terraphase engineering

September 18, 2024

Sheila Marquises
Public Works Director
City of San Leandro
San Leandro, California

sent via email to SMarquises@sanleandro.org

Subject: Change Order Request to Provide Additional Mapping Services, Collect Critical Asset Data, Evaluate Groundwater Elevation Data, Develop Community Outreach Materials, and Collaborate with Regional Stakeholders for the Shoreline Sea Level Rise Adaptation Plan, San Leandro, California

Dear Ms. Marquises:

Terraphase Engineering Inc. (Terraphase) is submitting this change order for additional services to support the Shoreline Sea Level Rise Adaptation Plan for San Leandro, California (Site), on behalf of the City of San Leandro (City; Client). The previously authorized scope of work and budget were presented in Terraphase's proposal dated April 14, 2023, and as outlined in Schedule A of the Consulting Agreement between Terraphase and the City. This change order request was developed based on the discussion between Terraphase and the City during a meeting on December 6, 2023, regarding the mapping products prepared under the original scope of work, and additional meetings and email communication with the City. It is our understanding that the City would like to understand the potential impact to City assets from projected surface water inundation in years 2050 and 2100 using Mean Higher High Water (MHHW) and King Tide datums, as well as the influence of sea-level rise (SLR) on surface water inundation and groundwater rise/emergence for year 2070. The additional mapping also includes mapping assets that were not identified during the existing scope of work. In addition, it is our understanding the City would like Terraphase to collect survey data for critical assets where data may be lacking, conduct an evaluation of groundwater elevation data to better understand and fine tune estimates of SLR-induced groundwater rise and emergence, develop outreach materials and messaging for use in Community Workshops that will be conducted by the City, and to conduct meetings to collaborate with neighboring Operable Landscape Units (OLUs) to support adaptation planning.

Since the previously authorized scope of work was issued, the California Sea Level Rise Science Task Force (CSLRTF) from the Ocean Protection Council (OPC) has released updated SLR guidance (CSLRTF 2024)[1] that provides updated SLR projections consistent with the best available science (Sweet et al.

[1] *California Sea Level Rise Guidance: 2024 Science and Policy Update*. 2024. California Sea Level Rise Science Task Force, California Ocean Protection Council, California Ocean Science Trust.

2022)[2]. The updated projections for the high-risk scenario, which is the recommended scenario for SLR planning in California, are slightly lower than the previous projections as follows:

Table 1 Comparison of OPC Projections

Year	Former Projection (feet)	Updated Projection (feet)
2050	1.9	1.2
2070	3.5	3.0
2100	6.9	6.6

For consistency with the OPC guidance and to align with local and regional shoreline adaptation efforts throughout the Bay Area, the proposed scope of work herein assumes use of the updated projections for the additional mapping products. Based on communication with the City, the existing maps of surface water inundation and groundwater rise/emergence for years 2050 and 2100 will not be revised to incorporate the updated projections.

A detailed cost estimate for the revised scope of work is attached (Table 1).

Revised Scope of Work

The revised scope of work is presented as Tasks 1 through 6 below.

Task 1: Mapping Mean Higher High Water and SLR, Years 2050 and 2100

This task includes preparation of surface water inundation maps using a datum of Mean Higher High Water (MHHW) plus the SLR magnitudes for years 2050 and 2100 (1.2 and 6.6 feet, respectively). The MHHW datum will be established using the San Leandro Marina CA tidal gauge station #9414688. These maps will be constructed using the same four map views of the City established for the existing mapping products. The deliverables include 4 maps for year 2050 and 4 maps for year 2100, referred to as Daily Surface Water Inundation, as follows:

1. Daily Surface Water Inundation, 2050, Oyster Bay

[2] Sweet, W.V., B.D. Hamlington, R.E. Kopp, C.P. Weaver, P.L. Barnard, D. Bekaert, W. Brooks, M. Craghan, G. Dusek, T. Frederikse, G. Garner, A.S. Genz, J.P. Krasting, E. Larour, D. Marcy, J.J. Marra, J. Obeysekera, M. Osler, M. Pendleton, D. Roman, L. Schmied, W. Veatch, K.D. White, and C. Zuzak, 2022: Global and Regional Sea Level Rise Scenarios for the United States: Updated Mean Projections and Extreme Water Level Probabilities Along U.S. Coastlines. NOAA Technical Report NOS 01. National Oceanic and Atmospheric Administration, National Ocean Service, Silver Spring, MD, 111 pp. https://oceanservice.noaa.gov/hazards/sealevelrise/noaa-nos-techrpt01-global-regional-SLR-scenarios-US.pdf

2. Daily Surface Water Inundation, 2050, Mulford Gardens
3. Daily Surface Water Inundation, 2050, Marina Faire
4. Daily Surface Water Inundation, 2050, Heron Bay
5. Daily Surface Water Inundation, 2100, Oyster Bay
6. Daily Surface Water Inundation, 2100, Mulford Gardens
7. Daily Surface Water Inundation, 2100, Marina Faire
8. Daily Surface Water Inundation, 2100, Heron Bay

This task includes one meeting between Terraphase and the Client to present the mapping products.

The cost for this task is $5,659.

Task 2: Mapping King Tide and SLR, Years 2050 and 2100

This task includes preparation of surface water inundation maps using a datum of Highest Astronomical Tide (HAT) (also referred to as a King Tide) plus the SLR magnitudes for years 2050 and 2100 (1.2 and 6.6 feet, respectively). The HAT datum will be established using the San Leandro Marina CA tidal gauge station #9414688. These maps will be constructed using the same four map views of the City established for the existing mapping products. The deliverables include 4 maps for year 2050 and 4 maps for year 2100, referred to as King Tide Surface Water Inundation, as follows:

1. King Tide Surface Water Inundation, 2050, Oyster Bay
2. King Tide Surface Water Inundation, 2050, Mulford Gardens
3. King Tide Surface Water Inundation, 2050, Marina Faire
4. King Tide Surface Water Inundation, 2050, Heron Bay
5. King Tide Surface Water Inundation, 2100, Oyster Bay
6. King Tide Surface Water Inundation, 2100, Mulford Gardens
7. King Tide Surface Water Inundation, 2100, Marina Faire
8. King Tide Surface Water Inundation, 2100, Heron Bay

This task includes one meeting between Terraphase and the Client to present the mapping products.

The cost for this task is $5,659.

Task 3: Mapping Surface Water Inundation and Groundwater Rise, Year 2070

This task includes preparation of a comprehensive set of surface water inundation and groundwater rise and emergence maps for SLR at year 2070 (3.0 feet). The 2070 surface water inundation maps will be developed using the Base Flood Elevation (BFE) datum, consistent with the 2050 and 2100 maps prepared for the existing scope of work; in addition, surface water inundation maps will be prepared using MHHW and the HAT (King Tide) datums for year 2070 as described for Tasks 1 and 2 above.

Groundwater rise and emergence maps for year 2070 will be developed using the Pathways Climate Institute LLC (Pathways) and the San Francisco Estuary Institute (SFEI) Shallow Groundwater Response to

Sea-Level Rise study, consistent with the existing scope of work. The Pathways/SFEI data set that maps 36-inches (3 feet) of SLR relative to their modeled baseline/current conditions will be used.

All maps will be constructed using the same four map views of the City established for the existing mapping products. The deliverables include 16 maps identified as follows:

1. Base Flood Elevation + SLR in 2070, Oyster Bay
2. Base Flood Elevation + SLR in 2070, Mulford Gardens
3. Base Flood Elevation + SLR in 2070, Marina Faire
4. Base Flood Elevation + SLR in 2070, Heron Bay
5. Daily Surface Water Inundation, 2070, Oyster Bay
6. Daily Surface Water Inundation, 2070, Mulford Gardens
7. Daily Surface Water Inundation, 2070, Marina Faire
8. Daily Surface Water Inundation, 2070, Heron Bay
9. King Tide Surface Water Inundation, 2070, Oyster Bay
10. King Tide Surface Water Inundation, 2070, Mulford Gardens
11. King Tide Surface Water Inundation, 2070, Marina Faire
12. King Tide Surface Water Inundation, 2070, Heron Bay
13. Depth to Groundwater, 2070, Oyster Bay
14. Depth to Groundwater, 2070, Mulford Gardens
15. Depth to Groundwater, 2070, Marina Faire
16. Depth to Groundwater, 2070, Heron Bay

This task includes one meeting between Terraphase and the Client to present the mapping products.

The cost for this task is $11,318.

Task 4: Collect Location and Elevation Data for Critical Assets

This task includes collection of location and elevation data for critical assets that may not be adequately characterized with existing data. Terraphase will collect the data with the Arrow Gold RTK GNSS Receiver[3], a Global Positioning System (GPS) unit that uses rea-time kinetic data from a global navigation satellite system. The horizontal accuracy of this unit is approximately one foot; for the vertical accuracy, the unit is within three feet.

This task also includes incorporating the asset GPS data into the Geographic Information Systems (GIS) database and mapping the assets on the existing and proposed flood maps. This task includes labor and direct costs associated with electronic field data collection and travelling to the asset locations. It is assumed up to ten assets will require measurements.

[3] Arrow Gold Real-Time Kinetic Global Navigation Satellite System; Arrow Gold® RTK GNSS Receiver- Eos (eos-gnss.com)

This task includes one meeting between Terraphase and the Client to identify the assets requiring a survey.

The cost for this task is $14,076.

Task 5: Evaluate Available Groundwater Elevation Data

This task includes Terraphase review of groundwater monitoring program reports and groundwater modeling efforts in the East Bay that may provide information that can be used to develop more realistic depictions of how the groundwater response to SLR dissipates with distance from the shoreline. Additionally, Terraphase will obtain and review available groundwater level data within and in the vicinity of the City of San Leandro and compare that information to the baseline conditions (referred to as "current conditions") used by the San Francisco Estuary Institute (SFEI) to map groundwater rise and emergence. Terraphase will evaluate uncertainty associated with the known limitations and errors that exist with the SFEI baseline conditions and assess how that has influenced the groundwater rise and emergence mapping products for this project. The information obtained from the data review and analysis of groundwater conditions will be used to better define current groundwater levels and groundwater level trends due to seasonal climatic conditions and tidal influence. This evaluation will be used to refine conclusions regarding groundwater rise and emergence for the San Leandro study area.

This task includes preparation of a draft technical memorandum and a final technical memorandum that incorporates one round of compiled comments from the City Stakeholder group. The memorandum will include a synopsis of the data and information obtained from the reports and modeling efforts, will provide our analysis of current and future groundwater level trends, and an evaluation of how SLR-induced groundwater rise may dissipate with distance from the shoreline.

The cost for this task is $24,370.

Task 6: Map Additional Assets

This task includes mapping assets identified during the interviews conducted for the Background Report as listed on the asset inventory table emailed to the City on January 24, 2024. The task budget also includes an allowance to map up to 10 additional assets identified by the local Sogorea Te' Land Trust, which have not yet been provided to the City.

This task includes two meetings between Terraphase and the Client to ensure all assets have been identified. It is assumed that after the second meeting, the Client will provide a final list of assets for the mapping. This task also includes time to obtain the data and information to map the additional assets to all existing and proposed additional mapping products.

The cost for this task is $8,172.

Task 7: Develop Outreach Materials and Messaging

This task includes preparation of presentation materials and messaging to support community workshops and meetings that focus on local and regional adaptation strategies to mitigate SLR-induced flooding. The messaging will include caveats regarding uncertainties associated with the SLR projections and the available surface water and groundwater data sets. The materials will include the goals and plans outlined in the San Franciso Bay Conservation and Development Commission (BCDC) One Bay Vision for regional adaptation projects and other applicable neighboring and/or regional projects.

This task includes four meetings between Terraphase and the Client to select the mapping products and develop the messaging. It is anticipated the maps will provide context for the Community regarding daily inundation versus extreme weather events.

This task also includes Terraphase preparation for and attendance at three meetings:

- One meeting with agencies the City is collaborating with.
- One public workshop or community meeting.
- One City Council meeting.

This task also includes development of questions and/or prompts to be used by the City during Community Workshops #1 and #2, and one agency work session to solicit input to develop the Shoreline Master Plan Concept and Draft Master Plan. This work will be performed by Raimi + Associates (R+A), the Master Plan subconsultant for this project. In addition, this task includes production of a one-page factsheet that will help explain the Plan, including the key adaptation goals, policies, and strategies to the community. The factsheet will be translated into Spanish and can be distributed throughout the City of San Leandro to engage all residents. City staff will support the translation of the factsheet into additional locally relevant languages.

The cost for this task is $30,466.

Task 8: Collaboration with Neighboring Operable Landscape Units

This task includes preparing for and participating in meetings between Terraphase, the City, neighboring OLUs (San Leandro and Alameda Creek), and applicable organizations, including but not limited to:

- San Francisco Estuary Institute
- Bay Conservation and Development Commission
- San Leandro Bay/Oakland/Alameda Estuary Adaptation Group
- East Bay Dischargers Authority
- Hayward Area Shoreline Planning Agency

The purpose of these meetings is to ensure adaptation plans prioritized by the City are consistent with and done in collaboration with neighboring OLUs. This task also includes other coordination or collaboration tasks associated with adaptation planning as determined by the City. It is assumed the

meetings and other coordination/collaboration tasks will be conducted consistent with the project timeline.

The cost for this task is $18,014.

Task 9: Project Management and Meetings

This task includes project management tasks including scope and budget review and tracking, invoicing, internal communication, and Client communication.

This task also includes R+A attendance at the public hearing to adopt the Master Plan.

The cost for this task is $16,052.

Cost Estimate

The total estimated costs are as follows:

Task	Description	Cost
1	Map MHHW + SLR, 2050 and 2100	$5,659
2	Map King Tide + SLR, 2050 and 2100	$5,659
3	Comprehensive Set of Maps, 2070	$11,318
4	Collect Location and Elevation Data for Critical Assets	$14,382
5	Evaluate Available Groundwater Elevation Data	$24,370
6	Map Additional Assets	$8,172
7	Develop Outreach Materials and Messaging	$30,466
8	Collaboration with Neighboring OLUs	$18,014
9	Project Management	$16,052
	Total:	**$134,093**

The total cost for all proposed additional tasks is **$134,093**. A detailed cost estimate is attached (Table 1). Terraphase proposes to complete this work on a time-and-materials basis. Terraphase will not exceed this authorization without prior written approval of the client.

Schedule

Terraphase will start the proposed work upon approval to proceed. It is our understanding that the work will require approximately 11 months to complete.

Closing

We are grateful for the opportunity to offer our services on this important project. If you have any questions or comments regarding this submittal, please contact me at 617-947-3070 or by email at tracy.roth@terraphase.com.

Sincerely,

for Terraphase Engineering Inc.

Tracy Roth, PG

Principal Hydrogeologist

Lucas W. Paz, PhD, CPESC, QSD

Principal Hydrologist

Attachments: Table 1 – Time-and-Materials Cost Estimate

Acceptance of Proposal

The cost, specifications, and conditions outlined herein are satisfactory and are hereby accepted. Terraphase is authorized to proceed with the work, as specified.

This proposal is hereby accepted by a duly authorized representative of the Client to whom it is addressed:

Signature: _____ *Date:* _____

Printed Name: _____

Title: _____

Table 1 - Time and Materials Cost Estimate
Client: City of San Leandro

Category	Units	2023 Standard Rate	Discount	Rate	Task 1: Map MHHW + SLR 2050, 2100		Task 2: Map King Tide + SLR 2050, 2100		Task 3: Set of Maps for 2070		Task 4: Collect Location and Elevation Data for Critical Assets		Task 5: Evaluate Available Groundwater Elevation Data		Task 6: Map Additional Assets		Task 7: Outreach Materials and Messaging		Task 8: Collaboration with Neighboring OLUs		Task 9: Project Management and Meetings		TOTALS	
					Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost
Labor																								
Senior Principal	Hour	$ 297.00	10%	$ 267.30		$ -		$ -		$ -		$ -	4	$ 1,069		$ -		$ -		$ -		$ -	4	$ 1,069
Principal	Hour	$ 278.00	10%	$ 250.20	6	$ 1,501	6	$ 1,501	12	$ 3,002	20	$ 5,004	60	$ 15,012	10	$ 2,502	54	$ 13,511	72	$ 18,014	35	$ 8,757	275	$ 68,805
Senior Associate	Hour	$ 259.00	10%	$ 233.10		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Associate	Hour	$ 240.00	10%	$ 216.00		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Senior Project	Hour	$ 225.00	10%	$ 202.50		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Project	Hour	$ 210.00	10%	$ 189.00	22	$ 4,158	22	$ 4,158	44	$ 8,316	48	$ 9,072	40	$ 7,560	30	$ 5,670	28	$ 5,292		$ -		$ -	234	$ 44,226
Senior Staff 2	Hour	$ 194.00	10%	$ 174.60		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Senior Staff 1	Hour	$ 177.00	10%	$ 159.30		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Staff 2	Hour	$ 158.00	10%	$ 142.20		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	16	$ 2,275	16	$ 2,275
Senior Editor/ Senior Project Coordinator	Hour	$ 155.00	10%	$ 139.50		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Senior Technician	Hour	$ 145.00	10%	$ 130.50		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Staff 1	Hour	$ 137.00	10%	$ 123.30		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Editor 2/Project Coordinator 2/Accountant 2	Hour	$ 135.00	10%	$ 121.50		$ -		$ -		$ -		$ -	6	$ 729		$ -	6	$ 729		$ -	8	$ 972	20	$ 2,430
Technician 3	Hour	$ 125.00	10%	$ 112.50		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Editor 1/Project Coordinator 1/Accountant 1	Hour	$ 115.00	10%	$ 103.50		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Technician 2	Hour	$ 106.00	10%	$ 95.40		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Technician 1	Hour	$ 88.00	10%	$ 79.20		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Total Terraphase Labor						**$ 5,659**		**$ 5,659**		**$ 11,318**		**$ 14,076**		**$ 24,370**		**$ 8,172**		**$ 19,532**		**$ 18,014**		**$ 12,004**		**$ 118,805**
Direct Costs																								
Subcontractor																								
Raimi + Associates (expenses)	Total	$ 13,620.00		$ 13,620.00		$ -		$ -		$ -		$ -		$ -		$ -	0.7298	$ 9,940		$ -	0.2702	$ 3,680	1	$ 13,620
0	Total	$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Total Subcontractor Costs						***$ -***		***$ -***		***$ -***		***$ -***		***$ -***		***$ -***		***$ 9,940***		***$ -***		***$ 3,680***		***$ 13,620***
Other Direct Costs																								
Total Other Direct Costs						***$ -***		***$ -***		***$ -***		***$ -***		***$ -***		***$ -***		***$ -***		***$ -***		***$ -***		***$ -***
Direct Cost Handling		10%		10.0%		$ -		$ -		$ -		$ -		$ -		$ -		$ 994		$ -		$ 368		$ 1,362
Total Direct Costs						**$ -**		**$ -**		**$ -**		**$ -**		**$ -**		**$ -**		**$ 10,934**		**$ -**		**$ 4,048**		**$ 14,982**
Terraphase Equipment/Supplies (ERS)																								
Truck/Vehicle (day)	Day	$ 184.00		$ 184.00		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
IPad and Electronic Field Data (day)	Day	$ 35.00		$ 35.00		$ -		$ -		$ -	5	$ 175		$ -		$ -		$ -		$ -		$ -	5	$ 175
Daily Consumables (includes gloves, ziplock bags and trash bags)	Each	$ 21.00		$ 21.00		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Field Health and Safety and Decon Supplies (daily fee)	Day	$ 30.00		$ 30.00		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -		$ -	0	$ -
Total Terraphase Equipment/Supplies (ERS)						**$ -**		**$ -**		**$ -**		**$ 175**		**$ -**		**$ -**		**$ -**		**$ -**		**$ -**		**$ 175**
Travel Costs																								
Mileage	mile	$ 0.655		$ 0.655		$ -		$ -		$ -	200	$ 131.00		$ -		$ -		$ -		$ -		$ -	200	$ 131.00
Total Travel Costs						**$ -**		**$ -**		**$ -**		**$ 131.00**		**$ -**		**$ -**		**$ -**		**$ -**		**$ -**		**$ 131.00**
Total Estimated Project Unit Costs						**$ 5,659**		**$ 5,659**		**$ 11,318**		**$ 14,382**		**$ 24,370**		**$ 8,172**		**$ 30,466**		**$ 18,014**		**$ 16,052**		**$ 134,093**