

We Can Do Better

We MUST Do Better

Presented by...

PHASE1ESA.CA
DUE DILIGENCE DONE RIGHT

CASE No. 1

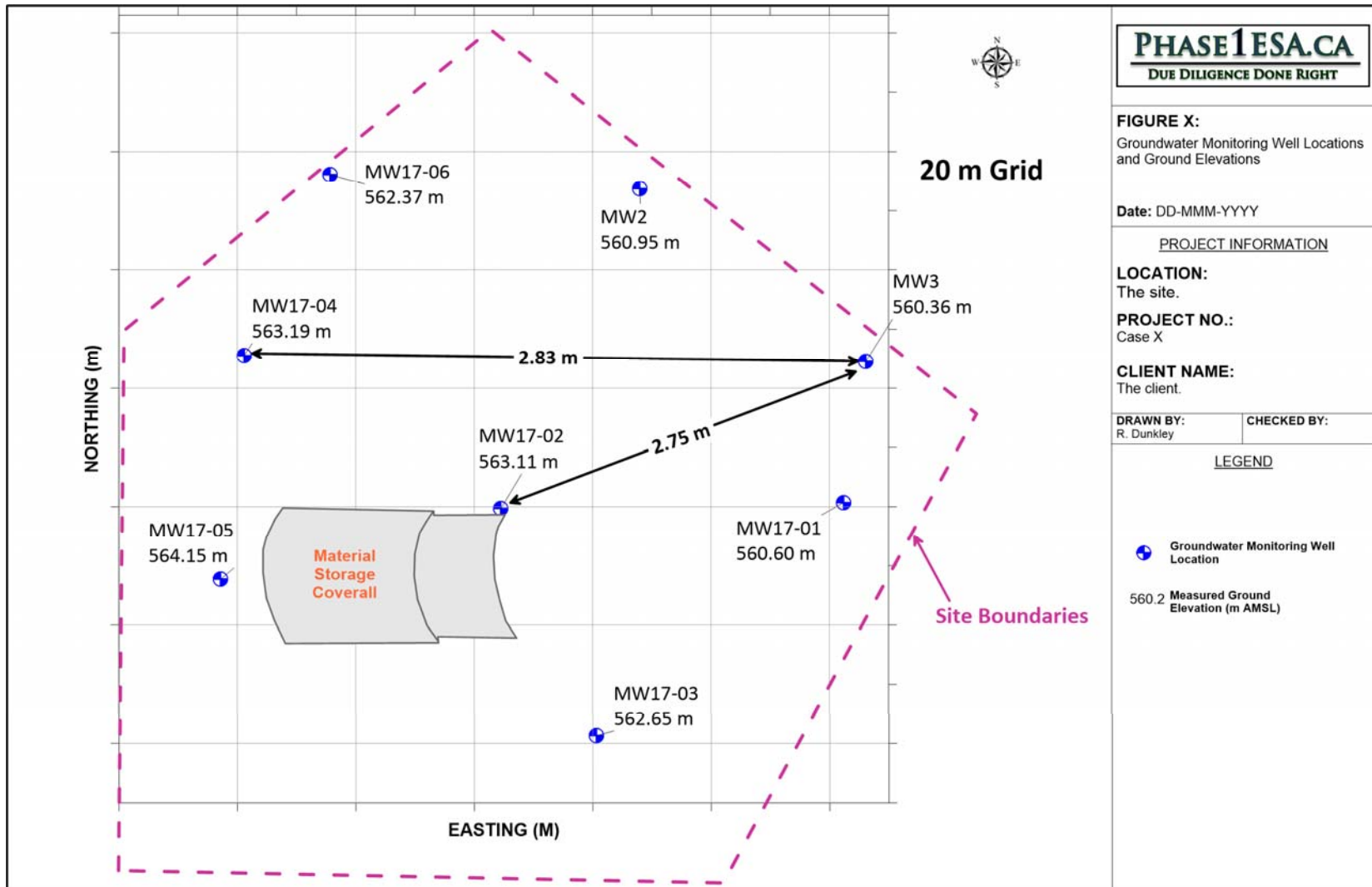
The site is a commercial-industrial storage yard that is used to store materials and equipment used for maintaining specific types of public infrastructure. One of the materials stored in this yard is commonly associated with soil and groundwater contamination and is very soluble and mobile in groundwater.

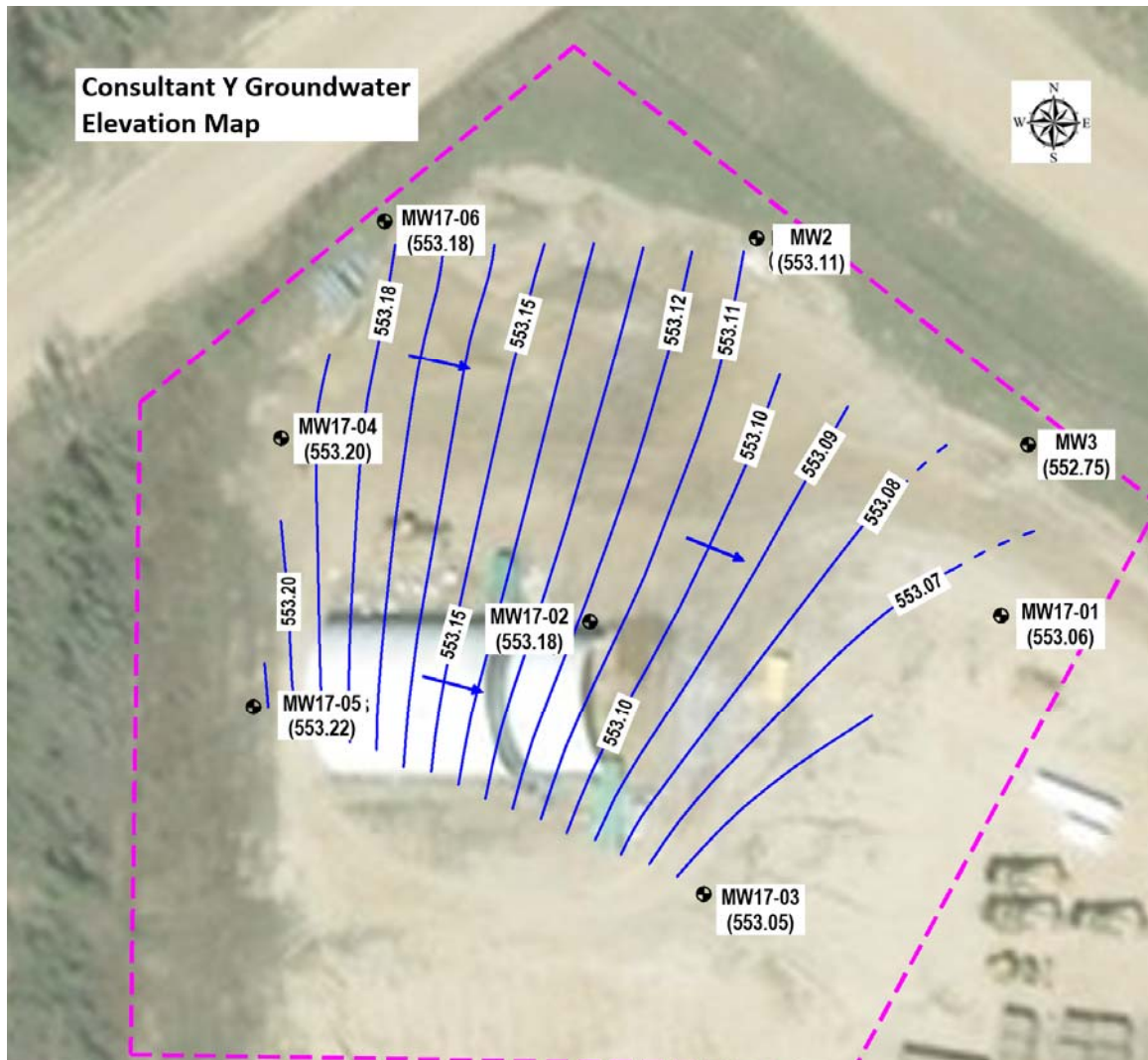
History

The site is actually a small portion of a multi-acre commercial-industrial property that has been leased to a Government department that employs a private contractor to run the site operations and maintain the public infrastructure using the materials and equipment stored at the site. The owner of the property (the client) is concerned about the condition of soil and groundwater.

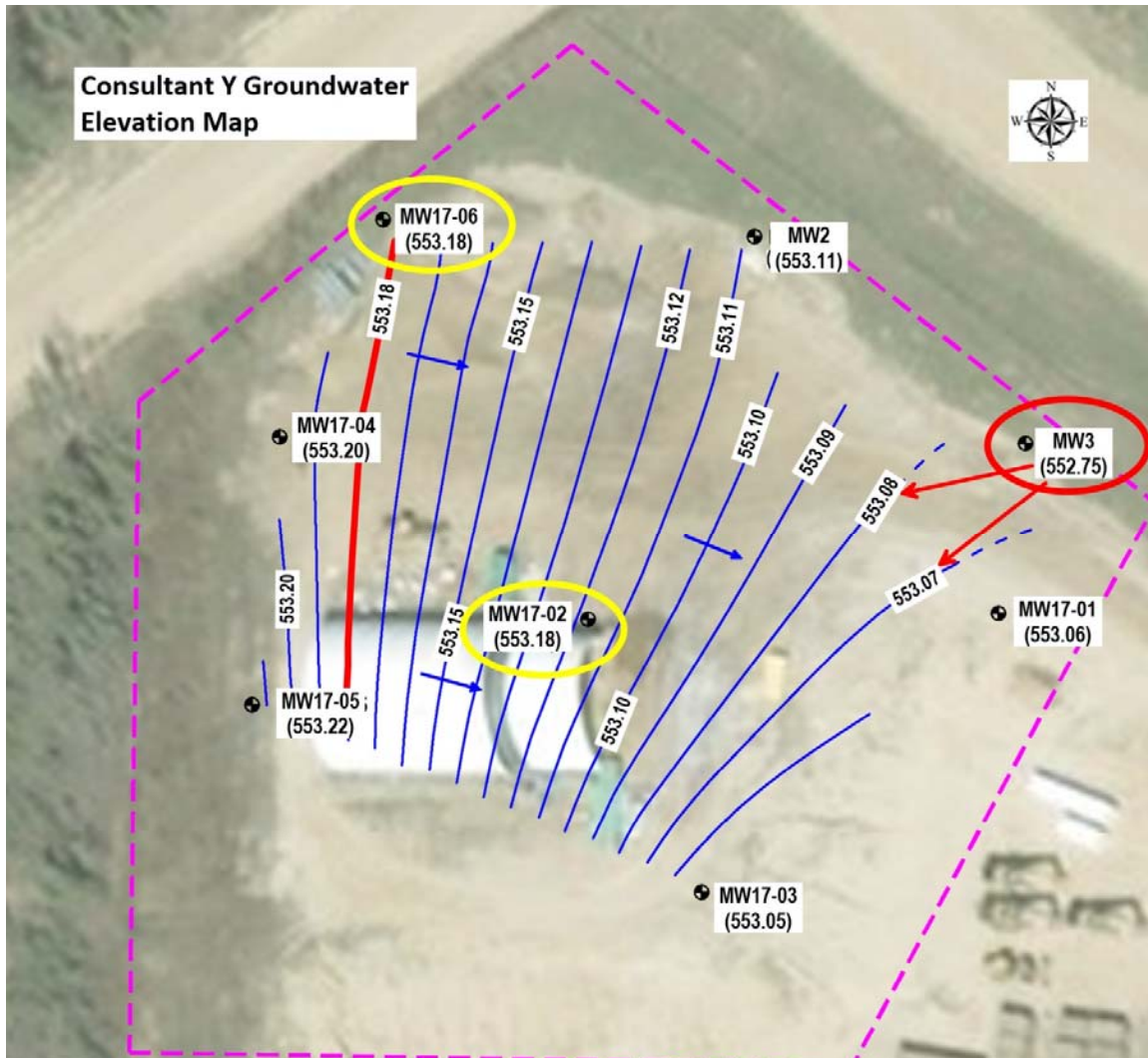
Background Information on the site

From previous work there were already several groundwater monitoring wells on the site. There is one storage building.

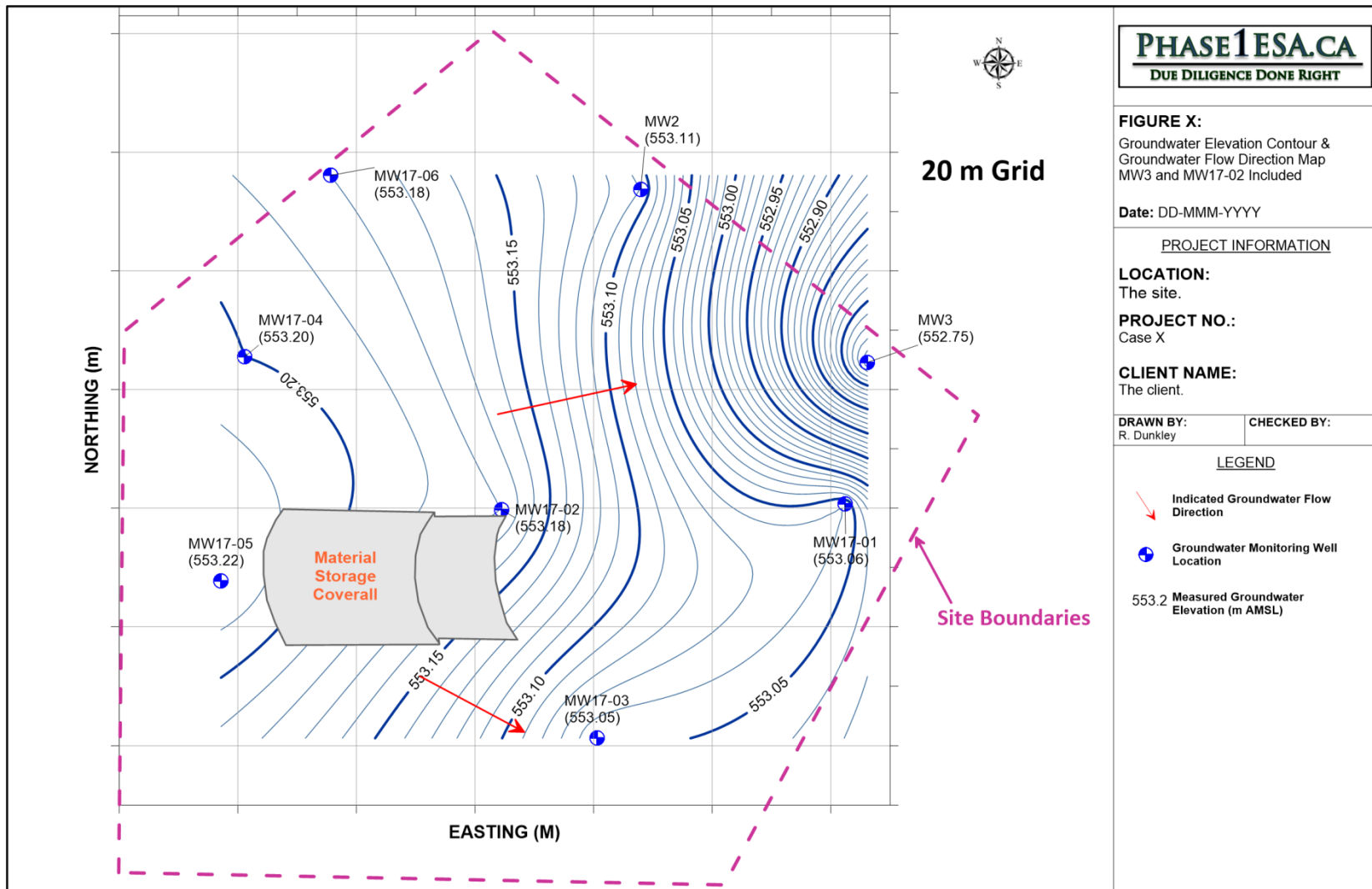


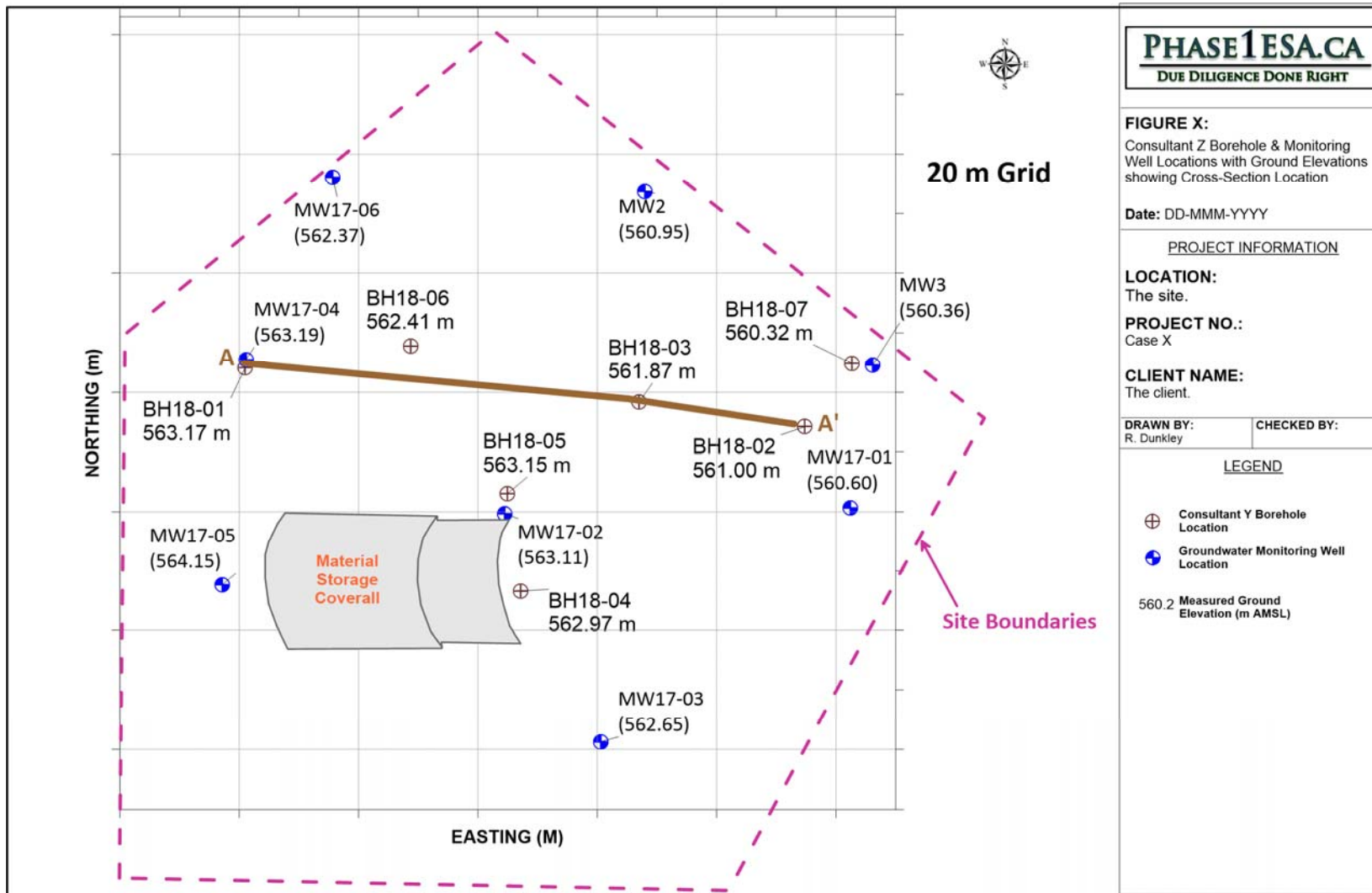


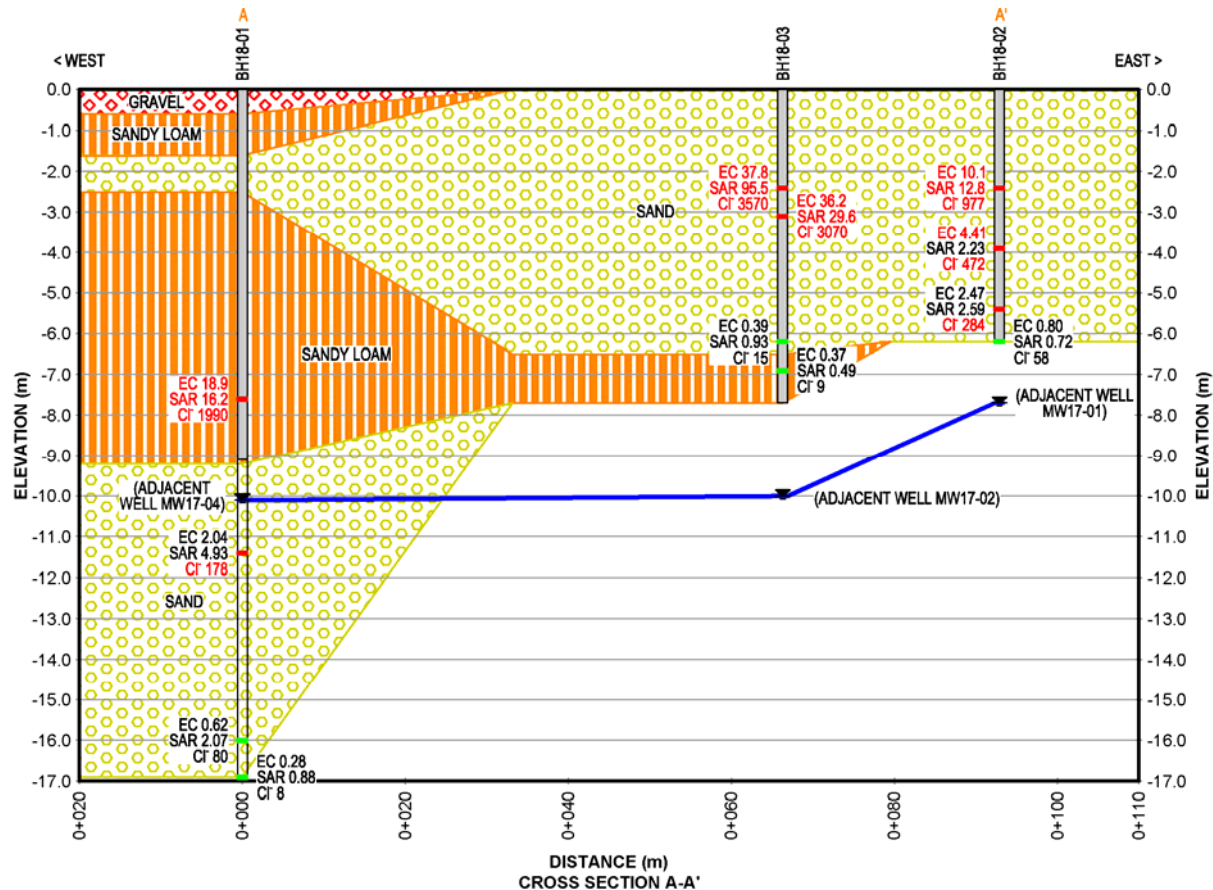
Can you tell where the problems are with this map? There are two of them.



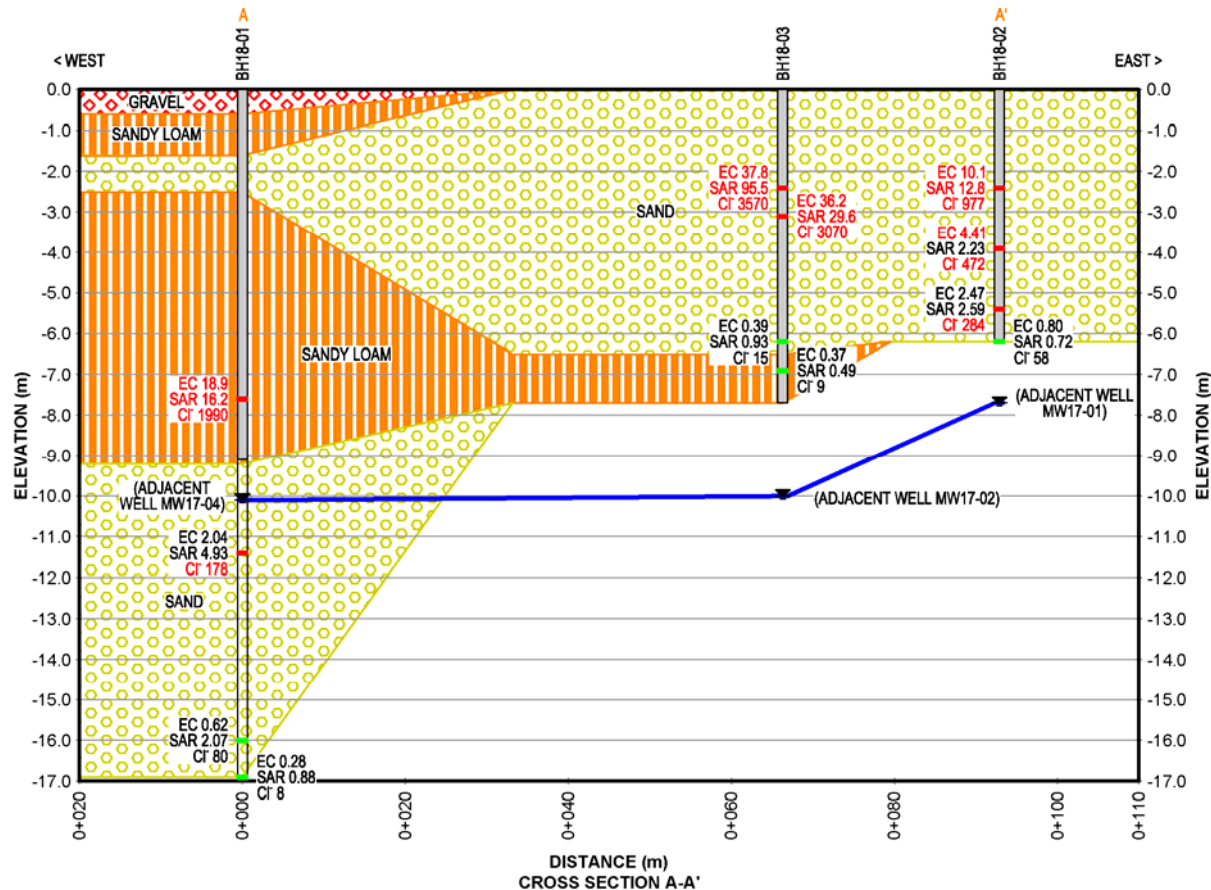
MW17-02's and MW3's elevations don't fit with the groundwater elevation contours. The map doesn't reflect the data. Two data points have been ignored in the plot but no explanation of why was given anywhere in the report.



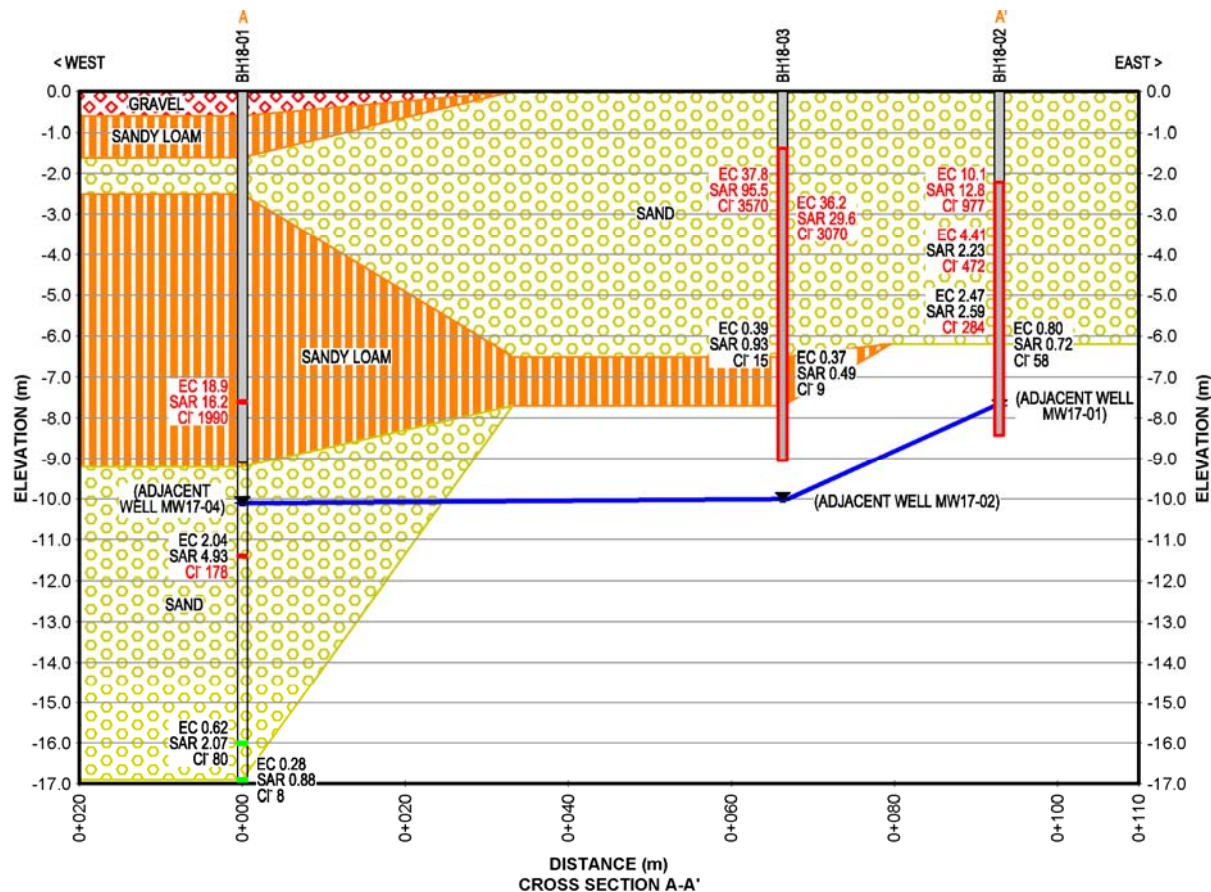




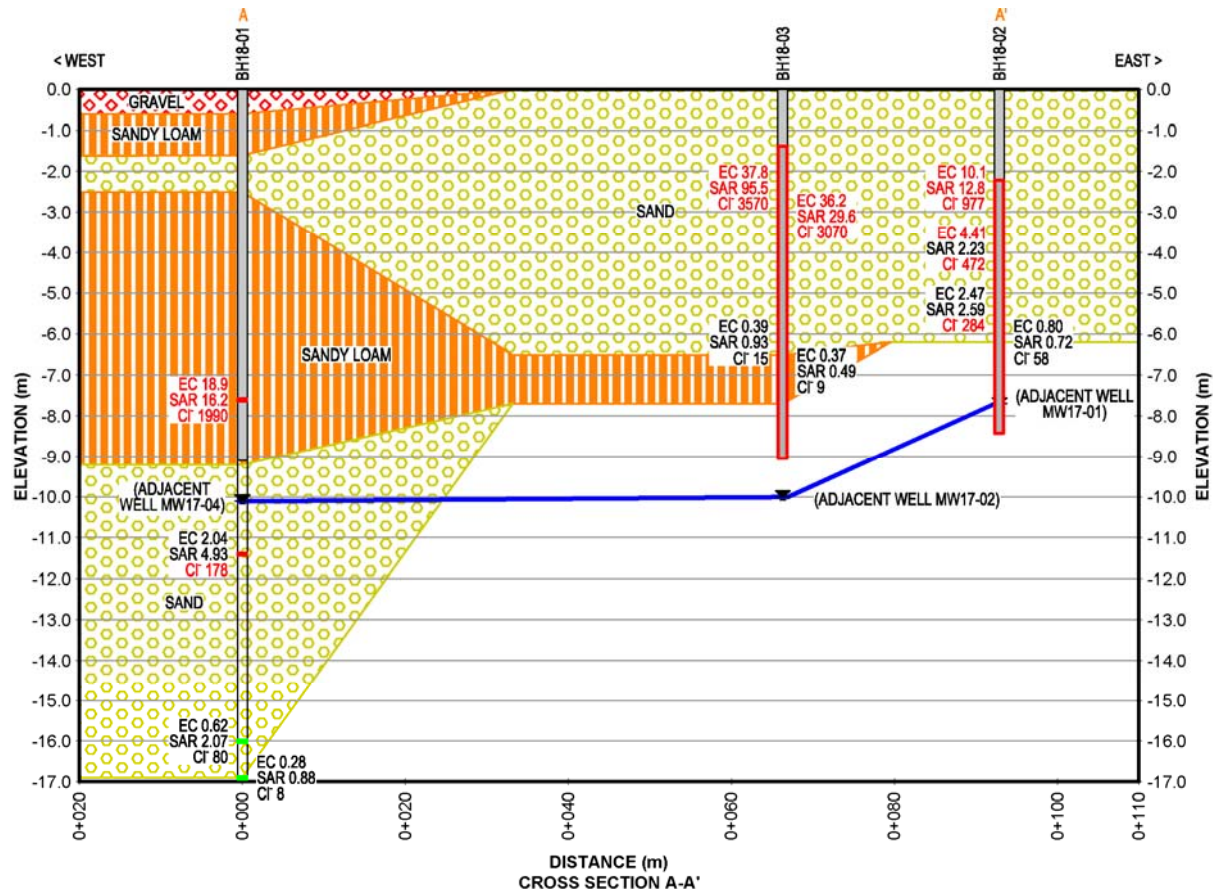
This was the actual cross section from Consultant Y's report. Can you spot the problems with it? There are several.



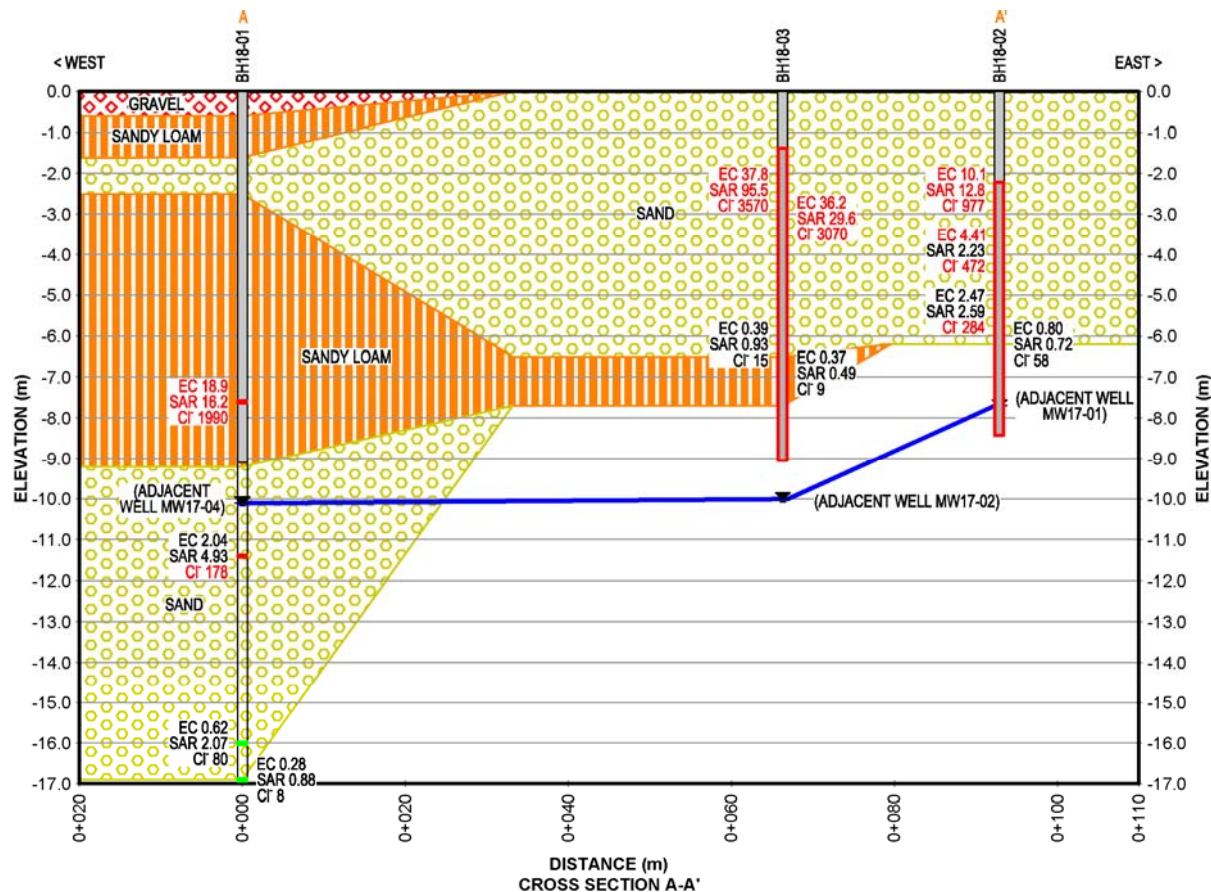
The total depths of all 3 boreholes are correct and the depths to the different zones from ground surface at all three boreholes are also correct. The problem is, all three wells are at different elevations with the difference in elevation between BH18-01 and BH18-02 being -2.17m.



The X-section is **wrong and misleading**. The elevations of all the lithological contacts are incorrect at the east end of the X-section. The red outlined well bores show where the east boreholes should've been plotted. The zone contacts, etc., should be shifted downwards the same amount.



The groundwater elevations are wrong as well. The groundwater elevations at MW17-02 and 01 are 0.02 m and 0.14 m lower than at MW17-04, respectively. This figure shows that groundwater elevations are higher at the two east wells. This is false.



Remember how the groundwater elevation contour map clearly showed the groundwater flow direction was **west to east**? This cross section shows it flowing **east to west**.

This report made it through QA/QC and was submitted to a Government department and was paid for by taxpayers.

The biggest problem with this report was that the data collected was not interpreted and no conclusions or recommendations were included in the report; only results were stated and no interpretation of those results were given.

The data collected actually indicates that impacts are most likely migrating off-site and it's quite possible if not probable that more severe groundwater impacts than were detected by the monitoring well network exist below the reach of the existing monitoring wells due to higher density and downward migration of the plume. That information would've been useful for their client to know but these matters are not touched upon in Consultant Y's report.

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CASE No. 2

The subject property is a single storey multi-tenant commercial retail plaza located in the main downtown business district of a town with a population of ~7,000.

History

Phase1ESA.ca's client (the client) purchased the property as an investment in 2011. Prior to purchasing, they had a Phase I ESA conducted on the property in order to secure financing. The ESA was performed by a large nation-wide environmental consulting company that specializes in commercial properties. The 2011 ESA did not identify any APECs for the site.

History (Cont'd)

In 2017, the client decides to sell the property and an environmental consultant is hired to do another Phase I ESA. The consultant is actually the same company as the consultant who did the work in 2011 except now they are operating under a different business name. For the purposes of this talk, this consultant shall be referred to as Consultant X.

Much to the surprise and dismay of the client, the 2017 Phase I ESA identifies **three** APECs for the site and recommends a Phase II ESA. The three APECs are all related to business activities and land uses on nearby properties dating back to the 1950s, 60s and 70s.

History (Cont'd)

Given that all three APECs are related to land use activities that occurred in the 50s and 60s, etc., the client is wondering why these APECs were not identified in the 2011 Phase I.

- Did new information become available since 2011?
- Did reporting standards and/or the scope of Phase I ESAs change between 2011 and 2017?
- Was the information used to identify the three APECs in 2017 also available to Consultant X in 2011?
- Did Consultant X fail to provide the client with adequate due diligence in 2011? Were they **negligent**?
- If damages are suffered, are there potential grounds for taking **legal action** against Consultant X?

History (Cont'd)

Phase1ESA.ca is hired to review the two Phase I reports and other available information and report back on how and why the three APECs were missed or not reported in 2011.

Depending on what is discovered, the information in Phase1ESA.ca's report may be provided to a lawyer to determine if any legal actions against Consultant X are warranted and to evaluate the chances of being successful with these legal actions if they are taken.



The three APECs identified in the 2017 Phase I report

APEC No. 1: Former Fuel Depot/Oil Storage Site

How was this missed? Was it possible to identify this in 2011?

Historical Air Photos Analyzed by Consultant X

1951, 1966, 1973, 1980, 1987, 1993, 1998, 2003, 2009

Why a 15 year gap between 1951 and 1966? All other gaps are around 6 - 7 years.

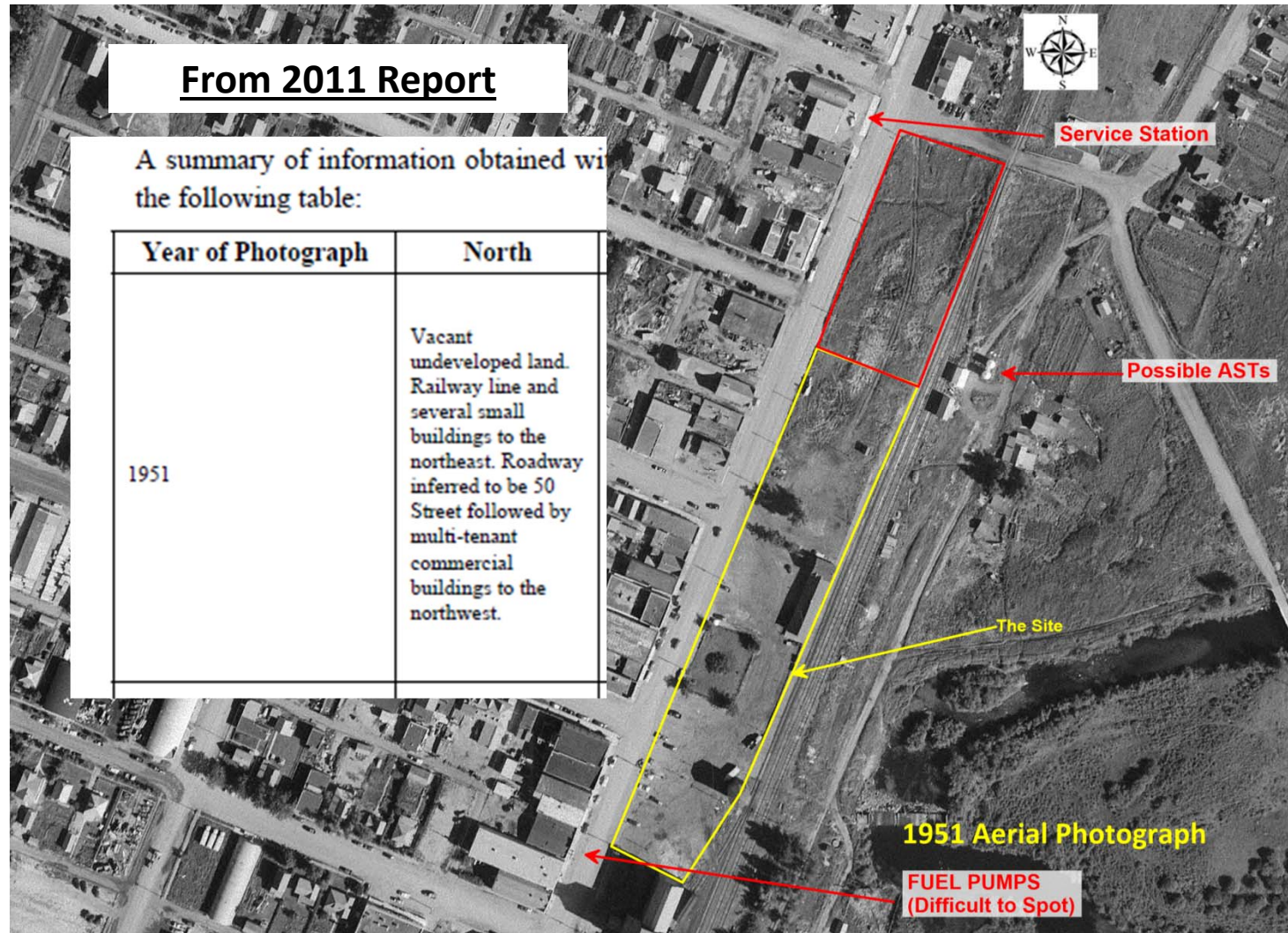
Good quality, low scale air photos were available from 1956 (1:14,400) and 1963 (1:4,800).

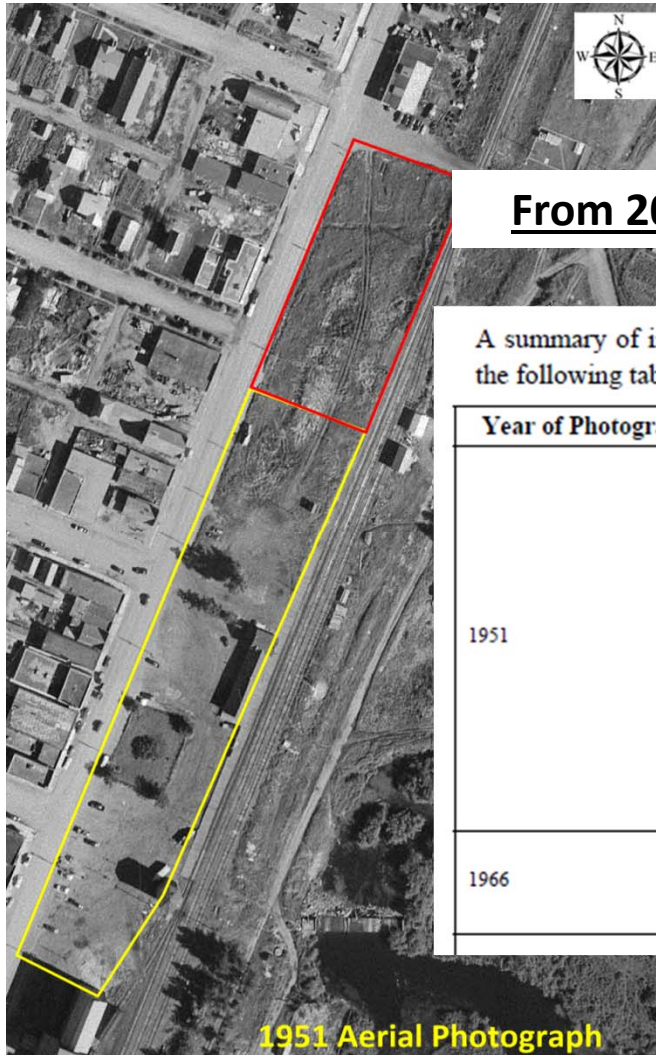
Why select the 1966 photo (1:31,680) over the 1963 photo (1:4,800)?

From 2011 Report

A summary of information obtained with the following table:

Year of Photograph	North
1951	Vacant undeveloped land. Railway line and several small buildings to the northeast. Roadway inferred to be 50 Street followed by multi-tenant commercial buildings to the northwest.

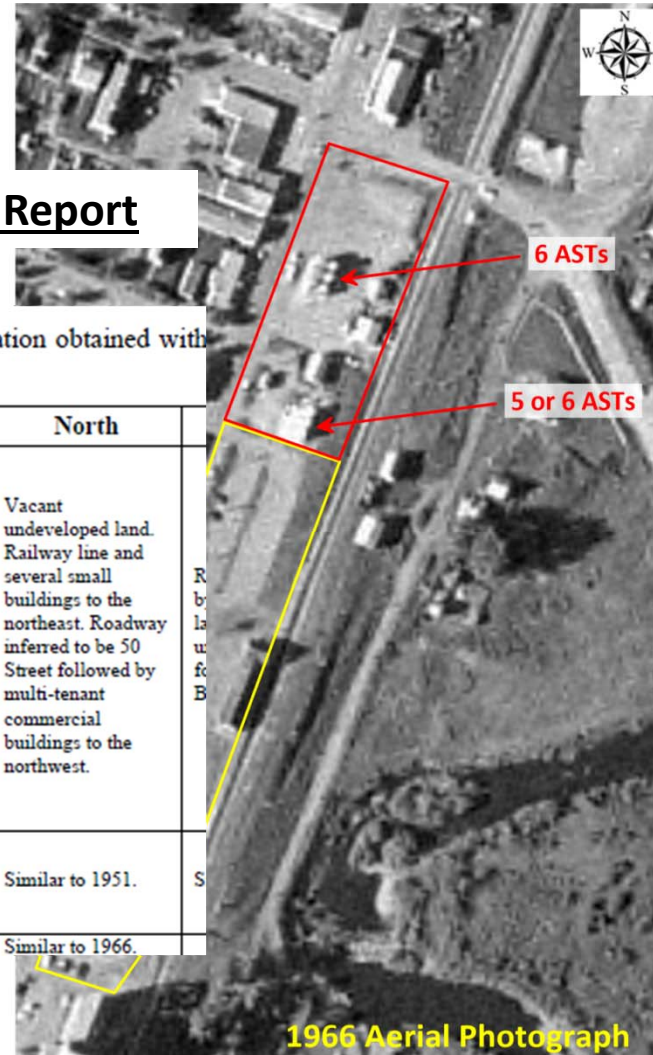


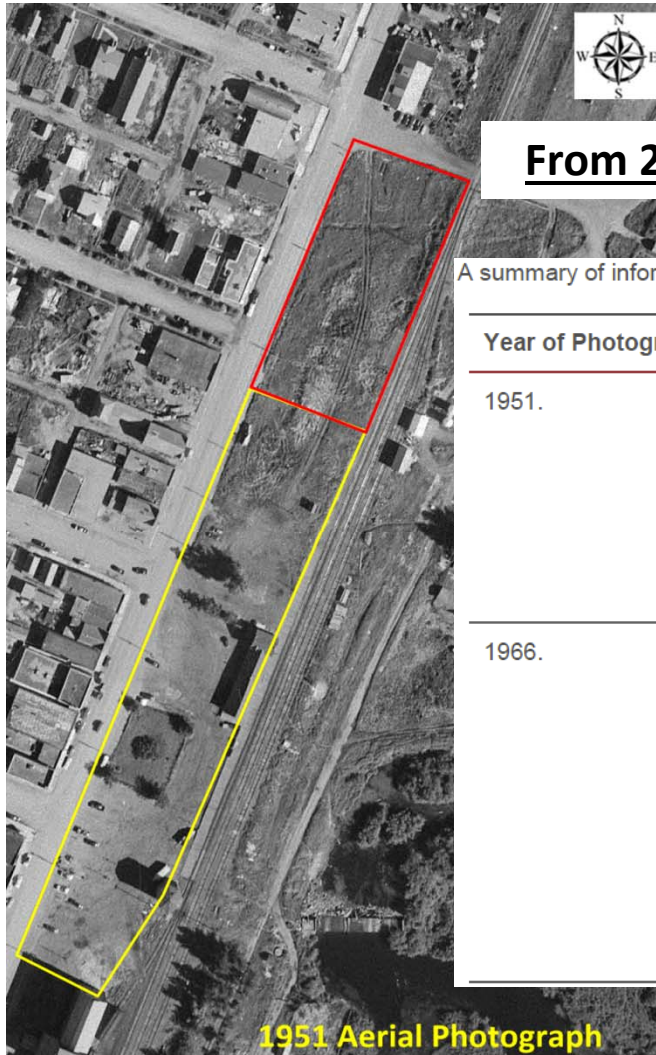


From 2011 Report

A summary of information obtained with the following table:

Year of Photograph	North
1951	Vacant undeveloped land. Railway line and several small buildings to the northeast. Roadway inferred to be 50 Street followed by multi-tenant commercial buildings to the northwest.
1966	Similar to 1951.
	Similar to 1966.

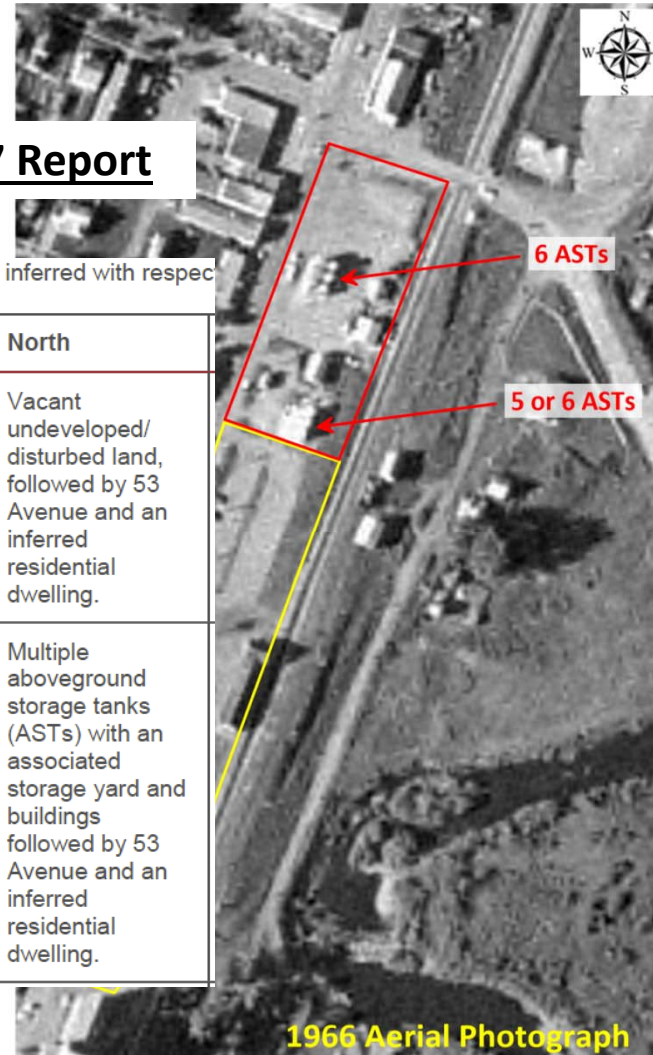




From 2017 Report

A summary of information inferred with respect

Year of Photograph	North
1951.	Vacant undeveloped/ disturbed land, followed by 53 Avenue and an inferred residential dwelling.
1966.	Multiple aboveground storage tanks (ASTs) with an associated storage yard and buildings followed by 53 Avenue and an inferred residential dwelling.



How was this missed in 2011?

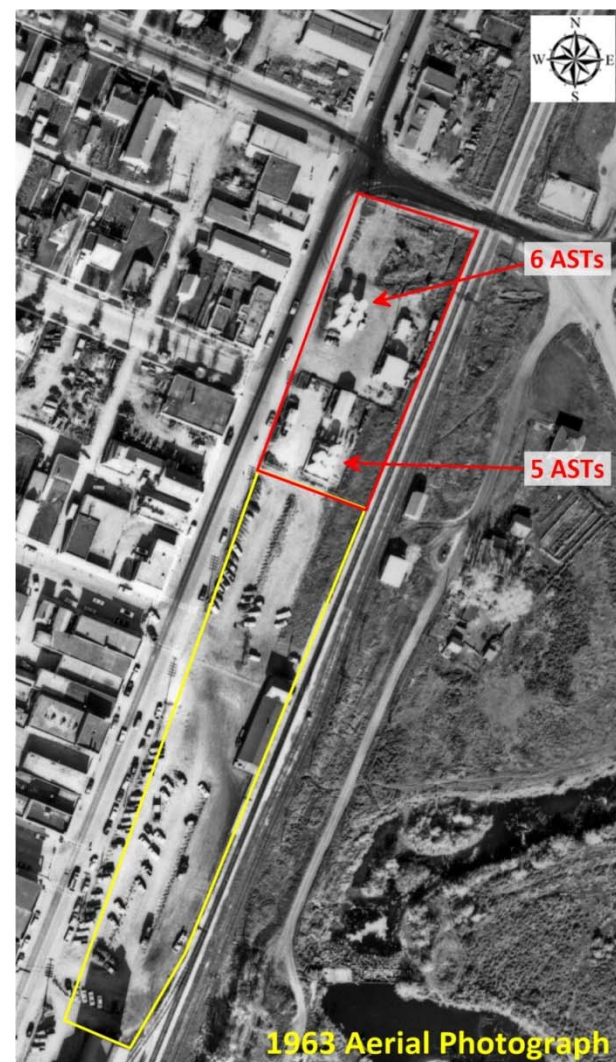
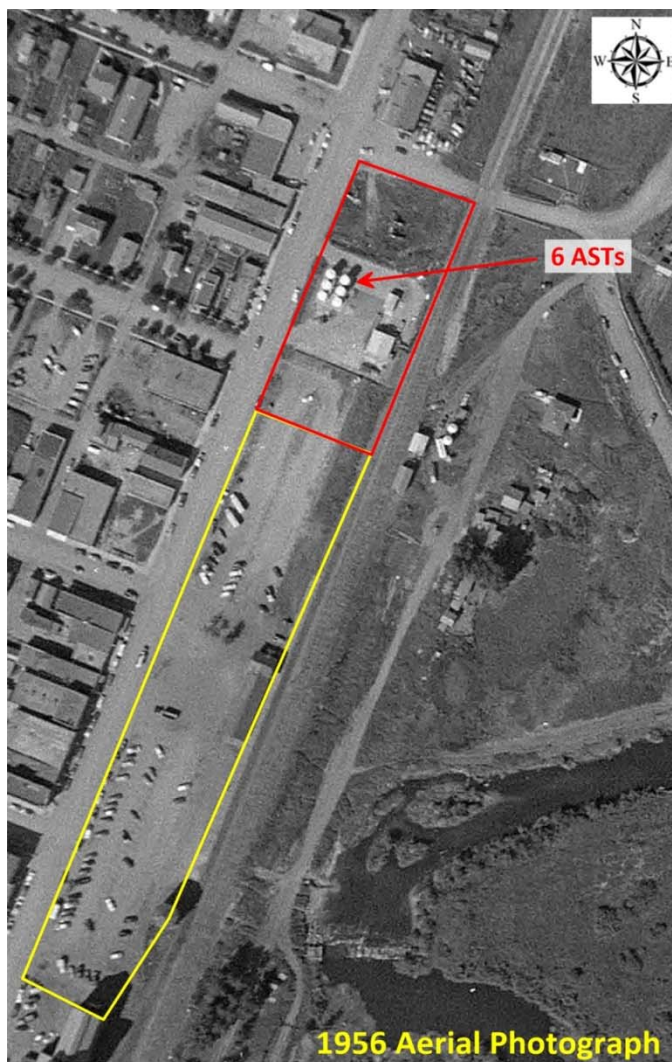
It is hard to imagine how the new development and the presence of the ASTs in the adjacent lot to the north could've been completely missed during the AP review. Inexperienced and/or poorly trained reviewer?

Why wasn't this glaring (and potentially dangerous from a legal liability aspect) omission not caught during the review process?

Part of the problem is that this company does not provide copies of the relevant portions of the historical air photos that were reviewed in an appendix to the report. This makes it more difficult for the report reviewer to ensure air photos have been correctly interpreted.

Notwithstanding that, the report reviewer should have caught that there was a 15 year gap in the air photos that were reviewed.

What would they have seen if they had also looked at the 1956 (1:14,400) photo to reduce the 15 year photo gap and/or chose the much higher resolution 1963 (1:4,800) photo instead of the 1:31,680 scale 1966 air photo?

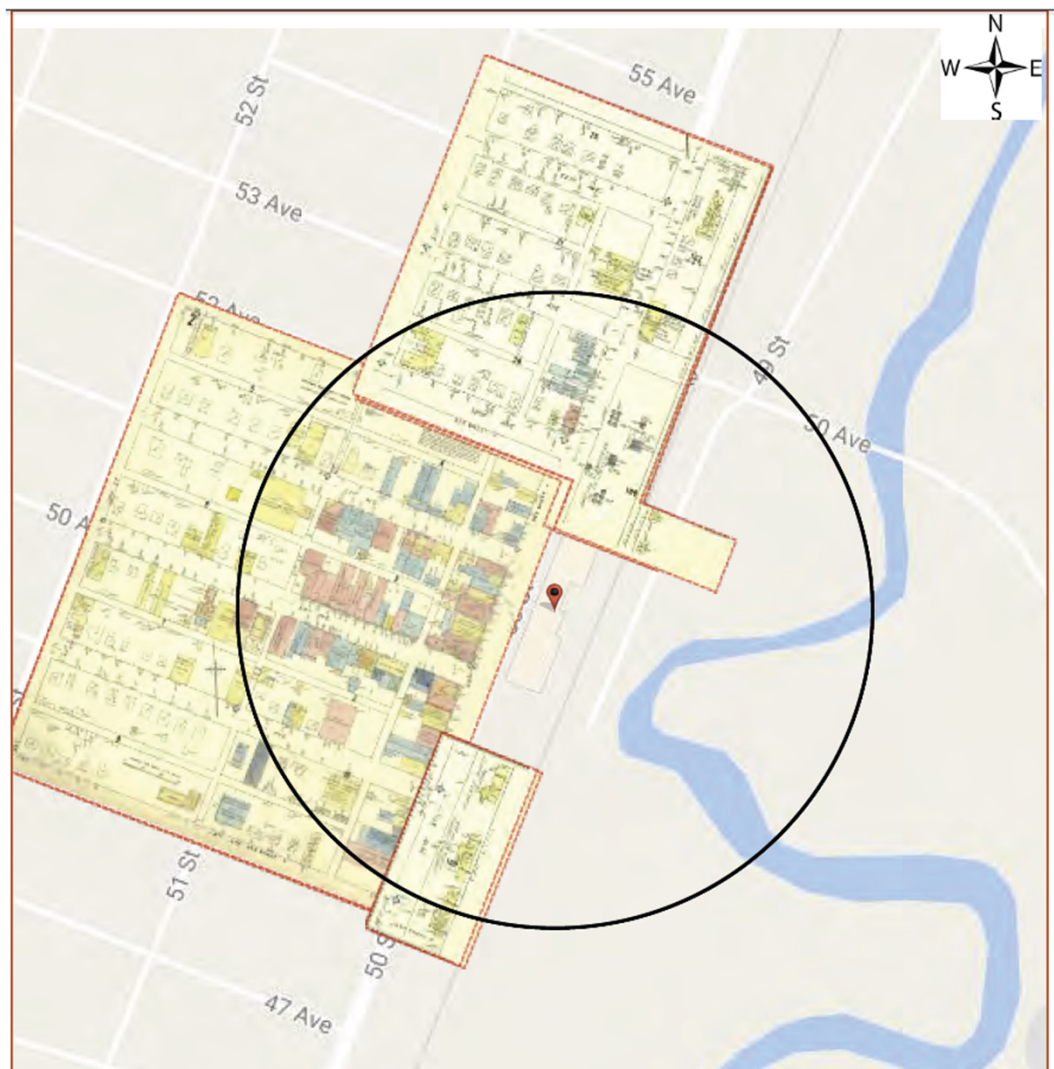


APEC No. 2: Former Dry Cleaning Facility 20m west of the Site.

How was this missed? Was it possible to identify this in 2011?

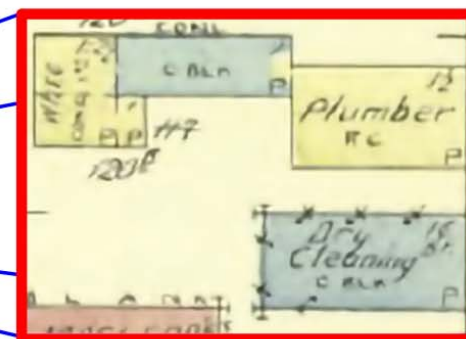
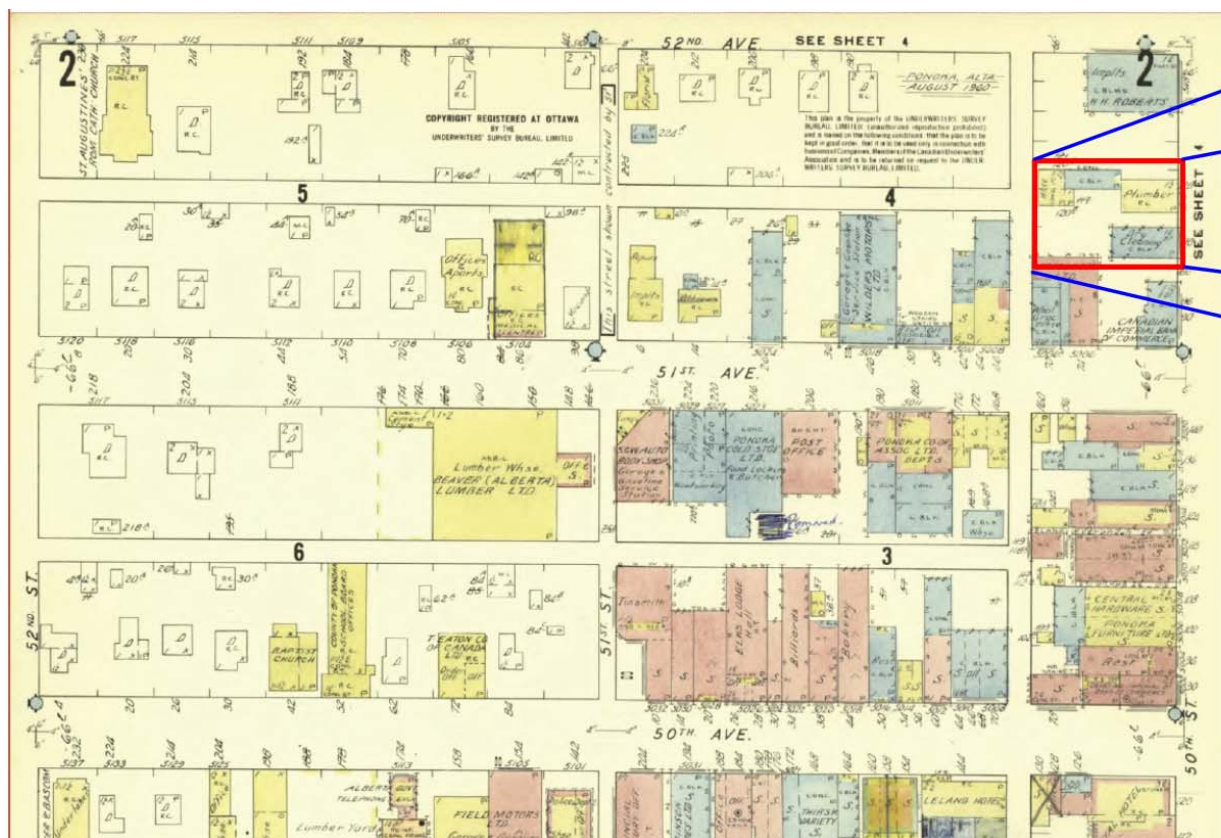
Historical dry cleaning operations cannot usually be detected through air photo reviews so they have to be discovered by other means. Common ways of doing this are via the use of Business Directories, Phone Books and/or Fire Insurance Maps (FIMs) where available.

In 2011, Consultant X conducted a search through Risk Management Services (RMS) (now ERIS) to determine if any FIMs were available for the site. The search report showed that a FIM for the site itself wasn't available but the following 1960 FIMs were:

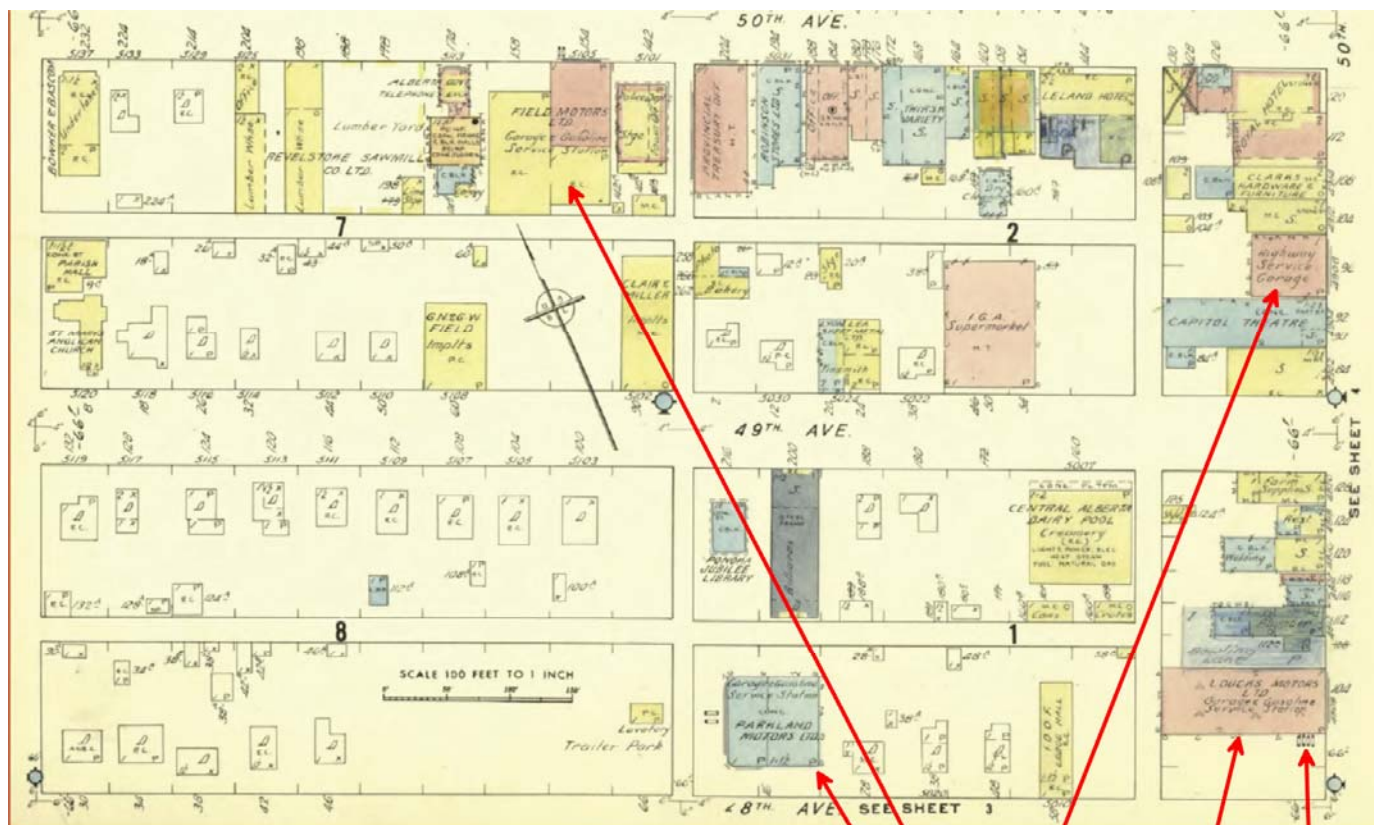


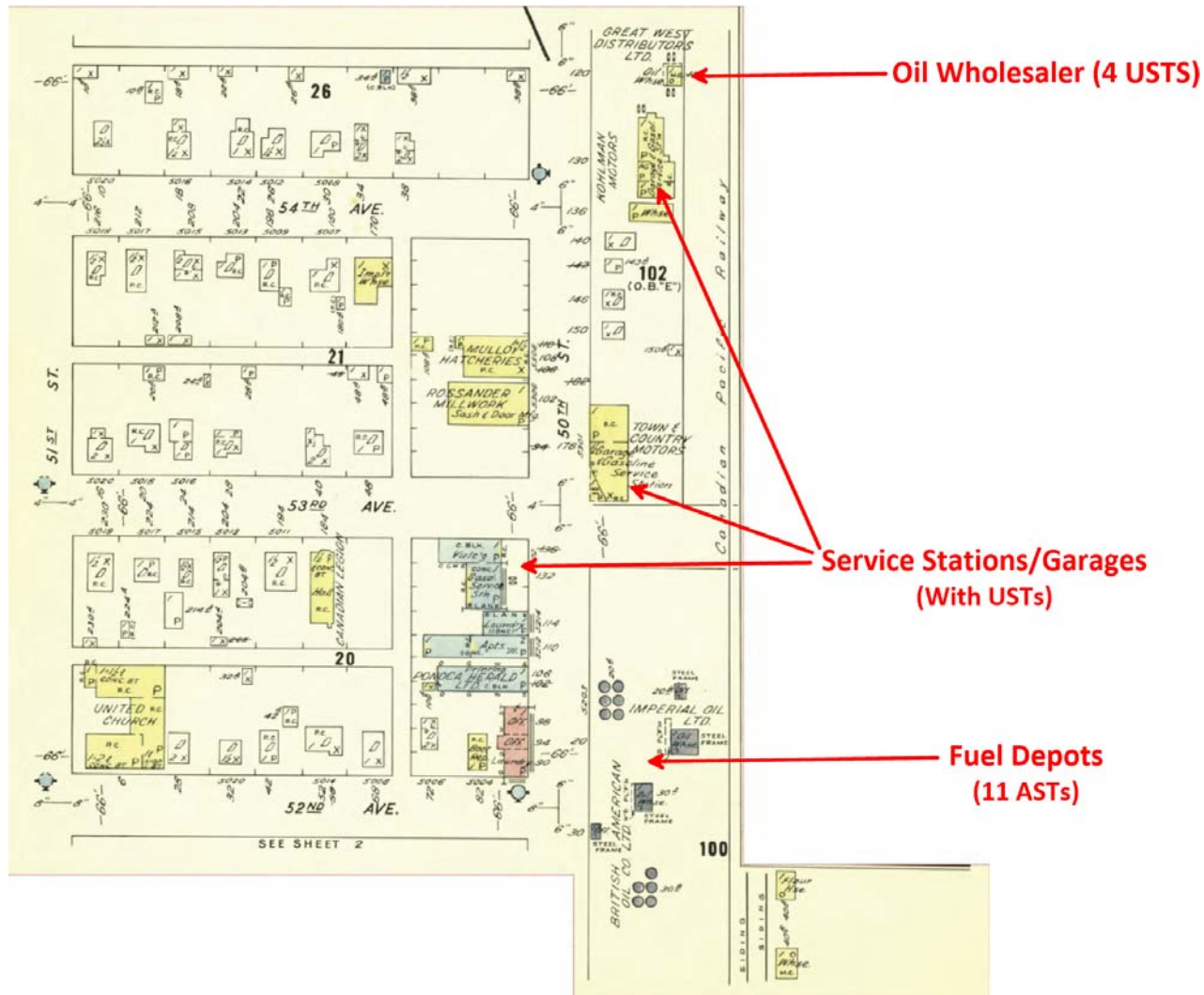
The RMS FIM search report in the appendix to the 2011 report clearly shows the available FIMS were NOT ordered by Consultant X. They were, however, ordered in 2017.

What would Consultant X have learned if they had ordered the 1960 FIMs in 2011?



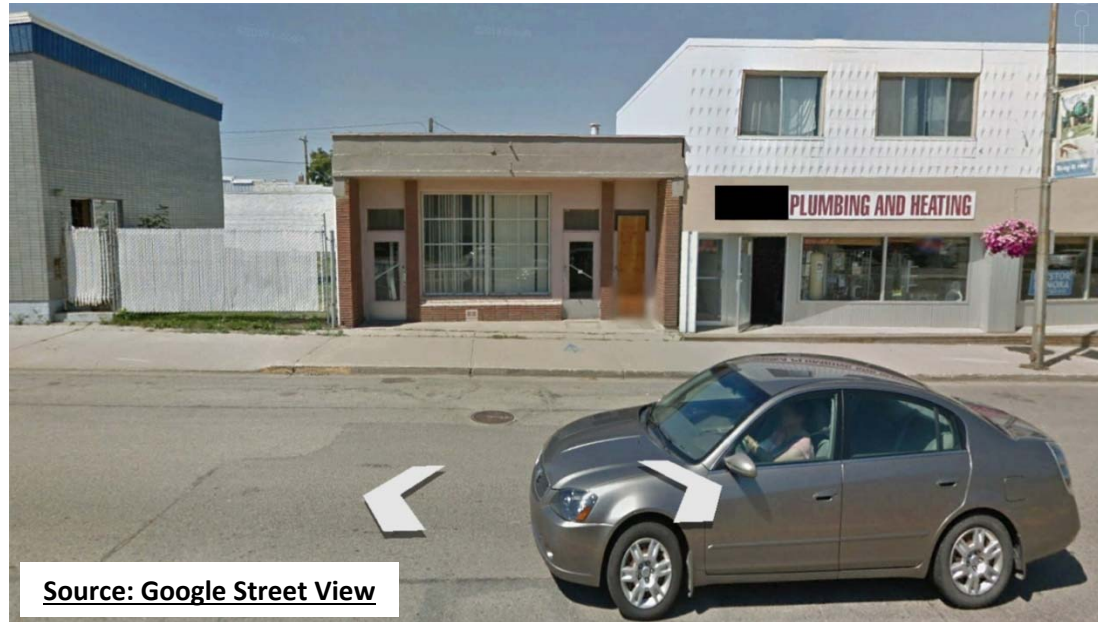
Anything Else?





Was there any other way to have discovered the Former Dry Cleaner 20 m west of the Site in 2011?

YES! During the site inspection they could've simply looked across the street and observed what was there.



An abandoned and boarded up commercial property on a prime commercial strip often indicates a contaminated site.

The above Google Street View image is from 2015. The property was abandoned ~2007 so this is what they would've seen in 2011.

Within 15 minutes of finding this image on Street View, Phase1ESA.ca contacted the owners of the businesses on either side of the abandoned property by phone and learned:

- The identity and type of business that was there (Dry Cleaner);
- How many years dry cleaning business operated;
- Name of business owner and approximate year of death;
- Year business closed and was abandoned (~2007);
- Identity of current owner; and
- Approximate year some remedial efforts took place on the property and some information on what was done.

Had they been observant enough to notice the abandoned and boarded up commercial property directly across the street (and hydraulically up-gradient) of the subject property, Consultant X's field inspector(s) could've simply walked 20 m across the street and into the businesses on either side of the abandoned property and obtained all of this information.

While it's hard to blame the report reviewer for not knowing what was missed during the site inspection, the reviewer could have checked the appendix of the report to verify the contents of the RMS FIM search report and discovered that FIMs for the surrounding properties were available and should've been ordered.

APEC No. 3: Former Gas Service Station 20 m west of the southwest corner of the Site.

How was this APEC missed? Was it possible to identify this as an APEC in 2011?

The APEC for the former service station located west across the street from the southwest corner of the Site came from a Phase II ESA report obtained from ESAR.

In 2011, no APECs were identified with respect to the information found on ESAR. In 2017, it was noticed in an ESAR report a 2007 Groundwater sample collected at the former service station reported an Ethylbenzene level > 2016 AT1 Guideline Limits. (The sample also reported a Xylene level > 2016 AT1 Guideline limits but they missed reporting that detail.) This was determined to be an APEC by Consultant X in 2017.

The same ESAR report was reviewed by Consultant X in 2011 when the 2010 AT1 Guidelines were in effect. The Ethylbenzene concentration reported in the 2007 groundwater sample was **five times** the 2010 AT1 Guideline limit.

Conclusion: This could have and should have been caught and reported as an APEC in 2011.

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CASE No. 3

The subject property is a medium industrial site comprised of a chrome and nickel plating facility in one building and a hydraulic repair facility in an adjacent building.

Year 1 (2006)

Consultant “A” Conducts a Combined Phase I/II ESA on subject Property as part of a Due Diligence effort for a company wanting to purchase both facilities.

In the Geology & Hydrogeology Section of the Phase I report Consultant A makes the following statement:

*“The local topography of the subject site **is even with drainage to the east toward XX Street and west toward XY Street.** The regional topography slopes gently to the north.”*

In the following two paragraphs they then say:

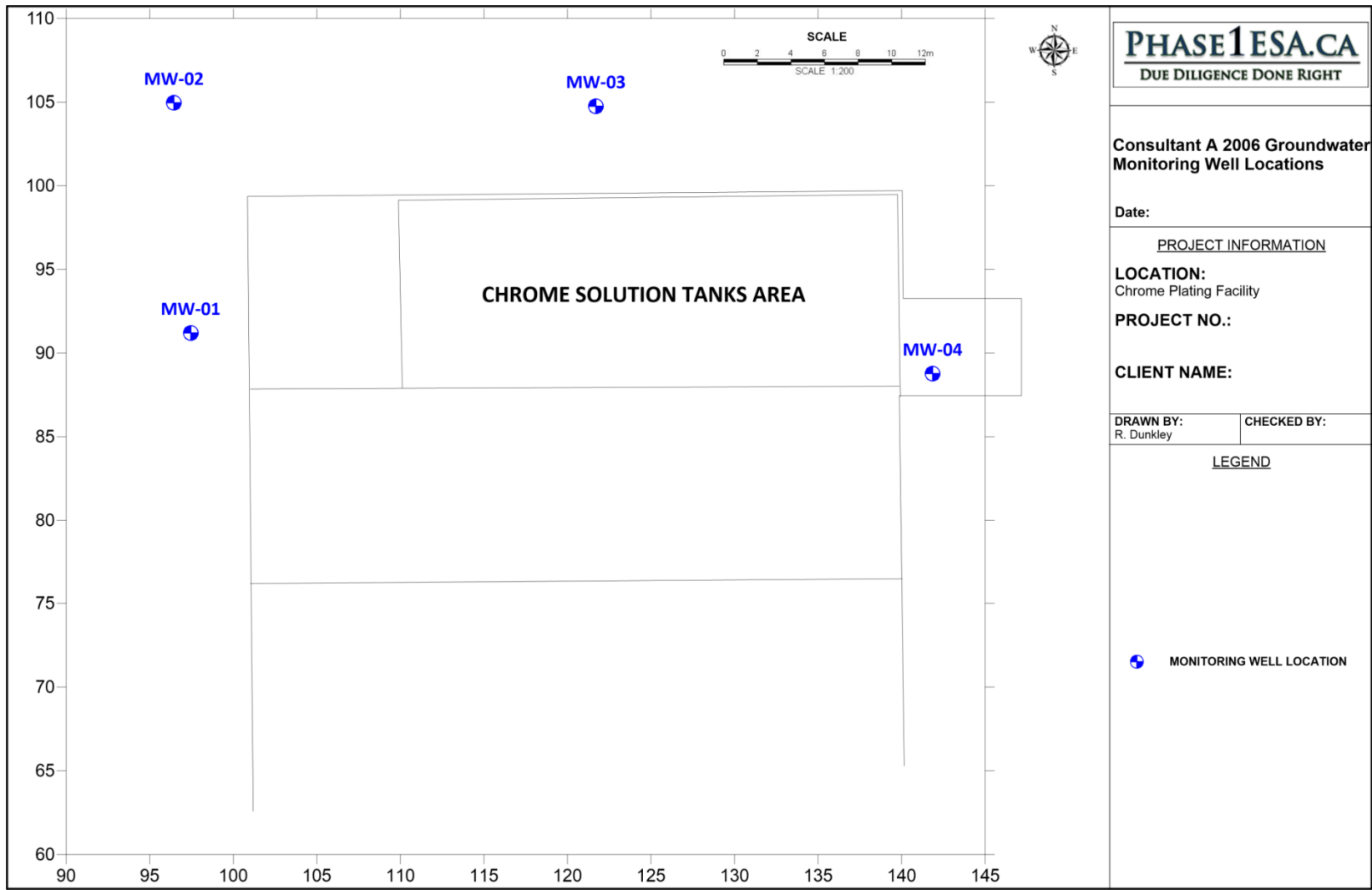
*“Regional groundwater flow is the overall direction of groundwater flow in a given region. (Consultant A) reviewed a map of the area and the regional groundwater flow is expected to be north towards the Big River. The regional topography is also to the north. **Local shallow groundwater flow is, therefore, assumed to be in a northerly direction.**”*

*...“The **expected REGIONAL** groundwater flow to the north indicates that any subsurface contamination in the area may be expected to migrate in a northerly direction...”*

Fact: The direction of local shallow groundwater flow is often influenced more heavily by local topography than regional topography or regional deep groundwater flow.

The above statements made by Consultant A are conjecture and are based only on an unproven and untested **hypothesis**.

Consultant A then proceeds to install four groundwater monitoring wells in the following locations :



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**Consultant A 2006 Groundwater
Monitoring Well Locations**

Date:

PROJECT INFORMATION

LOCATION:
Chrome Plating Facility

PROJECT NO.:

CLIENT NAME:

DRAWN BY:
R. Dunkley

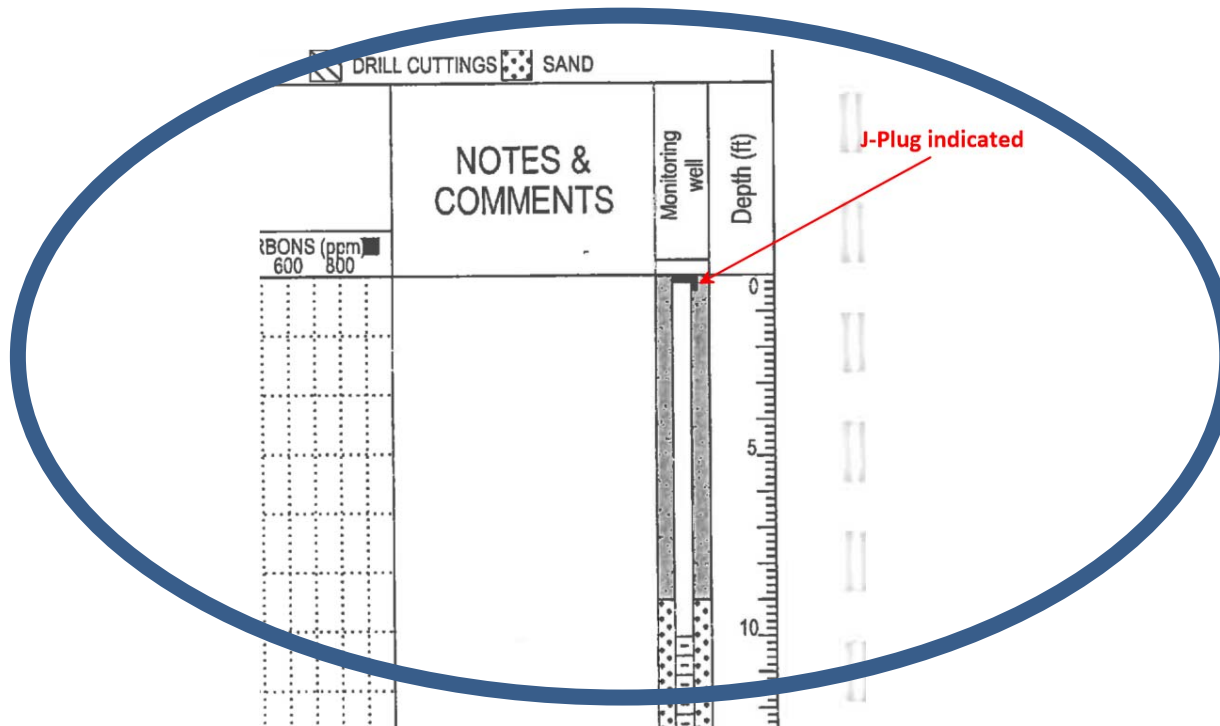
CHECKED BY:

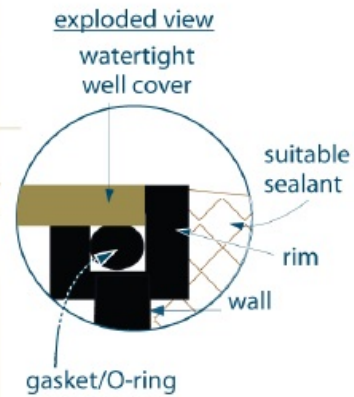
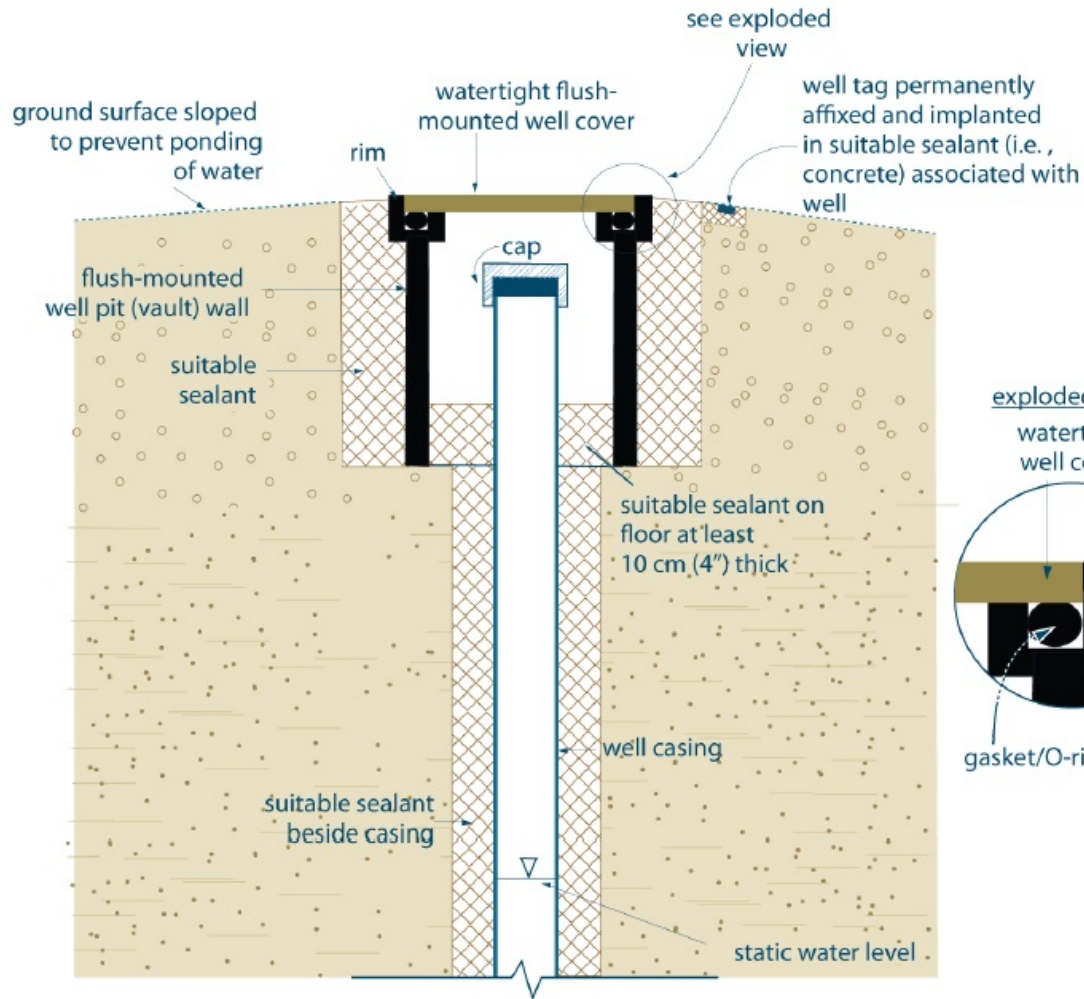
LEGEND

Consultant A then attempts to conduct a Groundwater Elevation Survey to determine the direction of shallow groundwater flow but they botched it and then said the attempted survey yielded no useful results.

What they did shows Consultant A's Field Techs and the report writer were inexperienced/not well trained and did not know how to conduct a proper groundwater elevation survey. It's possible that the person who reviewed and signed off on the report didn't either.

There's NO information on how the groundwater monitoring wells were constructed within the text of the 2006 report but you can tell from the Borehole Logs in the Appendix that flush mounted Road Boxes and casing caps or J-Plugs were used.





Commonly used J-Plugs



Consultant A 2006 Elevation Survey Data Table

2006

TABLE 6: ELEVATIONS

Station	Backsight (m)	Height of Instrument (m)	Int. Foresight (m)	Foresight (m)	Elevation (m)
BM	0.701	100.701			100.000
MW 01			1.769		98.932
MW 02			1.767		98.934
MW 03			1.589		98.112
TP #1	1.495	100.755		1.441	99.260
MW 04			1.687		98.068
MW 05			1.218		99.537
TP #2	1.674	101.335		1.094	99.661
TP #3	1.559	101.136		1.758	99.577
MW 06			1.638		99.498
MW 07			1.501		99.635
TP #4	1.734	101.441		1.429	99.707
TP #5	1.263	100.685		2.019	99.422
BM				0.592	100.093

Notes:

1. All Readings are Top of Traffic Box
2. Beck Drilling
3. Benchmark Details

Note: Only the Ground Elevation was surveyed in at each monitoring well location.
Top of Casing or Top of Pipe elevations were not.

Consultant A 2006 Groundwater Elevation Survey Data Table

2006

Installation Summary																Groundwater Measurements - June 5, 2006							Comments
Well ID	Date Installed	Grnd. Elev. (m)	Pipe Length (m)	Pipe Stickup (m)	T.O.P. Elev. (m)	Slotted Interval Elevation (m)		Slotted Section (m)	Purge Volume (L)	Purge Volume Required (L) ²	Product Thickness (cm)	Water Level T.O.P. (m)	Water Elevation (m)	Organic Vapour Readings									
						from	to																
MW 01	1-Jun-06	98.932	9.07	0.00	98.93	89.862	95.958	6.10	36.0	39.8	-	2.54	96.392	-	Brown Turbid								
MW 02	1-Jun-06	98.934	7.36	0.00	98.93	91.574	96.144	4.57	29.5	32.9	-	1.96	96.974	-	Brown Turbid - bubbles in the first two bailers								
MW 03	1-Jun-06	99.112	7.38	0.00	99.11	91.732	96.302	4.57	29.5	30.5	-	2.38	96.732	-	Brown Turbid - bubbles in the first two bailers								
MW 04	1-Jun-06	99.068	7.39	0.00	99.07	91.678	96.248	4.57	31.0	33.4	-	1.91	97.158	-	Brown Turbid								
MW 05	1-Jun-06	99.537	8.93	0.00	99.54	90.607	96.707	6.10	40.0	40.0	-	2.38	97.157	-	Brown Turbid - bubbles in the first two bailers								
MW 06	1-Jun-06	99.498	5.97	0.00	99.50	93.528	96.578	3.05	6.5	9.9	-	4.35	95.148	-	Brown Turbid								
MW 07	1-Jun-06	99.635	5.90	0.00	99.64	93.735	96.785	3.05	16.0	20.9	-	2.48	97.155	-	Brown Turbid								

Notes:

1. T.O.P. = Top of Pipe

2. Purge Volume Required is based on three well volumes

3. Testing Parameters

4. Note

Notice that they are saying stickup height is zero at each well and TOP/TOC elevations are at ground level which was measured as the top of the roadbox. **THIS IS IMPOSSIBLE!**

Note also that water level measurements were made relative to TOP/TOC and groundwater elevations were calculated from that. This means every single groundwater elevation is off by an amount equal to the stickup height.

As a result, all of their calculated groundwater elevations were likely to be off by somewhere in the range of 0.03 – 0.08 m.

Their flawed groundwater elevation measurements were likely what caused the groundwater elevation survey to yield results that were difficult for Consultant A to interpret/make sense of.

These errors were obvious in the report but not picked up in QA/QC by the report reviewer. The failure to produce a valid groundwater elevation survey was explained in the report as follows.

*“Groundwater flow direction could not be accurately determined. This could be due to the fact that the monitoring wells are completed to different depths in the upper aquifer, well construction was not identical, **and/or groundwater in the newly installed wells may have not stabilized by the time the groundwater monitoring was conducted.** As discussed in Section 3.2, Consultant A **expects that groundwater flow would ultimately be to the north toward the Big River, however local hydrogeological conditions commonly affect localized groundwater flow conditions.**”*

Year 5 (2010)

In early 2010, some contamination was discovered in the chrome containment pit and soil beneath some of the chromium solution tanks.

Consultant “B” comes in to do a Phase II to investigate the contamination. This is what they said about the shallow groundwater flow direction in their report:

*“Based on Consultant A’s report, the local shallow groundwater flow was **assumed** to be in a northerly direction toward the Big River based on regional topography.”*

So they are aware the direction of shallow groundwater flow has ONLY been **assumed thus far.**

Based on only that assumption and without doing a groundwater elevation survey they stated that their No. 1 concern was:

“1. Contamination migrating offsite to the north onto the neighbour’s property”

Then they added **4 more sentinel wells north of the building**. This shows Consultant B was accepting Consultant A’s untested hypothesis/assumption as a **FACT**.

Years 5 - 8 (2010 - 2013)

Consultant A conducts Bi-annual groundwater sampling and monitoring and issues annual Groundwater Monitoring Reports for years 2010 – 2013. Depths to groundwater are measured every year but a proper groundwater elevation survey is never performed. All that is reported in these reports are the depths to groundwater at each monitoring well; nothing else. (No ground or other elevation data is reported.)

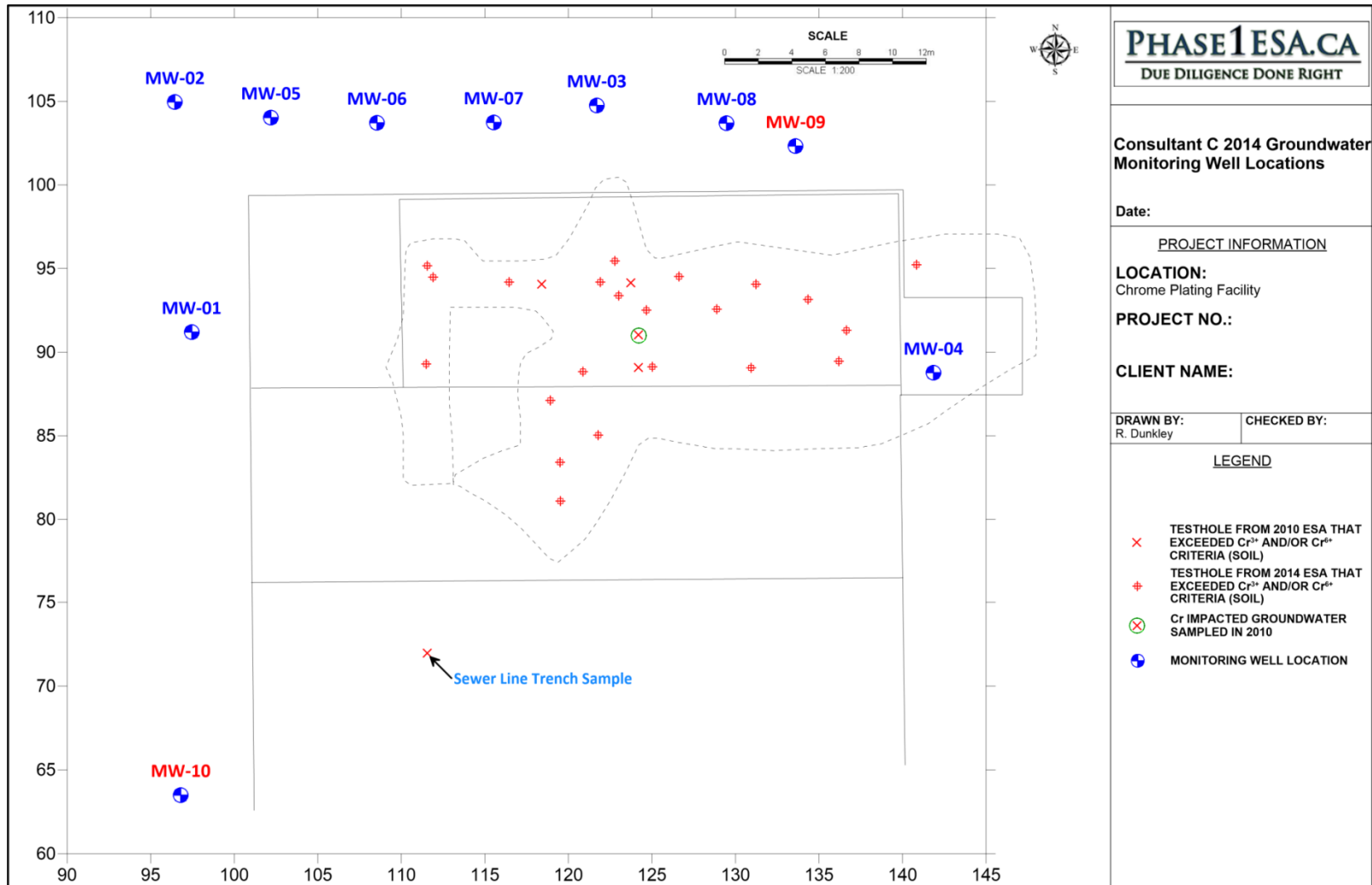
Without explanation, Consultant A changed its mind on the most probable direction of shallow groundwater flow stating the following in each of its annual reports:

*“The direction of shallow groundwater flow on the Site is **expected to be east-northeast**, towards ████ Creek Ravine.”*

Again, this is **conjecture** and no data has been produced to prove this yet.

Year 9 (2013)

A new consultant (Consultant C) is brought in and conducts what it calls a Phase III ESA on the site but oddly it is only a Phase II ESA. Chromium and Hex Chrome impacts to soil beneath the facility are further delineated and a considerable amount of it is found, much of it **BELOW** the water table depth. Two new groundwater monitoring wells are added to the array:



Almost to its credit, Consultant C did do a survey measuring Northings and Eastings and ground elevations at all 10 monitoring wells but, inexplicably, they did not complete a groundwater elevation survey. Depths to groundwater were only measured at their two new wells.

With only that information, here's what they said in their report:

“... Consultant C measured depth to groundwater in monitoring wells MW-10 and MW-09. Depth to groundwater in these wells was 2.03 and 2.06 m bgs, respectively...”

*Based on groundwater monitoring reports by Consultant A between 2010 and 2013, groundwater depths ranged from... . The groundwater depths measured over this period of time **ALSO** indicated that shallow groundwater tends to flow in a **north-northeast** direction on the subject property."*

Wait... is that what Consultant A said in those reports?

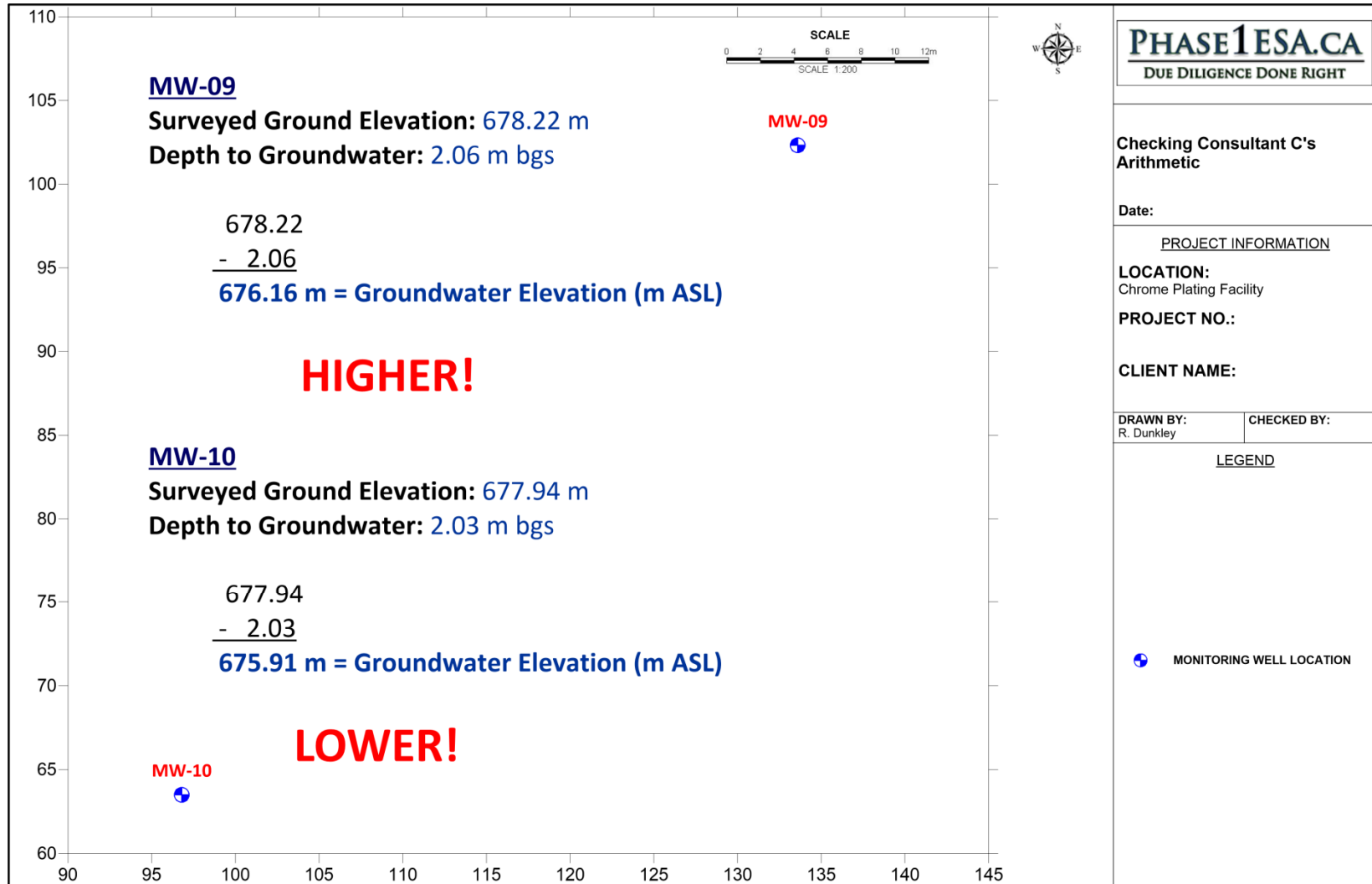
*"The direction of shallow groundwater flow on the Site is **expected** to be **east-northeast**, towards [REDACTED] Creek Ravine."*

Nope! And they only said it was "**expected**" to be in that direction. Also, Consultant C's reported groundwater depths from 2010-13 did not indicate **ANYTHING**.

This is what Consultant C then said in the report conclusions:

"As the shallow groundwater flows in a northerly direction, and test hole MW-10 could be considered upstream or background from the metal contaminated soil area..."

Hmmm... Maybe we should just check what your groundwater elevation data indicate, Consultant C. You checked those data over, right?



Conclusions:

1. Groundwater cannot possibly flow northeast!
2. MW-10 **cannot be considered an upstream/background well**. In fact, it may be the **only** downgradient well in the entire network!
3. It appears that neither Consultant C's report writer or reviewer bothered to look at what their own data was indicating. No one checked the math.

My reaction after checking Consultant C's arithmetic...

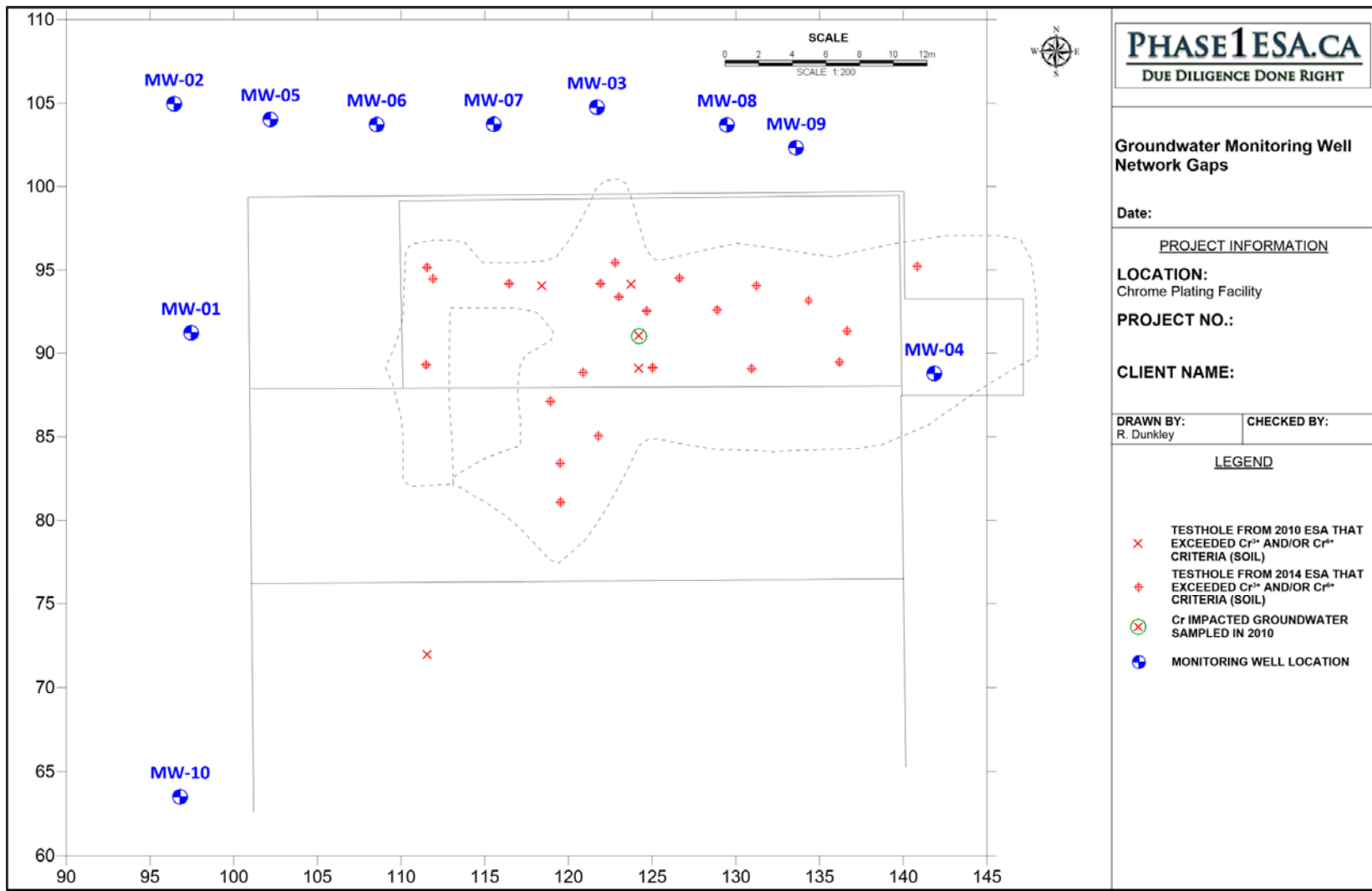


Year 10 (2014)

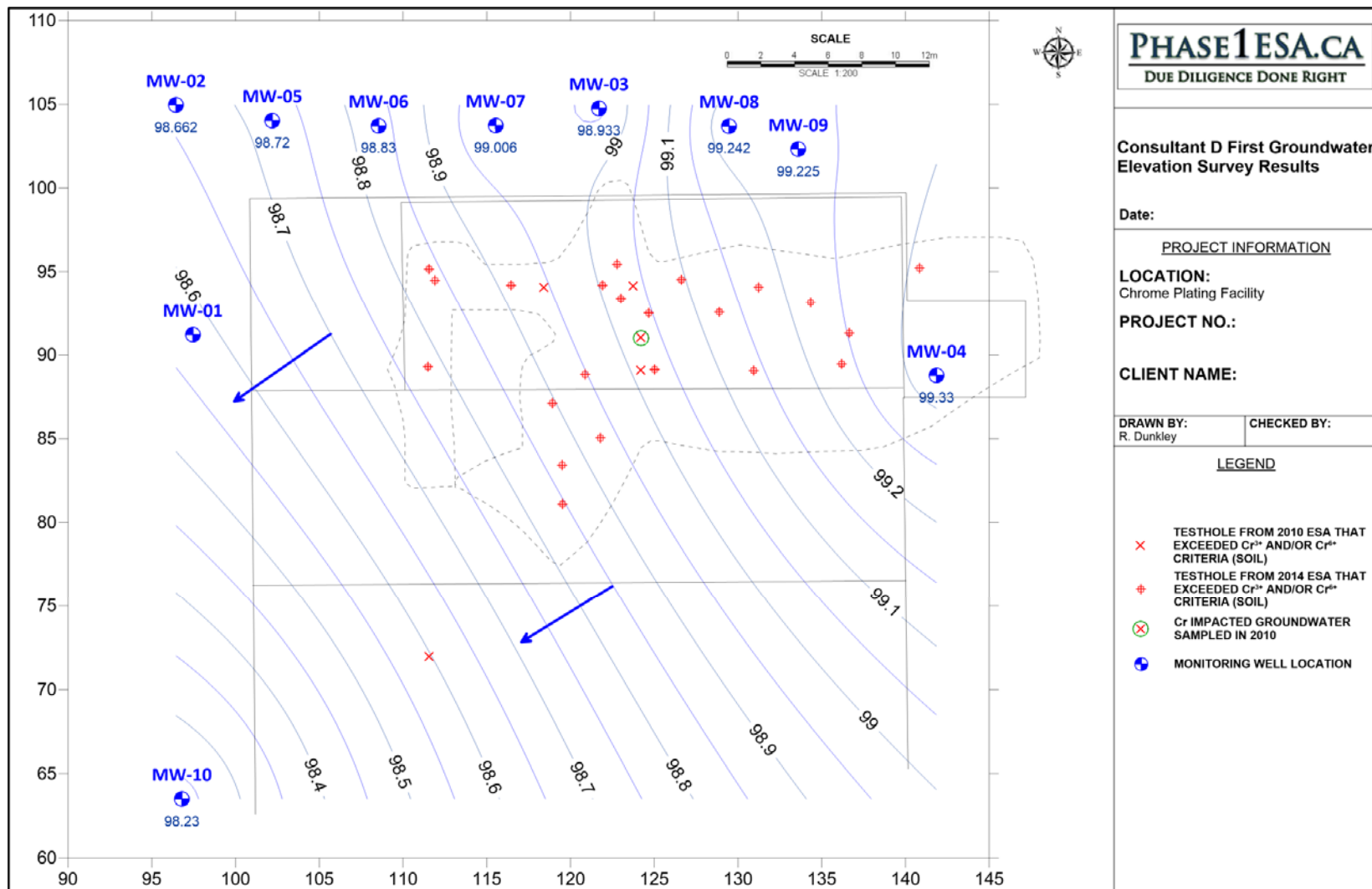
While working at another consulting company (Consultant D), I am given all of these reports to review and critique by my client who wants to buy both operations. They are concerned about incurring a large environmental liability and want an expert opinion on these reports.

Because the deficiencies in Consultant A, B and C's reports are so obvious, it takes me little time to spot the problems with the reports and inform them that to date the direction of shallow groundwater flow has only been assumed/postulated but has **NEVER** once been verified.


This site could have a Hex Chrome groundwater plume going off-site in a number of possible directions completely undetected because of the sizeable gaps in the monitoring well network.



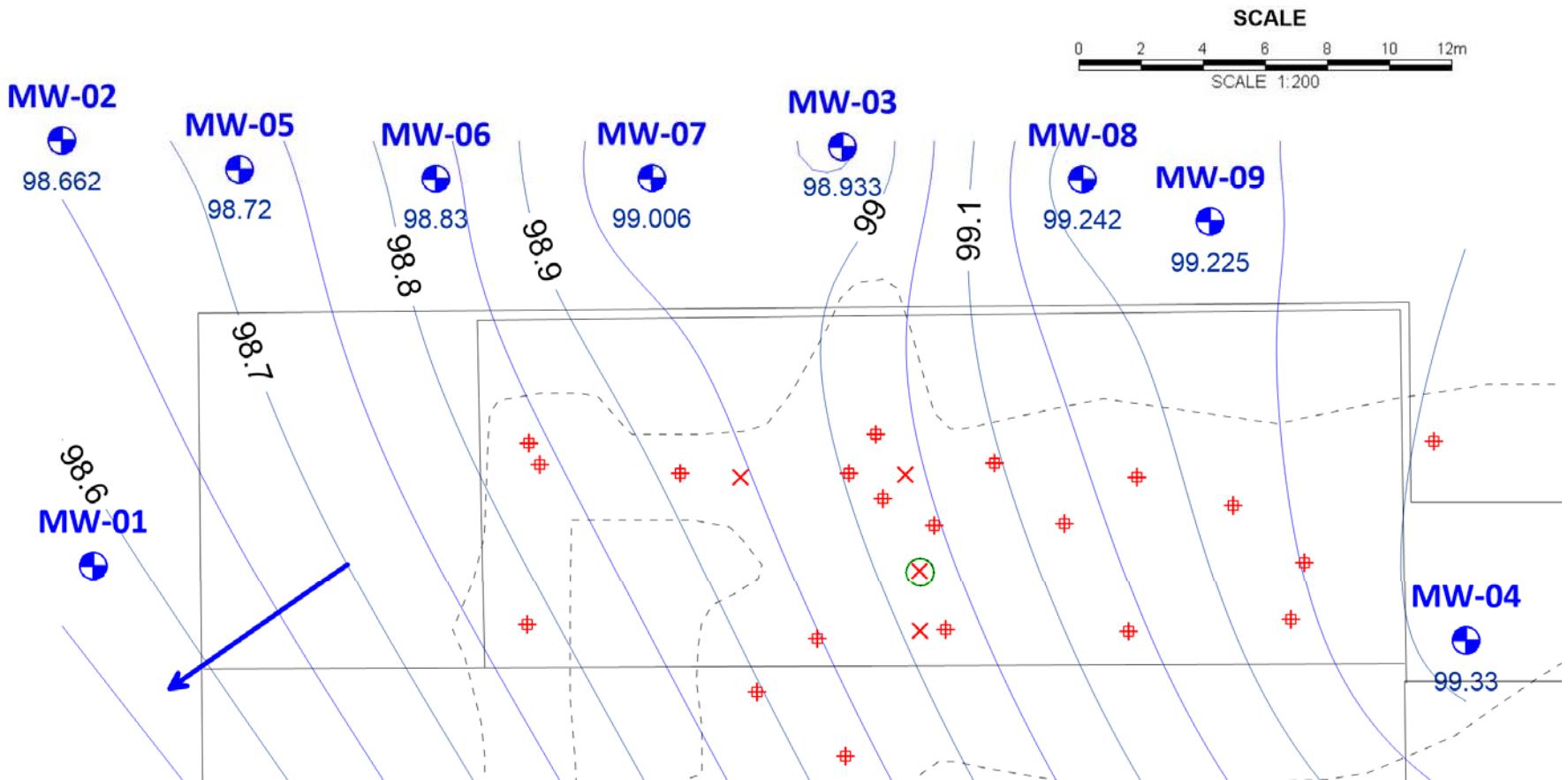
I recommended doing a groundwater elevation survey to FINALLY determine the direction of shallow groundwater flow. Here's what we found:



GUESS WHAT?

- 1. Not Northerly towards the Big River.**
- 2. Not East-Northeast towards the  Creek Ravine.**
- 3. Not North-Northeast either!**

**GUESS WHAT ALSO
CONSULTANTS A, B
and C?**



Conclusions

Despite the fact that most companies believe and claim they have rigorous quality control, my experience reviewing dozens of ESA reports over the years has shown me that these types of errors are not as rare as you might think/hope. No doubt the companies who issued the reports featured in this presentation *thought* their QA/QC programs were good enough to ensure only good quality work could get transmitted through to clients and regulators but the fact that these reports got through seems to suggest otherwise. **The errors in the last two cases talked about were potentially serious and could have resulted in legal actions being taken against the companies that issued those reports.**

If companies' QA/QC programs are as good as most companies think they are, how come these types of serious errors can get through QA/QC without being detected?

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1. Could it just be that the people involved in the writing and reviewing of these reports were incompetent? Is it that simple?
2. Could it be that companies are over-confident and complacent about their work and QA/QC programs? Are their QA/QC programs perhaps not as rigorous and effective as they think they are?
3. Could it be that companies are not budgeting enough time on projects to do an adequate/thorough review of the work?
4. Could it be that companies are not doing an adequate job of training their employees on how to do a proper technical review of reports?
5. Could it be that companies are not doing an adequate job of training their employees on how to do their jobs or at least certain aspects of their jobs in general?

Some Questions To Ask Yourselfs

1. Does your company have a rigorous, stepped training program to train junior employees at their jobs or do you put them on projects with more senior people and expect they'll learn from them and experience?
2. Does your company have a program to train employees on how to review reports? Any SOPs for reviewing reports (e.g. list of things that must be checked).
3. Does your company have a practice lead and/or somebody who's responsible for ensuring your QA/QC programs are being followed and are effective?
4. Does your company budget **extra** time for peer review on projects where the field work and/or report writing are done by junior employees?
5. Has your company ever had its QA/QC program(s) audited either internally or by an external auditor?
6. Does your company ever have senior technical personnel do random extra reviews of reports that have been approved for transmittal?

You may think that your company's employee training programs are first rate and your QA/QC program is robust, rigorous and near bullet-proof. I'm here telling you that from all the mistakes, errors and omissions I've seen and continue to see in so many reports, that's not what I'm seeing from my chair.

As an industry, we CANNOT afford to have reports with errors/omissions like the ones detailed in this presentation going out to clients and regulators. It damages our industry's reputation and can only cause the trust the public and regulators have in our abilities and our work to be diminished.

DO NOT be complacent about your QA/QC programs. Complacency/over confidence leads to reports like the ones detailed in this presentation being released to clients and regulators. Audit your QA/QC programs regularly and be constantly rigorous in your reviews and due diligence.

We Can Do Better

We MUST Do Better



Questions?