

Railway Project

Water wells survey in three sections of the railway

AUGUST 2017

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1. General objective

For the analysis of the sections to be laid down in trenches in the preliminary design for modifying the Montevideo to Paso de los Toros railway, it is of special interest to determine the phreatic level and its variation in the surrounding areas.

From DINAMIGE's¹ database, it is possible to obtain data from past drillings (location, depth of well, flow) that have been conducted over the years, and which could provide relevant information to the project. However, this information may not be up-to-date, so it is necessary to conduct a survey of these wells to determine their current situation (existence or not, type of use, pumping capacity, etc.)

Measurements or tests of any kind in existing wells are not included within the scope of this study.

2. Particular scope of the project

For the purpose of this study, three different sections on the route of the railway are determined to be analysed:

- Section 1: located in the zones of "Bella Vista", "Capurro", "Prado", "Paso Molino" and "Belvedere" (Montevideo).
- Section 2: located in the city of "La Paz" and surrounding areas (Montevideo and Canelones).
- Section 3: located in the city of "Las Piedras" (Canelones).

From among all water wells documented by DINAMIGE, those who are closer to the areas of study mentioned above will be selected, since obtaining their information will be priority for the project.

A minimum of 8 perforations will be surveyed for each study section, which means that at least 24 wells will be surveyed.

¹ Mining and Geology National Direction

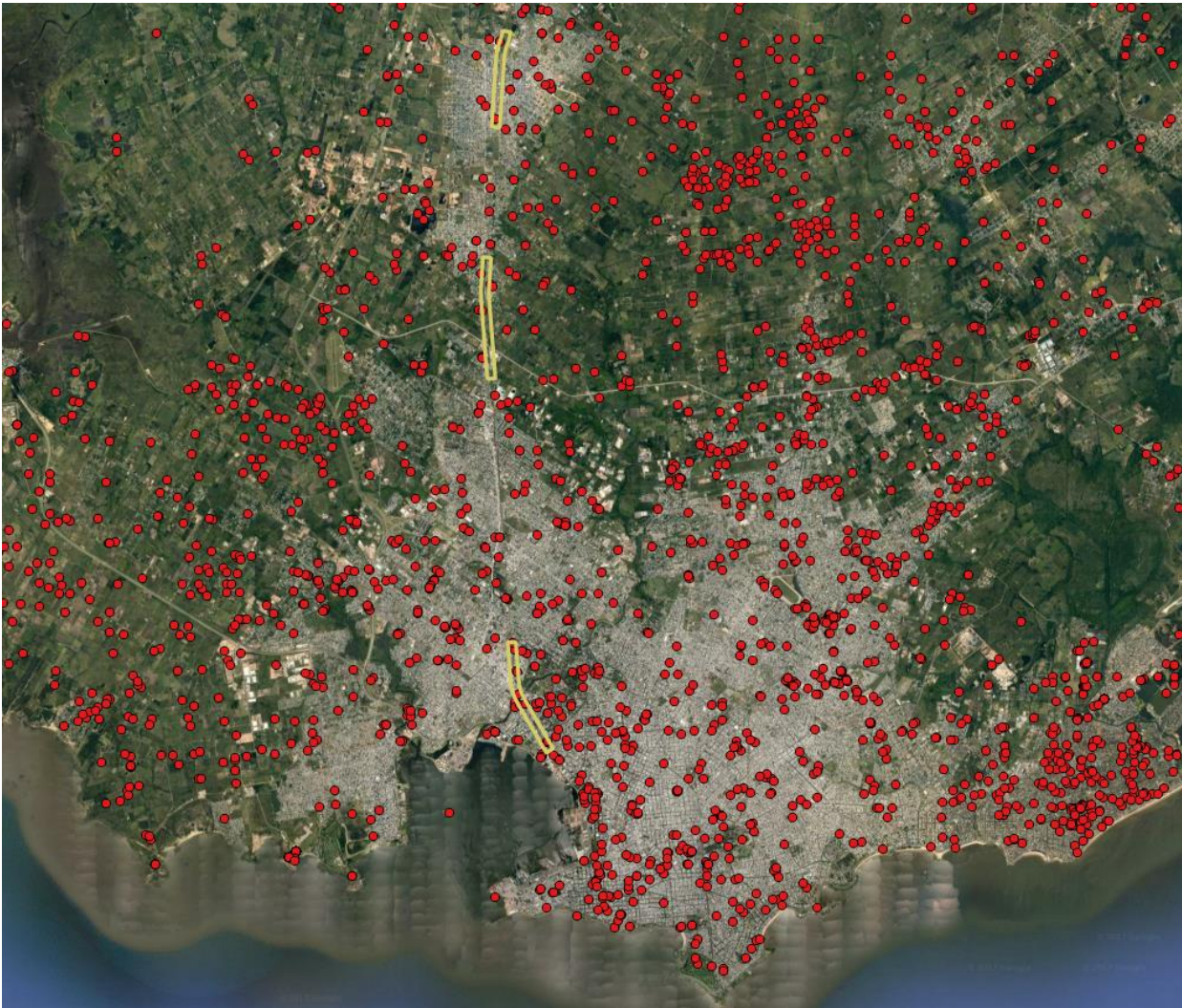
3. Existing information and on site survey

All the information extracted out of DINAMIGE's register and the information collected on site is compiled in this chapter.

Out of the survey, water wells will be classified in one of four possible categories:

- Category A: No information obtained regarding to the well.
- Category B: Connected to OSE, no existing wells
- Category C: Connected to OSE, possible water well in the property, not in use (neither necessarily accessible)
- Category D: Water well in use

Figure 1 - General view. DINAMIGE's documented wells in the area (red dots) and the three study sections (in yellow).



3.1. Section 1: “Bella Vista”, “Capurro”, “Prado”, “Paso Molino” and “Belvedere”

During a previous selection, there were identified 28 wells close to the area of interest. From this selection, a total of 26 wells were finally visited. Furthermore, an existing perforation was found, which was not documented by DINAMIGE (Well number: 0). In some cases, DINAMIGE’s data indicates that there exists (or existed) more than one perforation per property.

Figure 2 - Study section 1 and wells of interest (yellow dots).



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Table 1 Information obtained from DINAMIGE for Section 1.

N°	Location	Water Well Number	Water well ID	Last Known Flow	Depth	Phreatic level
1	URUGUAYANA 3779/3747	8955	DIN G 104	1.2	38	38
2	SANTA LUCIA 4028	8474	DIN B 663	8	40.5	39
3	FELIX OLMEDO 3542/3544/3546	9292	DIN K 94	8	33	32
4	FELIX OLMEDO 3542/3544/3546	9289	DIN K 94	8	33	30
5	GRAL HORNOS 4441 / 4437 BIS	8558	DIN E 45	8	24.45	0
6	AGRACIADA 3690	8893	DIN G 9	6	30	24
7	AGRACIADA 3655	7820	DIN E 54	6	19.75	30
8	AMADO NERVO 3746	9193	DIN G 53	3	26	19
9	URUGUAYANA 3779/3747	8898	DIN G 14	3	30	26
10	INDIA MUERTA 3853	8417	DIN B 357	0	15.3	30
11	GAUCHOS 4107 / 4109	7825	DIN E 59	1.1	32.2	0
12	RBLA. BALTASAR BRUM 3346 bis / 3346	8529	DIN B 1047	0	38	32
13	RBLA. BALTASAR BRUM 3346 bis / 3346	8198	DIN A 15	5.5	33	0
14	RBLA. BALTASAR BRUM 3346 bis / 3346	8531	DIN B 1062	4	39.6	22
15	CONVENIO 866	8276	DIN A 575/1	13.2	41.5	14
16	CONVENIO 880	8277	DIN A 575/2	9.5	32	28
17	FILADELFIA 353	8758	DIN D 4	14	18	28
18	PARQUE CAPURRO	8278	DIN A 580/1	2	10.9	0
19	PARQUE CAPURRO	8279	DIN A 580/2	4.4	10.7	6
20	GRAL HORNOS 4355 / 4355 BIS	8241	DIN A 379/1	0	30.6	4
21	GRAL HORNOS 4355 / 4355 BIS	8242	DIN A 379/2	0.9	13.15	0
22	FELIX OLMEDO 3670	9207	DIN G 77/1	8	38	11
23	FELIX OLMEDO 3670	9208	DIN G 77/2	4.5	53	38
24	URUGUAYANA 3836	8360	DIN E 17	0	0	53
25	SANTA LUCIA 4042	8397	DIN B 265	22	35.5	34
26	URUGUAYANA 3770	9027	DIN E 100	2	70.9	70

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Table 2 Information obtained during survey for Section 1.

Water Well Number	Cat	Location	Information obtained
8955	B	URUGUAYANA 3779/3747	Connected to OSE, no existing wells. There were perforations when the factory was still working (over 15 years ago)
8474	B	SANTA LUCIA 4028	Small factory. Contact: 23048906. Connected to OSE, no existing wells.
9292	A	FELIX OLMEDO 3542/3544/3546	Households: "Los Cedros". Properties were visited but no contact was made.
9289	A	FELIX OLMEDO 3542/3544/3546	Households: "Los Cedros". Properties were visited but no contact was made.
8558	A	GRAL HORNOS 4441 / 4437 BIS	Households. Properties were visited but no contact was made.
8893	B	AGRACIADA 3690	Shop. Connected to OSE, no existing wells.
7820	B	AGRACIADA 3655	Devoto (supermarket). Contact: 24804610 (Technical office) - Arq. Mauro Severo
9193	B	AMADO NERVO 3746	Property is a garage nowadays. No existing wells.
8898	B	URUGUAYANA 3779/3747	Warehouse: "La Aurora". Connected to OSE, no existing wells. There were perforations when the factory was still working.
8417	A	INDIA MUERTA 3853	Sports Club: Property was visited but no contact was made.
7825	B A	GAUCHOS 4107 / 4109	4107 – Connected to OSE, no existing wells. 4109 – Property was visited but no contact was made.
8529	B	RBLA. BALTASAR BRUM 3346 bis / 3346	SAMAN. Contact: Arq. Martín Minasian minasian@saman.com.uy (22081421). These documented wells do not exist anymore.
8198	B	RBLA. BALTASAR BRUM 3346 bis / 3346	
8531	B	RBLA. BALTASAR BRUM 3346 bis / 3346	
8276	B	CONVENIO 866	No existing wells.
8277	B	CONVENIO 880	No existing wells.
8758	C	FILADELFIA 353	IMM – Garbage collection. Contact: Silvana González (Direc.) 25227417. No existing wells. However, years ago, when the incinerator still worked, they used wells.
8278	B	PARQUE CAPURRO	Public park. It was visited but no well or perforation was sighted.
8279	B	PARQUE CAPURRO	Public park. It was visited but no well or perforation was sighted.
8241	B	GRAL HORNOS 4355 / 4355 BIS	Households. Connected to OSE, no existing wells.
8242	B	GRAL HORNOS 4355 / 4355 BIS	Households. Connected to OSE, no existing wells.
9207	B	FELIX OLMEDO 3670	Police department (7th.) Connected to OSE and fills an elevated tank. No existing wells.
9208	B	FELIX OLMEDO 3670	Police department (7th.) Connected to OSE and fills an elevated tank. No existing wells.
8360	A	URUGUAYANA 3836	Youth center. Property was visited but no contact was made.
8397	C	SANTA LUCIA 4042	No existing perforations. Possible closed water well (over 30 years ago).
9027	B	URUGUAYANA 3770	Connected to OSE, no existing wells. There were perforations when the factory was still working (over 15 years ago)

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According to SAMAN Company, there are no wells of those documented in DINAMIGE’s database. However, they have made a perforation in their property with the purpose of alleviating the pressure on a work of infrastructure (groundwater level in this infrastructure depends on rain, and varies between 2,5 to 4,0 metres). In the well, a continuous pumping of water is carried out, with the following details:

Table 3 – SAMAN well – Additional Information

Water Well Number	Cat	Purpose	Use	Pumping (Litres/hour)	Operating time (hours/day)
0	D	Alleviating Pressure	None (pumped to the bay)	13.000 - 14.000	24

3.2. Section 2: “La Paz”

During a previous selection, there were identified 13 wells close to the area of interest. From this selection, a total of 10 wells were finally visited. Additional information regarding 6 perforations (well numbers 1 to 6) was acquired thanks to “Maltería Oriental SA”, since they carry out a periodic monitoring in existing wells close to their property. In some cases, DINAMIGE’s data indicates that there exists (or existed) more than one perforation per property.

Figure 3 - Study section 2 and wells of interest (yellow dots).



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Table 4 - Information obtained from DINAMIGE for Section 2.

N°	Location	Water Well Number	Water well ID	Last Known Flow	Depth	Phreatic level
1	RUTA MAYO GUTIERREZ 2555, and Hilario Cabrera	9352	DIN E 183/1	4	30	22
2	RUTA MAYO GUTIERREZ 2555, and Hilario Cabrera	9353	DIN E 183/2	0	70	-
3	CAMINO OSVALDO RODRIGUEZ 8525	9478	DIN K 219	0	75	-
4	Gutiérrez 66/64 and Rincón	4090	DIN B 68	0	65	-
5	RUTA MAYO GUTIERREZ 2978	9038	DIN E 111	1.3	104.65	103
6	MAGALONA 3260	8239	DIN A 314	0.8	24.8	23
7	RUTA MAYO GUTIERREZ 2555, and Hilario Cabrera	8921	DIN E 142	2.7	50	7
8	EMILIO ANDREON 141 and Victoria	2360	DIN I 26	7	30	29
9	BERNARDO ETCHEVARNE 5192	12358	PRN 1762	3	96	-
10	RINCON 341 and Mayo Gutiérrez	1614	DIN S 18	3	32	28

Table 5 - Information obtained during survey for Section 2.

Water Well Number	Cat	Location	Information obtained
9352	C	RUTA MAYO GUTIERREZ 2555, and Hilario Cabrera	Foster care (NGO) - 23209985. Connected to OSE. Possible closed water well.
9353	C	RUTA MAYO GUTIERREZ 2555, and Hilario Cabrera	Foster care (NGO) - 23209985. Connected to OSE. Possible closed water well.
9478	B	CAMINO OSVALDO RODRIGUEZ 8525	Household. Connected to OSE, no water wells acknowledged by owner.
4090	C	Gutiérrez 66/64 and Rincón	Households. Connected to OSE. Possible closed water well, beneath the construction
9038	B	RUTA MAYO GUTIERREZ 2978	Household. Minimum information acquired. Connected to OSE.
8239	A	MAGALONA 3260	Household. Properties were visited but no contact was made.
8921	C	RUTA MAYO GUTIERREZ 2555, and Hilario Cabrera	Foster care (NGO) - 23209985. Connected to OSE. Possible closed water well.
2360	B	EMILIO ANDREON 141 and Victoria	Household, for over 30 years. Connected to OSE, no existing wells.
12358	C	BERNARDO ETCHEVARNE 5192	Construction company - 23200114. Connected to OSE, and have not use wells for years. Existing water well (decoration)
1614	B	RINCON 341 and Mayo Gutiérrez	Households. Connected to OSE, no existing wells. Property nearby: Small abandoned factory (no information acquired).

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In the following table it is shown some basic information obtained by “Maltería Oriental SA” during the monitoring they carried out in the perforations. Some of them are located in their property, while the rest are situated in nearby properties.

Table 6 – Maltería Oriental S.A. - Monitoring information

Water Well Number	Cat	Use	Extracted volume (m³/month)	Operating time (hours/day)	Operating time (hours/month)	Extracted volume (m³/year)
1	D	Industrial	2025	18	450	24300
2	D	Industrial	1575	18	450	18900
3	D	Industrial	720	18	450	8640
4	D	Industrial	900	18	450	10800
5	D	Industrial	900	18	450	10800
6	D	Industrial	1350	18	450	16200

3.3. Section 3: “Las Piedras”

During a previous selection, there were identified 13 wells close to the area of interest. From this selection, a total of 12 wells were finally visited. In some cases, DINAMIGE’s data indicates that there exists (or existed) more than one perforation per property.

Figure 4 - Study section 3 and wells of interest (yellow dots).

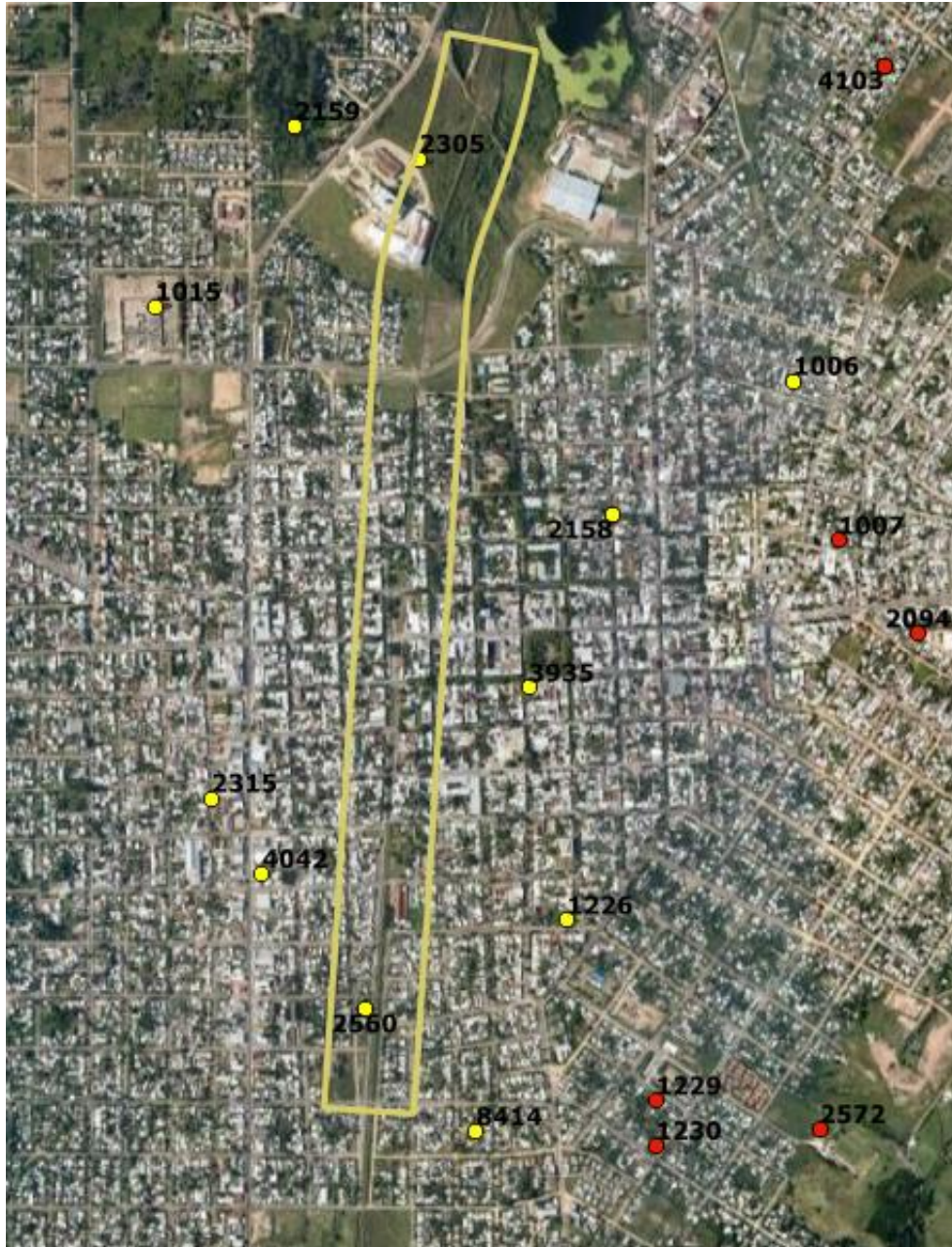


Table 7 - Information obtained from DINAMIGE for Section 3.

N°	Location	Water Well	Water well	Last Known	Depth	Phreatic
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		Number	ID	Flow		level
1	RIVERA 608 and Manuel Freire	1226	DIN K 172	12	37.7	35
2	MASSINI 699 and Baltasar Brum	2315	DIN H 243	13	23.6	23
3	PANDO 469 and República Argentina	1006	DIN A 206/7	3.7	35.1	16
4	LAVALLEJA 625 and Instrucciones Año XIII	3935	DIN G 234	10	28	27
5	ENRIQUE POUHEY 9000, and Sergio Matto	2305	DIN H 181	0	50	-
6	BLANES VIALE 9000, and Batlle Berres	1015	DIN A 216	1.2	26.55	26
7	JOSE ELLAURI 711/737 and Enrique Pouey	4042	DIN B 334	1	38	32
8	CARLOS GARDEL 108 and Atanasio Sierra	8414	DIN B 351	0	0	38
9	GENERAL LEANDRO GOMEZ 525	2158	DIN C 18	2.4	52.5	52
10	ENRIQUE POUHEY 5, and Sergio Matto	2159	DIN C 28	9.9	26	24
11	ALFONSO ESPINOLA 808 and Carmelo Colman	2575	DIN S 8	10	33.5	-
12	ALFONSO ESPINOLA 808 and Carmelo Colman	10497	DIN K28/068	23	53	37
13	ALFONSO ESPINOLA 808 and Carmelo Colman	2560	DIN N 2	12	29	-

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Table 8 - Information obtained during survey for Section 3.

Water Well Number	Cat	Location	Information obtained
1226	A	RIVERA 608 and Manuel Freire	Property was visited but no contact was made.
2315	B	MASSINI 699 and Baltasar Brum	Household. Connected to OSE. No water wells acknowledged by owner.
1006	B	PANDO 469 and República Argentina	Household (for over 40 years). Connected to OSE, no existing wells.
3935	A	LAVALLEJA 625 and Instrucciones Año XIII	Property was visited but no contact was made. Shops closed/abandoned.
2305	D	ENRIQUE POUHEY 9000, and Sergio Matto	CORFRISA (refrigerator) 23644601. Contact: Selva Hernández. Existing well
1015	B	BLANES VIALE 9000, and Batlle Berres	Graveyard. No existing wells.
4042	B	JOSE ELLAURI 711/737 and Enrique Pouey	Different shops (welding - hairdresser - furniture sale). Connected to OSE, no existing wells.
8414	A	CARLOS GARDEL 108 and Atanasio Sierra	Carpentry (might be abandoned) Property was visited but no contact was made.
2158	B	GENERAL LEANDRO GOMEZ 525	Household. Connected to OSE. No water wells acknowledged by owner.
2159	B	ENRIQUE POUHEY 5, and Sergio Matto	Household. Connected to OSE, no existing wells. No water wells acknowledged by owner.
2575	B	ALFONSO ESPINOLA 808 and Carmelo Colman	No existing constructions – recently demolished. No existing wells sighted. Neighbour informs there were water wells in properties nearby, but haven't been used in many years.
10497	B	ALFONSO ESPINOLA 808 and Carmelo Colman	
2560	B	ALFONSO ESPINOLA 808 and Carmelo Colman	

For the well 2305 (in use), this additional information was collected during the survey:

Table 9 - Well Number 2305 – Additional Information

Water Well Number	Cat	Use	Pumping (m ³ /hour)	Operating time	Depth
2305	D	Water supply in case of fire (or fire drill)	4.0	Varies (only when its needed)	68m

4. Synthesis of information collected in the field

Information obtained through the survey is now presented in one image per section, categorizing each perforation according to its situation:

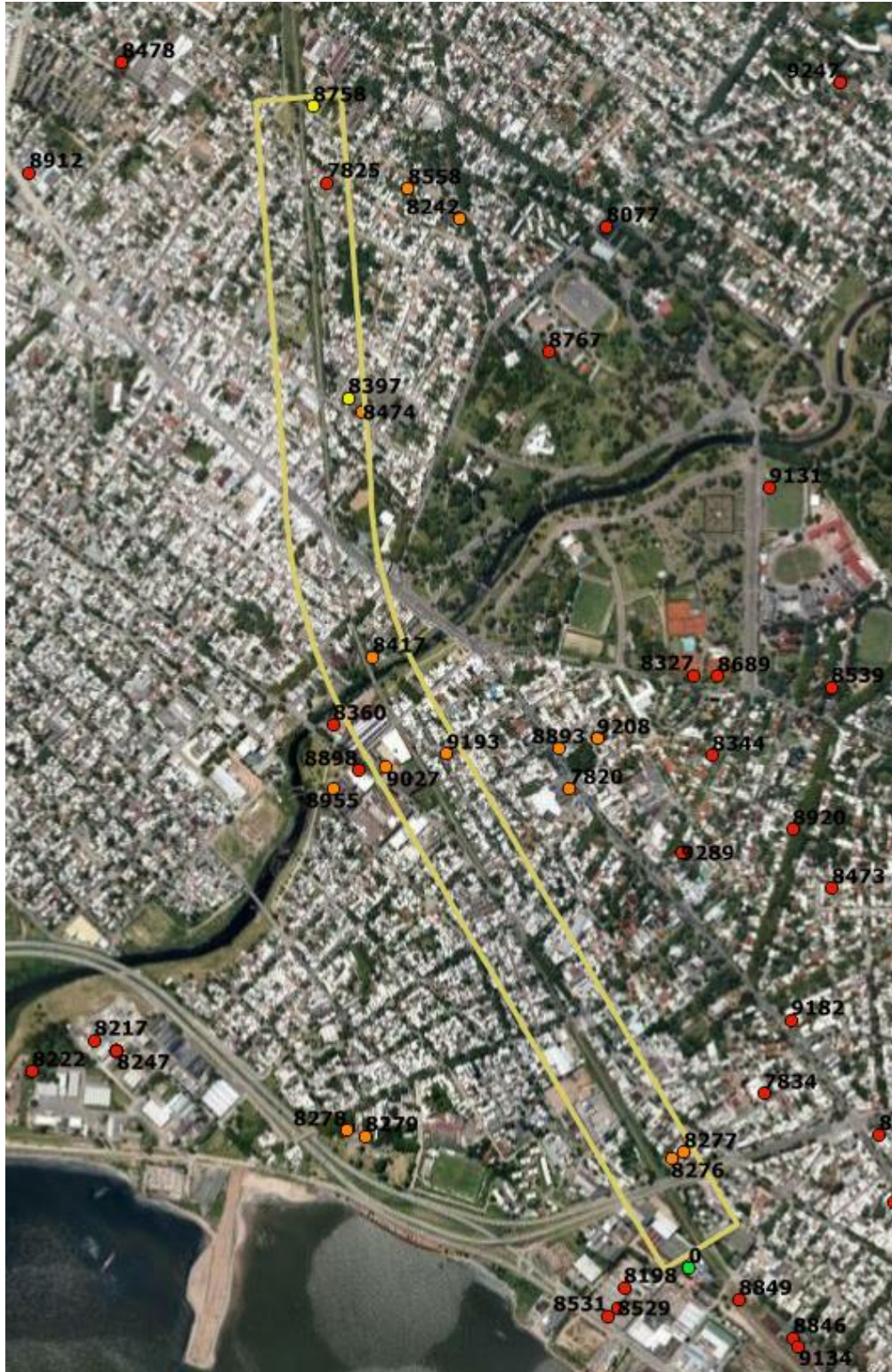
- Category A (in red colour): No information obtained regarding the perforation.
- Category B (in orange colour): Connected to OSE, no existing wells

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- Category C (in yellow colour): Connected to OSE, possible water well in the property, not in use (neither necessarily accessible)
- Category D (in green colour): Water well in use

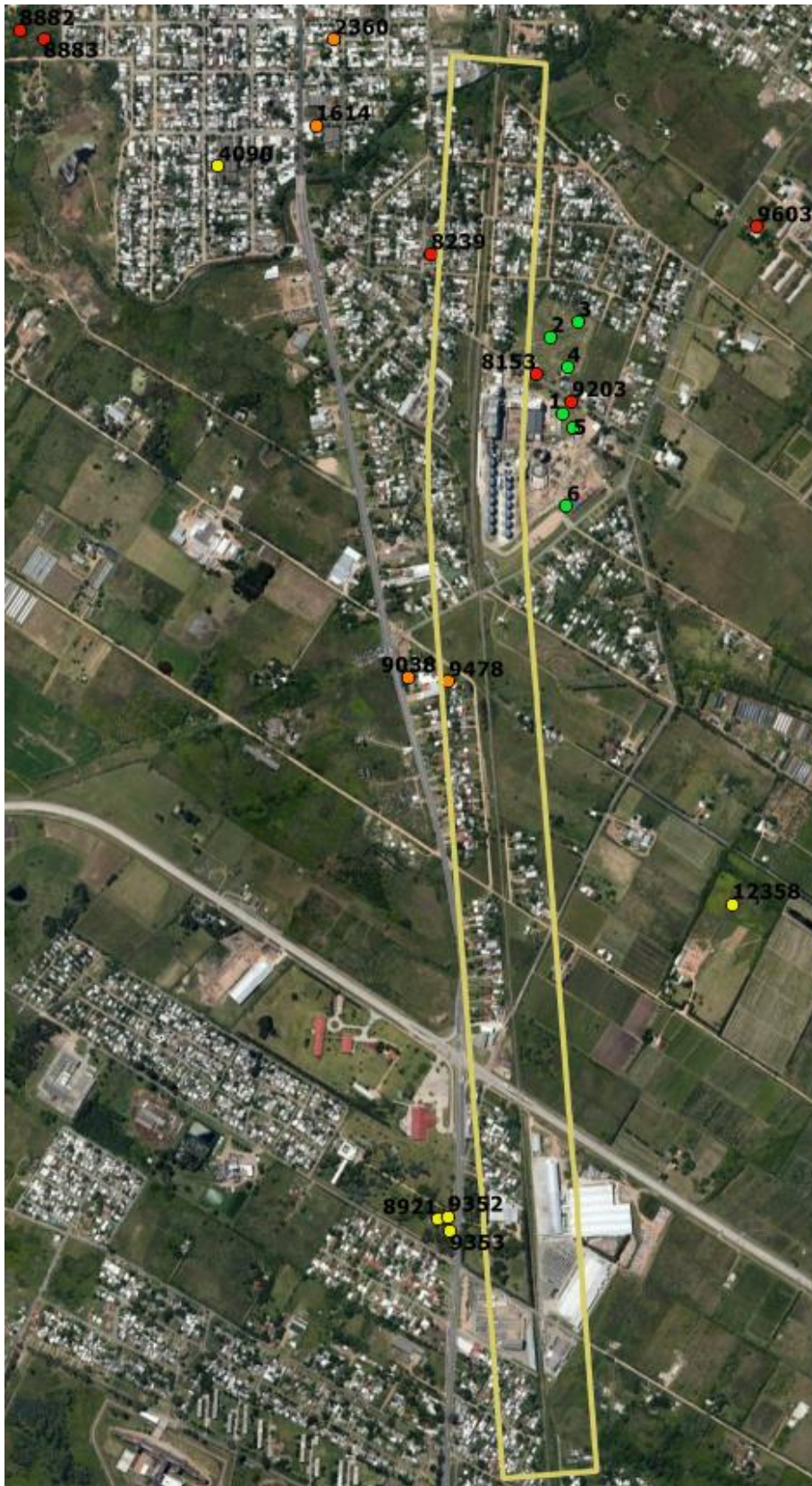
Figure 5 – Section 1



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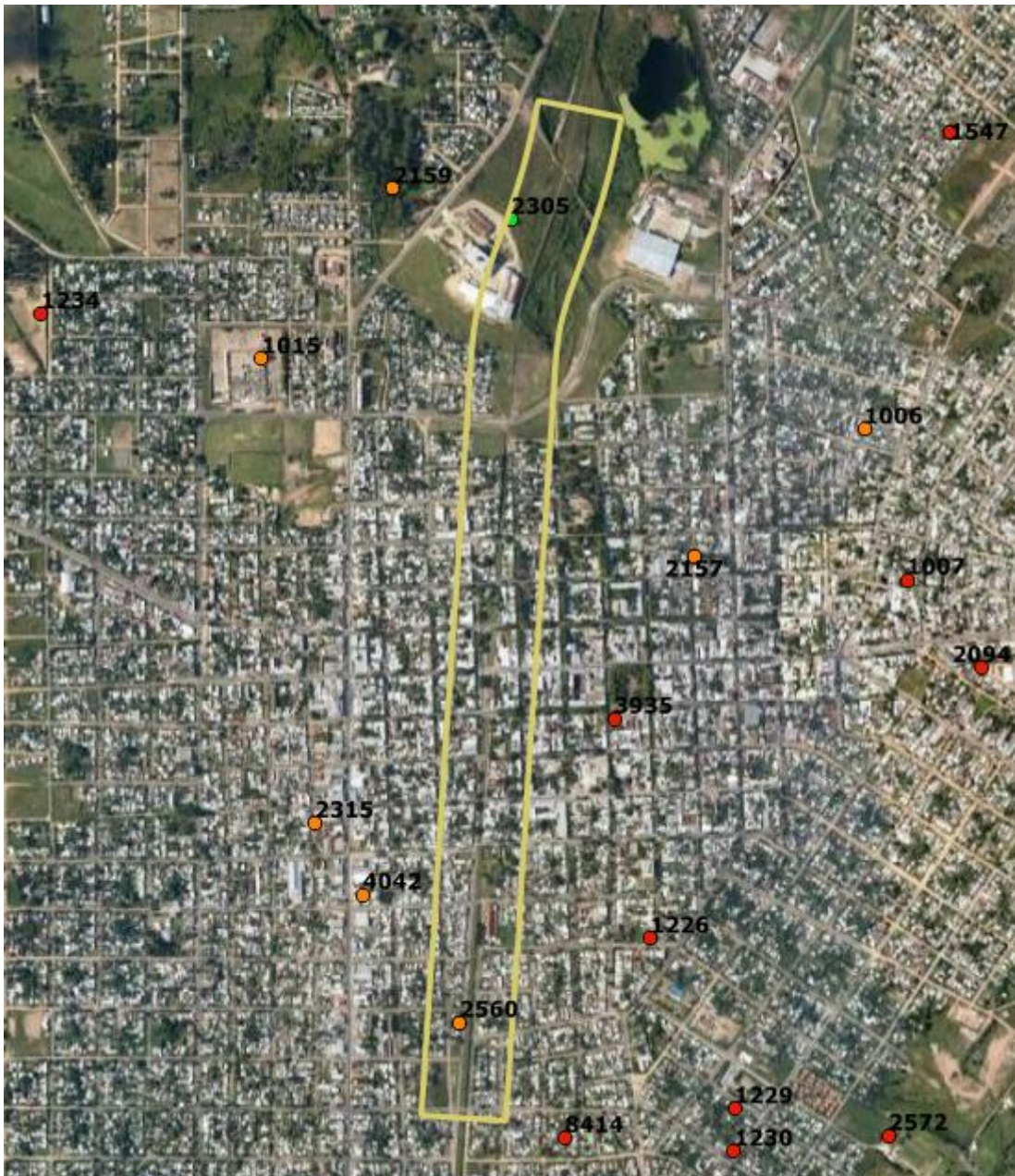
Figure 6 – Section 2



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Figure 7 – Section 3



The shapes containing the defined areas and the listed water wells are delivered together with this report.

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