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FACSIMILE TRANSMITTAL SHEET

To: CITY OF SUNNYVALE

Project No.: WMN-101B

Date: 8/20/92

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Transmitted:

- ☐ As requested
- ☐ For your approval
- ☒ For your information
- ☐ For your review
- ☐ For your action
- ☐ For your files

Subject: ADDENDUM GEOTECHNICAL REPORT – SMART STATION

Notes:

cc: URS + 3E

If you have any questions, please contact us.

Wahler Associates

[signature]

Wahler Associates
Geotechnical and Environmental Engineers

August 20, 1992
Project WMN-101B

URS Consultants, Inc.
500 N.E. Multnomah Street, Suite 100
Portland, Oregon 97232

Attention: Mr. Robert Carn

Subject: Addendum Report
Sunnyvale Materials and Recovery
Transfer (SMaRT) Station

Reference: Wahler Associates' Report titled *Geotechnical Investigation, SMaRT Station*, dated May 1990.

Preliminary Drawings, titled *SMaRT Station*, dated July 21, 1992 by URS Consultants

Gentlemen:

This addendum report was prepared by Wahler Associates, after reviewing the referenced drawings and report, in order to provide additional geotechnical recommendations for the new design of the proposed Sunnyvale Materials and Recovery Transfer (SMaRT) station in Sunnyvale, California. All the recommendations presented in our referenced report apply, except as modified herein.

A. PROJECT DESCRIPTION

This addendum to the original geotechnical investigation, dated May 1990 was necessary due to changes in the site layout, structures, and site preparation proposed for the SMaRT Station.

The basic changes from the original investigation are as follows:

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- The total site area to be developed for the SMaRT Station has been reduced by about 1.5 acres in order to eliminate any excavation in the closed landfill located immediately south and east of the site.

- The processing building has been revised from an L-shaped configuration to a standard rectangular building. The total area of this building has been reduced from 100,000 square feet to 96,825 square feet.

- The combined wood and yard wastes processing and maintenance facility has been revised from a 19,000 square foot building located 90 feet (±) away from the main processing building to separate structures located against the north wall of the main processing building. The wood and yard wastes building is now a 9,375 square foot addition, and the vehicle maintenance building is a 2,000 square foot addition.

- The office and visitor's building has been reduced from a 2-story, 9,600 square foot building to a 1-story 6,000 square foot building, and has been separated from the main processing building.

- The proposed finished floor in all of the buildings will be at about Elevation +4 feet. The roadways will also be at about Elevation +4 feet with slopes for proper drainage. It is assumed that the site is currently at approximately Elevation 0.0.

The primary structures will be steel-frame, with concrete or masonry wall construction. Steel columns are planned to carry roof loads to the foundation system. In general, the waste processing and recovery building will be 30 to 40 feet in height with a concrete slab floor.

Column loads for the main processing building will be in the 70 to 80 kip range with all structural foundations to be supported on piling. Spread foundations will be utilized for the single-story office building and for the miscellaneous equipment required for waste processing.

B. GRADING AND EARTHWORK

1. Clearing and Stripping

To provide uniform support beneath the proposed facilities, it is recommended that the existing fill be removed at least to Elevation -2. Subject to approval by Wahler Associates, the excavated materials may be used as engineered fill below Elevation 0, provided that they are free of organics, debris, and any other unsuitable materials. It is likely that the excavated material will require processing in order to be made suitable for use as engineered fill. Imported fill can then be placed and compacted over the recompacted fill.

Prior to the start of any grading activity, the site should be stripped of surface vegetation and topsoil containing a significant amount of organic matter, roots and soft soils. The depth of stripping is estimated to average 2 to 3 inches in most areas. The stripping depth will probably increase toward the perimeter of the site where weeds, etc., are concentrated. The stripped material should be either removed from the site, or stockpiled in designated areas for later use in landscaping. Any debris on the site should also be removed prior to any grading activity.

The exposed surfaces, after stripping and over-excavating to Elevation -2, should be scarified to a depth of at least 6 inches, and compacted to a minimum of 90 percent of the laboratory maximum dry density determined in accordance with ASTM D1557-78.

2. Fill Material

Materials to be used for the construction of the fill should be non-organic, and have no rock or similar irreducible material with a maximum dimension greater than 6 inches; material larger than 2 inches should not exceed 15 percent of the fill. No material larger than 2 inches in maximum size should be used in the upper 3 feet of fill. The upper 3 feet of fill should be non-expansive, and it should have a maximum Plasticity Index of 12 and a minimum R-value of 20. All materials should be approved by the

Geotechnical Engineer. Materials intended for use as fill should be submitted to the Geotechnical Engineer for approval at least two weeks prior to their intended use.

There are several commercial sources of materials available near the project site. Names, telephone numbers and address of the persons to contact at these facilities are included in Table 1.

3. Compaction

The upper 6 inches of the subgrade exposed after stripping or excavation should be scarified, moisture-conditioned, and properly compacted to achieve at least 90 percent relative compaction prior to fill placement. All material placed for the proposed fill should be compacted, by mechanical means, to a minimum of 90 percent relative compaction, except the upper 5 feet, where the minimum relative compaction should be 95 percent, in accordance with ASTM D1557-78. Because of the varying thicknesses of fill, proposed in order to achieve the desired finished grades, the required 95 percent compaction in the upper 5 feet will include portions of the existing fill to be recompacted. Fill materials should be compacted at a moisture content within 2 percent of the optimum moisture content determined in the laboratory by the recommended compaction standard.

C. SETTLEMENT

1. Total Anticipated Settlement

The proposed fill at the SMaRT Station site has been revised since our original report was issued. Based on a maximum of 4 feet of fill placed in the Processing Area, and the revised configuration of the facility, new settlement analyses were performed. The TSET (Version 4.97a) computer program was used in the analyses in order to model settlement at 100 locations within the SMaRT Station. The idealized soil profiles (Profile I and Profile II), as well as the soil parameters used in the May 1990 analyses were used in the new settlement analysis.

The maximum estimated settlement caused by the proposed 4 feet of fill is about 4 inches; additional settlement may occur due to machinery and temporary refuse loads which were not included in the settlement analyses. Settlements caused by specific structures or stockpiles can be estimated when the impossed loads become available.

2. Estimated Time Rate of Settlement Induced by New Fill

We estimate that approximately 15 percent of the total settlement will occur during construction of the fill, due to the elastic deformation of the partially saturated foundation and older fill soils. The remaining settlement is time-dependent and is governed by the rate of dissipation of excess pore pressures generated in the foundation soils by the additional overburden load created by the new fill and footings. Based on our analyses, we estimate that in a period of about 3 months about 50 percent of the total settlement will occur. The time-rate estimate of settlement is shown on the graph on Figure IV-1 of our referenced report.

Conventional methods used in estimating the time-rate of settlement generally tend to overestimate the time required for the settlements to occur. This is primarily due to the difficulty in detecting thin layers of sandy soils during the subsurface exploration. It is recommended that the settlement of the new fill be monitored to verify the design assumptions regarding the rate of settlement.

D. FOUNDATIONS

1. Main Building - Piles

a. **Pile Capacity** - It is recommended that the transfer station be supported on a driven pile foundation. Because of the high groundwater conditions encountered on the site, driven pile foundations would be a desirable foundation alternative, rather than cast-in-place concrete piers. Piles would derive their support through peripheral friction in the surrounding soils and not rely on end bearing. Skin friction resistance in the clay layers is based on adhesion factors compiled by McClelland (1974), and in the sand layers by friction coefficients developed by Meyerhof (1976). A safety factor of

2.0 has been applied to the ultimate load to determine the allowable pile load. The relationships between the allowable pile load and the required pile depths for 12-inch and 14-inch square piles are presented on Figure IV-2 of our referenced report.

Due to the nature of the subsurface materials, increase in resistance should be anticipated when penetrating through layers of granular soils. Because of the variability of the existing fill, which contains gravelly material and some concrete debris, the piles should be pre-drilled through the existing fill and sludge to about Elevation -10. The diameter of the pre-drilled holes should be made equal to, or less than, the side dimensions of the piles to maintain lateral load resistance. Removal of obstructions, such as concrete slabs and slabs and asphalt, may be necessary in order to drive the piles. As an alternative, and in order to minimize the potential for movement of possibly contaminated water, we recommend that piles be set on holes predrilled to a diameter of at least 4 inches larger than the diagonal dimension of the piles, and that casing be set to at least Elevation -10. After the piles are driven, we recommend that the space between the casing and the piles be grouted with a bentonite-cement slurry.

It is recommended that design assumptions and the capacity of the piles be verified by driving a minimum of six indicator piles, one each near the exploratory borings within the structure, using the pile driving analyzer. The selected piles should be retapped after a period of about two weeks. The analyses should be completed prior to ordering the remaining piles.

b. **Lateral Loads** - Lateral forces, such as seismic and wind loads, can be resisted by the piles through a combination of cantilever action and passive resistance of the soil adjacent to the pile below Elevation -10. Because of the predrilling and other uncertainties regarding the piles installation, we recommend that no pile lateral resistance be assumed on the soils above Elevation -10. The maximum design value recommended for lateral loading is 3 kips for 12-inch concrete piles and 5 kips for 14-inch concrete piles. The actual design values should be determined when the final structure design has been completed and the type of piles to be used selected.

c. **Uplift Loads** - Resistance to uplift loads can be developed by friction along the pile shaft. For intermittent uplift forces, the uplift resistance of the piles may be assumed to be 40 percent of the recommended compressive maximum allowable axial load of the pile. Uplift resistance of 50 percent of the allowable pile load may be assumed for short-term dynamic loading, such as during an earthquake. Piles used to resist uplift should be adequately reinforced along their entire length to resist tensile forces.

d. **Downdrag** - Settlement of the proposed fill will result in the development of negative skin friction (downdrag) loads on the piles due to the relative downward movement of the surrounding soil and the pile. For 12-inch square piles, it is estimated that downdrag loads of up to 6.5 tons for 4 feet of fill will develop. These downdrag loads will reduce the service load capacity of the piles, and should be discounted from the ultimate loads presented in our referenced report. The downdrag loads can be reduced by up to 50 percent by coating the piles with a bituminous substance along the pile length within the fill. The base of the fill is estimated to be at about Elevation -10.

e. **Pile Settlement** - Some small settlement of the pile foundations will result from the settlement of the soils below the pile tips. The native soils anticipated at the pile tip elevations are stiff to very stiff clays. Therefore, it is estimated that the settlement of these soils will generally be very small.

f. **Pile Driving** - Piles should be driven continuously, without interruption, until the driving and depth criteria are attained. Adjacent piles should be driven to the required elevation using a hammer with a minimum driving energy compatible with the piles.

2. Office and Visitors Building - Shallow Foundations

a. **Allowable Bearing Pressure** - The office structure will be supported on shallow spread footings founded on 4 feet of new engineered fill. Footings should be underlain by a minimum of 24 inches of new engineered fill, should be founded a minimum depth of 18 inches below the lowest adjacent finished grade, and should be adequately reinforced. For exterior footings, grade may be taken as final adjacent pad grade and for interior footings, grade may be taken as finished floor elevation. Footings constructed in accordance with these recommendations may be sized for an allowable bearing pressure of 2 kips per square foot (ksf) for dead loads and 3 ksf for dead plus live loads. The allowable bearing pressure may be increased by one-third for short duration wind or earthquake loads.

b. **Lateral Loads** - Lateral loads on shallow footings and pile caps, resulting from wind or earthquake, may be resisted in the form of passive pressure on the side of footings and friction between the bottom of the footings and the soils on which they are supported. The passive soil resistance against footings within the engineered fill may be taken equal to a fluid having an equivalent density of 400 pounds per square foot, per foot of depth. This assumes that the footings are placed neat against the soil face or that properly compacted backfill is placed in the space between the footings and the soil faces. Because of the active pressure acting on the side of footings from sustained lateral loads, represented by a fluid having an equivalent density of 35 pounds per square foot, per foot of depth, a net passive resistance of 365 pounds per square foot, per foot of depth should be used. A frictional coefficient of 0.35 may be used to resist lateral loads at the base of the spread footings. No friction can be assumed to exist at the base of the pile caps, or grade beams between pile caps, due to the potential settlement of the soil beneath them.

E. Pre-Excavation at Locations of Piles

1. Excavation Methods

The proposed engineered fill could be excavated with a backhoe. Existing fill materials and alluvium should be excavated with a backhoe although some debris may be encountered in the existing fill that could be difficult to excavate. A large diameter auger may also be considered for use to excavate the pile locations.

2. Allowable Side Slopes

Short-term excavations for construction of pile caps and retaining structures, to a maximum depth of 20 feet within the engineered fill, should be stable with 1 horizontal to 1 vertical side slopes.

F. RETAINING WALLS

1. General

The general recommendations presented in our original report for the loading dock (pages IV-11 through IV-12) are valid for retaining wall designs in the present SMaRT Station configuration. These recommendations include lateral earth pressures, drainage and backfill requirements.

2. Allowable Bearing Capacity

According to available information regarding the proposed retaining walls, it is anticipated that retaining walls 10 feet or less in height will be supported on footings at Elevation -3. We recommend that a minimum of 4 feet of engineered fill be placed beneath retaining walls supported on shallow footings. The fill should be compacted to 95 percent, as defined in Section B of this report. Continuous footings constructed as described above may be sized for an allowable bearing pressure of 1.8 kips per square foot (ksf) for dead loads and 2.7 ksf dead plus live loads. Alternatively, the retaining walls should be supported on piles in accordance with the recommendations previously given for piles.

G. PAVEMENT DESIGN

The pavement design recommendations presented on pages IV-13 through IV-14 of our original report are still valid. Because of the anticipated heavy truck traffic, pavement sections for traffic indices of 9 and 10 were analyzed and are presented in Table 2.

E. LIMITATIONS

This addendum report has not been prepared for use by parties other than the designers of the project. It may not contain sufficient information for the purposes of other parties or other uses. If any changes are made in the project as described in this addendum report, the conclusions and recommendations contained herein should not be considered valid, unless the changes are reviewed by Wahler Associates, and the conclusions and recommendations are modified or approved in writing.

We appreciate the opportunity to continue to be of service to URS Consultants, Inc., on this project and look forward to working with you in the future. If you have any questions, please do not hesitate to call.

Very truly yours,

WAHLER ASSOCIATES

Bruce Gaviglio
Senior Engineer
GE No. 333, California

BG:geo/rep/wmn101h

cc: Addressee (3)
Mr. John Emmett
Mr. Tim Ridley

TABLE 1

COMMERCIAL SOURCES OF FILL MATERIALS

Mission Valley Rock Company:	7999 Athenour Way, Sunol, CA Phone: (415) 862-2257 Attn: Eric Herman
Raisch Products, Inc.:	2829 Monterey Road, San Jose, CA Phone: (408) 227-9222 Attn: Bob Beatty Mountain View Plant: 1105 L'Avenida
Kaiser Permanente	Permanente Road, Cupertino, CA Phone: (408) 252-1804 Attn: Harry Anders
Langley Hill Quarry	19500 Skyline Blvd., Woodside, CA P.O. Box 2969, Redwood City, CA Phone: (415) 851-0179 Attn: Mike Dempsey
Dumbarton Quarry Associates:	9600 Thornton Avenue, Fremont, CA Phone: (415) 793-8861 Attn: Joe Evans
East Bay Excavating: La Vista Quarry	28814 Mission Boulevard, Hayward, CA Phone: (415) 538-5080 Attn: Wayne Caporusso
Stevens Creek Quarry:	12100 Stevens Canyon Road, Cupertino, CA Phone (408) 253-2512 Attn: Rich Voss

TABLE 2

PAVEMENT DESIGN FOR PARKING LOTS AND DRIVEWAYS

Traffic Index	Alternative Sections	Asphaltic Concrete (inches)	Class 2 Aggregate Base (inches)	Class 2 Aggregate Subbase (inches)
4	A	2.0	9.0	--
	B	2.0	4.0	6.0
5	A	2.5	11.5	--
	B	2.5	6.0	6.0
6	A	2.5	15.0	--
	B	2.5	6.0	10.0
7	A	3.0	18.0	--
	B	3.0	6.0	13.5
8	A	3.5	21.0	--
	B	3.5	8.0	14.0
9	A	4.0	24.0	--
	B	4.0	8.0	17.0
10	A	4.5	27.0	--
	B	4.5	8.0	20.0

NOTE:

1. All layers in compacted thickness
2. Caltrans Standard Specifications, latest edition
3. Based on an assumed R-value of 5