緊急事件應變調查、地下儲槽土壤氣體查證外，也進行污染場址驗證、監測井維護管理、宣導活動辦理，遂於 106 年委託香港商艾奕康股份有限公司台灣分公司(以下簡稱本團隊)執行「106 年度臺中市土壤及地下水污染調查及查證工作計畫」(以下簡稱本計畫)，計畫執行期程為 106 年 1 月 24 日~12 月 31 日，茲說明本計畫工作執行成果摘要如後。

### 一、高污染潛勢區農地土壤調查

依土污法第 6 條辦理農地定期監測，總共調查 90 筆坵塊，共採集 90 點土壤，其中僅 2 筆大甲區 DF004-B 及 DF005 坵塊鎘超過食用作物農地土壤污染管制標準，而大里地區與大甲區今年土壤檢測結果雖低於管制標準，但仍超過監測標準，宜持續辦理監測。並由特徵雷達指標分級結果顯示大突寮圳第二給水、詹厝園圳幹線第一給水、第四給水灌溉範圍之重金屬雷達圖特徵均為鎳、鉻、鋅凸出型，具有相似特徵，而詹厝園圳幹線第二給水沿線農地主要特徵則為鉻、鎳、銅及鋅，明顯為兩股不同污染來源。而大甲區農地雷達特徵圖均以鋅、鎳較為明顯，且農地特徵均相似。針對今年環保署及環保局調查超過管制標準之 28 坵塊農地建議研擬農地污染改善及監督驗證計畫，向環保署申請經費，儘快投入改善與達成解列目標，早日還地於民。

### 二、高污染潛勢地區地下水污染調查

本年度完成豐枯水期合計採集 78 口次，由檢測結果顯示潭子加工出口區、大里光正路地區、臺中港大型儲槽、臺中工業區、漢翔公司、興農王田廠、三晃公司、幼獅工業區周圍下游監測井之地下水僅臺中工業區、大甲幼獅工業區及大里光正路有超過管制標準情形，調查成果摘要如下。

#### (一)臺中工業區

B00343 監測井於枯水期檢出鉻濃度為 0.637 mg/L、豐水期濃度為 0.885mg/L，今年度檢測結果仍有檢出鉻超出地下水污染管制標準，相較於 105 年度檢測結果，雖濃度有略為降低，但仍表示該區域之鉻污染持續影響下游區域地下水品質。

本次枯水期檢測結果發現臺中工業區預警網多口監測井皆有檢測出微量三氯乙烯濃度，包含 B00343、B00365、B00403 以及 B00424 監測井，分布廣泛，其最北側 B00424 監測井之三氯乙烯(濃度超過查證基準值 0.006mg/L)可能是受到上游西屯區協和段 33 地號場址之影響，未來須密切留意。

#### (二)潭子加工出口區及附近地區

區外三處場址監測井(L00094、L00095、L00096)地下水，以今年度

監測結果來看，距離加工出口區最遠的 L00094 其 VOCs 濃度有略高於 L00095，表示加工出口區內污染仍影響區外地下水品質，仍需持續監測，以觀察區內污染經管理處及改善業者加藥結果是否提升區外地下水品質。

### (三)大甲區幼獅工業區及周邊區域

今年枯水期 B00373 有地下水鎳超出管制標準，惟於豐水期調查 B00373 鎳已降低於監測標準，而 B00429 的鎳高於管制標準，檢視 B00429 與 B00373 之間隔著四好橋溝，此溝寬度亦有 10 公尺左右，兩座井相距約 80 公尺。其中 B00429 與台姿記公司污水放流口距離約 20 公尺，近年來兩座監測井的地下水鎳含量經常有超過地下水污染管制標準的現象，台姿記公司之前為七條五列管場址，屬於土壤重金屬鎳超標而列管，該場址雖於 105 年 1 月 18 日已解除列管，不排除仍有未飽和層污染或其他污染情形，亦或鄰近上游是否有其他電鍍製程與其他污染來源，需要密切留意。

### (四)大里光正路地區

今年枯豐水期針對大里光正路三處污染場址下游監測井 B00113 進行監測，監測結果仍超過地下水污染管制標準，且於豐水期更下游 B00238 地下水鉻濃度有超過監測標準跡象，檢視該井自 102 年迄今監測結果，檢測值於管制標準與監測標準間震盪。

檢視大里光正路水力控制的良窳也會影響鄰近與下游監測井的監測數值，上游正佑公司與保勁公司抽水改善成效有限，導致污染團仍擴散至下游 B00113 與 B00238 監測井，其鉻濃度持續超標，雖已於 6 月 20 日環保署參事及環保局科長曾前往正佑公司召開協商會，請正佑公司檢視電鍍槽體防溢設備否則目前改善作業只在於防止污染擴散非污染改善。

### (五)臺中港大型儲槽區

枯水期間對於 L00055 及 L00073 之監測結果水質正常，但距離匯僑公司較近的 L00073 監測井仍有測到微量之氯乙烯濃度(0.00606 mg/L)，水質仍稍受匯僑場址的影響。

### (六)臺中精密機械科技創新園區地下水水質監測結果

今年度枯水期精密園區下游之 B00046 監測井之無超標情形。本計畫亦彙整精密園區於申報備查階段之自行監測結果其中 GW05、GW06 兩座監測井近三年之三氯乙烯含量雖未達監測標準，但一直有超出查證基準值；另查詢精密園區開發計畫環境影響說明書及相關委外專案，亦未發現有著手調查污染源的紀錄，此現象需後續密切留意，建議仍需於下游定期監測，必要時可於園區內 GW5、GW6 借井以被動式擴散袋採樣方法進行地下水質調查作業，以避免有突發污染事件發生。

## (七)其他地區

漢翔航空公司、興農公司王田廠、三晃公司、台灣優力豐富站等列管場址均已處於污染改善階段，其下游監測井地下水水質監測結果均低於地下水污染管制標準。

### 三、監測井維護管理

本年度上、下半年監測井內外部巡查各分別完成 198 口及 209 口，於修繕維護應完成井況評估 37 口（區域井 4 口、場置性井 33 口），監測井維護 18 口、井體設施修復 9 口、監測井再次完井 19 口、井中異物排除及攝影 5 口及 10 口廢井作業，惟 L00012、L00151、B00113 監測井體有破損情形，建議依損壞程度分類於明年度安排修繕或維護，而 L00005、L00169、B00403 三座井有發現異物，且今年度本團隊協助環保局擬定監測井內部維護評分制度，經評估結果總分高於 14 分之監測井合計共 33 口，建議後續進行井況評估，確認井內現況。

### 四、場址監督驗證

依契約針對列管場址至少每兩個月巡查 1 次，本團隊自民國 106 年 1~11 月總共完成 893 場次巡查，本團隊於 4 月份發現正佑公司放流水不符合放流水標準，並每月加強稽查，經確認仍有未符合放流水標準之情形，已祭出罰單要求業者限期改善；保勁地下水鉻濃度有突升情形，環保局已函文要求保勁啟動緊急應變改善地下水鉻濃度突升情形，並請該公司確實檢視釐清污染突升是否為廠內作業不慎導致；瑞昌採樣於民國 105 年曾放流水水質 pH 與鉻均不符合放流水標準，今年度協助環保局每週加強稽查與抽驗，放流水情況已改善。此外，本團隊也協助環保局審查 109 件。

場址驗證部分，原合約執行 5 處場址驗證，因場址改善期程似有提前，故本計畫辦理契約變更，增加后里農地場址驗證，惟場址因改善契約與土壤離場問題致期程回至原定期程，未能於今年度完成驗證，而今年度本計畫共驗證 5 處場址，僅 1 處場址通過驗證，而檢視場址未能通過驗證之因素，多為初期場址細密調查未臻完善所致，建議依土污法持續列管並請場址研提控制計畫書變更與確實釐清污染範圍。

### 五、地下儲槽稽查

本年度 1 月、5 月及 9 月應線上申報地下儲槽各有 316 家、317 及 318 家，並分別於 2 月、6 月及 9 月完成審查，申報率及審查率均達 100 %。另也完成 106 年 1 月、5 月及 9 月地下儲槽污染潛勢分級，並依據分級結果，共挑選 15 家高污染潛勢之地下儲槽進行查核，其中共有 9 家土壤氣體仍高於警戒值，且有 3 家污染潛勢分級以達 A 級、1 家為 B1 及 1 家連續兩次查核追蹤均為 B1 等級，除第三次查核結果分級納入明年度追蹤外，第一、二次查核結果依據環保署分級後續原則建議，本計畫啟動應變經費執行土壤或地下水污染調查，檢測結果顯示 TPH 及 BTEX 檢測尚合格。

#### 、緊急應變作業

截至 106 年 12 月 20 日為止，土壤及地下水應變已完成大里區光正段 1065-2 地號農地、西屯區東林段 261 地號農地、梧棲區永安段工廠、大雅區埔子墘段工廠、大甲區甲民段及日新段與大安區安行段等 4 筆地號、神岡區福隆段污染案，順里發加油站、中港貨櫃轉運站、中華加油站、大連加油站、關連工業區地下水及后里區月眉排水區等 5 個農地坵塊等 12 件案例，其中有 3 件驗出污染物超過管制標準、1 件檢出污染物超過監測標準，實做實算之總經費為 786,843 元。

## 七、其他工作成果

協助環保局辦理 1 場次地下儲槽法令說明會、1 場次環保法規講習會，參與人數均符合契約規定，會後問卷調查結果顯示學員滿意度高，宣導成效良好。因應土測報告回歸地方環保局自行審查，本團隊建立審查與備查流程及架設土污法第八條及第九條規範資訊宣導網站，並協助辦理土測報告審查共計 70 件，審查率為 100%，平均審查天數從 66 天降至 45 天以下。

## Abstract

Taichung Environmental Protection Bureau (TCEPB) has carried out the work to manage the current quality of soil and groundwater, including regular monitoring, emergency treatment and investigation, confirmation for soil gas near underground storage tanks, testifying contaminated sites, management and maintenance of monitoring wells, and educational campaign. In 2017, TCEPB has commissioned AECOM (the team) to run “2017 Project of contamination investigation and confirmation for Taichung soil and groundwater” (the “project”), and the working period was from January 24<sup>th</sup> 2017 to December 31<sup>st</sup> 2017. The following abstract is the interpretation of the project.

### 1. Investigation of highly potential contaminated farmland

According to Article 6 in Soil and Groundwater Pollution Remediation Act, the regular monitoring has been imposed to farmlands. There were 90 parcels under investigation with totally 90 collected samples and two parcels (DF004-B and DF005) in Dajia district was found that the zinc concentration is higher than the farmland control standards. Although the examination results from Dajia and Dali districts were below control standards, they were higher than the monitoring standards, suggesting the surveillance should be continued.

The results by characteristic radar index showed that the concentrations of nickel, chromium and zinc were the characteristics in 2<sup>nd</sup> water supplement of Datuliao waterway and in 1<sup>st</sup> and 4<sup>th</sup> water supplement of Zhancuoyuan waterway. On the other hand, the concentrations of nickel, chromium, zinc and copper were the characteristics in 2<sup>nd</sup> water supplement of Zhancuoyuan waterway, indicating the sources of pollution were different. The results in Dajia farmlands showed that the concentrations of nickel and zinc were the characteristics. Our team suggested that the supervision and verification plans for 28 farmlands exceeding control standards should be drawn up as soon as possible in order to remove them from contamination control list.

### 2. Investigation of highly potential contaminated groundwater

In 2017, we had successfully completed groundwater sampling for 78 wells in both drought and monsoon seasons, including Taichung Export Processing Zone (TEPZ), Taichung Dali GuangZheng road area, large-size storage tank area of Taichung harbor, Taichung Industrial Park, Aerospace Industrial Development Corporation (AIDC), Sinon Corporation (Wang Tian factory), Tali Sunko Ink Co., Ltd, and Da Jia Youth Industrial Park (DYIP). The results showed that groundwater at Taichung Industrial Park, Da Jia Youth

Industrial Park (DYIP), Taichung Dali GuangZheng road area exceeded the control standards. The detail results are as follows:

a. Taichung Industrial Park

The chromium concentrations at B00343 monitoring well was 0.637 mg/L in drought season and 0.855 mg/L in monsoon season, respectively. Although the chromium concentrations in 2017 were lower than the ones in 2016, the investigation results showed that the chromium concentrations still exceeded the control standards, which indicated chromium pollutant from this area still had impact on the quality of groundwater at downstream area.

Investigation results of monitoring wells B00343, B00365, B00403 and B00424 inside Taichung Industrial Park's early-warning network in drought season showed that slight amount of trichloroethylene (TCE) was found. The concentration of trichloroethylene (TCE) at monitoring well B00424, which is at the northernmost location, exceeded the baseline value of confirmation(查證基準值) (0.006mg/L). It is likely that B00424 was affected by upstream no. 33, Xiehe section, Xitun district. Close attention to this site is necessary.

b. Taichung Export Processing Zone (TEPZ) and its perimeter

L00094, L00095 and L00096 are three monitoring wells outside the TEPZ. VOCs concentrations of L00094, the furthest one from TEPZ, were higher than those of L00095, which means the contaminant from TEPZ still affected the quality of groundwater outside TEPZ. Monitoring operation should be constantly taken to observe the groundwater outside TEPZ after improvement method was carried out (加藥) in TEPZ by management office(管理處) and quality improvement team(改善業者).

c. Dajia Youth Industrial Park (DYIP) and surrounding area

The nickel concentration at B00373 exceeded the control standards in drought season but not in monsoon season, and the nickel concentration at B00429 exceeded the control standard. There is a gap with 10 meters width between B00373 and B00429 and the distance between them is 80 meters. Recently, these two monitoring wells had nickel content usually higher than the control standard as B00429 is 20 meters far from sewage outfall of Tai Zi Ji Co.Ltd.. The company was under inspection by Article 7-5 in Soil and Groundwater Pollution Remediation Act and had been in control list because of exceeding nickel concentration in soil. Although it

had been removed from control list by January 18<sup>th</sup> 2016, the contaminant may come from unsaturated zone, upstream area, electroplating process area or other sources. Close attention to this site is necessary.

d. Taichung Tali Guang Zheng road area

Monitoring well B00113 is located at downstream area of three contaminated sites in Taichung Tali Guang Zheng road area. It exceeded the control standards in both monsoon and drought seasons. Moreover, the chromium concentration at B00238 exceeded the control standard in monsoon season in 2017. The value had been ups and downs between the monitoring standard and control standard since 2013.

Because Zheng You Co., Ltd. and Bao Jing Company didn't conduct pumping operation properly and thus, the plume was spread to downstream monitoring wells B00113 and B00238, causing chromium concentrations over the control standard. The counselor of EPA and Chief of TCEPB held a meeting with Zheng You Co., Ltd. at June 20<sup>th</sup> for demanding Zheng You Co., Ltd. to inspect the plating tank. Otherwise, the current operation would merely prevent plume from being spread rather than improve the overall condition.

e. Dajia Youth Industrial Park (DYIP)

The monitoring results showed that L00055 and L00073 in drought season didn't exceed the monitoring standards. Monitoring well L00073 near Prim Oil Chemical Service Corporation (POCS) was found vinyl chloride concentration at 0.00606 mg/L as a result of slight affect by POCS..

f. The Taichung City Precision Machinery Innovation Technology Park

In 2017, downstream monitoring well B00046 in the park didn't exceed the monitoring standards. Self – monitoring results of GW05 and GW06 were well-documented in this report. It showed that trichloroethylene (TCE) concentrations of GW05 and GW06 had not been exceeding the monitoring standards for three years but over the baseline value of confirmation. There was no investigation on contaminant source in Park Development of Project Environmental Impact Statement or outsourcing projects, suggesting the surveillance of downstream area be continued. To avoid unexpected contamination incident, passive diffusion bag sampler method would be conducted at GW-05 and GW-06 when necessary.

g. Other areas



Aerospace Industrial Development Corporation (AIDC), Sinon Corporation (WangTian factory), Taichung Tali Sunko Ink Co., Ltd. and Taiwan UL FengFu gas station had been in improvement stage and all of the downstream monitoring wells did not exceed the control standards.

### 3. Well monitoring and maintenance management

In first half year, the team had completed exterior and interior patrol and inspection for 198 monitoring wells and 209 in each half year. Other results included condition evaluation for 37 wells, i.e 4 area wells and 33 site-placed wells, maintenance of 18 monitoring wells, repairing body facility for 9 wells, re-developing 19 wells, removing unexpected substance and inner photography for 5 wells, and termination on 10 wells. The team suggested to repair or maintain L00012, L00151 and B00113 depending on its damage. Besides, L00005, L00169 and B00403 were found to have unexpected substance inside. The team assisted TCEPB to draw up grading system for monitoring well interior maintenance. The result suggested that there were 33 wells in need of further evaluation in order to understand the situation inside the wells since their monitoring wells score were higher than 14.

### 4. Verification and supervision of pollution site

The team had completed 893 times patrol and inspection since January 2017, and ended up in November 2017 according to the contract (once per two months). In April, the team found Zheng You Co., Ltd.(正佑公司) was not able to meet the effluent standards and thus inspected them again with enhanced monthly audit. However, they still couldn't improve the situation to meet the requirement and had been fined to ask them for immediate improvement. The chromium concentration of Bao Jing Company (保勁地下水) was found to increase unexpectedly so that the TCEPB had already formally informed Bao Jing Company (保勁地下水) to initiate emergency response to address and improve this issue and see if it was caused by their improper factory operation. As both effluent pH and chromium concentration from Ruey Chang Printing & Packing Foil Co., Ltd. had not conformed to effluent standards in 2016, the team assisted TCEPB to conduct enhanced weekly audit and examination and the results were qualified. In addition, the team had assisted TCEPB to review 109 reports.

The original contract requested to complete 5 sites confirmation. The team planned to carry out the confirmation in HouLi farmlands additionally, but didn't accomplish because of some issues over soil offsite. The project in 2017 had confirmed only 1 out of 5 sites was qualified. The reasons of failing to qualify might be imperfect site investigation in early time, suggesting that the sites

should be kept in control list to address the contaminated extent clearly.

## 5. Inspection of underground storage tank

There were 316 (January), 317 (May) and 318 (September) underground storage tank industries that had to complete online application, separately. The team finished the verification in February, June and September. Both the percentage of application and verification were 100%. According to the contamination potential classification of underground storage tank completed by the team, 15 underground storage with high potential of contamination had been selected for verification. Among the selected, there were 9 stations at which concentrations of soil gas were still higher than regulatory warning standards and 3 of them belonged to level A, 1 of them belonged to level B1 and 1 of them was found level B1 in two sequential inspections. Apart from the results of the 3<sup>rd</sup> inspection integrated into the surveillance next year, the results of 1<sup>st</sup> and 2<sup>nd</sup> inspection launched the soil and groundwater investigation according to EPA's rating and showed no detection of TPH and BTEX.

## 6. Emergency treatment work

As of 18<sup>th</sup> December 2017, the team had completed 12 soil and groundwater emergency treatment works, including 2 farmlands in Dali and Xi Tun, 2 factories in Wu Chi and Daya, 4 lands in Dajia, 1 contaminated site in Shenang, Shunlifa gas station, Zhonghua gas station, Dalian gas station, Zhonggang container transfer station, guanlian industry park and drainage area in Houli. There were 3 cases found exceeding the control standards and was 1 case found exceeding the monitoring standards. The total funds was 786,843 NTD.

## 7. Other achievements

The team assisted TCEPB holding 1 groundwater storage tank laws explanation session and 1 environmental regulation workshop. The amount of participants conformed to the contract and the results of questionnaire showed high satisfaction. As Report of Investigation and Detection in Soil Pollution (± 測報告) would be reviewed by TCEPB, the team established a process of review and memo and set up a website to advocate Article 8 and 9 in Soil and Groundwater Pollution Remediation Act. Besides, 70 reports were 100% reviewed and the team reduced the working time from 66 days to 45 days.