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THE ENVIRONMENTAL REDEVELOPMENT OF A RAILYARD AND PORT FACILITY*

PAUL SCOVAZZO and RICHARD STRUBBLE
WAPORA Inc., 7926 Jones Branch Drive, Suite 1100, McLean, VA 22102 (U.S.A.)

Summary

The owner of an over 100 year old railyard and port facility in the city of Baltimore wished to redevelop the facility and adjacent waterfront into mixed industrial, commercial, and residential use. The property covered 189 acres with 139 acres of dry land. WAPORA, Inc. was contracted to solve three major problems. First, at low cost determine with engineering confidence the environmental impact to the property from previous activities. An environmental detective case where no previously *known* contamination was on site. Areas of focus included: surface soils, subsurface soils, groundwater, hazardous drums, industrial buildings, pits, and sumps. Second problem, delineate, design, and negotiate with the state remediation of groundwater, drums, aboveground and underground storage tanks, and 5000 cubic yards of soils with EP-Toxic arsenic, cadmium, and lead. Finally, problem three, to complete the remediation and remain one step ahead of the facility's decommissioning and demolition crews while operating underfoot of an active port facility.

1. Introduction

Evolving environmental laws and liability issues have had a profound effect on the expanding and lucrative field of real estate redevelopment, especially in urban and "rustbelt" areas, making environmental investigations as indispensable to buyers and sellers as title searches. Current laws place primary responsibility for environmental remediation on the *current* owner of a property and not necessarily the "original polluter." Such laws have not only caused buyers of properties but also their financial backers to require that environmental investigations be performed since an unseen or unidentified environmental problem can quickly bring financial ruin and legal sanctions to these parties.

The environmental consultant is now the newest player in the real estate game, addressing environmental issues that are counter to the following typical components of a successful real estate transaction:

- Interested buyer, investor, or developer not worried about possible current or future liabilities

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- A successful loan application.
- Closure in a reasonable time frame
- Low acquisition cost and high profit margins

The larger and more complex the development project is, the more at odds environmental issues are with the transactions moving ahead. With existing commercial or industrial properties, the probability of previous on-site activities having serious environmental impacts is high. The environmental consultants role in this new game is to:

- Demonstrate with sound scientific and engineering principles that the property at closure is environmentally acceptable for the planned development use
- Remediate any environmental concerns found in the time allotted before closure
- Control the site investigation and remediation so the property transaction is still profitable

Unlike Federal or State Superfund managed site investigations, which may take years and several hundred thousand dollars to complete, investigations tied into real estate transactions must be timely and cost effective for the "deal" to happen. A great amount of pressure is placed on the consultant to determine if there are any problems, what they are, and how much it will cost to correct them, all within a short time frame. These tasks are made more difficult by the moving target of "how clean is clean" to satisfy all involved. The consultant's work must also be technically sound and scientifically defensible in the event that litigation occurs.

For example, WAPORA is currently completing an environmental investigation and remedial action program for a complex real estate transaction involving numerous buyers, sellers, regulatory agencies, and other government offices. WAPORA's client, CSX Transportation (CSXT), a national transportation company, operated an over 100 year old, 190 acre railyard and port facility within the City of Baltimore, Maryland, called Port Covington. CSX Realty (CSXR), CSX's land development company, with the assistance of the City's economic redevelopment agency created a master redevelopment plan for the site which involved the transfer of an adjacent industrial property to CSXR, the sale of over 60 acres of CSXT property to other developers, and the redevelopment of the remaining property by CSXR into mixed industrial, commercial and recreational uses.

There were no obvious environmental issues at the beginning of the project, but 100 years of railroad use raised a number of potential concerns. Due to the size and complexity of this project, WAPORA played many roles among the various parties: technical advisor, strategic planner, mediator, negotiator, and most importantly environmental detective.

The following narrative describes how the detective story for this project unfolded.

2. Background investigation

All detectives start with a suspect's history; in this case the past historical and present uses of the property and adjacent properties. This initial phase of the investigation utilized the following informational sources:

- Insurance maps dating back 100 years
- Aerial photographs, present and past
- Employee interviews
- Local historical library
- Site walkover
- Past lease agreements

Even though these investigatory steps do not seem to be typical for a scientific approach, when they are done by trained technical staff experienced in

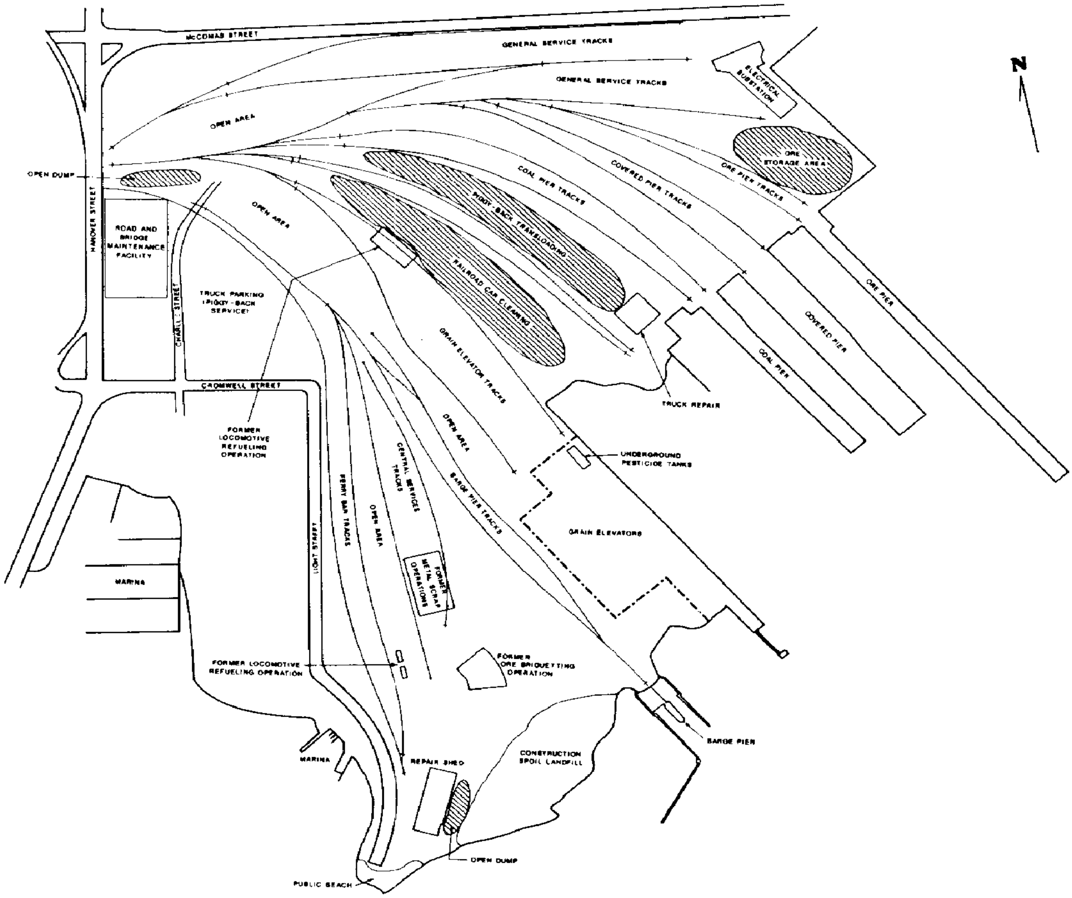

Fig. 1. Site map.

the environmental field, they produce the leads and guidance that are needed for a successful environmental investigation.

Figure 1 presents a descriptive map of the property and pictorially identifies the site use information obtained during the background investigation:

- General bulk materials transloading and transportation areas having potential for spills
- Diesel locomotive refueling stations
- Truck and locomotive repair operations
- PCB-containing transformer locations
- Active and inactive landfilling sites
- Ore briquetting operation
- Large grain elevator and transloading facility

3. Project scope

A project the size of Port Covington involves a series of physical and chemical investigations whose complete discussion would be too lengthy for this presentation. Therefore, this paper will focus on a difficult problem common to all real estate investigations: how to satisfactorily determine the environmental state of surface soils without performing a cost-prohibitive, site-wide grid sampling and analysis program.

However, in order to show the potential complexity of real estate development projects, such as Port Covington, this section will briefly discuss all of the investigations conducted at this site.

Drum investigation. Years of track and equipment maintenance along with freight handling had left drums singly or in groups of two or more laying throughout the site. No records existed for these drums and, for the most part, no decipherable labels. WAPORA "overpacked" and collected these drums for staging in one consolidated location. Once consolidated, the drum contents were identified or sampled. WAPORA completed the drum investigation by arranging for and supervising the drums proper disposal. Over 160 drums were involved in this investigation and included such waste streams as tar, paints, solvents, greases, acids, asbestos cement, calcium carbide, and lubricating oils.

Site structures investigation. All 58 active and inactive buildings and other structures on site were surveyed to determine if they contained any hazardous materials or asbestos. Any physical hazards were noted, and asbestos containing materials in violation of Maryland regulations were identified for subsequent removal prior to building demolition.

Storage tanks investigation. All aboveground and underground oil and gasoline storage tanks were located. Tank contents were sampled and disposed of according to state environmental regulations. Subsequent remediation included proper removal and decommissioning of all tanks prior to disposal as scrap metal.

Debris pile investigation. Several areas of the site were used by property tenants and local residents as open dumps. These debris piles were inspected for the presence of hazardous materials and asbestos. Ultimately these piles were removed from the site for disposal in an approved sanitary landfill.

Landfill investigation. An on-site construction spoil landfill was checked using test pits and deep soil probes to confirm its contents.

Transformers investigation. All on ground and pole mounted transformers were sampled for the presence of PCBs. Soil samples beneath all the transformer locations were also checked to ensure there were no historical PCB oil spills.

Septic tanks investigation. All septic tanks were located and their contents checked for the presence of hazardous materials and oils, especially those serving equipment maintenance buildings.

Pits, sumps, sewers, and storm drain investigation. These structures were checked and sampled for the presence of hazardous materials and oils resulting from possible spills or improper disposal practices.

Hydrogeologic investigation. Because of historical, on-site, diesel locomotive fueling operations, extensive investigations of subsurface soil and groundwater were conducted at several locations throughout the property.

4. Surface investigation

The presence of contaminated surface soils is determined from a comprehensive sampling program. The site's background investigation guides the design of the sampling plan.

For this project, WAPORA instituted a surface soil sampling program which divided the property into seven operational unit types:

- Track groups servicing the same pier or business use
- Open areas between tracks
- Former scrap metal operation
- Former ore briquetting operation
- Repair operations
- Refueling areas
- Grain elevator area

4.1 Area-wide composite sampling

The first step in pursuing possible contamination sources in surface soils is area-wide composite sampling within an operational unit. The purpose of the area-wide composite sampling is to indicate the presence or absence of contamination without incurring the high costs associated with sampling on a grid pattern.

The development of an area-wide composite sampling program follows from the following premises:

1. No preceding knowledge of contamination.
2. Subsamples for a composite come from a definable *Operational Unit.*
3. Any location within the Operational Unit has an equal chance of being impacted due to the same historical usage.
4. Composite samples of five locations expedite the investigation, control cost, and represent a manageable limit for subsamples.
5. Results of the analyses of the composite sample are representative of the historical impact on the Operational Unit.
6. If the composite sample results are above pre-established trigger contaminant levels (i.e. background or health-based concentrations), a more detailed investigation of the Operational Unit's contamination levels and physical extent is performed starting with analysis of the subsample locations.

A decision matrix for the area-wide composite sampling program is shown in Fig. 2.

Analyses for the surface composite samples were chosen from the following list at WAPORA's discretion:

- Base/neutral and acid extractable organics (BNAs)
- Metal analyses for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver (the RCRA metals)
- Pesticides (units related to the grain elevator operations)

Volatile organics were not selected for possible analysis for surface soils since any spill of volatile organic type chemical will dissipate from surface soils in less than 4 months. These materials will either evaporate or migrate into the subsurface soils.

The choice of the above 8 RCRA metals for total metal analyses instead of the 13 metals on the EPA's Priority Pollutant list results from WAPORA's experience with the presence of heavy metals at other railroad facilities.

4.2 Nine-point star composite sampling

If a detailed investigation of an Operational Unit is triggered, WAPORA first analyzes the subsample locations using 9-point star samples for the contaminants of concern. The 9-point star sampling technique results from extensive discussions between several regulatory agencies and WAPORA. The purpose of the 9-point star sample is to obtain a representative sample in the

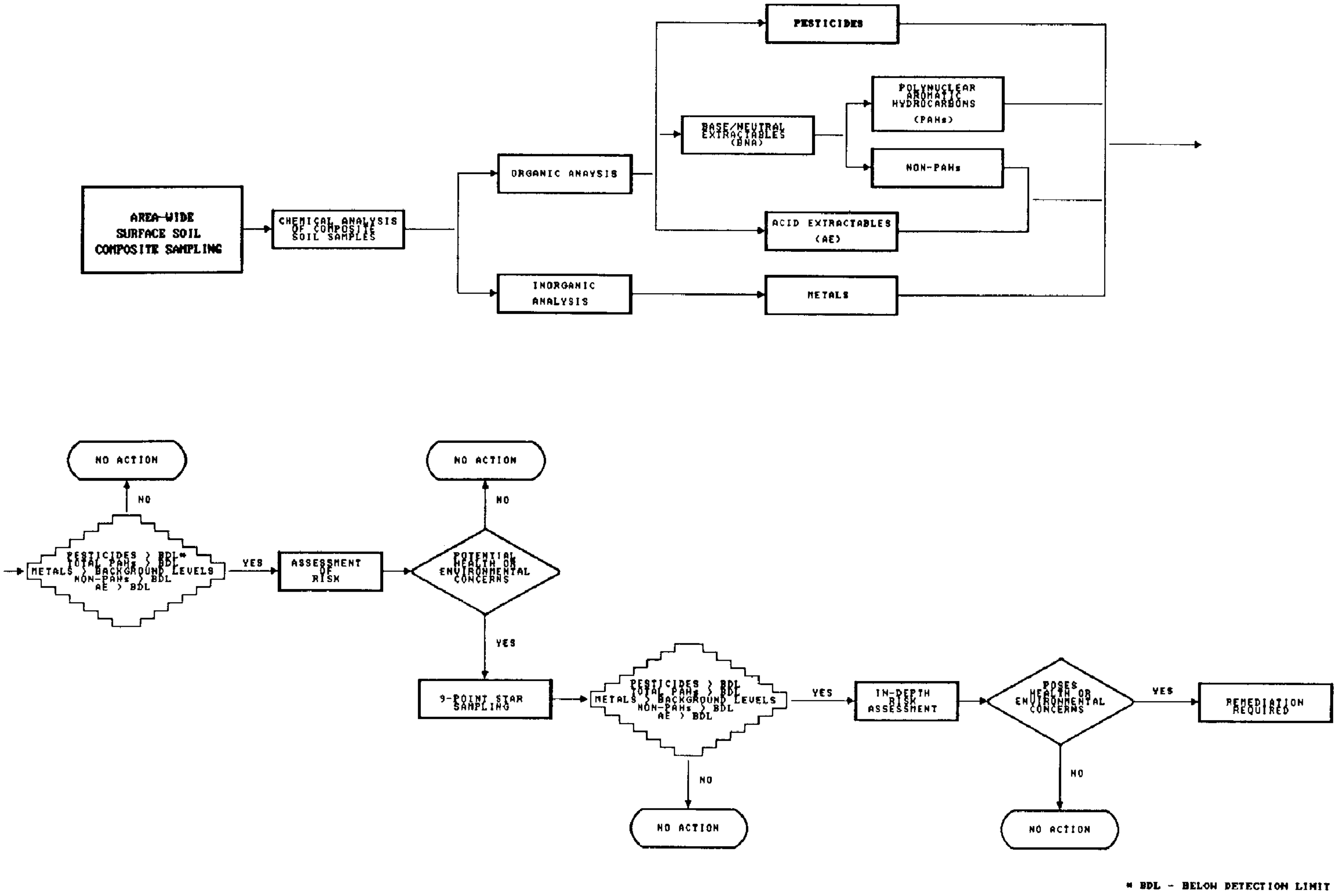

Fig. 2. Decision matrix for area-wide surface soil composite sampling.

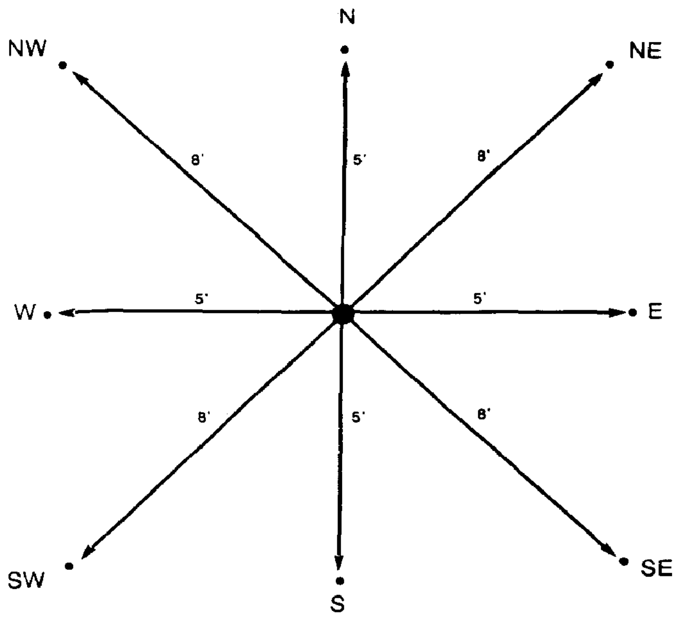

Fig. 3. The nine-point star composite.

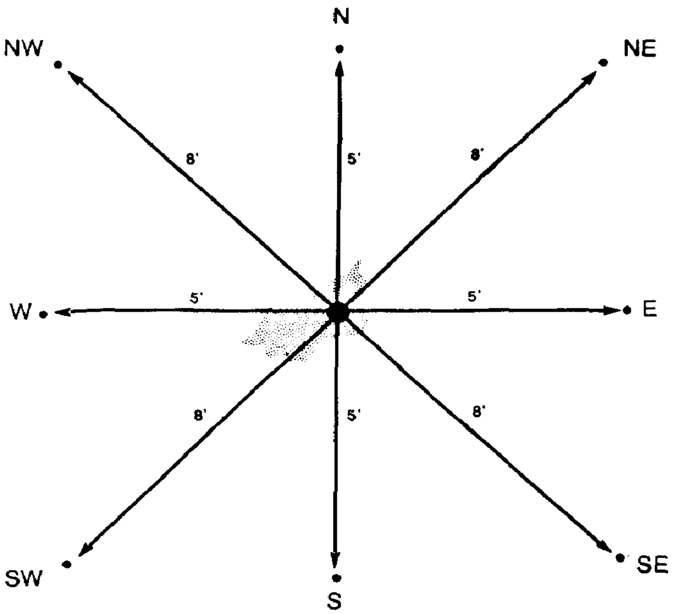

Fig. 4. Case 1: An insignificant area of contamination.

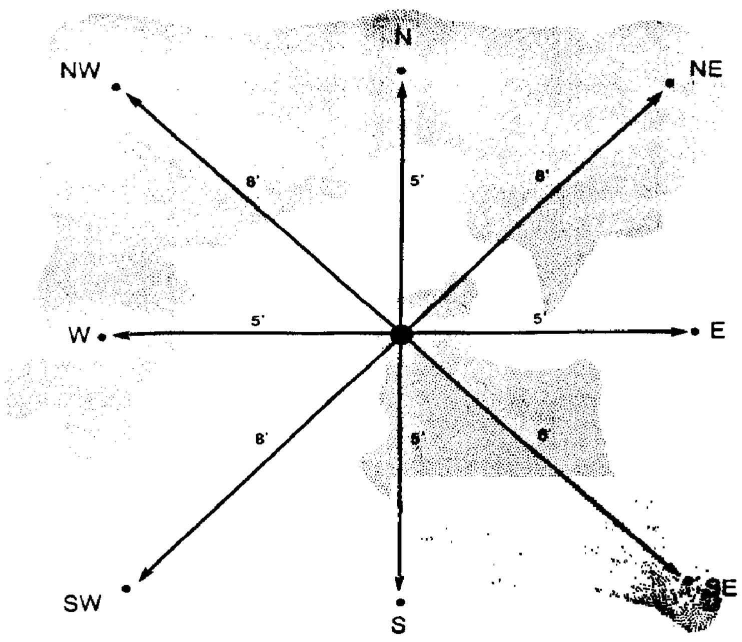

Fig. 5. Case 2: A significant area of contamination.

inherently non-homogeneous soil matrix. The 9-point sample design addresses the fact that health-based risk assessments and background concentration studies work with *average* soil levels. The design is a 9-point star pattern of equal-size grab samples composited into one sample. As depicted in Fig. 3, samples are collected at the center; at 5 ft distances north, south, east, and west; and at 8 ft distances northeast, southeast, southwest, and northwest of the center.

The analytical results of the 9-point samples are statistically more representative of a location than a grab sample. A grab sample may be in a spot of contamination of insignificant size or in a relatively clear spot in an otherwise significant patchwork of contamination. Therefore, utilizing a 9-point star pattern provides a better probability of obtaining the average contaminant concentration level across the area. Figures 4 and 5 illustrate two possible cases of soil contamination.

4.3 Example

If the 9-point star sampling program identifies significant soil contamination then further investigation will follow a more traditional approach for these types of studies. An example is the operational unit designated as the former Ore Briquetting Operation. The building where ore briquetting operations took place had burnt down, and WAPORA designated the building and surrounding area as an operational unit. The area-wide sampling of this unit did not show

TABLE 1

Analysis results from 9-point star sampling of the subsample locations

Subsample	Arsenic (ppm)	Lead (ppm)	Cadmium (ppm)
Ore 1	100	420	85
Ore 2	750	880	320
Ore 3	510	630	200
Ore 4	1700	1400	630
Ore 5	1200	1500	600

any organic chemical contamination but did indicate three heavy metals above trigger concentration levels: arsenic, lead, and cadmium.

The next step in the sampling decision matrix was to conduct 9-point star sampling of the subsample locations. The results are shown in Table 1.

These results indicate that the briquetting unit definitely had significant metals contamination in the surface soils.

WAPORA then initiated a full-scale remedial investigation program. Historical aerial photographs indicated adjacent areas that had been used for storage of ore briquetting raw materials and products. Former lease agreements and construction specifications revealed the pattern of operational activities and located a paved pad now buried by ore waste.

WAPORA's approach for specifically delineating the physical extent of contamination in the former briquetting area followed a stepped sequence where each following step built upon previously acquired information:

1. Survey in a 100 ft × 100 ft grid centered at the former briquetting building and extending 500 feet in all directions
2. Grab sampling and analysis at the grid node locations
3. 6 in. depth sample analysis at grid node locations where surface soils contained metal levels greater than the trigger levels
4. 12 in. depth sample analysis at grid node locations were 6 in. samples contained metal levels greater than the trigger levels
5. 18 in. depth sample analysis at grid node locations where 12 in. samples contained metal levels greater than the trigger levels
6. Continual depth sample analysis in 6 in. increments as needed
7. Tighten the surface grid spacing to 50 ft on the edge of the contaminated area based on the analytical results from step 2
8. Tighten the surface grid spacing to 25 ft on the edge of the contaminated area based on results of step 7
9. Tighten the surface grid spacing to 12.5 ft on the edge of the contaminated area based on the results from step 8

10. Determine the EP-Toxicity of soils with EP-Toxicity analysis of the 100-foot grid nodes containing levels greater than the trigger levels
11. EP-Toxicity analysis of 6 in. samples from the grid node locations with EP-Toxic soils on the surface
12. EP-Toxicity analysis of 12 in. samples from the grid node locations with EP-Toxic soils at 6 in. depth
13. Continual depth EP-Toxicity analysis in 6 in. increments as necessary
14. Determine limits and extent of required remediation using the results of steps 1 through 13

In summary, the ore briquetting unit investigation, by following the above stepped approach, successfully delineated an area of heavy metal contaminated soils. All this material, though a defined health hazard, was visibly indistinguishable from the rest of the site. Other operational units with similar visible characteristics, when subjected to the same historical and area-wide composite sampling, proved to be of no identifiable environmental concern.

5. Conclusion

Even though WAPORA's investigation of the Ore Briquetting Operational Unit demonstrated the validity of this sampling technique as a environmental detective tool, its real benefit in terms of major sampling and analytical cost savings can be seen in the operational units which have little or no environmental contamination. In total, 31 surface soil operational units were investigated with 31 area-wide composite samples. From these, six units were subsequently investigated with 9-point star sampling which resulted in only four areas requiring a detailed soil investigation. Following this methodology, instead of a site grid based sampling program, resulted in an approximate cost savings to the client of over $110 000 in sample collection and analytical costs. Additionally, the time to complete this program was shortened by 4 weeks.