

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, verification for soil gas near underground storage tanks, testifying pollution sites, management and maintenance of monitoring wells, and educational campaign. In 2016 TCEPB has commissioned 「AECOM」 to run 「2016 Project of investigating and verifying pollution for Taichung soil and groundwater」 (the “project”), and the working period was from February 1st 2016 to December 31st 2016. The following abstract is the interpretation of the project.

1. Investigation of highly potential polluted farmland

According to Article 6 in Soil and Groundwater Pollution Remediation Act the regular monitoring has been imposed to farmlands. There were 86 parcels under investigation with totally 100 collected samples and only one parcel (D003) in Dali district was found that the concentrations of chromium and copper are higher than the control standards. Although the results from Houli and Dajia districts are below control standards, they are still higher than the monitoring standards, suggesting the surveillance be continued.

2. Investigation of high pollution potential area groundwater

In 2016, we have successfully completed groundwater sampling for 91 wells in both drought and monsoon season, giving totally 182 samples. The results indicate there are 10 areas exceeding monitoring standards, i.e. Taichung Export Processing Zone (TEPZ) and its perimeter, Taichung Tali Guang Zheng road area, large-size storage tank area of Taichung harbor, Taichung Industrial Park, Aerospace Industrial Development Corporation (AIDC), Sinon Corporation (Wang Tian factory), Taichung Tali Sunko Ink Co., Ltd, Da Jia Youth Industrial Park (DYIP), Chenenergy Global Corporation and Taiwan UL FengFu gas station. The detail results are as follows:

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

B00152 and B00335 are two wells exceeding the control standards in both drought and monsoon season. At B00152 well the trichloroethylene (TCE) concentrations are 0.0762 mg/L and 0.550 mg/L, respectively, and the concentration of tetrachloroethylene (PCE) is 0.0581 mg/L in monsoon season; while B00335 well shows PCE concentrations at 0.0872 mg/L and 0.111 mg/L in respective seasons.

There are other wells also exceeding monitoring standards in monsoon season, such as L00153 well giving PCE and TCE concentrations at 0.151 mg/L and 0.167 mg/L, respectively, and B00070 well indicating PCE and TCE concentrations at 0.102 mg/L and 0.082 mg/L respectively. In addition, the monitoring wells located at downstream of the TEPZ groundwater reveal the concentrations of chloro-diene pollutant lower than the control standards, except for L00097 well giving TCE concentration at 0.0384 mg/L in monsoon season exceeding the monitoring standard.

To understand the feature of water usage in TEPZ area, AECOM had applied 3 extra wells (B00404, B00069 and L00153) to continuously monitor the water table. B00404 well (located in Lingsen Precision Industries, Ltd) is significantly affected by nearby pumping station (PW7) while B00069 and L00153 are relatively less affected although the intermittent drawdown can be found following the increase in pumping water at PW7.

b. Taichung Tali Guang Zheng road area

The chromium concentrations at B00113 and B00137 wells, i.e. 0.658 mg/L and 1.01 mg/L respectively, exceed the control standards at drought season; while at monsoon season, there are also two wells, B00140 (1.27 mg/L) and B00113 (1.24 mg/L), indicating chromium concentration higher than the control standards, especially B00113 located at downstream showing higher chromium concentration than the control standard at both drought and monsoon season. Yet the concentration is slightly decreased as compared to last year data and it is known the highly polluted area is located at Alley 221, Renhua Road.

According to the analysis of Monitoring and Remediation Optimization System (MAROS), the monitoring work should be carried out once a year for each well in this area and the installing density of monitoring wells in the area should be higher as a result of pollutant source at Alley 221. Besides, Alley 212, Guang Zheng road which is located below Alley 221, Ren Hua road is the diffuse point as well, and the demand is the same as Alley 221 for monitoring wells. Thus, it is better to set additional monitoring wells between 221 alley, Guang Zheng road and early-warning network B00234 to understand the diffusion and movement situation of groundwater pollution.

c. Large-size storage tank area in Taichung harbor

B00416 well [located in Prim Oil Chemical Service Corporation (POCS)] shows the concentration of vinyl chloride at 0.0769 mg/L and 0.0486 mg/L in monsoon and drought season which exceed the control standards. The concentration of vinyl chloride at L00073 well (Located in Young Sun Chemtrade Corporation., Ltd) exceeds the control standard in drought season (0.0276 mg/L). Considering the location of L00073 well where affected by tidal action, we cannot rule out the effects by the groundwater transportation from POCS.

d. Taichung Industrial Park

B00347 well (located in the area of Ruey Chang Printing & Packing Foil Corporation., Ltd) shows the concentration of chromium (2.35 mg/L) higher than the control standard in monsoon season, and at the downstream area, the self-setting well (located in Taichung Industrial Park) presents chromium concentration at 79.2 mg/L and 36.5 mg/L in drought and monsoon season, respectively, which extremely exceed the control standards. B00343 well is located further downstream area (early-warning network) that shows the chromium concentration at 1.06 mg/L and 0.72 mg/L individually in monsoon and drought season, which are higher than the control standards and indicate the pollutant in warning area. Therefore, we suggest industrial park commence the emergency process and maintain monitoring. To secure the safety of drinking water for citizens on the backward of early-warning network, the examination over heavy metal concentration is important.

e. Aerospace Industrial Development Corporation (AIDC)

Most analysis over Volatile Organic Compound (VOCs) sample give lower concentrations than the monitoring standards. However, inside AIDC factory, the detection in monsoon season shows a value 0.0824 mg/L of TCE that exceeds the control standard and is different from those in seasonal report submitted to AIDC. TCEPB will not be responsible for the monitoring service because of the new policy indicating the monitoring process should be transferred to behavior or party decided by Taiwan Environmental Protection Administration (new EPA). In the situation, we realize the variety of information and thus, we recommend TCEPB carry out at least one peer monitoring for each site as striving for 2018 budget.

f. Sinon Corporation (WangTian factory)

At drought season, L00112 and L00111 wells (inside the factory) show several pollutant concentrations in groundwater that exceed control standards, i.e., L00112 pollutants including benzene (0.12 mg/L), chlorobenzene (11.4 mg/L) and vinyl chloride (0.02 mg/L); L00111 pollutants including 1, 2-dichloroethane (0.0594 mg/L), 1,4-dichlorobenzene (1.08 mg/L) and chlorobenzene (3.86 mg/L). Outside the factory, L00141 well shows chlorobenzene exceeding the control standard (drought season:1.29 mg/L, monsoon season: 1.33 mg/L) and thus, we suggest TCEPB focus on L00141 well for monitoring at least once a year and request Sinon Corporation to improve the remediation process as soon as possible or increase the range of hydraulic control. Additionally, soil excavation work should be accelerated.

g. Taichung Tali Sunko Ink Co., Ltd

Inside the factory, B00256 and B00382 wells show arsenic concentrations in groundwater that exceed control standards, i.e., B00256 in drought season (0.625 mg/L) and monsoon season (0.739 mg/L); B00382 in drought season (1.45 mg/L) and monsoon season (1.33 mg/L). B00256 well also shows several VOC concentrations exceeding control standards, and the values in drought season are higher than in monsoon season, i.e., 1,4-dichlorobenzene (0.868 mg/L), benzene (0.704 mg/L), chlorobenzene (16.0 mg/L) and vinyl chloride (0.0278 mg/L). B00382 is another well with pollutant concentrations exceeding VOC control standards in both drought and monsoon season, i.e., chlorobenzene (6.17 mg/L), PCE (0.099 mg/L) and vinyl chloride (0.0995 mg/L) in drought season; chlorobenzene (2.68 mg/L) in monsoon season. Consequently, we suggest industry focus on the control of groundwater emergency process that may avoid the diffusion of pollutant during remediation work program.

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

TY09/B00429 is a self-set well that shows the concentrations of nickel exceed the control standards in both drought (1.15 mg/L) and monsoon (1.52 mg/L) season, and the nearby well B00373 shows the concentrations of nickel exceed the control standards in monsoon season as well (0.887 mg/L). Besides, inside DYIP's early-warning network, L00168 well was first found the concentration of nickel exceed the monitoring standard in monsoon season (0.393 mg/L). Moreover, we have completed organizing the basic information and location distribution of 49

industries using nickel and 3 industries using arsenic in DYIP for follow-up managing administrator to trace the source of pollution and keep monitoring the wells with unusual data.

i. Other area

Taiwan UL FengFu gas station (L0090 well) shows that several pollutant concentrations exceed the control standards in drought season, including Naphthalene (0.604 mg/L), methyl tert-butyl ether (MTBE) (1.73 mg/L) and TPH (45.2 mg/L); in monsoon season, the concentrations of pollutants are decreased to monitoring standards due to the remediation work undergoing, but still need to be monitored. Chenergy Global Corporation (B00345) shows the concentrations of TPH at 77.4 mg/L in drought season and 60.1 mg/L in monsoon season, both of which exceed the control standards. Thus, we should ask industry to ensure that the pollutants will not be transported to groundwater through infiltration and diffuse to further area.

3. Maintenance and management of monitoring wells

In first half year, we have completed exterior and interior patrol and inspection for 214 monitoring wells and 219 in the last half year. Other results include condition assessment for 37 wells, rebuilding 19 wells, eliminating foreign substance for 5 wells, repairing 19 well exteriors and body facility of 9 wells and abrogating 5 wells. Our team found there are 26 wells in need of exterior repair at the last half year; however, the budget is limited that we suggest to repair it depending on its damage level. Besides, there are 8 monitoring wells in need of condition evaluation to ensure if the well is well functional.

4. Verification and supervision of pollution site

Our team complete 817 times patrol and inspection since February 2016, and end up in October 2016 according to the contract (once per two months). On 25th March, we found soil vapor extraction (SVE) equipment present low efficiency in Tai An northbound gas station; on 19th September, we sample and measure the effluent pH and chromium concentration from Ruey Chang Printing & Packing Foil Corporation., Ltd which cannot conforms to effluent standards; some pollution farmland grow plants, i.e., no.377, Dun Bei section, Hou Li district; no. 744-2, Tian Shuei section, Long Jing district. Additionally, our team has assisted TCEPB examine 88 reports.

The original contract indicate to complete 5 sites verification, however, due to most sites postpone its working time, TCEPB agree to adjust the content of original contract. On 16th November, our team accomplish the verification of Shen Gang gas station, and the results show the concentrations of TPH still exceed the control standards. Thus, we suggest TCEPB announce Shen Gang gas station as a pollution control site in accordance with the law. On 22th November, our team accomplish the verification of Yuken Hydraulics Corporation., Ltd, and the results show the concentrations of TPH and VOCs are lower than control standards and thus, we suggest to remove it from pollution control list.

5. Inspection of underground storage tank

There are 312 (January), 313 (May) and 310 (September) underground storage tank industries have to complete online application, separately, our team finish the verification in February, June and September. Both the percentage of application and verification are 100%. According to the pollution potential classification of underground storage tank which is completed by our team, the team has selected 12 highly potential polluted underground storage for verification. Among selected high pollution potential underground storage tanks, Long Jing shan Loong gas station, Wu Feng Lin Sen road gas station, Chih Kao gas station and Yong He street gas station are belong to level A which are investigated through emergency process funds. On 7th November, the investigation results of Wu Feng Lin Sen road gas station shows the concentration of soil gas is lower than regulatory warning standards. On 8th November, soil gas investigation results of Yong He street gas station present only one detection tube's value exceed regulatory warning standards; nonetheless, we suppose it could be a anthropogenic effect. On 10th November, the investigation results of Long Jing shan Loong gas station shows the highest value of TPH is 15,200 mg/kg which exceeds control standards. On 21th November, the investigation results of Chih Kao gas station shows there is no detection of TPH and BTEX.

Moreover, the trace investigation results of Ta Tung gas station and Tan Zi gas station shows that the former has stable soil gas condition, latter has continuously 2 unusual soil gas value and further the measurement results of gas chromatography indicates the presence of benzene substance. Our team have completed the adjustment of original contract for Tan Zi gas station, and finish soil sampling on 15th November that the concentrations of TPH and VOCs are lower than the control standards. Besides, the investigation results of

Ruei Guo gas station present the concentrations of TPH and VOCs are lower than the control standards as well.

6. Emergencies treatment work

As of 21th December 2016, our team have completed 12 soil and groundwater emergencies treatment works, including Da Jia farmland, Wu Ri farmland, Tali district illegal dicard place, Wai Pu district illegal discard place, pronunciation of Sinon Corporation groundwater program, Tai Ping electroplating factory, 2 industries from Da jia, reporting soil exception from Taichung industry park, Xi Tun district farmland and Long Jing shan Loong gas station. There are 7 cases exceeding control standards, and the total funds is 732,661 NTD.

7. Other achievements

Our team assist TCEPB holding 1 groundwater storage tank laws explanation session, 1 environmental regulation workshop, 20 campus educational propagandas and 1 soil and groundwater public propaganda. The amount of all activities participants conform to contract and the results of questionnaire shows high satisfaction. The international environmental exhibition didn't hold this year by EPA, but complete 1 farmland pollution remediation model for TCEPB.

Furthermore, our team also assist 22 place's initial sited assessment, visiting 7 factories on the upstream of Da Jia farmland, writing the proposal for 2011Tali farmland claim, planning the deliberation standards for Taichung soil and groundwater pollution improvement program, completing groundwater pollution classification in Xi tun, Nan Tun, Tai Pin and Wu Chi districts', updating 4,572 data from Taichung soil and groundwater environmental information database.