## Relevancia y Potencial

Desde una perspectiva hidrológica la relación e interacción de los sistemas de drenaje del **Vertedero Municipal de Yauco** con las cuencas del **Río Yauco** y **Río Loco** es por demás limitado y prácticamente irrelevante. De igual manera calificamos su importancia en términos del potencial de aprovechamiento. Lo cierto es, que el grado de aislamiento hidrológico que exhiben y su incapacidad para satisfacer demandas de uso son el resultado de diversos factores de estado, entendiendo como primarios: *el balance de agua negativo que caracteriza la zona* y *la formación geológica que compone los terrenos.*

Como argumento a favor del sistema superficial que sirve los predios se puede postular que bajo eventos de precipitación extraordinarios se podrá generar un flujo a través de los cauces de drenaje capaz de accesar el canal principal de la cuenca y ejercer funciones típicas de ecosistemas lóticos. No obstante, reconociendo que la probabilidad de ocurrencia anual de tales eventos es muy baja y que su intérvalo de recurrencia anual es muy largo, resulta fundamentado reafirmar que la presencia de dicho sistema en el área es prácticamente irrelevante.

En la localidad de estudio el sistema hidrológico subterráneo no tiene el potencial para servir como fuente de abasto pues carece de una unidad geológica capaz de transmitir agua en cantidades aprovechables. La naturaleza impermeable de la **Formación Juana Díaz** se evidencia al comparar la pobre transmisividad registrada para el estrato saturado (**170** galones/día/pie) (gpd/p) con el valor mínimo utilizado (**100,000** gpd/p) para declarar como productiva una unidad acuífera (*Freeze & Cherry, 1979)* y con los valores de transmisividad del productivo acuífero aluvial del **Río Loco**, que fluctuan entre **300,000** a **600,000** gpd/p (McClymonds, 1967).

## REFERENCIAS


*Crooks, J.M., I.G. Grossman y D.B. Bogart.* 1968. **Water resources of the Guayanilla-Yauco Area, Puerto Rico.** U.S. Geological Survey Water-Resources Bulletin 5, 55 p.

*Díaz, J.R.* 1974. **Coastal Salinity Reconnaissance and Monitoring System, South Coast, Puerto Rico.** U.S. Geological Survey Open-File Report 74-1, 27 p.

*Driscoll, F.G.* 1989. **Groundwater and Wells**. Johnson Filtration Systems Inc. St. Paul Minnesota

*Ewel, J.J. y J.L. Whitmore.* 1973. **The ecological life zones of Puerto Rico and the U.S. Virgin Islands.** Forest Service Research Paper ITF-18, Forest Service, U.S. Dept. of Agriculture. 72 pp.

*Freeze, R. A. y J. A. Cherry.* 1979. **Groundwater.** Prentice-Hall Inc., Englewood Cliffs, New Jersey.

*Gierbolini, R.E.* 1975. **Soil Survey of the Mayaguez Area of Western Puerto Rico.** Soil Conservation Service, U.S. Department of Agriculture.

*Heath, R.* 1987. **Basic Ground-Water Hydrology.** U.S. Geological Survey Water-Supply Paper 2220.

*Hem, J. D.* 1989. **Study and interpretation of the chemical characteristics of natural waters**. 3rd Edition. U.S. Geological Survey Water-Supply Paper 2254, p 157.

*Krushensky, R.D. y W.H. Monroe.* 1978. **Geologic map of the Yauco and Punta Verraco Quadrangles, Puerto Rico.** Miscellaneous Geologic Investigations, U.S. Geological Survey MAP I-1147.

*Lohman, S.W.* 1979. **Ground-Water Hydraulics.** U.S. Geological Survey Professional Paper 708. 70 p

*McClymonds, N.E.* 1967. **Water resources of the Guanica area, Puerto Rico.** U.S. Geological Survey Water-Resources Bulletin No.6, 42 p.

*Quiñones-Aponte, V.* 1986. **Simulation of Ground-water Flow in the Río Yauco Alluvial Valley, Yauco, Puerto Rico.** U.S. Geological Survey Water-Resources Investigations Report 85-4179, 31 p.

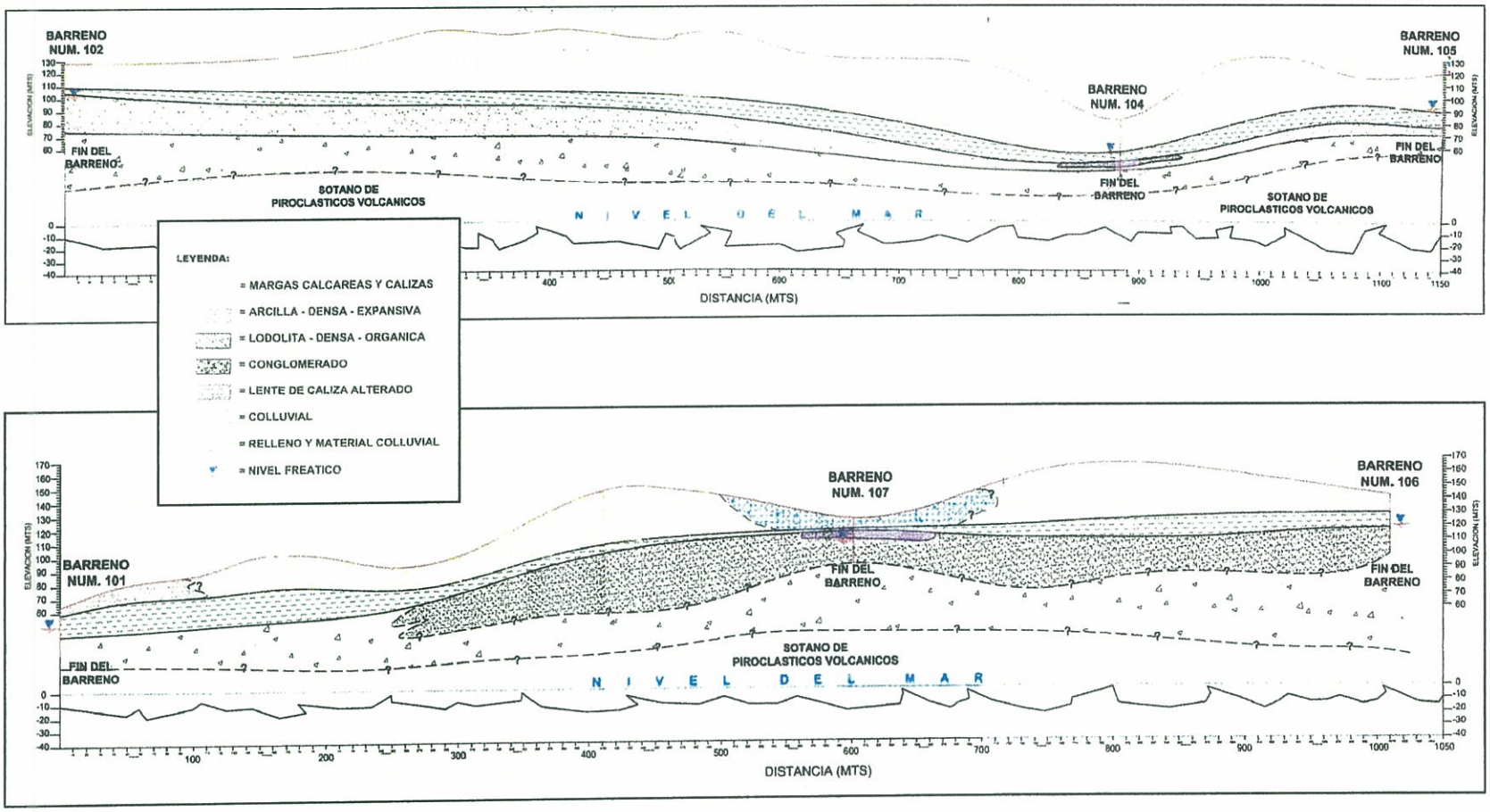
*Ramos-Gines, O.* 1986. **Peñuelas-Guánica Region, Atlas of Ground-Water Resources in Puerto Rico and teh U.S. Virgin Islands.** *Veve, T. D. and B.E. Taggart (Ed.)* U.S. Geological Survey Water-Resources Investigations Report 94-4198, pp. 66 – 74.

# ANEJOS

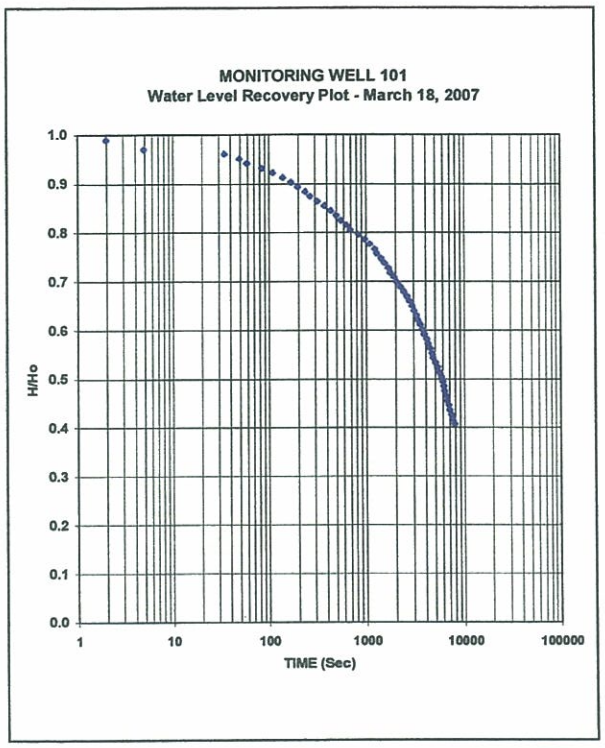
# PERFIL ESTRATIGRAFICO: AREA DEL VERTEDERO DE YAUCO

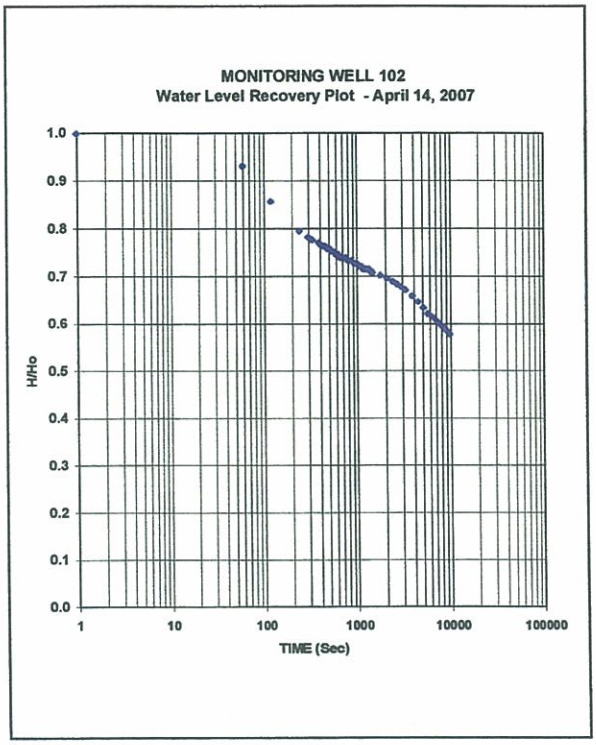
Fuente: Victor Rivera Associates, Inc.

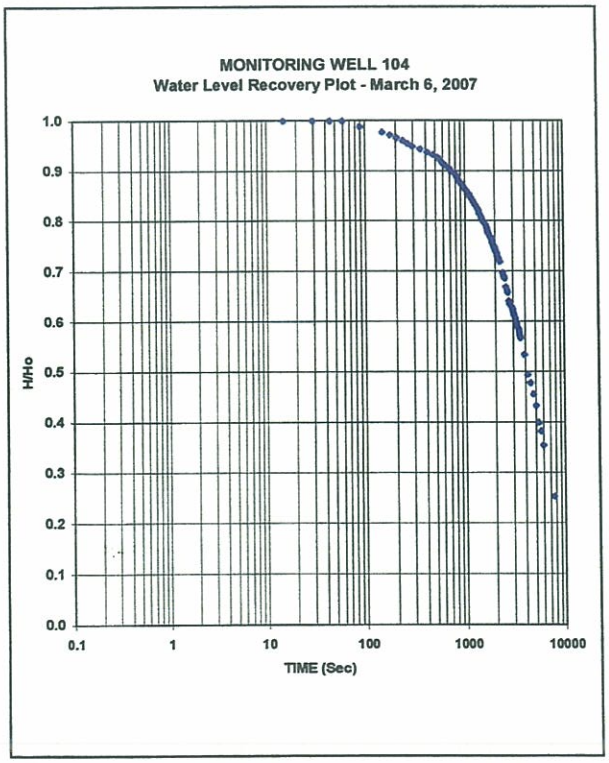
Mario Soriano Ressi -Geólogo

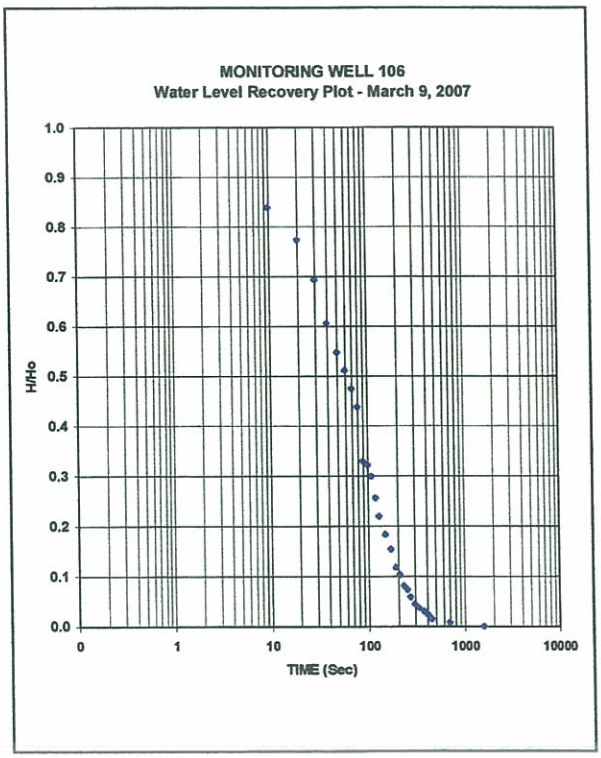


Curvas de recuperación de nivel de agua obtenidas en pozos de monitoreo seleccionados, Vertedero de Yauco, Puerto Rico.



# TABLAS DE DATOS

## Computo de Transmisividad

| Area | Slug Method | Ts $cm^2/sec$ | Bailer Method | Tb $cm^2/sec$ | Range From | Range To | T Units | T Average |
|---|---|---|---|---|---|---|---|---|
| MW101 | Curve 1 | 0.001 | Equation A | 0.002 | 0.001 | 0.003 | $cm^2/sec$ | 0.002 |
| | Curve 2 | 0.001 | Equation B | 0.003 | 0.057 | 0.235 | $ft^2/day$ | 0.15 |
| | Average | 0.001 | Average | 0.003 | 0.423 | 1.75 | gpd/ft | 1.09 |
| | | | | | | | | |
| MW102 | Curve 1 | 0.001 | Equation A | 0.003 | 0.001 | 0.004 | $cm^2/sec$ | 0.002 |
| | Curve 2 | 0.001 | Equation B | 0.004 | 0.057 | 0.326 | $ft^2/day$ | 0.19 |
| | Average | 0.001 | Average | 0.004 | 0.423 | 2.44 | gpd/ft | 1.43 |
| | | | | | | | | |
| MW104 | Curve 1 | 0.004 | Equation A | 0.002 | 0.005 | 0.004 | $cm^2/sec$ | 0.004 |
| | Curve 2 | 0.006 | Equation B | n/a | 0.465 | 0.326 | $ft^2/day$ | 0.40 |
| | Average | 0.005 | Average | 0.002 | 1.19 | 3.48 | gpd/ft | 2.33 |
| | | | | | | | | |
| MW106 | Curve 1 | 0.21 | Equation A | 0.31 | 0.23 | 0.25 | $cm^2/sec$ | 0.24 |
| | Curve 2 | 0.25 | Equation B | 0.18 | 21.39004 | 23.25005 | $ft^2/day$ | 22.32 |
| | Average | 0.23 | Average | 0.25 | 160.00 | 173.91 | gpd/ft | 166.95 |

## Computo de Velocidad Promedio del Flujo

| Ruta de | Ruta a | Distancia (pies) | *K* p/d | dh/dl p | Θ | Velocidad Promedio (pies por día) |
|---|---|---|---|---|---|---|
| MW102 | MW101 | 2011 | 0.03 | 0.09 | 0.40 | **0.01** |
| MW102 | MW104 | 2625 | 0.05 | 0.04 | 0.31 | **0.01** |
| MW106 | MW101 | 3937 | 2.28 | 0.06 | 0.31 | **0.44** |
| MW106 | MW104 | 2953 | 2.30 | 0.06 | 0.22 | **0.58** |
| MW106 | MW102 | 3347 | 2.29 | 0.02 | 0.31 | **0.13** |

# INSTRUMENTOS ANALITICOS

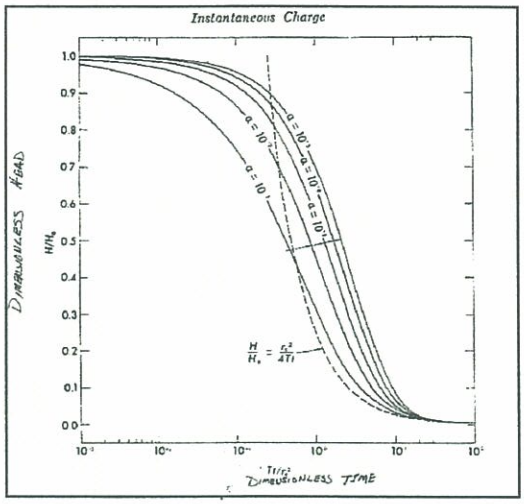
## Transmisividad ( T )

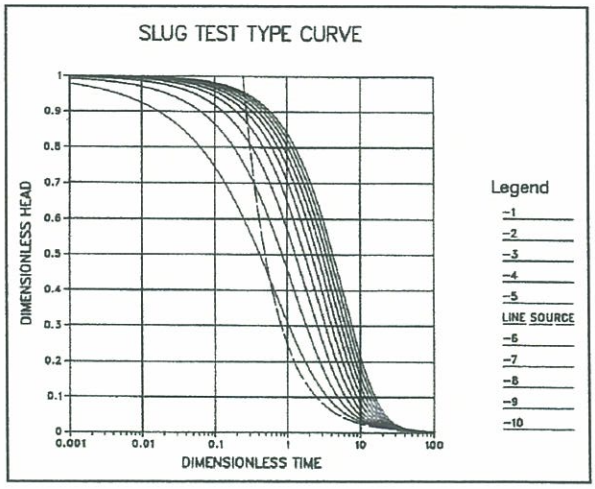
### *Método de Porrazo (Slug Test) - Solución de Cooper (Lohman, 1979)*

$$T = \frac{1.0\,(r_c^2)}{t}$$

T - transmisividad
Tt / ( $r_c^2$) = 1.0 (punto de correlación)
$r_c^2$ - radio de camisilla
t – tiempo

*Curvas Tipo*




### *Método de Extricación (Bailer Test) - Solución de Skibitzke (Lohman, 1979)*

| | | |
|---|---|---|
| $T = \dfrac{V}{4\,(\Pi)\,(s')\,(t)}$ | $T = \dfrac{1}{4\,(\Pi)\,(s')}\,[V_1/t_1 + \ldots V_n/t_n]$ | $T = \dfrac{V}{4\,(\Pi)\,(s')}\,[1/t_1 + \ldots 1/t_n]$ |
| Un ciclo | Multiples ciclos – *V* variada | Multiples ciclos – *V* constante |

*V* - volumen de agua removido en una extracción, s' - abatimiento residual
t - tiempo en segundos terminada la extracción, Π - pi

Coeficiente de Almacenamiento ( S )

*Método de Porrazo (Slug Test) - Solución de Cooper (Lohman, 1979)*

$$S = \frac{r_c^2}{r_s^2} \alpha$$

S - coeficiente de almacenamiento
$r_s^2$ - radio de rejilla
$r_c^2$ - radio de camisilla
$\alpha$ – curva tipo

Velocidad Promedio *(Lohman, 1979)*

$$V = \frac{K\ (dh / dl)}{\Theta}$$

K – conductividad hidráulica
dh /dl – gradiente hidráulico
$\Theta$ - porosidad efectiva

# DATOS DE RECUPERACION DE NIVEL

## MW-104 – 6 DE MARZO DE 2007

| T (sec) | Head (bls) | m | H | H/Ho |
|---|---|---|---|---|
| -1 | 37.52 | 11.436 | na | na |
| 0 | 39.3 | 11.979 | 0.543 | 0.999 |
| 15 | 39.3 | 11.979 | 0.543 | 0.999 |
| 30 | 39.3 | 11.979 | 0.543 | 0.999 |
| 45 | 39.3 | 11.979 | 0.543 | 0.999 |
| 60 | 39.3 | 11.979 | 0.543 | 0.999 |
| 90 | 39.28 | 11.973 | 0.537 | 0.988 |
| 150 | 39.26 | 11.966 | 0.530 | 0.977 |
| 180 | 39.25 | 11.963 | 0.527 | 0.971 |
| 210 | 39.24 | 11.960 | 0.524 | 0.966 |
| 240 | 39.23 | 11.957 | 0.521 | 0.960 |
| 270 | 39.22 | 11.954 | 0.518 | 0.954 |
| 300 | 39.21 | 11.951 | 0.515 | 0.949 |
| 360 | 39.20 | 11.948 | 0.512 | 0.943 |
| 420 | 39.19 | 11.945 | 0.509 | 0.938 |
| 480 | 39.18 | 11.942 | 0.506 | 0.932 |
| 540 | 39.17 | 11.939 | 0.503 | 0.926 |
| 570 | 39.16 | 11.936 | 0.500 | 0.921 |
| 600 | 39.15 | 11.933 | 0.497 | 0.915 |
| 650 | 39.14 | 11.930 | 0.494 | 0.910 |
| 700 | 39.13 | 11.927 | 0.491 | 0.904 |
| 740 | 39.12 | 11.924 | 0.488 | 0.898 |
| 800 | 39.11 | 11.921 | 0.485 | 0.893 |
| 840 | 39.10 | 11.918 | 0.482 | 0.887 |
| 870 | 39.09 | 11.915 | 0.479 | 0.881 |
| 900 | 39.08 | 11.912 | 0.476 | 0.876 |
| 960 | 39.07 | 11.909 | 0.473 | 0.870 |
| 990 | 39.06 | 11.905 | 0.469 | 0.865 |
| 1050 | 39.05 | 11.902 | 0.466 | 0.859 |
| 1110 | 39.04 | 11.899 | 0.463 | 0.853 |
| 1140 | 39.03 | 11.896 | 0.460 | 0.848 |
| 1200 | 39.02 | 11.893 | 0.457 | 0.842 |
| 1230 | 39.01 | 11.890 | 0.454 | 0.837 |
| 1290 | 39.00 | 11.887 | 0.451 | 0.831 |
| 1350 | 38.99 | 11.884 | 0.448 | 0.825 |
| 1380 | 38.98 | 11.881 | 0.445 | 0.820 |
| 1410 | 38.97 | 11.878 | 0.442 | 0.814 |
| 1470 | 38.96 | 11.875 | 0.439 | 0.808 |
| 1500 | 38.95 | 11.872 | 0.436 | 0.803 |
| 1560 | 38.94 | 11.869 | 0.433 | 0.797 |
| 1620 | 38.93 | 11.866 | 0.430 | 0.792 |
| 1680 | 38.92 | 11.863 | 0.427 | 0.786 |
| 1710 | 38.91 | 11.860 | 0.424 | 0.780 |
| 1740 | 38.90 | 11.857 | 0.421 | 0.775 |
| 1800 | 38.89 | 11.854 | 0.418 | 0.769 |
| 1860 | 38.88 | 11.851 | 0.415 | 0.764 |
| 1890 | 38.87 | 11.848 | 0.412 | 0.758 |
| 1950 | 38.86 | 11.845 | 0.409 | 0.752 |
| 1980 | 38.85 | 11.841 | 0.405 | 0.747 |
| 2010 | 38.85 | 11.841 | 0.405 | 0.747 |
| 2040 | 38.84 | 11.838 | 0.402 | 0.741 |
| 2100 | 38.83 | 11.835 | 0.399 | 0.736 |
| 2130 | 38.82 | 11.832 | 0.396 | 0.730 |
| 2190 | 38.81 | 11.829 | 0.393 | 0.724 |
| 2250 | 38.80 | 11.826 | 0.390 | 0.719 |
| 2400 | 38.76 | 11.814 | 0.378 | 0.696 |
| 2460 | 38.75 | 11.811 | 0.375 | 0.691 |
| 2520 | 38.74 | 11.808 | 0.372 | 0.685 |
| 2580 | 38.71 | 11.799 | 0.363 | 0.668 |
| 2640 | 38.70 | 11.796 | 0.360 | 0.663 |
| 2700 | 38.69 | 11.793 | 0.357 | 0.657 |
| 2760 | 38.66 | 11.784 | 0.348 | 0.640 |
| 2820 | 38.65 | 11.781 | 0.345 | 0.634 |
| 2940 | 38.64 | 11.777 | 0.341 | 0.629 |
| 3000 | 38.63 | 11.774 | 0.338 | 0.623 |
| 3060 | 38.62 | 11.771 | 0.335 | 0.618 |
| 3120 | 38.61 | 11.768 | 0.332 | 0.612 |
| 3180 | 38.60 | 11.765 | 0.329 | 0.606 |
| 3240 | 38.59 | 11.762 | 0.326 | 0.601 |
| 3300 | 38.58 | 11.759 | 0.323 | 0.595 |

## MW-106 – 9 DE MARZO DE 2007

| T (sec) | min | Head (bls) | m | H |
|---|---|---|---|---|
| -1 | -1 | 65.55 | 19.980 | na |
| 0 | 0.00 | 66.92 | 20.398 | 0.418 |
| 10 | 0.17 | 66.70 | 20.331 | 0.351 |
| 20 | 0.33 | 66.61 | 20.303 | 0.323 |
| **30** | 0.50 | 66.50 | 20.270 | 0.290 |
| 40 | 0.67 | 66.38 | 20.233 | 0.253 |
| 50 | 0.83 | 66.30 | 20.209 | 0.229 |
| **60** | **1.00** | 66.25 | 20.194 | 0.214 |
| 70 | 1.10 | 66.20 | 20.178 | 0.198 |
| 80 | 1.20 | 66.15 | 20.163 | 0.183 |
| 90 | 1.30 | 66.00 | 20.117 | 0.137 |
| 100 | 1.40 | 65.99 | 20.114 | 0.134 |
| 110 | 1.50 | 65.96 | 20.105 | 0.125 |
| **120** | 2.00 | 65.90 | 20.087 | 0.107 |
| 130 | 2.10 | 65.85 | 20.072 | 0.092 |
| 150 | 2.30 | 65.80 | 20.056 | 0.076 |
| 170 | 2.50 | 65.76 | 20.044 | 0.064 |
| 190 | 3.10 | 65.71 | 20.029 | 0.049 |
| 210 | 3.30 | 65.69 | 20.023 | 0.043 |
| 230 | 3.50 | 65.66 | 20.014 | 0.034 |
| 250 | 4.10 | 65.65 | 20.011 | 0.031 |
| 270 | 4.30 | 65.63 | 20.005 | 0.025 |
| **300** | 5.00 | 65.61 | 19.999 | 0.019 |
| 330 | 5.30 | 65.60 | 19.996 | 0.016 |
| 375 | 6.15 | 65.59 | 19.992 | 0.012 |
| **420** | 7.00 | 65.58 | 19.989 | 0.009 |
| 450 | 7.30 | 65.57 | 19.986 | 0.006 |
| 690 | 11.30 | 65.56 | 19.983 | 0.003 |
| 1570 | 26.10 | 65.55 | 19.980 | 0.000 |

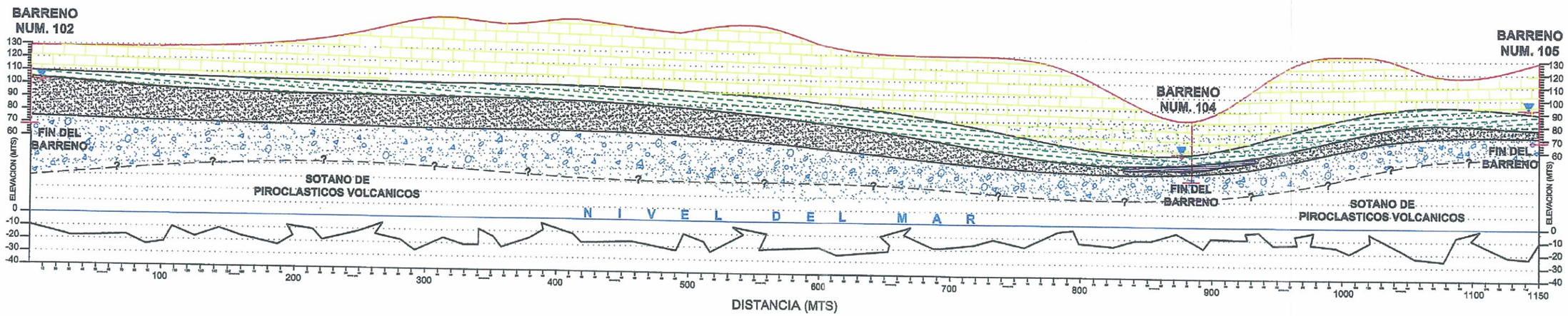
# DATOS DE RECUPERACION DE NIVEL

## MW-101 – 18 DE MARZO DE 2007

| sec | min | WL | H | | 0.314 |
|---|---|---|---|---|---|
| -1 | -1 | 48.5 | na | m | H/Ho |
| 0 | 0 | 49.53 | 1.03 | 0.314 | 1.000 |
| 2 | 0.001 | 49.52 | 1.02 | 0.311 | 0.990 |
| 5 | 0.08 | 49.50 | 1.00 | 0.305 | 0.971 |
| 35 | 0.58 | 49.49 | 0.99 | 0.302 | 0.961 |
| 50 | 0.83 | 49.48 | 0.98 | 0.299 | 0.951 |
| 60 | 1.00 | 49.47 | 0.97 | 0.296 | 0.942 |
| 85 | 1.42 | 49.46 | 0.96 | 0.293 | 0.932 |
| 110 | 1.83 | 49.45 | 0.95 | 0.290 | 0.922 |
| 140 | 2.33 | 49.44 | 0.94 | 0.287 | 0.912 |
| 170 | 2.83 | 49.43 | 0.93 | 0.283 | 0.903 |
| 200 | 3.33 | 49.42 | 0.92 | 0.280 | 0.893 |
| 240 | 4.00 | 49.41 | 0.91 | 0.277 | 0.883 |
| 270 | 4.50 | 49.40 | 0.90 | 0.274 | 0.874 |
| 320 | 5.33 | 49.39 | 0.89 | 0.271 | 0.864 |
| 380 | 6.33 | 49.38 | 0.88 | 0.268 | 0.854 |
| 440 | 7.33 | 49.37 | 0.87 | 0.265 | 0.845 |
| 500 | 8.33 | 49.36 | 0.86 | 0.262 | 0.835 |
| 555 | 9.25 | 49.35 | 0.85 | 0.259 | 0.825 |
| 635 | 10.58 | 49.34 | 0.84 | 0.256 | 0.815 |
| 695 | 11.58 | 49.33 | 0.83 | 0.253 | 0.806 |
| 840 | 14.00 | 49.32 | 0.82 | 0.250 | 0.796 |
| 980 | 16.33 | 49.31 | 0.81 | 0.247 | 0.786 |
| 1100 | 18.33 | 49.30 | 0.80 | 0.244 | 0.777 |
| 1230 | 20.50 | 49.29 | 0.79 | 0.241 | 0.767 |
| 1290 | 21.50 | 49.28 | 0.78 | 0.238 | 0.757 |
| 1440 | 24.00 | 49.27 | 0.77 | 0.235 | 0.747 |
| 1560 | 26.00 | 49.26 | 0.76 | 0.232 | 0.738 |
| 1700 | 28.33 | 49.25 | 0.75 | 0.229 | 0.728 |
| 1780 | 29.67 | 49.24 | 0.74 | 0.226 | 0.718 |
| 1950 | 32.50 | 49.23 | 0.73 | 0.223 | 0.709 |
| 2070 | 34.50 | 49.22 | 0.72 | 0.219 | 0.699 |
| 2235 | 37.25 | 49.21 | 0.71 | 0.216 | 0.689 |
| 2425 | 40.42 | 49.20 | 0.70 | 0.213 | 0.680 |
| 2595 | 43.25 | 49.19 | 0.69 | 0.210 | 0.670 |
| 2750 | 45.83 | 49.18 | 0.68 | 0.207 | 0.660 |
| 2940 | 49.00 | 49.17 | 0.67 | 0.204 | 0.650 |
| 3090 | 51.50 | 49.16 | 0.66 | 0.201 | 0.641 |
| 3250 | 54.17 | 49.15 | 0.65 | 0.198 | 0.631 |
| 3370 | 56.17 | 49.14 | 0.64 | 0.195 | 0.621 |
| 3565 | 59.42 | 49.13 | 0.63 | 0.192 | 0.612 |
| 3735 | 62.25 | 49.12 | 0.62 | 0.189 | 0.602 |
| 3885 | 64.75 | 49.11 | 0.61 | 0.186 | 0.592 |
| 4150 | 69.17 | 49.10 | 0.60 | 0.183 | 0.582 |
| 4285 | 71.42 | 49.09 | 0.59 | 0.180 | 0.573 |
| 4530 | 75.50 | 49.08 | 0.58 | 0.177 | 0.563 |
| 4650 | 77.50 | 49.07 | 0.57 | 0.174 | 0.553 |
| 4820 | 80.33 | 49.06 | 0.56 | 0.171 | 0.544 |
| 5105 | 85.08 | 49.05 | 0.55 | 0.168 | 0.534 |
| 5310 | 88.50 | 49.04 | 0.54 | 0.165 | 0.524 |
| 5550 | 92.50 | 49.03 | 0.53 | 0.162 | 0.514 |
| 5790 | 96.50 | 49.02 | 0.52 | 0.159 | 0.505 |
| 6030 | 100.50 | 49.01 | 0.51 | 0.155 | 0.495 |
| 6150 | 102.50 | 49.00 | 0.50 | 0.152 | 0.485 |
| 6300 | 105.00 | 48.99 | 0.49 | 0.149 | 0.476 |
| 6495 | 108.25 | 48.98 | 0.48 | 0.146 | 0.466 |
| 6660 | 111.00 | 48.97 | 0.47 | 0.143 | 0.456 |
| 7000 | 116.67 | 48.96 | 0.46 | 0.140 | 0.447 |
| 7140 | 119.00 | 48.95 | 0.45 | 0.137 | 0.437 |
| 7395 | 123.25 | 48.94 | 0.44 | 0.134 | 0.427 |
| 7650 | 127.50 | 48.93 | 0.43 | 0.131 | 0.417 |
| 7935 | 132.25 | 48.92 | 0.42 | 0.128 | 0.408 |

## MW-102 – 14 DE ABRILDE 2007

| sec | min | WL | H | | 0.491 |
|---|---|---|---|---|---|
| -1 | -1 | 85.25 | na | m | H/Ho |
| 1 | 0 | 86.86 | 1.61 | 0.491 | 0.999 |
| 60 | 1.00 | 86.75 | 1.50 | 0.457 | 0.931 |
| **120** | **2.00** | **86.63** | 1.38 | 0.421 | 0.857 |
| 240 | 4.00 | 86.53 | 1.28 | 0.390 | 0.795 |
| 300 | 5.00 | 86.51 | 1.26 | 0.384 | 0.782 |
| 330 | 5.50 | 86.50 | 1.25 | 0.381 | 0.776 |
| 390 | 6.50 | 86.49 | 1.24 | 0.378 | 0.770 |
| 420 | 7.00 | 86.48 | 1.23 | 0.375 | 0.764 |
| 450 | 7.50 | 86.48 | 1.23 | 0.375 | 0.764 |
| 480 | 8.00 | 86.47 | 1.22 | 0.372 | 0.757 |
| 510 | 8.50 | 86.47 | 1.22 | 0.372 | 0.757 |
| 540 | 9.00 | 86.46 | 1.21 | 0.369 | 0.751 |
| 570 | 9.50 | 86.46 | 1.21 | 0.369 | 0.751 |
| 600 | 10.00 | 86.45 | 1.20 | 0.366 | 0.745 |
| 630 | 10.50 | 86.45 | 1.20 | 0.366 | 0.745 |
| 660 | 11.00 | 86.44 | 1.19 | 0.363 | 0.739 |
| 690 | 11.50 | 86.44 | 1.19 | 0.363 | 0.739 |
| 750 | 12.50 | 86.44 | 1.19 | 0.363 | 0.739 |
| 810 | 13.50 | 86.43 | 1.18 | 0.360 | 0.733 |
| 870 | 14.50 | 86.43 | 1.18 | 0.360 | 0.733 |
| 930 | 15.50 | 86.42 | 1.17 | 0.357 | 0.726 |
| 990 | 16.50 | 86.42 | 1.17 | 0.357 | 0.726 |
| 1050 | 17.50 | 86.41 | 1.16 | 0.354 | 0.720 |
| 1110 | 18.50 | 86.41 | 1.16 | 0.354 | 0.720 |
| 1170 | 19.50 | 86.40 | 1.15 | 0.351 | 0.714 |
| 1230 | 20.50 | 86.40 | 1.15 | 0.351 | 0.714 |
| 1290 | 21.50 | 86.40 | 1.15 | 0.351 | 0.714 |
| 1350 | 22.50 | 86.40 | 1.15 | 0.351 | 0.714 |
| 1410 | 23.50 | 86.39 | 1.14 | 0.347 | 0.708 |
| 1470 | 24.50 | 86.39 | 1.14 | 0.347 | 0.708 |
| 1770 | 29.50 | 86.38 | 1.13 | 0.344 | 0.701 |
| 2070 | 34.50 | 86.37 | 1.12 | 0.341 | 0.695 |
| 2370 | 39.50 | 86.36 | 1.11 | 0.338 | 0.689 |
| 2670 | 44.50 | 86.35 | 1.10 | 0.335 | 0.683 |
| 2970 | 49.50 | 86.34 | 1.09 | 0.332 | 0.677 |
| 3270 | 54.50 | 86.33 | 1.08 | 0.329 | 0.670 |
| 3870 | 64.50 | 86.31 | 1.06 | 0.323 | 0.658 |
| 4470 | 74.50 | 86.29 | 1.04 | 0.317 | 0.646 |
| 5070 | 84.50 | 86.27 | 1.02 | 0.311 | 0.633 |
| 5670 | 94.50 | 86.25 | 1.00 | 0.305 | 0.621 |
| 6270 | 104.50 | 86.24 | 0.99 | 0.302 | 0.615 |
| 6870 | 114.50 | 86.23 | 0.98 | 0.299 | 0.608 |
| 7440 | 124.00 | 86.22 | 0.97 | 0.296 | 0.602 |
| 8040 | 134.00 | 86.21 | 0.96 | 0.293 | 0.596 |
| 8640 | 144.00 | 86.20 | 0.95 | 0.290 | 0.590 |
| 9240 | 154.00 | 86.19 | 0.94 | 0.287 | 0.584 |
| 9840 | 164.00 | 86.18 | 0.93 | 0.283 | 0.577 |



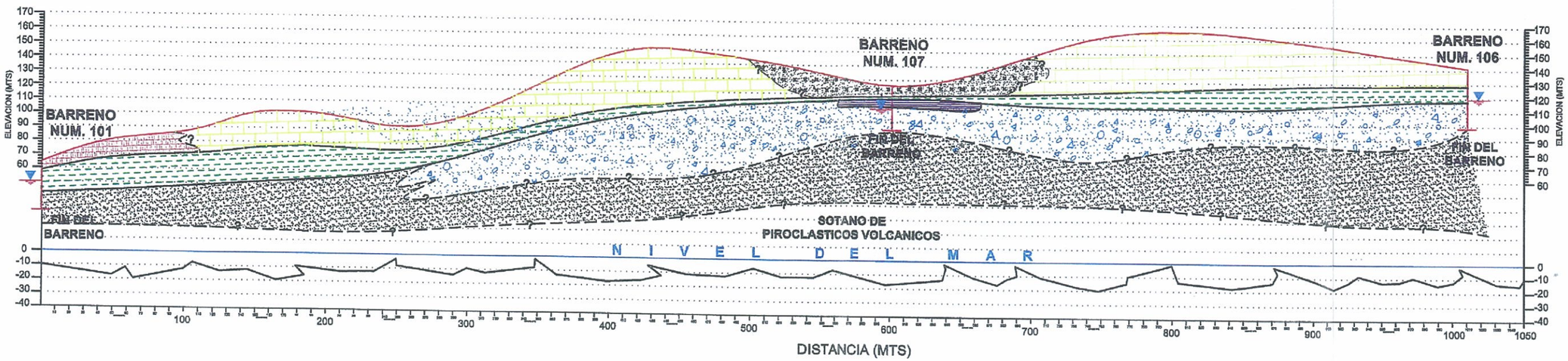

**LEYENDA:**

- = MARGAS CALCAREAS Y CALIZAS
- = ARCILLA - DENSA - EXPANSIVA
- = LODOLITA - DENSA - ORGANICA
- = CONGLOMERADO
- = LENTE DE CALIZA ALTERADO Y ARCILLA
- = NIVEL FREATICO

## *PERFIL ESTRATIGRAFICO* A A

ESCALA HORIZONTAL = 1:3000
ESCALA VERTICAL = 1:3000

FIGURA NUM. 3




**LEYENDA:**

- = MARGAS CALCAREAS Y CALIZAS
- = ARCILLA - DENSA - EXPANSIVA
- = LODOLITA - DENSA - ORGANICA
- = CONGLOMERADO
- = LENTE DE CALIZA ALTERADO Y ARCILLA
- = COLLUVIAL
- = RELLENO Y MATERIAL COLLUVIAL
- = NIVEL FREATICO

## *PERFIL ESTRATIGRAFICO* B B

ESCALA HORIZONTAL = 1:3000
ESCALA VERTICAL = 1:3000

FIGURA NUM. 4

# Apéndice 8:

# Estudio de Ruido