requested to get mon. well elevation data; will use as water table - meaning points w.a.

TRURO MUNICIPAL LANDFILL

COMPREHENSIVE SITE ASSESSMENT

(VOLUME 1: TEXT, FIGURES, and TABLES)

April 1998

PREPARED FOR

TOWN OF TRURO
TRURO, MA

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Section 1: Introduction

The Truro Municipal Landfill is located off of Route 6 in Truro, Massachusetts. The landfill is in the process of undergoing closure and capping. The Comprehensive Site Assessment (CSA) is the investigatory process required under the Massachusetts DEP Regulations, specifically 310 CMR 19. This Comprehensive Site Assessment Report presents the results of the CSA investigation, analyzes the collected information and provides recommendations and conclusions on the environmental status of the landfill and the affected media around the landfill. The CSA investigations were conducted in compliance with the MaDEP SERO approved CSA Scope of Work, which was submitted in July 1996 as part of the Initial Site Assessment Report and approved in November 1996. The report generally follows the outline provided in the MaDEP Landfill Technical Guidance Manual.

The format of the report is as follows: all the text portions of the report are in the front, the tables and figures are located in the back of the report, and the appendices are located in a separate volume. This format allows easier reading and reviewing of the information and minimizes the number of copies of the appendices requiring production.

Section 2: Summary Of The Initial Site Assessment

The Initial Site Assessment (ISA) report combined all the information available on the Truro Landfill Site. Several reports have been prepared by other consultants in which data has been collected to begin to characterize the site and determine what impacts the landfill has had on the surrounding environment. The following is a summary of the site conceptual model composed of all the existing information gathered for the ISA This summary combines the geology, hydrogeology, ground water analytical data and sensitive receptor data to summarize the conceptual model of the site.

Landfill: The landfill is an area of approximately 5.5 acres where municipal solid waste had been disposed. The bottom of the waste is above the water table with most of the waste being above elevation 15 MSL. The waste is described as typical solid municipal waste with little industrial type wastes. There was a septage lagoon adjacent to the landfill which has been closed and the remaining sludge was buried within the landfill. The landfill has discontinued accepting any waste. No visible sign of leachate generation was seen during the ISA site visit or at anytime during the years of monitoring. Additionally, no visible, olfactory, or anecdotal evidence of landfill gas generation was identified during the ISA site visit or during the years of monitoring.

Geology: The local geology in the landfill area consists of glacially deposited coarse to medium sands. There is a potential silt and clay layer underlying the site as defined in two of the soil borings at the site. This layer does not appear to be acting as an aquitard, but may preclude contaminants from migrating very deep at the site.

Ground Water Flow: Ground water at the site is at approximately elevation 7 MSL. The ground water flows north toward the Pamet River. The ground water gradient is mostly horizontal and is very slight, estimated at 0.0003 ft/ft. There were some indications of a slight downward vertical gradient at some well clusters. No data exists on the actual hydraulic conductivity of the ground water, however the hydraulic conductivities have been estimated from the literature at around 200 ft/day. Taking these values into account the water is moving at an estimate of 0.2 feet/day.

Ground Water Quality: Ground water quality data from the site indicates that there have been sporadic and discontinuous detection of contaminants at the site. The only contaminant detected at the site above a primary drinking water standard is nitrate. The inorganic parameters measured at the site and down gradient of the site indicate that the landfill has changed the chemical signature of the ground water, however there appears to be no indication that this chemical change correlates to any plume of contamination which contains compounds that would impact human health or the environment.

Receptors: The landfill site is in a remote area of Truro. The site is surrounded by the Cape Cod National Seashore. The closest dwelling is over 2000 feet away. Based on the ground water flow and chemistry it appears that it is unlikely that any private or public

water supply wells will be impacted by the landfill. Also, since the area is remote, there is no potential impact to anyone from landfill gas. There are potential surface water pathways from ground water discharges. The major discharge point is the Pamet River which is over 3600 feet from the site. There is a small wetland immediately adjacent to the landfill. No data exists at this time to determine if any impact from the landfill has occurred with in the wetland, however no sign of distress was noted during the ISA site visit.

Refer to Figure 1, Site Plan for all existing site improvements, landfill contours, natural and man-made features at the landfill.

Section 3: Summary Of CSA Field Work Completed

The CSA Scope of Work was reviewed and approved with modifications by the MaDEP Southeast Regional Office in November 1996. The CSA Scope of Work detailed the field work required to fill data gaps identified in the Initial Site Assessment. This additional work included installation of additional monitoring wells, installation of landfill gas monitoring probes, and sampling of new and existing wells, gas monitoring probes, surface water and sediment. The following summary details the field work completed.

Soil Borings:

Soil borings were completed for installation of monitoring wells. Five soil borings were advanced during the investigation. Borings were advanced using 6.5 inch hollow stem augers. Split spoon samples were collected every five feet throughout the depth of the boring. Each split spoon was logged on a boring log form. A sample of soil was collected and placed in a jar for head space analysis. Head space was analyzed using a Photovac 2020 PID and results recorded on the boring log. During all drilling operations the work area was monitored by a PID and CGI to ensure the proper level of protection was maintained. In the locations were a couplet was being installed, the deep well boring was logged and the shallow well location was drilled to depth. Refer to Appendix A for copies of the boring logs

Monitoring Well Construction:

Five monitoring wells were installed to further define ground water flow and quality around the landfill. Wells were installed in the locations as modified by the MaDEP in their comments to the CSA Scope of Work. Upon completion of the boring, the well was constructed in the borehole. Wells were constructed using 2 inch schedule 40 PVC risers with a 10 foot schedule 40 #10 slot screen. A sand pack was placed using natural formation material to at least one foot above the screen. A five foot seal was then installed above the sand pack using hydrated bentonite chips if the seal was above the water table (shallow wells) or using a bentonite slurry tremie grouted into place for wells where the seal was below the water table (deep wells). The remainder of the borehole was backfilled using a cement - bentonite - sand grout mixture. A five foot long steel protective casing was set into the grout and a pad was constructed around the casing using concrete. Wells were developed using an electric displacement pump for at least one hour or until the water ran clear. Wells were developed at least 24 hours after construction. Wells were secured with locks keyed alike. Refer to Appendix B for Well Construction Logs

Landfill Gas Monitoring Probes:

Four landfill gas monitoring probes were installed in locations as modified by MaDEP in their comments to the CSA Scope of Work. Probes were installed by hand auguring a three inch hole five feet deep. Probes were constructed using a one inch schedule 40 PVC riser with a one foot length of #10 slot schedule 40 PVC screen. A hose barb fitting was installed on the cover cap for sampling. The borehole was backfilled with #0 sand to one foot above the screen and then sealed with a two foot bentonite chip seal which was hydrated. A protective casing was placed into the seal and then locked with a locked keyed the same as the wells.

Sampling Rounds:

Four sampling rounds were completed upon installation of all monitoring locations. The location of sampling points were identified in the CSA Scope of Work. Eleven monitoring wells were sampled during each sampling event. Additionally, the non-potable water supply at the landfill was sampled during the first two sampling rounds. One private water supply well (Falk) was sampled during the July sampling round. Surface water and sediments were sampled during the first two rounds and then once more during the final round. The landfill gas monitoring probes were sampled during all four rounds. Refer to Table 1, Monitoring Locations from the CSA Scope of Work for the parameters list for the sampling locations.

Refer to Figure 2, Monitoring Locations, for the location of wells, surface water/sediment locations, and landfill gas probes.

Quality Assurance:

During all sampling rounds, quality assurance sampling was conducted to ensure adequate quality data. Quality assurance samples included duplicates, field blanks, equipment blanks, and trip blanks. These samples were collected in accordance with the CSA Scope of Work. Refer to the raw data packages in Appendix D for the results and analysis of quality assurance sampling. All data was determined to be of adequate quality and useable for characterization and risk assessment for this CSA report.

Section 4: Site Geology and Hydrogeology

Site Geology

Summary of ISA Geology:

As discussed in previous documents, the site geology at the landfill is consistent with the generalized surficial geology. Topography at the site indicates that prior to being used as a landfill, the site may have been mined for sand. The edges of the site are severely sloped with evidence of slope failure and erosion in areas where slopes are greater than 45%. The landfill materials have been placed within the bottom of this mined area in accordance with the filling plans filled with the landfill site assignment. The top of the landfill is gradually sloped from the east to the west. The base of the landfill stops short of a small wetlands. Topography at the site ranges from a high of 100 feet above MSL at the top of the high banks to a low of 10 feet above MSL at the wetlands.

Previous boring logs completed for monitoring well installations and visual inspection of the site soils indicates that the soils consist of coarse to fine sands site wide. Review of historical logs indicates that discontinuous deposits of silt and clay are present at varying elevations and thicknesses.

CSA Soil Borings:

Five soil borings were advanced as part of the well installation process. The borings were advanced using hollow stem augers. Soil samples were collected every five feet throughout the entire depth of each boring. The samples were logged on forms which are located in Appendix A. The starting elevations and locations of these borings provided a wide range of samples. The borings indicate that the soil across the site are very consistent with past borings and regional geology. The soils are described as fine to coarse sand. There were localized areas of fine gravel in many of the borings. Additionally, silt and clay was encountered at various depths and thicknesses as in the past. It was noted that in most cases, the soils below the water table were more fine than identified in previous boring logs. In general nothing was identified to change the conceptual model of the geology at the site other than the finer nature of the water bearing strata which may be indicative of a locally less transmissive aquifer.

Geologic Cross Sections:

Geologic cross sections have been prepared using data from all investigations. Figure 4, Cross Section B-B runs from MW-1 up gradient of the landfill to TRU-5 adjacent to the Pamet River. This cross section runs parallel to ground water flow. The cross section illustrate the general uniformity of the strata. The cross section also shows the relatively flat ground water table present at the site.

Figure 3, Cross Section A-A, runs from MW-3 cross gradient to the landfill to MW-2 also cross gradient to the landfill. This cross section runs perpendicular to ground water flow. It shows the general uniformity of the geology and the discontinuous nature of the clay and silt deposits at the site.

Figure 5, Cross Section Location Plan, shows the plan view locations of the cross sections.

Hydrogeology

Summary of ISA Hydrogeology

The Truro Municipal Landfill lies within the Chequesset lens within the Cape Cod Aquifer. Several wells have been installed at the site by other consultants and by the Cape Cod Commission. In general the ground water at the site is located at 7 feet above MSL. The general direction of ground water flow is to the north toward the Pamet River which is over 3600 feet down gradient of the site.

Twenty-one wells have been installed at the site by different consultants as discussed in the ISA Report. Existing data from reports reviewed indicate that the water table has a very flat hydraulic gradient in the range of 0.0003 feet/foot which is reflective of highly permeable aquifers. Additionally, data from the triplet wells indicate that the majority of the flow is horizontal, however there is a slight downward vertical gradient component of flow.

CSA Well Installation:

Five new wells were installed as part of the CSA field program. These wells were installed in locations up gradient and cross gradient to the landfill. The new wells included a single well at the up gradient location (MW-1) and two couplets located north and south of the landfill (MW-2 S,D and MW-3 S, D). These new wells consist of 2 inch diameter PVC wells with ten feet of #10 slot screens. Wells MW-1, MW-2S, and MW-3S were designed as water table wells with the screens straddling the water table. Wells MW-2D and MW-3D were designed to monitor zones previously found to have increased levels of contamination and to provide vertical gradient information. Refer to Appendix B for the well construction logs and to Figure 2, Monitoring Locations for the locations of these wells

Water Level Monitoring:

Water levels were measured during the sampling rounds. All the new wells were measured over the four sampling rounds as well as the other well in the sampling program which include TRU-2 S,I, D and TL-4 S,I, D. Table 2, Ground Water Elevation Measurements, is a summary of the four water level monitoring rounds as well as an

additional round during the first quarter of 1998. The water levels at the site range from a high of elevation 9.21 MSL to a low of 5.51 MSL. The highest ground water elevations were found during the January sampling round and the low during the October sampling round. In general there was a fluctuation of approximately 2 feet between the highest and lowest readings in the wells. Figure 6, Ground Water Contour Map shows the ground water contours and flow direction at the site which was created using the water level data.

Vertical Gradients:

It has been noted that there is a slight downward gradient in the multilevel monitoring wells. During the sampling rounds, the measurement of the water levels was not accurate enough to define a gradient. A water level round was conducted during the first quarter of 1998 to accurately measure water levels to obtain gradient information. A review of this data shows that the variation between the wells in clusters is less than 0.01 feet in most cases. Of the wells measured, MW-2 S, D indicated and upward gradient of 0.02 ft, MW-3 S, D indicated a flat gradient, TRU-2S,I,D indicated a downward gradient between TRU-2I and D of 0.01 ft, and TL-4 S,I,D indicated a downward gradient of 0.02 ft. These gradients are very slight and are barely beyond the accuracy of measurement. They do indicate that the gradients are not such that they have significant influence on contaminant migration.

Surface water/groundwater Interaction:

A review of ground water elevations versus the water elevations in the wetland adjacent to the landfill indicate that the surface water is discharging to the ground water in this area. The wetland exists most likely due to a silt clay layer which has created a perched water table in this location.

Based on a review of regional hydrogeology and ground water elevations near the Pamet River, ground water is discharging to surface water in the Pamet River area. As discussed in prior reports, the Pamet River is the divide between the Chequessett Lens and the Pamet Lens.

Hydraulic Conductivity:

General

Hydraulic conductivities in the bulk aquifer have been reported in the literature in the range of 200 ft per day. Hydraulic conductivity testing was completed at the site to determine the localized conductivity in order to estimate ground water flow velocities.

Methodology:

A short-term pumping test was completed as part of the CSA investigation. It was determined by some preliminary tests at the site that it would be very difficult to make meaningful measurements via slug tests and therefore a pumping test was performed. The MaDEP Standard References for Monitoring Well Publication and the text "Analysis and Evaluation of Pumping Test Data" by Kruseman and de Ridder were consulted in conducting and analyzing the pumping test.

Well TL-4 was selected as the pumping well and TL-4I was selected as the monitoring well. This selection was made due to the proximity of the wells (i.e. close together) and the similar depth of the screens. A 2 inch Grundfos variable speed pump was used to evacuate water from the pumping well. The water was piped over 50 feet away from the monitoring well to insure no impact. The well was pumped at the maximum capacity of the pump which was 5 gallons per minute. An electronic water level meter was used to monitor the draw down in both the pumping well and the monitoring well. Measurements were taken every 10 seconds during the first 5 minutes, every 30 seconds for the next 25 minutes, and approximately every 3-5 minutes for the next 90 minutes until the test was terminated after 2 hours (120 minutes). The flow rate of the pumping well was measured every 10 minutes through out the test. The monitoring of the recovery of the pumping well was attempted however, there was no check valve on the pump and all the water in the hose ran back into the well when the pump was shut down and the data was meaningless. Recovery was monitored in the monitoring well. Full recovery was reached in the monitoring well after 14 minutes.

Analysis and Results:

The data collected was entered onto data sheets. Copies of these sheets are located in Appendix C. A data file was created in the computer and loaded into a software package. The data was analyzed using the software AQTESOLV created by Geraghty and Miller Co. The unconfined analysis package was run and the data was analyzed using the Cooper-Jacob Method. The results of this analysis indicated a hydraulic conductivity of 43.0 ft/day. The recovery test data was analyzed using the Theis Recovery Method and resulted in a calculated hydraulic conductivity of 43.8 ft2/day.

In general the results of the pumping test indicate that the local conductivity of the aquifer is much lower than the regional conductivity. The localized fine grained sandy soil is most likely the cause of the reduced conductivity.

Based on this data, the estimated ground water flow rate in the area using 0.0003 ft/ft as the horizontal gradient and 43 ft/day as the hydraulic conductivity, the flow rate is estimated to be .02 ft/day at the site. This is significantly less than the estimated 0.6 ft per day.

Section 5: Analytical Results

Soil:

Analysis of soil was conducted as part of the well installation project. During soil boring advancement, split spoon samples were collected every five feet through out the depth of the boring. Each split spoon sample was screened for VOCs and explosive gases in accordance with MaDEP soil screening methodology. There was no detection of any VOCs or explosive gases in any of the samples collected. Additionally, there was no olfactory or visual evidence of any contamination. Due to the lack of any detection using field screening, no samples were collected for laboratory analysis. A review of previous data reports form other well installations indicated that there was little evidence of soil contamination in the field screening samples. It can be concluded that there is no evidence that soils are contaminated outside the actual extents of the landfill.

Surface Water:

Surface water samples were collected during three of the sampling rounds (Jan., Apr., Oct.). The parameters sampled included field parameters, standard inorganic parameters, VOCs, and metals.

There were no VOCs detected during any of the sampling rounds.

Standard inorganic parameters detected included COD, chloride, and TDS. None of the detected inorganic parameters were indicative of landfill leachate and do not appear to match the signature of the ground water at the landfill.

Metals results indicate a consistent detection of iron, manganese, and zinc in surface water. Other detected metals which were not detected consistently included barium, lead, copper, and mercury.

Field parameters collected included temperature, specific conductance, pH, and dissolved oxygen. Specific conductance and dissolved oxygen were representative of normal surface water quality. The pH had a wide range between 4.5 to 11.2 over the three rounds.

Sediment:

Sediment was sampled during three sampling rounds (Jan, Apr., Oct.). Sediment was sampled for Inorganic Parameters, PCBs, Pesticides, and Metals.

There were no PCBs or pesticides detected in any of the sampling rounds.

The inorganic parameter analysis indicated no detection of nitrate or cyanide. Sulfate and chloride was detected in all rounds, however the levels were very low and not indicative

of landfill leachate.

Metals were sampled during the three sampling rounds. Barium, chromium, copper, iron, lead, manganese, and zinc were all consistently detected in the sampling rounds. These results are indicative of the oxidation/reduction of native and possible landfill related metals from runoff.

Refer to Table 3, Summary of Surface Water and Sediment Results, for a summary of field parameters, inorganic analysis and metals results for Surface Water and Sediment

Ground Water:

Ground Water was sampled in eleven wells during all four sampling rounds. The wells sampled are identified in Table 1. The parameters sampled included field parameters, inorganic parameters, metals, and VOCs (EPA 8260). The results are summarized in Table 4, Inorganic Analysis, Table 5, Summary of Metal Results, and Table 6, Volatile Organic Compounds Hits Only, and Table 7, Summary of Field Parameter Monitoring. These tables summarize the data from the sampling rounds for comparison and trend analysis.

Inorganic Parameters including alkalinity, chloride, COD, cyanide, nitrate, sulfate, and TDS. In general there are no specific standards for these compounds however they are useful as indicators of landfill leachate. Nitrate has a drinking water standard of 10 mg/l which was exceeded in Well TRU-2I during one sampling round and Well TL-4S in all four rounds. In review of the inorganic parameters, the wells which are considered directly down gradient of the landfill (i.e. TL-4S,I,D and TRU-2S,I,D) show increased levels of inorganic parameters, specifically alkalinity, COD, and TDS.

Field Parameters were measured during each sampling round for Temperature, pH, Specific Conductance, and Dissolved Oxygen. As with the inorganic parameters, there are no specific standards associated with these parameters, however they are excellent indicators of landfill leachate. Specific conductance was the best indicator parameter for delineating the extents of the plume. These results are contoured on Figure 7, Leachate Plume Map which shows the core of the leachate plume.

Metals parameters were sampled during all four sampling rounds. Metals analyzed include arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, selenium, silver, zinc, and mercury. During the first two sampling rounds, there were several exceedances of metals in many wells. Refer to Table 5, Metals Results Summary, which highlights all exceedances. As reported in the Interim CSA report, it was noted during purging and sampling that the wells were very turbid. It was decided that during the final two rounds that the metals samples be filtered to determine if the metals were in solution or a result of the high turbidity. The results of the final two rounds indicated no exceedances of any of the regulated metals parameters except for one hit of lead in well TL-4D and a drastic reduction in secondary parameters such as iron and manganese. It is

concluded that there is not a metal problem in the ground water at this site.

Volatile Organic Compounds were sampled during all four rounds using EPA method 8260. The results of this analysis is presented in Table 6, Ground Water VOC Results (Hits Only). The results of the sampling indicate that there is sporadic levels and occurrences of VOCs at the site. Chloroform was found in two new wells where no other evidence of contamination was identified. The levels are below regulatory standards. It is generally thought that chloroform is a naturally occurring compound in water and not attributable to any source in the landfill. Wells directly down gradient of the landfill (TL-4 and TRU-2) had sporadic hits of chlorinated compounds such as chloroethane, 1,1 dichloroethane, cis-1,2 dichloroethene, and vinyl chloride. Vinyl chloride was the only compound detected above the drinking water MCL in wells TRU-2D, TL-4I, and TL-4D all occurring only once during the July sampling round. It is concluded that there are some low levels of chlorinated VOCs present in the leachate plume that are typical to landfills of this type in that there are most likely very small releases of various chemicals from within the landfilled material.

Landfill Gas:

Landfill gases were sampled in a phased approach. A field gas survey was completed on all four gas probes. Parameters included oxygen, methane (%LEL), TVOCs, and hydrogen sulfide. Based on the results of the field survey, the two locations showing potential impacts were selected for laboratory analysis for VOCs. Over the four rounds, location SGP-4 and SGP-3 were consistently the two locations showing the highest field measurement and were sampled for VOCs. Location SGP-3 had no detection of VOCs during any of the four sampling rounds. Location SGP-4 had a detection of Total Xylene during the January round but had no detection of VOCs during the subsequent three rounds. Location SGP-4 field sampling results consistently showed the most depressed levels of oxygen and the highest %LEL readings. Refer to Table 8, Landfill Field Gas Survey Results Summary for a summary of the field gas survey results.

Sampling of Potential Receptor Pathways

Non-potable well:

The non-potable water supply at the transfer station was sampled during the first two sampling rounds for inorganic parameters and VOCs (EPA 524). This well is used to wash hands, flush toilets, and wash down the hopper, pavements, and equipment at the transfer station.

There were no VOCs detected during either of the sampling rounds.

Inorganic parameters sampled include alkalinity, ammonia, and nitrate. The results of the inorganic analysis indicate that the water is of potable quality for these parameters and is not impacted by the landfill.

Falk Well:

The Falk well is the closest private water supply well in the vicinity of the landfill. This well was sampled once during the July sampling event for VOCs (EPA 524), inorganic parameters, and lead. There was no lead detected in the sample. The inorganic parameters sampled included alkalinity, ammonia, and nitrate. The results of the analysis indicated the water was good quality and had none of the signature results indicative of the leachate plume.

One VOC was detected (chloroform) which is routinely found in drinking water. This contaminant is not attributed to the landfill and was not a level of concern. The results of the sampling event were provided to the property owner.

Refer to Table 9 for a summary of the Inorganic and Field Analysis results for the Falk and Non-Potable Wells

Swap Shop Gas:

Due to the elevated %LEL and TVOC results in SGP-4, a survey of the swap shop building was completed in January 1998 to determine if landfill gas was detected in the swap shop. The survey indicated that no landfill gas was entering this building. Oxygen levels were normal, no TVOCs or %LEL was detected. Low levels of CO and H2S were detected (1 ppm) however the levels were low and of no concern.

Operators Building Gas:

The only other structure of concern on or near the landfill was the operator building which houses the transfer station controls and is also the operator's office. A survey was completed during January 1998 to determine if landfill gases were migrating into this structure. The results of the survey indicated normal levels of oxygen, no detection of methane, CO, or H2S. A low level hit of TVOC was detected (0.6 ppm) which could be attributable to any number of site activities that are on-going including vehicle operations.

Section 6: Site Conceptual Model

This section combines all the geologic, hydrogeologic, and analytical data into one conceptual model which comprehensively characterizes the site. All the specific information presented in the other sections is made more general in this section in order to present the big picture in both words and figures. By presenting this information in one section, it provides a good basis to analyze the site to complete the Baseline Risk Assessment.

Conceptual Model:

Landfill:

Comprises an area of approximately 5.5 acres. None of the waste material is in contact with groundwater. The waste in mostly residential municipal waste with limited amounts of commercial and construction waste. The site has accepted waste for over 50 years and was operated as a permitted landfill from 1977 until 1997. The site had septage lagoons which were closed out in the 1980's.

Ground Water:

Ground water flows to the North toward the Pamet River and actually discharges to the river. The aquifer consists of medium to find sands with trace areas of silt and clay. The flow velocity has been estimated at 0.02 feet per day. The horizontal gradient is gradual estimated at 0.0003 feet per foot. The vertical gradients are very slight, but tend to be in the downward direction at and down gradient of the landfill.

Contaminant Profile:

Analysis of ground water at the site indicates very limited levels or regulated contaminants. Nitrate and Vinyl Chloride were the only contaminants detected at the site which exceed a drinking water standard. Detection of low levels of other VOCs were sporadic and inconsistent, which is typical of small municipal landfills.

There is a defined plume that indicates that the ground water chemistry has been effected by the existence of the landfill. Elevated levels of specific conductance, chlorides, total dissolved solids, and other non-regulated inorganic analyses are indicative of leachate generation from a landfill.

Landfill gas analysis indicates that there is limited gas generation at the perimeter of the property boundaries. Specific compound analysis indicated a one time detection of total xylene in one monitoring point. The methane generation is also limited and was found in one monitoring probe.

Figure 8, Conceptual Site Model Plan and Figure 9, Conceptual Site Model Cross-section depict the conceptual site model graphically as described above.

Section 7: Baseline Risk Assessment

A qualitative baseline risk assessment has been conducted for the Truro Municipal Landfill. The risk assessment evaluates the contaminant - pathway- receptor model in a qualitative analysis to determine if the site poses a risk to public health or the environment to a degree in which a quantitative risk assessment is required. If the qualitative assessment indicates a lack of risk either due to lack of contamination or lack of a potential receptor, then the qualitative assessment is deemed adequate and no further evaluation is required.

Summary of Analytical Data

The analytical data for all media was detailed in Section 5 of this report. This section will briefly summarize the contaminants detected in each media and the frequency of detection.

Ground Water:

There were few contaminants of concern detected in the ground water. Two contaminants were detected above drinking water standards. These include Nitrate and Vinyl Chloride.

Nitrates were consistently detected in excess of the MCL in one well, TL-4S during all sampling rounds. This well is just outside the limits of the landfill waste area.

Vinyl chloride was detected in excess of the MCL in 3 out of 11 wells (TRU-2D, TL-4I, and TL-4D) during one sampling round (Jul 97). The contaminant was never detected again in any well at the site. These wells are just outside the landfill and are considered to be in line with the core of the landfill leachate plume.

Other contaminants such as chloroethane, cis-1,2 dichloroethene, and MTBE were detected sporadically in the two well clusters immediately down gradient of the landfill (TL-4 and TRU-2) however, the detections were well below the MCLs and no trend was identified.

Soil:

No indication of soil contamination was identified during installation of any of the wells on site during field screening activities and therefore no samples were collected for laboratory analysis. The only potential for soil contamination is with in the waste mass in the landfill. There was no indication of contamination in the soil within the limits of the landfill as observed during grading operations.

Surface Water and Sediment:

One representative location within a small wetland at the base of the landfill was monitored during the sampling events for the CSA. There were no detection of organic or inorganic compounds of concern in the surface water or sediments. The only potential contaminants of concern were metals. Several metals were detected in sediments including lead, zinc, manganese, iron, barium, copper, and chromium. These compounds have potential importance with regards to impact to aquatic and terrestrial receptors. The comparative standards for these compounds are varied, not always relative and difficult to apply and therefore no comparisons are made in this assessment.

Landfill Gas:

Landfill gas was monitored at four locations during the four sampling rounds. These monitoring locations are at the property boundaries of the landfill to determine if any gas is potentially migrating off site. The results of the sampling indicated that only one monitoring location (SGP-4) suggested any potential for landfill gas emissions. The other 3 locations consistently indicated no detection of methane or volatile organic compounds. SGP-4 had consistent detection of methane ranging from .25% of LEL to 32% of LEL. The average level was 12.8% of LEL. Only one detection above 25% of the LEL was measured during the four sampling rounds. In this same probe, there was a one time detection of xylene in the laboratory analysis. The level of total xylene was 580 ppm/v during the Jan 97 sampling round. No detection of any VOCs were found in any other sampling events.

Summary of Pathways:

The media in which contaminants have been detected include air, ground water, surface water, and sediments. This section will identify the potential pathways that the identified contaminants could reach potential receptors.

Air Pathway: The only potential air pathway is collection of landfill gases in on site structures. Two structures exist on site in which people occupy for any length of time; these are the swap shop and the transfer station control office. Both of these buildings were surveyed for landfill gases during January 1998. There was no detection of any landfill gas including methane or VOCs. This sampling event was considered worst case since it was winter and the buildings were closed up during the colder months.

Ground Water Pathway: The potential pathway in which contaminated ground water could come in contact with a potential receptor is through ingestion of water via private residential drinking water wells. No existing drinking water wells are within the plume or directly down gradient of the plume. Additionally, the majority of the land around the landfill is owned by the CCNS and the likelihood for installation of wells is extremely remote.

Surface Water and Sediment Pathway: Contaminant in the surface water and sediments could come in contact with potential ecological receptors via ingestion of surface water or dermal contact with sediments.

Identification of Potential Receptors

Very few potential receptors are available at or near the Truro Municipal Landfill site that could come in contact with the contaminants at the site through the identified pathways. The reason for the lack of receptors is mainly due to the remote nature of the site. The site is surrounded by land owned by the Cape Cod National Seashore. Because of this the nearest dwelling to the landfill is over 2000 feet from the site. The following potential receptors have been identified:

Human Receptors:

Potential human receptors include transfer station workers and residents who visit the transfer station. The only pathway a receptor could come in contact with any contaminants is via the air pathway for inhalation of landfill gas or physical hazard from the explosive nature of landfill gases.

Since the aquifers on Cape are sole source aquifers, all water is considered to be potential drinking water. The closest private drinking water well is over 2000 feet from the landfill and is cross gradient to the landfill leachate plume. This well was sampled and found to have no contaminants associated with the landfill.

Ecological Receptors:

Since there is a wetland habitat at the base of the landfill, there is potential exposure to ecological receptors. However, since the wetland is very small and only seasonally wet, it is a limited habitat. A review of the natural history inventory reveals that there are no federal or Massachusetts protected or endangered species identified in the area or at this site.

Recommendations:

Refer to Table 10: Risk Assessment Contaminant - Pathway - Receptor Summary for a tabular presentation of the previous three subsections

Based on this baseline qualitative risk assessment, there is very little risk to any receptors at this site. The contaminants detected are at very low levels and have not been consistently detected. The pathways available for contact with contaminants are very limited and these pathways have been sampled for contaminants and were found not to have any detection of the identified site contaminants of concern. Based on this analysis, no further evaluation of risk is recommended and no recommendation for a quantitative risk assessment is warranted.

Section 8: Conclusions:

This Comprehensive Site Assessment Report has summarized and analyzed all the existing data collected at the Truro Municipal Landfill. The information collected and analyzed is adequate to characterize the environmental impact imposed by the existence of this landfill for several decades.

The results of the investigation indicate that the landfill in its current configuration has impacted the environment. The impacts to the environment are very minimal as defined by the chemical analyses conducted on all the media at the site. Additionally, the baseline qualitative risk assessment resulted in very limited exposure potential to a very limited receptor population.

The following conclusions about additional monitoring and closure of the landfill have been drawn based upon the results of this CSA Report.

1. No additional monitoring locations are warranted. The existing locations are adequate to monitor the landfill for the long term.

2. A long term monitoring plan will be prepared upon approval of the CSA Report by the DEP. This plan will outline the monitoring locations, monitoring frequency and monitoring parameters for monitoring the status of the environment at the site. The long term monitoring plan will be incorporated into the Post Closure Monitoring and Maintenance Plan.

3. Since the impacts from the landfill have been determined to be minor and the risk imposed by the landfill is very limited, no CAAA report is necessary. The landfill will be capped in accordance with MaDEP Regulations and Guidance documents. The design of the cap is underway and will be submitted for MaDEP Approval. Capping activities to include rough grading and sand stockpiling are underway. Actual cap construction is planned for this fall.

TABLES

TABLE 1

Monitoring Well Sampling Locations

WELL ID	PARAMETERS	FREQUENCY
TRU-2 SID	M,V, I, F	QTLY
TL-4	Aquifer Test	Initial
TL-4SID	M,V,I,F Aquifer Test	1st 2 Qtrs Initial
MW-1	M,V, I, F	QTLY
MW-2 SD	M,V, I, F	QTLY
MW-3 SD	M,V, I, F	QTLY
Private Well	M,V,I,F	1st Round
On Site Non Potable well	V,I,F	1st Round

NOTES:

MW-1, MW-2SD, and MW-3 SD are newly installed wells

M,V,I, F - Metals, VOCs, Inorganics, and Field Parameters

QTLY - Quarterly for one year

1st Round - the initial round of sampling only

Note: Metals for private well is for Lead only

Note: VOCs for private and on-site well is via 524.2, all others via 8260

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TABLE 2

Ground Water Elevation Measurements

WELL	TOC ELEV (MSL)	DATE	DTW	GW ELEV (MSL)
MW-1	68.41	Jan-97	60.00	8.41
		Apr-97	60.00	8.41
		Jul-97	60.40	8.01
		Oct-97	62.00	6.41
		Mar-98	61.03	7.38
MW-2S	41.10	Jan-97	33.00	8.10
		Apr-97	33.60	7.50
		Jul-97	33.50	7.60
		Oct-97	33.00	8.10
		Mar-98	33.95	7.15
MW-2D	40.20	Jan-97	33.40	6.80
		Apr-97	32.50	7.70
		Jul-97	33.00	7.20
		Oct-97	34.30	5.90
		Mar-98	33.03	7.17
MW-3S	97.55	Jan-97	87.00	10.55
		Apr-97	90.10	7.45
		Jul-97	90.50	7.05
		Oct-97	92.00	5.55
		Mar-98	90.96	6.59
MW-3D	98.01	Jan-97	90.00	8.01
		Apr-97	91.00	7.01
		Jul-97	91.00	7.01
		Oct-97	92.50	5.51
		Mar-98	91.42	6.59
TRU-2S	17.61	Jan-97	10.50	7.11
		Apr-97	9.90	7.71
		Jul-97	10.50	7.11
		Oct-97	12.00	5.61
		Mar-98	10.48	7.13
TRU-2I	17.61	Jan-97	10.50	7.11
		Apr-97	9.90	7.71
		Jul-97	10.50	7.11
		Oct-97	12.10	5.51
		Mar-98	10.48	7.13
TRU-2D	17.61	Jan-97	10.50	7.11
		Apr-97	9.90	7.71
		Jul-97	10.50	7.11
		Oct-97	12.00	5.61
		Mar-98	10.49	7.12
TL-4S	34.21	Jan-97	25.00	9.21
		Apr-97	25.10	9.11
		Jul-97	26.00	8.21
		Oct-97	27.00	7.21
		Mar-98	25.99	8.22
TL-4I	34.21	Jan-97	25.00	9.21
		Apr-97	25.10	9.11
		Jul-97	25.90	8.31
		Oct-97	27.20	7.01
		Mar-98	26.01	8.20
TL-4D	34.21	Jan-97	25.00	9.21
		Apr-97	25.10	9.11
		Jul-97	26.20	8.01
		Oct-97	27.40	6.81
		Mar-98	26.02	8.19

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TABLE 3

Summary Of Surface Water And Sediment Results

Surface Water Samples				
Inorganic and Field Parameters:				
	Units	Jan-97	Apr-97	Oct-97
ALKALINITY	mg/l	<1.	<1.	<2.
CHLORIDE	mg/l	24	22	20.7
COD	mg/l	85	124	123
CYANIDE-T	mg/l	<0.03	<0.03	<0.03
NITRATE	mg/l	<1.00	<1.00	<1.0
SULFATE	mg/l	<5.	<5.	<2.5
TDS	mg/l	130	111	81
TEMP	o C	0.3	4.5	5.35
pH	units	4.6	4.68	11.2
SP. CON	umhos/cm	70	10.2	70
DISSOLVED O2	mg/L	10.7	60	6
Metal parameters				
	Units	Jan-97	Apr-97	Oct-97
ARSENIC	mg/l	<0.010	<0.100	<0.100
BARIUM	mg/l	0.013	<0.010	0.084
CADMIUM	mg/l	<0.0005	<0.010	<0.010
CHROMIUM	mg/l	<0.010	<0.010	<0.010
COPPER	mg/l	<0.010	<0.010	0.013
IRON	mg/l	1.58	0.942	8.95
LEAD	mg/l	0.009	<0.050	0.061
MANGANESE	mg/l	0.198	0.257	0.482
SELENIUM	mg/l	<0.010	<0.100	<0.100
SILVER	mg/l	<0.010	<0.010	<0.010
ZINC	mg/l	0.034	0.016	0.22
MERCURY	mg/l	<0.0005	<0.0005	0.015
Sediment Samples				
Inorganic/Field Parameters				
	Units	Jan-97	Apr-97	Oct-97
CHLORIDE	mg/kg	189	<40.	25.8
CYANIDE-T	mg/kg	<0.75	<0.75	<0.75
CORROSIVITY - pH	units	6.25	4.6	4.38
SPEC. CON.	umhos/cm	12	75	37
SULFATE	mg/kg	<100.	577	27
TOC	%	0.38		
Metal Parameters				
	Units	Jan-97	Apr-97	Oct-97
ARSENIC	mg/kg	<5.00	<5.00	<5.00
BARIUM	mg/kg	4.15	2.18	3.6
CADMIUM	mg/kg	<0.50	<0.50	<0.50
CHROMIUM	mg/kg	2.84	1.44	0.53
COPPER	mg/kg	3.41	1.8	3.88
IRON	mg/kg	NA	1,200.00	321
LEAD	mg/kg	5.05	3.28	5.98
SELENIUM	mg/kg	<5.00	14.4	11.4
SILVER	mg/kg	<0.50	<5.00	<5.00
SODIUM	mg/kg	25	<0.50	<0.50
ZINC	mg/kg	8.05	2.15	4.7
MERCURY	mg/kg	<0.100	0.142	<0.100

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TABLE 4

Inorganic Parameters Summary
All Units mg/l

Well ID	Date sampled	Alkalinity	Chloride	COD	Cyanide	Nitrate	Sulfate	TDS
MW-1	1/29/97	17	91	13	<0.03	4.36	8	242
	4/28/97	17	78	15	<0.03	6.6	7	230
	7/14/97	24	56.9	9	<0.03	1.78	10.5	210
	10/28/97	28	54	10	<0.03	3.2	5.5	143
MW-2S	1/29/97	28	33	9	<0.03	<1.00	6	256
	4/28/97	5	25	15	<0.03	<1.00	9	112
	7/14/97	14	28.2	<8.	<0.03	<1.00	7.1	150
	10/28/97	17	11.3	12	<0.03	<1.0	2.9	352
MW-2D	1/29/97	9	29	9	<0.03	<1.00	33	135
	4/28/97	50	18	8	<0.03	<1.00	11	116
	7/14/97	31	23	14	<0.03	<1.00	7.6	138
	10/28/97	13	22.8	<8.	<0.03	<1.0	6.5	414
MW-3S	1/29/97	11	35	15	<0.03	<1.00	9	100
	4/28/97	13	34	<8.	<0.03	<1.00	7	204
	7/14/97	10	34.9	18	<0.03	<1.00	9.8	148
	10/28/97	12	32.1	<8.	<0.03	<1.0	9.3	91
MW-3D	1/29/97	34	70	16	<0.03	<1.00	65	200
	4/28/97	34	66	18	<0.03	<1.00	73	296
	7/14/97	39	74.1	10	<0.03	<1.00	79.7	267
	10/28/97	34	60	13	<0.03	<1.0	72.5	246
TRU-2S	1/29/97	<1.	32	18	<0.03	<1.00	9	79
	4/28/97	2	27	16	<0.03	<1.00	10	96
	7/14/97	1	33	<8.	<0.03	<1.00	10.4	92
	10/28/97	<1.	27.6	<8.	<0.03	<1.0	8.7	<10.
TRU-2I	1/29/97	32	24	20	<0.03	10	86	235
	4/28/97	41	6	15	<0.03	8.25	98	215
	7/14/97	40	15	20	<0.03	9.46	113	266
	10/28/97	45	24.2	17	<0.03	8.2	117	170
TRU-2D	1/29/97	599	77	48	<0.03	<1.00	183	1,270.00
	4/28/97	706	159	48	<0.03	1	102	1,180.00
	7/14/97	76	23	33	<0.03	<1.00	158	1,240.00
	10/28/97	741	125	49	<0.03	<1.0	127	1,210.00
TL-4S	1/29/97	10	14	<8.	<0.03	31.2	19	243
	4/28/97	7	10	13	<0.03	41	12	254
	7/14/97	24	15.2	15	<0.03	21.7	36.4	327
	10/28/97	86	17.8	33	<0.03	21.2	34.3	325
TL-4I	1/29/97	922	41	79	<0.03	1.34	89	1,160.00
	4/28/97	974	<3.	74	<0.03	1.17	8	1,160.00
	7/14/97	102	178	73	<0.03	<1.00	125	1,120.00
	10/28/97	1,092.00	164	77	<0.03	<1.0	109	1,280.00
TL-4D	1/29/97	932	78	51	<0.03	1.49	147	1,470.00
	4/28/97	1,020.00	<3.	86	<0.03	<1.00	148	1,270.00
	7/14/97	103	227	88	<0.03	<1.00	175	1,490.00
	10/28/97	1,014.00	193	208	0.04	<1.0	151	1,520.00

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TABLE 5

Metals Results Summary

Units mg/l

	Well ID:	MW-1	MW-2S	MW-2D	MW-3S	MW-3D	TRU-2S	TRU-2I	TRU-2D	TL-4S	TL-4I	TL-4D
	GW Standard											
Jan-97												
ARSENIC	0.05	0.237	0.22	0.15	0.164	0.042	0.113	0.01	0.014	0.104	0.055	0.028
BARIUM	2	0.613	0.63	0.569	0.61	0.237	0.155	0.201	0.168	0.36	0.375	0.179
CADMIUM	0.005	0.0011	0.00	0.0018	0.0005	<0.0005	<0.0005	0.0042	<0.0005	0.0009	0.005	<0.0005
CHROMIUM	0.1	0.342	0.34	0.4	0.221	0.117	0.065	0.017	0.012	0.076	0.091	0.031
COPPER		0.178	0.15	0.198	0.077	0.043	0.042	0.014	0.024	0.1	0.087	0.011
IRON		410	303.00	329	172	75.4	104	30.7	35.6	98.6	120	60.5
LEAD	0.015	0.328	0.20	0.18	1.36	1.7	0.052	0.018	<0.005	0.046	0.054	0.013
MANGANESE		7.4	4.77	15.3	3.18	1.07	2.39	1.83	4.58	7.59	25	6.41
SELENIUM	0.05	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
SILVER		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
ZINC		0.585	0.59	0.771	0.283	0.139	0.141	0.055	0.028	0.228	0.225	0.053
MERCURY	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Apr-97												
ARSENIC	0.05	<0.100	0.19	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
BARIUM	2	0.171	0.74	0.42	0.257	0.123	0.15	0.058	0.134	0.319	0.202	0.161
CADMIUM	0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
CHROMIUM	0.1	0.111	0.51	0.083	0.131	0.068	<0.010	0.036	<0.010	0.054	0.043	0.03
COPPER		0.068	0.26	0.049	0.064	0.023	<0.010	0.017	<0.010	0.042	0.041	<0.010
IRON		184	544.00	108	137	64.1	16.3	61	32.4	83.9	58.7	69.2
LEAD	0.015	0.105	0.31	<0.050	0.088	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
MANGANESE		3.09	15.80	1.52	3.09	0.804	1.78	1.52	4.16	11.8	25.2	7.01
SELENIUM	0.05	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
SILVER		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
ZINC		0.193	0.99	0.173	0.188	0.079	<0.010	0.05	<0.010	0.146	0.082	0.026
MERCURY	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

TRURO MUNICIPAL LANDFILL CSA REPORT

TABLE 5

Metals Results Summary

Units mg/l

Jul-97												
ARSENIC	0.05	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	<0.010	<0.010	0.016
BARIUM	2	0.022	<0.010	<0.021	<0.010	0.014	0.012	0.11	0.11	0.168	0.088	0.074
CADMIUM	0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0011	<0.0005	0.0015	<0.0005	<0.0005
CHROMIUM	0.1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
COPPER		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	<0.010	<0.010	<0.010	<0.010
IRON		0.031	0.07	0.078	0.047	0.035	0.015	0.047	21.5	0.135	0.301	23.6
LEAD	0.015	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.026
MANGANESE		0.038	0.32	<0.010	0.068	0.028	0.033	2.45	4.02	7.09	18.9	8.06
SELENIUM	0.05	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
SILVER		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
ZINC		0.017	0.02	0.04	0.04	0.037	<0.010	0.019	0.015	0.013	0.012	0.048
MERCURY	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Oct-97												
ARSENIC	0.05	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
BARIUM	2	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.148	0.143	0.221	0.115	0.065
CADMIUM	0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
CHROMIUM	0.1	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
COPPER		0.018	0.02	0.015	0.015	0.017	<0.010	<0.010	<0.010	0.011	<0.010	<0.010
IRON		0.02	0.07	0.112	0.112	0.147	0.029	0.045	25.3	0.25	0.806	28.7
LEAD	0.015	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
MANGANESE		0.015	0.04	0.035	0.035	0.036	0.062	3.64	4.42	11.2	17.7	7.79
SELENIUM	0.05	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
SILVER		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
ZINC		0.023	0.04	0.021	0.021	0.018	0.02	0.012	0.011	0.031	0.025	0.014
MERCURY	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

d Apr Rounds are Total Metals
Oct Rounds are Dissolved Metals

TRURO MUNICIPAL LANDFILL CSA REPORT

TABLE 6

Ground Water Volatile Organic Compound Results (Hits Only)
Analysis Method EPA 8260
Units: ug/l

Well ID	Date Sampled	Chloroform	Chloroethane	MTBE	1,1 DCA	Vinyl Chloride	cis 1,2 DCE
		5	1000	70	70	2	70
TRU-2D	1/29/97						
	4/28/97						
	7/14/97		3		3	3	
	10/29/97		4				
TL-4I	1/29/97		5				
	4/28/97						
	7/14/97		9		3	2	
	10/29/97						
TL-4D	1/29/97		5	3			
	4/28/97						
	7/14/97		8			4	3
	10/29/97		7				
MW-2S	1/29/97	2					
	4/28/97						
	7/14/97						
	10/29/97	2					
MW-2D	1/29/97	2					
	4/28/97						
	7/14/97						
	10/29/97						
MW-3S	1/29/97	2					
	4/28/97						
	7/14/97	3					
	10/29/97	4					

Notes:
1. Wells not listed on table had no detections in any sampling round for VOCs
2. Blank spaces in table indicate that the compound was not detected
3. Shaded results indicate the result was above MaDEP/EPA MCL

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TABLE 7

Well Field Parameter Sampling Results

WELL #	DATE SAMPLED	TEMP (o C)	pH(units)	SP. CON (umhos/cm)	DISSOLVED O2 (mg/L)
MW-1	1/29/97	9.6	5.73	340	10.2
	4/29/97	13.8	5.96	900	10.6
	7/14/97	13.8	5.53	150	
	10/29/97	11.5	5.65	220	10.4
MW-2S	1/29/97	8.8	6.37	100	9.6
	4/29/97	9.5	7.2	70	10
	7/14/97	16.2	7.2	70	
	10/29/97	10.3	6.57	90	12.5
MW-2D	1/29/97	9.5	7.73	130	10.4
	4/29/97	9.9	9.95	8.8	150
	7/14/97	17.2	8.11	80	
	10/29/97	10.4	6.44	90	15
MW-3S	1/29/97	6.2	7.52	153	10.8
	4/29/97	8.9	7.19	110	11.9
	7/14/97	20.4	6.07	100	
	10/29/97	10.6	6.42	130	10.9
MW-3D	1/29/97	7.5	6.59	430	6.1
	4/29/97	9.5	6.55	340	7.1
	7/14/97	16.7	5.89	280	
	10/29/97	10.7	6.35	360	7.8
TRU-2S	1/29/97	7.2	5.69	140	9.2
	4/29/97	10	6.73	90	9.2
	7/14/97	12.4	6.11	80	
	10/29/97	10.9	6.66	90	9.6
TRU-2I	1/29/97	8.9	6.01	410	4.4
	4/29/97	10	6.02	360	8.8
	7/14/97	16.8	5.56	350	
	10/29/97	10.7	6.34	370	6.4
TRU-2D	1/29/97	8.2	6.59	1740	3.6
	4/29/97	10.1	6.26	1630	9.5
	7/14/97	18.6	6.39	1540	
	10/29/97	10.8	6.02	1,650	5.2
TL-4S	1/29/97	11.4	10.13	1160	5.8
	4/29/97	10.6	5.54	280	5.5
	7/14/97	19.2	5.22	160	
	10/29/97	12.5	6.25	390	7.8
TL-4I	1/29/97	13	6.66	2200	4
	4/29/97	12	6.2	2260	9.2
	7/14/97	21.1	6.57	1800	
	10/29/97	12.8	6.42	1,980	4.6
TL-4D	1/29/97	11.9	6.76	2190	4.6
	4/29/97	10.9	6.39	1780	8.2
	7/14/97	19.9	6.56	2040	
	10/29/97	12.6	6.15	2,020	7.8

TRURO MUNICIPAL LANDFILL CSA REPORT

TABLE 8

Landfill Gas Probe Field Parameter Results

Probe ID	Date	ppmTVOC	% LEL	% O2	ppm H2S
SGP-1	1/30.97	0	0	21.5	0
	4/30/97	0	0	19.8	0
	7/15/97	0	0	19.1	0
	10/30/97	0	0	20	0
SGP-2	1/30.97	0	0	21.6	0
	4/30/97	0	0	20.6	1
	7/15/97	0	0	20.4	0
	10/30/97	0	0	20.3	0
SGP-3	1/30.97	0	1	20.4	0
	4/30/97	0	0	20.3	0
	7/15/97	0	0	18.6	0
	10/30/97	1.3	0	19.6	0
SGP-4	1/30.97	<3.00	0.25	1.5	0
	4/30/97	0	12	0	0
	7/15/97	5.5	7	6.7	0
	10/30/97	2	32	1.1	8

TRURO MUNICIPAL LANDFILL CSA REPORT

TABLE 9

Summary of Inorganic Results
Non-Potable Transfer Station and Falk Wells

Units: mg/l

PARAMETER	Non-Potable	Non-Potable	Falk
	Jan-97	Apr-97	Jul-97
ALKALINITY	8	7	2
AMMONIA-N	0.13	0.81	0.38
NITRATE-N	1.79	1.36	<1.00
LEAD			<0.005

Note: No detection of VOCS via EPA 524

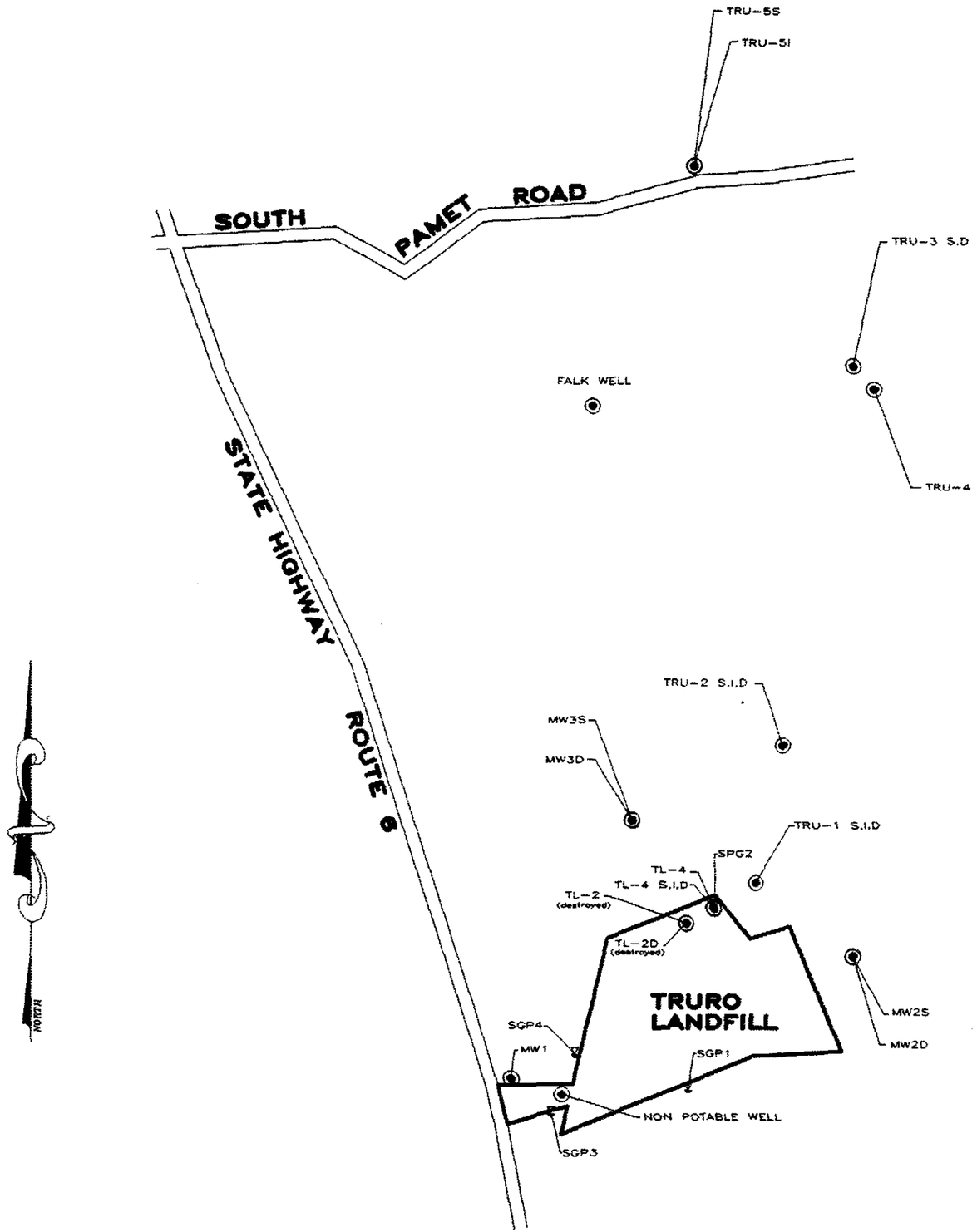
TRURO MUNICIPAL LANDFILL CSA REPORT

TABLE 10

BASELINE QUALITATIVE RISK ASSESSMENT
Risk Assessment Contaminant - Pathway - Receptor Summary Table

Media	Contaminants of Concern	Potential Pathways	Receptors	Risk Assessment
Air	Methane, Xylene	Gas collection in buildings	dump workers/public	sampling in buildings show no impact
Ground Water	vinyl chloride, nitrate	Private Drinking Water Wells	down gradient residents	sampling of closest well shows no impact. No contaminants above standard down gradient
Surface Water/Sediment	lead, copper, zinc, chromium	wetland habitat	terrestrial and aquatic organisms	remote location, low levels of contaminants, and no known protected species indicates limited impacts

FIGURES



TRURO MUNICIPAL LANDFILL
CSA REPORT

FIGURE: 2

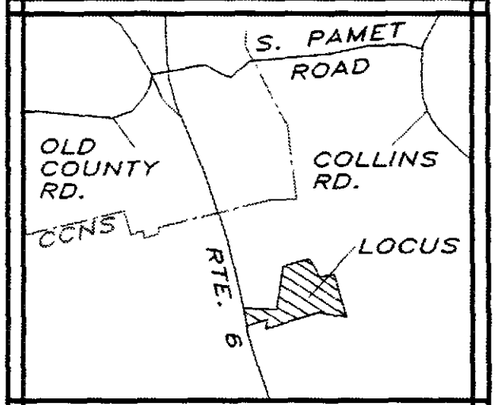
DESCRIPTION:
MONITORING LOCATIONS

SCALE: HORIZ. 1"=500'

DATE: APRIL 98

NOTES:

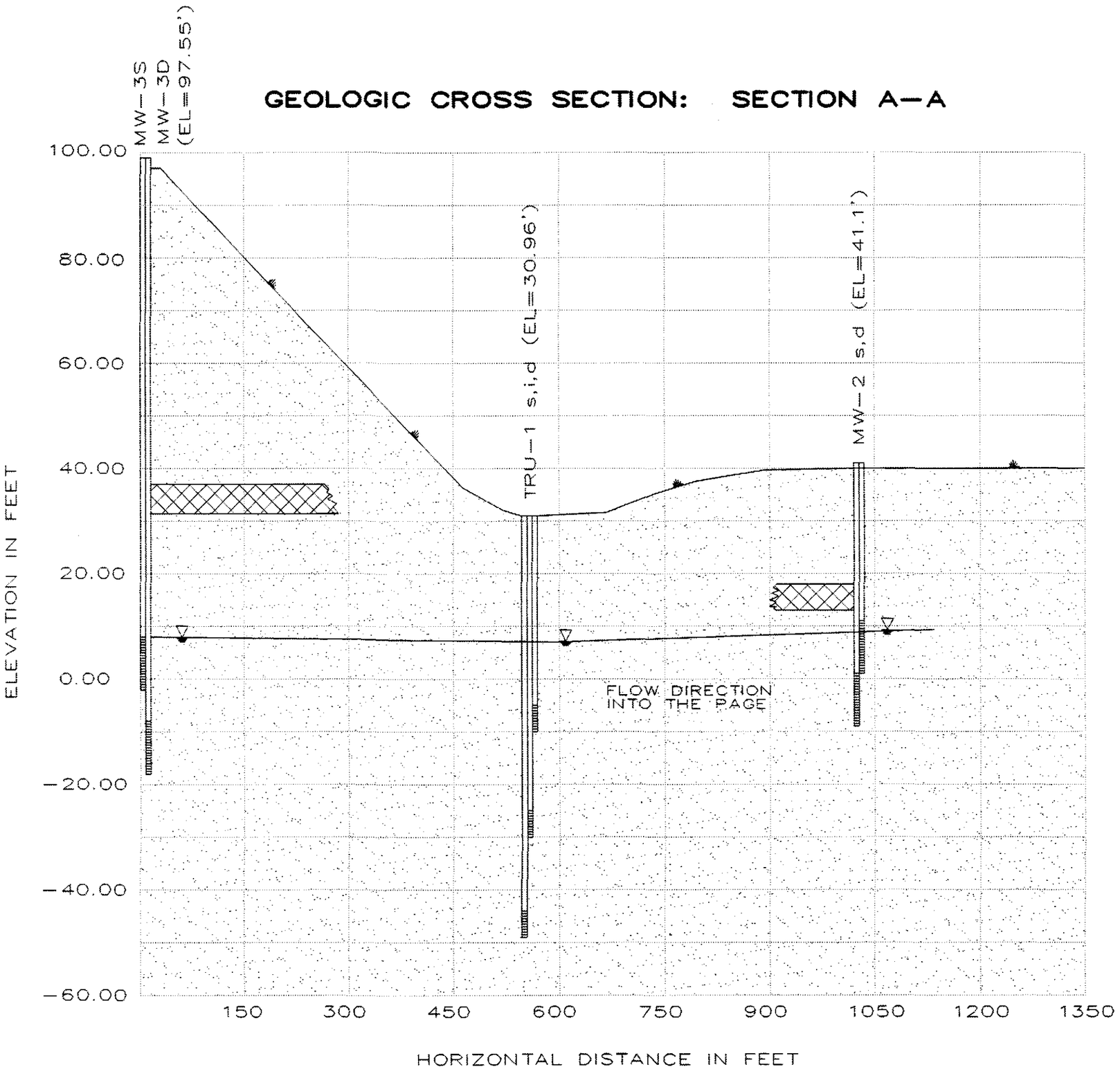
SYMBOLS:
- ◉ – WELL
- ▽ – SOIL GAS PROBE



LOCUS 1"=2000'

EAST CAPE ENGINEERING, INC.
CIVIL ENGINEERS
LAND SURVEYORS
44 RTE. 28, ORLEANS, MA.
TEL. (508) 255-7120

GEOLOGIC CROSS SECTION: SECTION A—A



TRURO MUNICIPAL LANDFILL CSA REPORT

FIGURE: 3

DESCRIPTION:
GEOLOGIC CROSS SECTIONS SECTION A—A

SCALE: HORIZ. 1"=150'
VERT. 1"=20'

DATE: APRIL 1998

NOTES:

SOIL TYPE INDICATORS

SILT/CLAY

SAND

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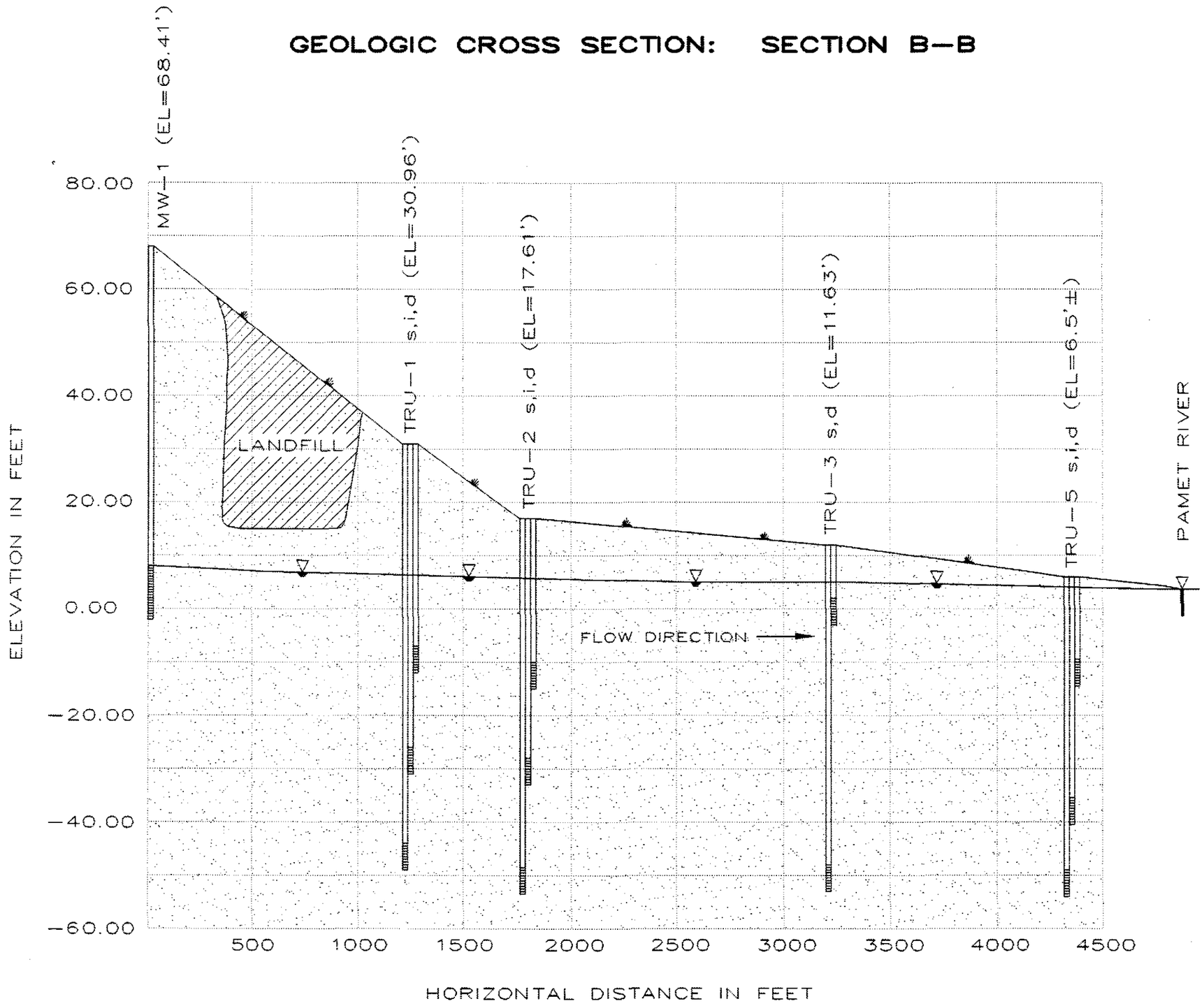
GEOLOGIC CROSS SECTION: SECTION B–B



TRURO MUNICIPAL LANDFILL CSA REPORT

FIGURE: 4

DESCRIPTION:
GEOLOGIC CROSS SECTIONS
SECTION B–B

SCALE: HORIZ. 1"=500'
VERT. 1"=20'

DATE: APRIL 1998

NOTES:

LEGEND

SAND

LANDFILL AREA

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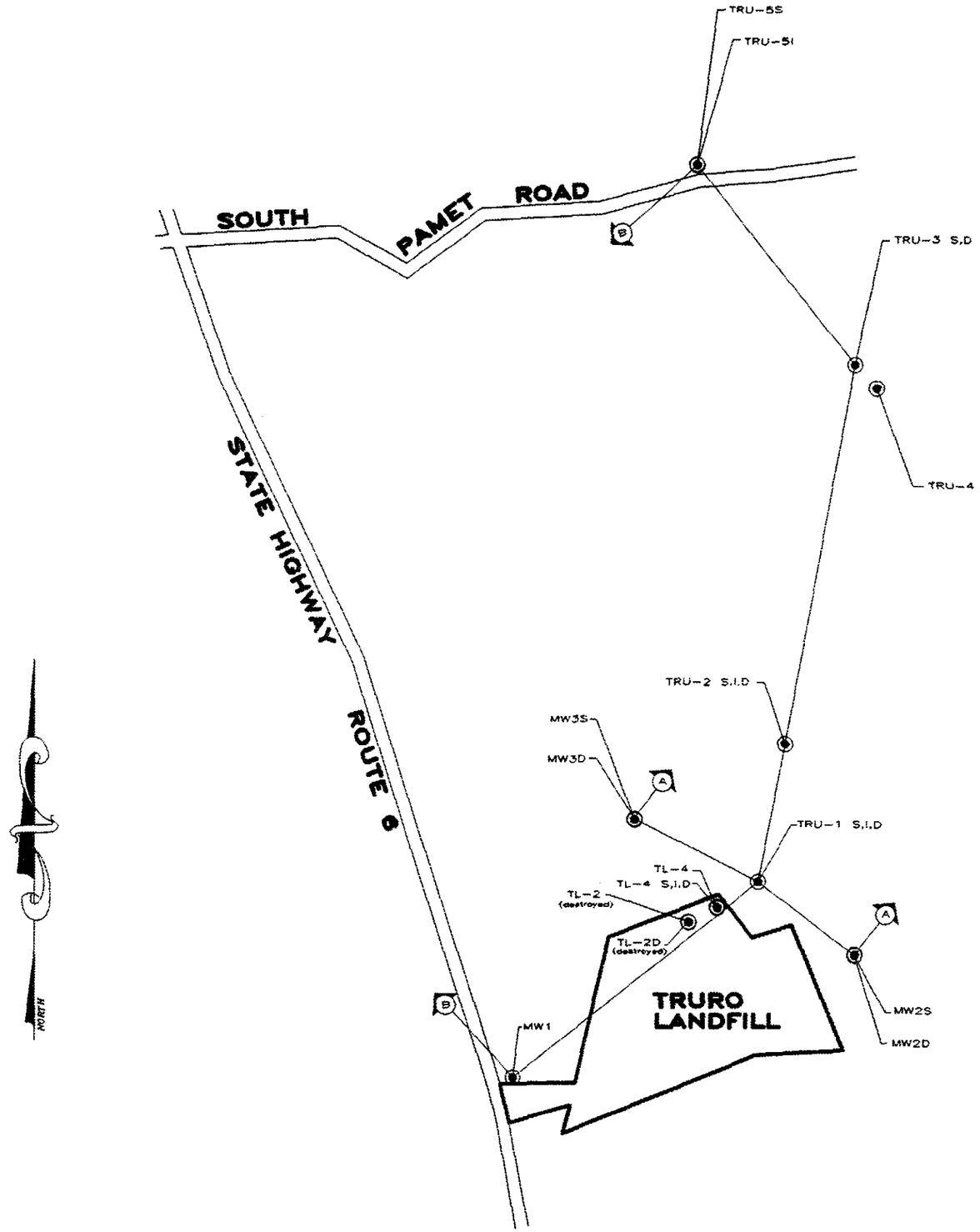


TRURO MUNICIPAL LANDFILL
CSA REPORT

FIGURE: 5

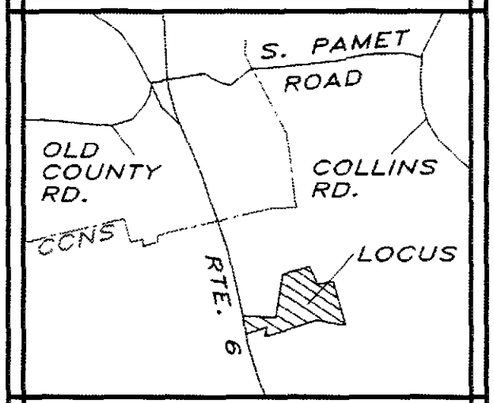
DESCRIPTION:
GEOLOGIC CROSS SECTION
LOCATION PLAN

SCALE: HORIZ. 1"=500'

DATE: APRIL 98

NOTES:

SYMBOLS
◉ – WELL



LOCUS 1"=2000'

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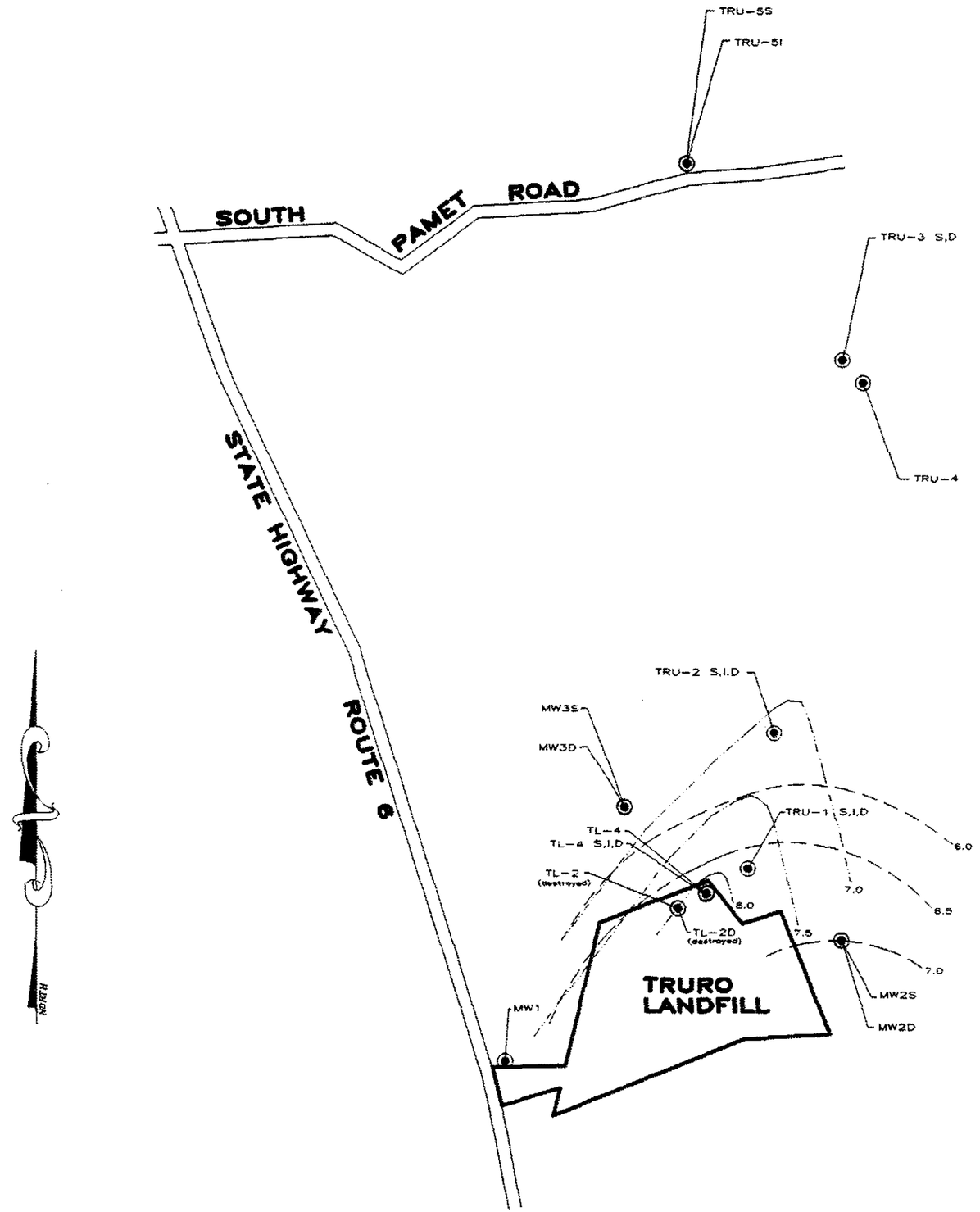


TRURO MUNICIPAL LANDFILL
CSA REPORT

FIGURE: 6

DESCRIPTION:
GROUNDWATER
CONTOUR MAP

SCALE: HORIZ. 1"=500'

DATE: APRIL 1998

NOTES:

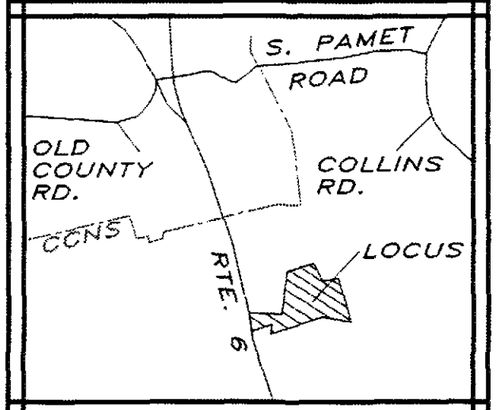
— —— — OCT. 97 MEASUREMENTS

—— - - —— MAR. 98 MEASUREMENTS

1) CONTOUR INTERVAL=0.5FT.
2) REFER TO TABLE 2 FOR SPECIFIC WATER TABLE MEASUREMENTS.

SYMBOLS:

◉ — WELL



LOCUS 1"=2000'

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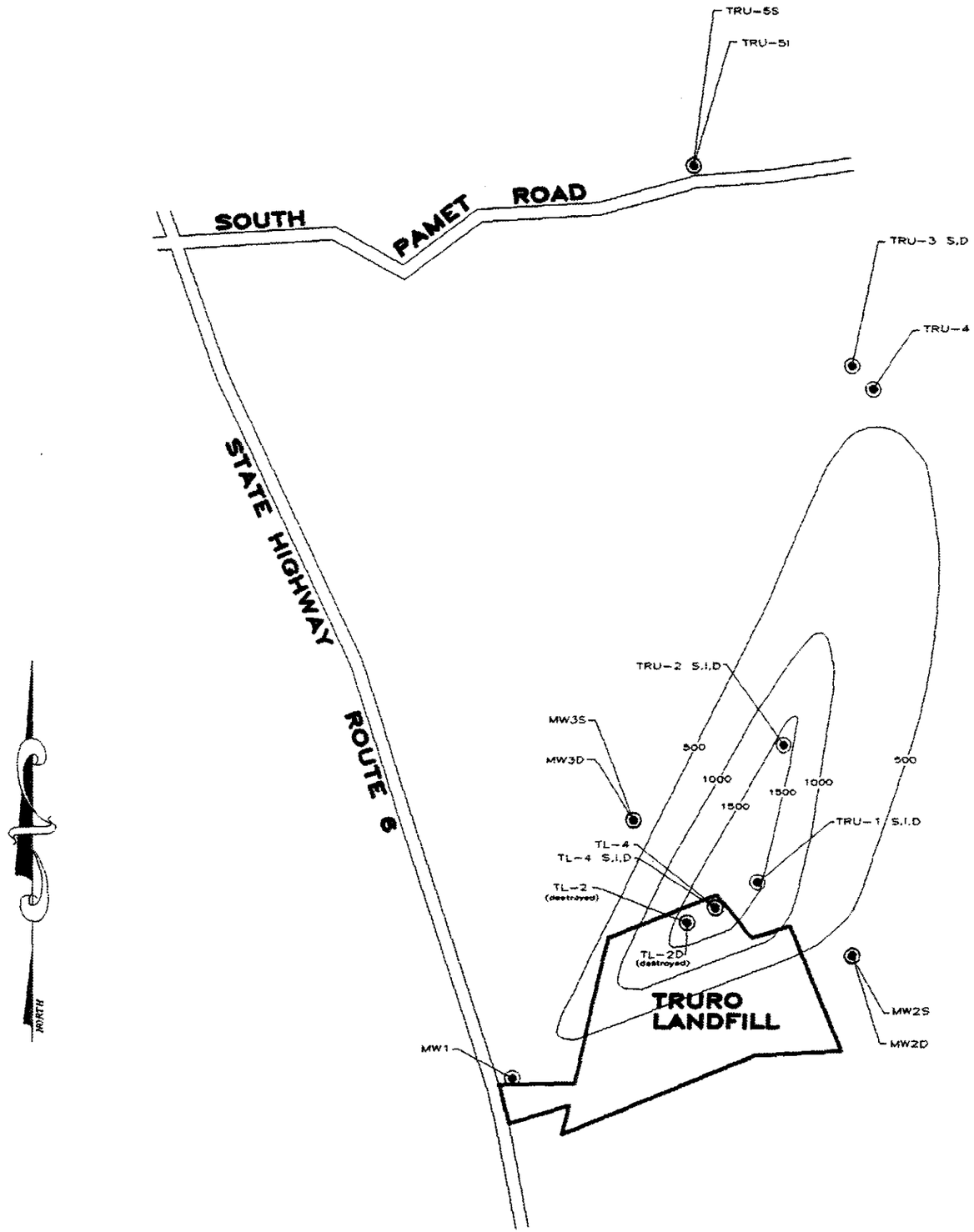


TRURO MUNICIPAL LANDFILL
CSA REPORT

FIGURE: 7

DESCRIPTION:
LEACHATE PLUME MAP

SCALE: HORIZ. 1"=500'

DATE: APRIL 1998

NOTES:

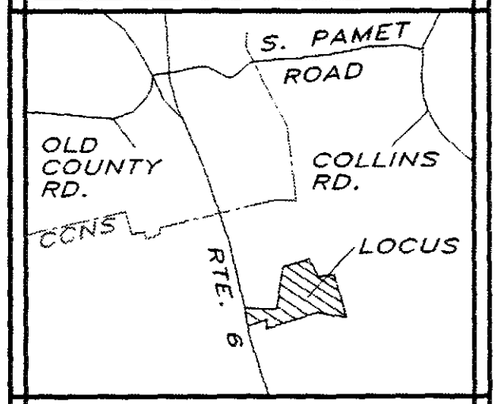
——— PLUME EXTENTS AS DEFINED BY SPECIFIC CONDUCTANCE MEASUREMENTS (OCT. 97)

1) CONTOUR INTERVAL 500 UMHOS/L

2) REFER TO TABLE 7 FOR INDIVIDUAL WELL RESULTS.

SYMBOLS:

◉ – WELL



LOCUS 1"=2000'

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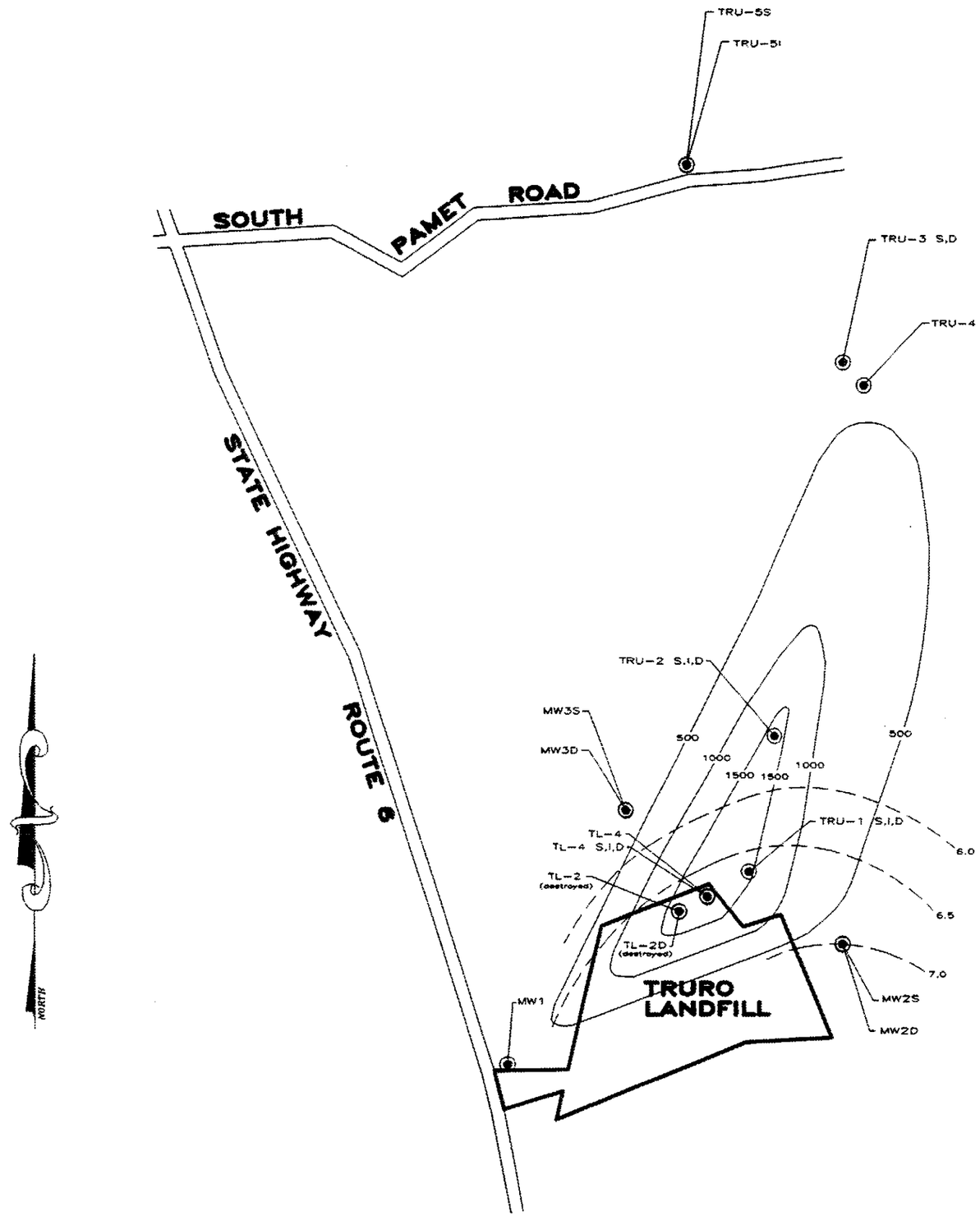


TRURO MUNICIPAL LANDFILL
CSA REPORT

FIGURE: 8

DESCRIPTION:
SITE CONCEPTUAL
MODEL PLAN

SCALE: HORIZ. 1"=500'

DATE: APRIL 1998

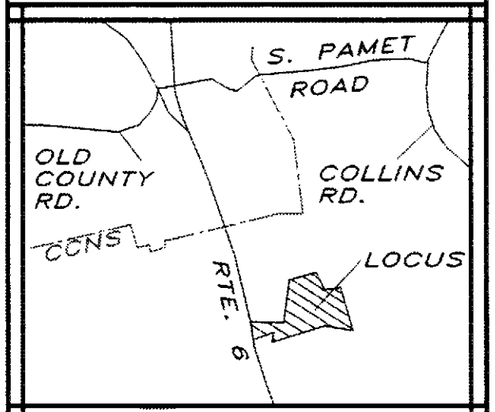
NOTES:

——— PLUME EXTENTS AS DEFINED BY SPECIFIC CONDUCTANCE MEASUREMENTS (OCT. 97)

— — GROUNDWATER CONTOUR MEASUREMENTS (OCT. 97)

SYMBOLS:

◉ – WELL



LOCUS 1"=2000'

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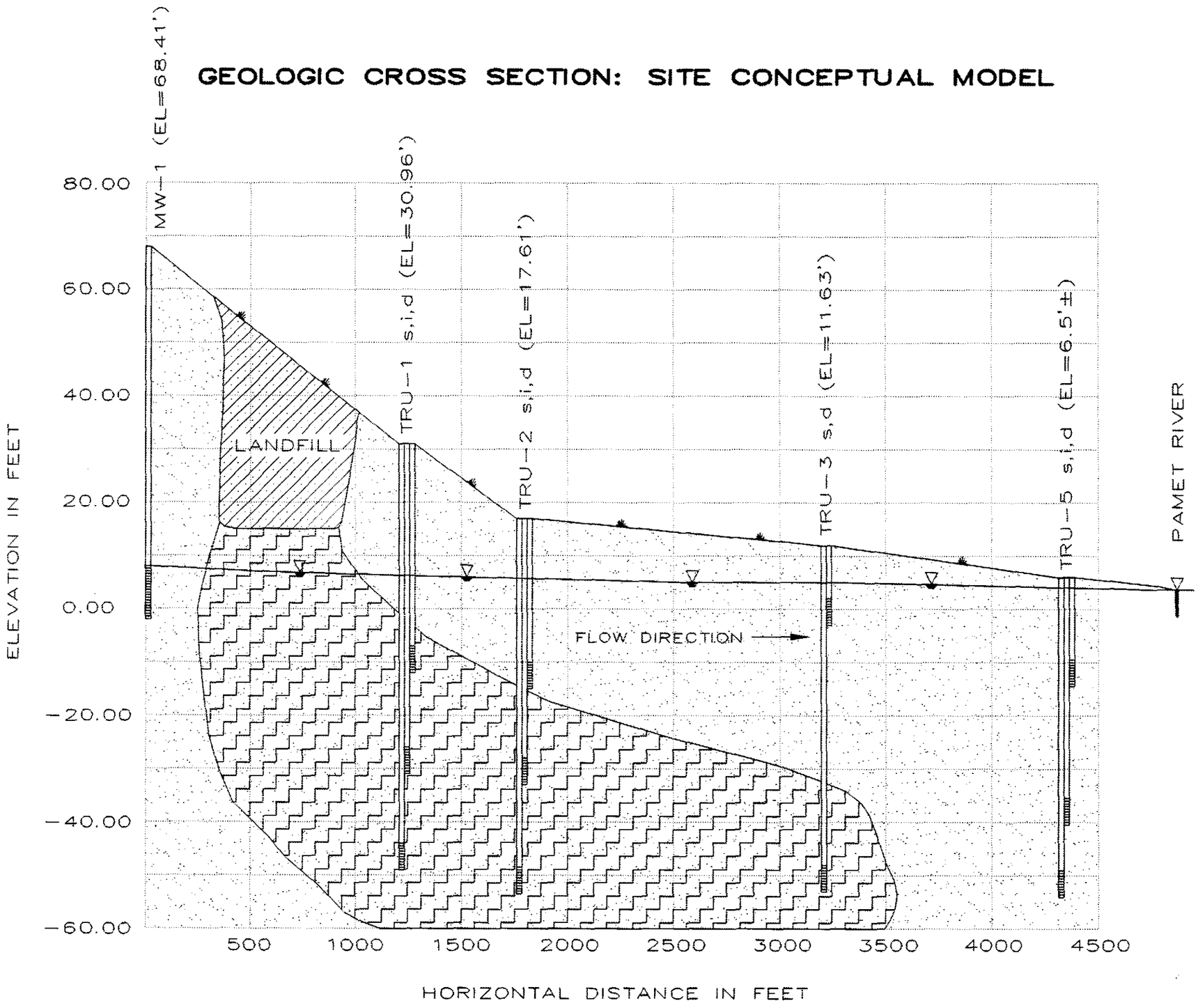
GEOLOGIC CROSS SECTION: SITE CONCEPTUAL MODEL



TRURO MUNICIPAL LANDFILL CSA REPORT

FIGURE: 9

DESCRIPTION:
SITE CONCEPTUAL MODEL CROSS SECTION

SCALE: HORIZ. 1"=500'
VERT. 1"=20'

DATE: APRIL 1998

NOTES:

LEGEND

- SAND
- LANDFILL AREA
- LEACHATE PLUME (AS DEFINED BY SPECIFIC CONDUCTANCE)

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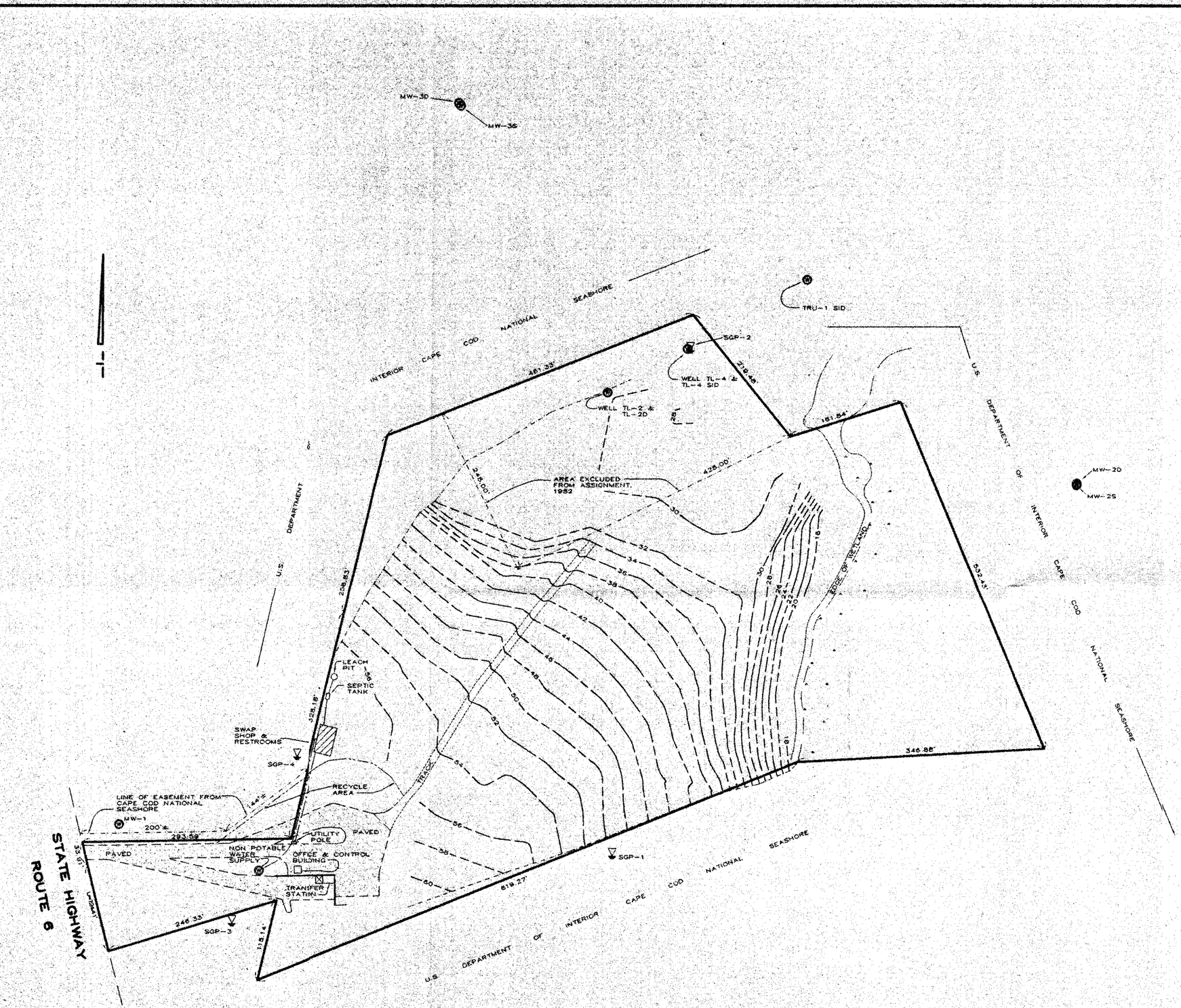

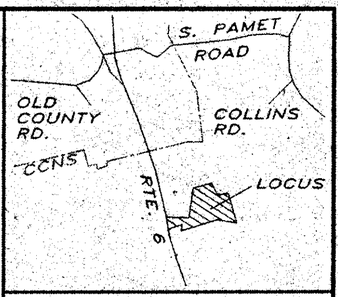

LOCUS: 1"=2000'

TRURO MUNICIPAL LANDFILL
CSA REPORT

FIGURE: 1

DESCRIPTION:

SITE PLAN

SCALE: HORIZ. 1"=100'

DATE: APRIL 1998

NOTES:

SYMBOLS:

- ⊕ —MONITORING WELL
- ▽ —SOIL GAS PROBE
- ——— CONTOURS OCT. 97

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DWG FILE: 80-139FG1
JOB FILE: 96-130