

July 17, 2020

Delta Conveyance Design and Construction Authority Stakeholder Engagement Committee Members

Subject: Materials for the July 22, 2020 Regular Committee Meeting

Members of the Stakeholder Engagement Committee:

The tenth regular meeting of the Delta Conveyance Design and Construction Authority (DCA) Stakeholder Engagement Committee is scheduled for a remote video conference on **Wednesday, July 22, 2020 at 3:00 p.m.**

Please join our meeting from your smartphone, computer or tablet. https://meetings.ringcentral.com/j/1489140415

SEC Members are asked to join the meeting at 2:45pm to ensure priority entry by the meeting hosts and to resolve any technical issues prior to the start of the meeting.

Enclosed are the materials for the committee meeting in a PDF file, which has been bookmarked for your convenience.

- Meeting Agenda
- Meeting Minutes- June 24, 2020 Regular SEC Meeting
- Second Tunneling ITR & DCA Response
- Sample Soil Conditioner Material Safety Data Sheets (MSDS)

All files presented during the meeting will also be available at dcdca.org by the Monday following the meeting.

Regards,

Sarah Palmer

Sarah Palmer, DCA Board Member Stakeholder Engagement Committee Chair

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Barbara Keegan, DCA Board Member Stakeholder Engagement Committee Co-Chair



DELTA CONVEYANCE DESIGN AND CONSTRUCTION AUTHORITY STAKEHOLDER ENGAGEMENT COMMITTEE

REGULAR MEETING AGENDA Wednesday, July 22, 2020, 3:00 p.m. Remote – Conference Access Information: Phone Number: 1 (623) 404-9000 <u>Access Code</u>: 148 914 0415 Electronic Meeting Link: Please join our meeting from your smartphone, computer or tablet. https://meetings.ringcentral.com/j/1489140415

The purpose of the Stakeholder Engagement Committee is to create a forum for Delta stakeholders to provide input and feedback on technical/engineering issues related to the DCA's current activities. Please note, this meeting is **not** part of the Department of Water Resources' California Environmental Quality Act public outreach process related to a potential Delta Conveyance project and therefore comments made in this meeting will not be recorded or tracked for those purposes. All items are information only.

In compliance with state and county health orders, the meeting will be held electronically only through the listed meeting link and telephone number. Assistance will be provided to those requiring accommodations for disabilities in compliance with the Americans with Disabilities Act of 1990; requests for accommodations can be made by contacting staff at (916) 347-0486 or info@dcdca.org. Members of the public may speak regarding items on the agenda when recognized by the Chair. Speakers are limited to three minutes each; however, the Chair may limit this time at her discretion. Please note that Item 4 is a single discussion item; subparts are listed for clarity. Persons wishing to provide public comments remotely on Agenda Items must email claudiarodriguez@dcdca.org by 4:00 pm. Email should include the name, phone number, or other identifier for the speaker and the requested item(s) on which he or she wishes to speak. The public may also provide written public comment by email to claudiarodriguez@dcdca.org. All written comments received prior to the conclusion of the meeting will be included in the written record for the meeting but will not be read during the meeting. Additional information will be provide at the commencement of the meeting.

1. WELCOME/CALL TO ORDER

- 2. ROLL CALL/HOUSEKEEPING
- 3. MINUTES REVIEW: June 24, 2020 Regular SEC Meeting
- 4. STAFF PRESENTATION & COMMITTEE DISCUSSION

4a. DWR General Updates and Alternatives Formulation
4b. DCA Response to SEC Comments
4c: SEC Questions or Comments on June 24th Presentation
4d: Public Comment on Item 4

FUTURE AGENDA ITEMS 5a. SEC Tour Updates 5b. August 24th SEC Meeting Topics 5c. August 20th SEC Report to DCA Board

6. NON-AGENDIZED SEC QUESTIONS OR COMMENTS



DELTA CONVEYANCE DESIGN AND CONSTRUCTION AUTHORITY STAKEHOLDER ENGAGEMENT COMMITTEE July 22, 2020 REGULAR MEETING AGENDA, CONTINUED

7. PUBLIC COMMENT ON NON-AGENDIZED ITEMS

This is the time and place for members of the public to address the Committee on matters that are within the Committee's jurisdiction but that are not on the agenda. Speakers are limited to three minutes each; however, the Chair may limit this time when reasonable based on the circumstances. Persons wishing to speak are requested to email claudiarodriguez@dcdca.org by 4:00pm with their name, phone number or other identifier. As these items have not been agendized, the Committee is not legally able to discuss these items at this meeting unless a recognized exception applies.

- 8. NEXT MEETING
- 9. ADJOURNMENT

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Next scheduled meeting: August 24, 2020 Regular Stakeholder Engagement Committee Meeting at 3:00p.m.



Memo

Contact: Valerie Martinez, SEC Facilitator

Date: July 22, 2020 SEC Meeting

Subject: Meeting Minutes

The meeting minutes from SEC Meeting 9 (June 24, 2020) are attached for your review. Please send any edits to hannahflanagan@dcdca.org by **noon Tuesday, July 21, 2020.** Since the SEC is not a voting group, this process will facilitate the review process and allow us to efficiently address the minutes at the meeting.

Item No. 3



STAKEHOLDER ENGAGEMENT COMMITTEE

MINUTES

REGULAR MEETING Wednesday, June 24, 2020 3:00 PM

(Paragraph numbers coincide with agenda item numbers)

[Editor's Comment: Minutes are provided to ensure an accurate summary of the Stakeholder Engagement Committee's meetings. The inclusion of factual comments and assertions does not imply acceptance by the Delta Conveyance Design and Construction Authority.]

1. WELCOME/CALL TO ORDER

The regular meeting of the Delta Conveyance Design and Construction Authority (DCA) Stakeholder Engagement Committee (SEC) was called to order via RingCentral video conference at 3:03 pm.

Director Palmer welcomed the SEC and meeting guests and thanked all for their participation. The meeting is being held via phone and video conference pursuant to Governor Newsom's Executive Order N29-20 in response to the COVID-19 State of Emergency.

The purpose of the SEC is to create a forum for Delta stakeholders to provide input and feedback on technical and engineering issues related to the DCA's current activities. The SEC is a formal advisory body to the DCA Board of Directors. As such, and like the DCA itself, the SEC is subject to public transparency laws applicable to local public agencies like the Brown Act and the Public Records Act. It is important to note that the SEC and its meetings are not part of the Department of Water Resources' (DWR's) California Environmental Quality Act (CEQA) public outreach process related to any potential Delta Conveyance project and therefore comments made at this meeting will not be tracked or recorded for those purposes. SEC member comments at this meeting will be recorded and tracked, but only for the purposes of the DCA.

2. ROLL CALL/HOUSEKEEPING

Committee members in attendance were Angelica Whaley, Anna Swenson, Cecille Giacoma, David Gloski, Douglas Hsia, Isabella Gonzalez-Potter, James Cox, Jim Wallace, Karen Mann, Lindsey Liebig, Malissa Tayaba, Dr. Mel Lytle, Peter Robertson and Sean Wirth. Ex-officio members Gilbert Cosio and Michael Moran were also in attendance. Philip Merlo didn't attend. Tribal representative alternate Jesus Tarango didn't attend.

Members Barbara Barrigan-Parrilla and Mike Hardesty were not in attendance

DCA Board Members in attendance were Director Sarah Palmer (Chair) and Barbara Keegan (Vice Chair) In addition, DCA and DWR staff members in attendance were Kathryn Mallon, Valerie Martinez, Joshua Nelson, Don Hubbard, Graham Bradner, Nazli Parvizi, Claudia Rodriguez, Jasmine Runquist and Carrie Buckman.



Ms. Palmer reviewed meeting guidelines and norms. All meetings are subject to the Brown Act. The chairperson presides over meetings and the vice-chairperson presides over the meeting in her absence. Discussion will be guided by the meeting facilitator, Valerie Martinez. Staff will provide technical information to support the committee's work. Each meeting will be goaloriented and purpose driven. The information provided is for purposes of discussion only and is subject to change. The committee holds no formal voting authority. We will seek consensus. All views will be listened to, recorded and reported. Participation in the SEC does not imply support for any proposed conveyance project.

Ms. Palmer reviewed housekeeping items. Members of the public can request to speak during the public comment period by emailing claudiarodriguez@dcdca.org. Written comments will be added to the record but not read during the meeting. Patience is appreciated, as this is the first teleconference for the SEC. DCA will work to ensure everyone is heard and receives the information needed.

The meeting is being recorded and will be posted on the website following the meeting. Please be mindful of your background, and please mute your microphone and/or stop your video if you need to step away during the meeting. In order to provide organized comments and allow SEC members to speak without talking over one another, SEC members are asked to use the "Raise Hand" feature in order to be recognized to speak during the meeting by Meeting Facilitator Valerie Martinez.

3. MINUTES REVIEW: May 27, 2020 Regular SEC Meeting

Ms. Palmer asked if there were any comments on the minutes, which were distributed to members. Any changes can be reported to Jasmine Runquist. No objections or changes were reported by SEC members.

4. RALPH M. BROWN ACT REMINDER

Mr. Nelson presented reminders regarding the Brown Act, in light of some changes since he last presented to the SEC in November 2019. The Brown Act is part of the Government Code and is California's open meeting law for local agencies, not state agencies. The purpose is to ensure that most discussions and deliberations occur in a public setting. Meetings must be held open and public. A meeting is defined as any gathering of a majority of the members at the same time and place to hear, discuss or deliberate upon any matter under their jurisdiction. The majority is 10 members of the SEC, excluding ex officio members. No serial meetings are allowed, which are defined as any SEC members discussing any SEC business outside of a standard meeting. A serial meeting could include standard communication or the use of an intermediary.

California Emergency Services Act gives the Governor the authority to suspend State law in an emergency and has done so regarding the Brown Act. The Executive Order N-29-20 does not have an end date but applies until state or local health officials are no longer requiring or recommending social distancing. The Order states that previous requirements for teleconference/electronic meetings have been suspended. The following are the requirements for current teleconference/electronic meetings:



- 1. Public can "observe and address" board
- 2. Agenda is timely posted (72 hours for regular meetings)
- 3. Notice says how public can observe and comment
- 4. Implement and advertise a procedure for "receiving and swiftly resolving" ADA accommodation requests
- 5. Make reasonable efforts to adhere to Brown Act as closely as possible to maximize transparency

Communication during virtual meetings should be done through the RingCentral platform, avoiding texts and instant messages. These texts and messages could be subject to disclosure. The Brown Act suspension has not eliminated the ban on serial meetings. Participants should be muted when they are not speaking during the meeting to help with background noise. The "raise hand" feature should be used when wishing to speak. "Video off" should be used thoughtfully.

Mr. Gloski said that at the last meeting, during the non-agenized portion, he asked if the SEC could hear from members that attended the DCA Board meeting and it was cited that it would be an issue with the Brown Act. Can this be explained?

Mr. Nelson said one of the requirements of the Brown Act is that any substantive discussions of the body must be included on the agenda. If there is something not on the agenda, there cannot be a substantive discussion. There is a safe harbor in the Brown Act for brief comments, reports, or future agenda requests. When that particular discussion turned more substantive is when it was suggested to be added to a future agenda.

Ms. Martinez informed that there were no requests for public comment on this item but reminded to submit requests for public comment to Ms. Rodriguez at this point, so that they may make their comment later in the meeting.

5. STAFF PRESENTATION & COMMITTEE DISCUSSION

a. DWR Tribal Engagement & Other Updates

[Editor's Note: due to technical difficulties, the presentation on tribal engagement occurred later in the meeting but is included in the minutes in this section in order to more accurately capture the information associated to the agenda items.]

Ms. Agustinez introduced herself as a member of the Navajo Tribe who has been working with DWR for 13 years as their Tribal Policy Advisor to engage with the tribes in the Delta regarding DWR programs and projects.

DWR is committed to proactive engagement with tribes who are interested in the Delta Conveyance Project. Ms. Agustinez thanked Mr. Tarango and Ms. Tayaba for their roles in the SEC.

DWR is engaging with tribes in accordance with state consultation policies and AB-52. Ms. Agustinez informed that the land in the Delta has been traditionally used by tribes. Tribal sovereignty is the recognition that there a difference in the public engagement process. As



sovereign nations, tribes are not a public entity. Specific engagement is required to have meaningful engagement, as laid out in state consultation policies. It is through government to government communication that lead agencies have the responsibility of maintaining confidentiality. Tribes are encouraged to be engaged in the public scoping process, voicing the concerns of tribes.

Governor Newson issues E.O. N-10-19 and the water portfolio followed shortly after. This executive order began the new planning process for Delta Conveyance and also set in motion that a state or local lead agency is required to offer Native American tribes, with an interest in tribal local resources located within their jurisdiction, the opportunity to engage in government to government consultation with agencies preparing CEQA documents. These orders are further defined in E.O. B-10-11, CNRA Tribal Consultation Policy, and DWR's Tribal Engagement Policy.

AB-52 is a CEQA amendment that further clarifies the role of tribes in the CEQA process and recognizes the tribal sovereignty of tribes in California government. It also recognizes that California Native American tribes have an expertise with regard to their history and practices and emphasizes the importance of incorporating tribal knowledge into the government analysis for the protection of tribal cultural resources.

As the lead agency for Delta Conveyance, DWR issued a Notice of Preparation under CEQA in January and began AB-52 tribal engagement. Other previous projects (such as the Bay Delta Conservation Plan and California WaterFix) did not use AB-52 as they predated it. Prior to the release of the NOP in Fall 2019, DWR conducted pre-AB 52 engagement meetings, after the release of the Water Resiliency Portfolio.

AB-52 applies to all California tribes, defined as federally recognized tribes and nonfederally recognized tribes and all CEQA lead agencies. If a tribe wishes to participate in AB-52, they must submit a written request to the lead agency. The lead agency will then begin the consultation prior to the release of a Negative Declaration or EIR.

Tribal Cultural Resources (TCRs) are defined under AB-52 as "a site, feature, place, cultural landscape, sacred place or object with cultural value to a 'California Native American tribe,' that is either on, or eligible for inclusion in, the California Historic Register or a local historic register, or is a resource that the lead agency, at its discretion and supported by substantial evidence, determines should be treated as a Tribal Cultural Resource." Any consulting agency is required to conduct a search list through the Native American Heritage Commission, as well as maintain a response list.

Since the release of the NOP on January 15, 2020, notifications for the Delta Conveyance Project were sent out to 121 tribes. They were informed of the availability of the NOP and given an invitation to consult with DWR under either AB-52 (for tribes that were on DWR's AB-52 list) or DWR's Tribal Engagement Policy. Tribes who were not on the DWR AB-52



consultation list at the time of the release of the NOP can still request consultation under DWR's Tribal Engagement Policy at any time during the course of the project.

Many tribes are working on currently reopening as a result of COVID-19 and DWR is working on moving forward with rescheduling meetings.

The pre-AB52 meetings with tribes took place on September 11, 2019 and November 12, 2019. DWR also assisted with the development of a Tribal Engagement Committee formed from an independent body of tribes in the Delta who meet monthly. DWR has been invited to provide technical assistance and advises on an invited basis.

Aside from that committee, DWR plans to schedule quarterly Informational Update Meetings for tribes and anticipates regional meetings throughout California, as well as at tribe governmental meetings, per invitation.

COVID-19 caused for tribes to close their reservation boundaries and close tribal economic businesses. DWR began receiving formal letters from tribes in April requesting to pause all consultation meetings due to COVID-19. In response, Governor Newsom issued E.O. N-54-20 which provided a 60-day extension to apply to CEQA projects, effective as of April 22, 2020. It was focused on the timeframes to initiate consultation, so it did not apply to the Delta Conveyance consultation process because that process was already initiated.

Ms. Agustinez mentioned she can return to the committee whenever an update is necessary or requested. She also shared a list of other resources.

Ms. Giacoma suggested that DWR's Tribal Consultant remain engaged in the process.

Ms. Agustinez informed that the engagement with DWR is pursuant to statutory guidelines. Tribal sovereignty is an issue and sometimes the public may not be aware of the coordination taking place within the government agencies and the consultation process. She will continue to be engaged.

Ms. Buckman provided an overview of current DWR environmental activities. The Draft Scoping Summary Report, which is the draft report capturing scoping-related information including comments received and scoping meetings transcripts, should be released in July. A Section 404/Section 10 application for the Department of the Army was submitted pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. Work continues on the initial steps for development of the Draft EIR. DWR is working to address comments received and complete the environmental process for the Soil Investigation IS/MND.

In regard to NEPA, this project is different in that it does not have a federal project proponent. This means that a regulatory agency will be the NEPA lead. DWR needs to formally engage the United States Army Corps of Engineers (USACE) to allow federal



agencies to determine the NEPA lead. An initiation letter was required for flood management from the local sponsor to initiate the Section 408 process; the Central Valley Flood Protection Board sent this letter in May. A Section 404 application is needed for wetlands and waters. With the submittal of the Section 404/Section 10 application, DWR has now formally engaged the USACE and is expecting the identification of the NEPA lead soon.

The Section 404 application includes a project description, an assessment of the impacts to wetlands and waters, and avoidance and minimization measures. DWR has already submitted the application to initiate the selection of the NEPA lead agency. No permit will be issued until after CEQA, NEPA, and other permitting processes are complete. The 404 application includes only one alignment because the Crops would not consider an application with multiple options. For that reason, only the Eastern Alignment was used in the application. To clarify, this does not constitute a decision; no decision will be made until after the environmental process is complete.

Mr. Cosio asked how the actual Section 404 application package that DWR submitted to the USACE can be located, and what is USACE's public notice process?

Ms. Buckman said the application is on the website. Ms. Parvizi can send out links to committee members. There is also additional background information on the website. The USACE's public notice process depends on how they proceed with NEPA. Should they become the NEPA lead, their notice would be combined with a Notice of Intent.

Ms. Barrigan-Parrilla asked what will happen in terms of having a lead agency for NEPA and what the NEPA process looks like with the President's executive order rolling back NEPA processes for water projects? Can the SEC be updated if there are any changes in the process?

Ms. Buckman said DWR doesn't anticipate the executive order to affect the NEPA process for this project. There is uncertainty with the NEPA process until we identify the federal agencies' roles, but if anything changes SEC members will be updated.

b. Delta-wide Soils Transportation and Balance

Mr. Bradner presented on RTM maintenance and soils material balance within the project. Between 6 and 15 million cubic yards (MCY) of RTM will be generated during tunnel boring operations, depending on differing tunnel diameters. Roughly 20 MCYs of soil fill will be needed at the project sites for various project features. The effects of hauling and logistical constrictions highlight the need to optimize onsite material uses to the extent that is practical and acceptable.

There are common RTM generation sites between the two alignments, including Twin Cities and the Southern Complex. The Central Alignment also has Bouldin Island as a



generation site and the Eastern Alignment has Lower Roberts. These are the locations where RTM will be generated throughout the project.

The tunnel depth is expected to be around 130 to 160 ft. below the ground. The material will include older soils consisting of sands, silts, and clays with the occasionally buried stream channels. Peats or organic materials are not anticipated to be encountered at the tunnel depth. This is not the material that will be excavated from the shafts.

Previous testing of RTM was performed about seven years ago that took soil samples collected from 19 borings along the expected tunnel alignment and depth, which at the time, was an alignment similar to the Central Alignment. The samples were blended with three typical soil conditioners and tested for material properties, strength, permeability, and toxicity. The conditioner application was purposefully higher than industry typical values to highlight the effects of the conditioners as they are mixed with the soil and determine if there were any changes to the soil properties.

Regarding the historical geotechnical laboratory testing, there are a couple different categories. Soil classification is the testing performed to determine material type. There are ASTM classifications for different soil types. Moisture content, Atterberg limits, and gradation and hydrometer help identify the gradation of the soil, the percentages of the different components, and what kind of soil is being dealt with. The constructability of the material is also assessed in terms of optimum moisture content and maximum dry density. Geotechnical performance is related to the shear strength of the soil, for example, when the material is used for an embankment construction.

Mr. Bradner presented a table summarizing the criteria of the geotechnical standards for embankment fills. The first column lists the characteristics, these are defined by laboratory testing. The second column is the USACE geotechnical levee practice and the third column is the CCR Title 23 which is the California Code of Regulations are the requirements for embankment fills that are specified by these two agencies. They govern what types of material meet specifications and requirements of embankment fill. This is what is used to take the laboratory testing that was performed and evaluate if the material is suitable for embankment construction. The right side of the table shows Samples without Conditioners and Samples with conditioners, i.e. RTM. The samples without conditioners are used as a base line to determine material properties and the characteristics of the soil extracted. The samples with conditioners look at the changes to determine if the resulting products still meet the specifications and requirements.

The first row of the table, Maximum particle size, says that according to regulations, material cannot exceed 2 inches in diameter. Based on this material, less than 1% qualifies as a gravel. A gravel material is anything between ¾ of an inch and 3 inches. The vast majority of this material is appropriate for embankment fill and anything oversized would be screened out.



The second row, % Fines is the amount of silt and clay found in the sample. USACE requires 20% of fine material and CCR Title 23 requires 30%. The base line condition has 67% to 69% fines and RTM has some variability with 45% to 71%.

The third and fourth rows, Plasticity Index (PI) and Liquid Limit (LL) are measures of soil plasticity. Both regulations are between 8 and 40 for PI, and the material met the requirements. Liquid Limit is less than or equal to 45 for both regulations. It's related to highly plastic materials and whether or not they have expansive properties. The samples without conditioners came in at 38 and the RTM came in between 40-46 which is workable and used often within the Central Valley. This can be addressed by zoning the use of the higher plasticity material or blending it with other soils to bring down the liquid limit.

The last row, Other Criteria, is mostly referring to trashes and similar materials that could be brought into a fill. This is not something the team is anticipating encountering at any of the tunnel depths being discussed. There are also additional criteria for saturated unit weight and organic content referenced by the Title 23 standards that would be met by all materials collected in the RTM.

Additional geotechnical testing was done regarding the strength and compressibility of that soil comparing the baseline material with the RTM material. There was a minor increase in compressibility and a slight decrease in shear strength for conditioned soils, but still workable and not considered problematic. Permeability reduced for the conditioned soils which appears to be related to some of the qualities of the conditioners that break down the clays and silts but is being flagged for further study.

The health, environmental, and ecology data was reviewed by several rounds of environmental specialists and toxicologists. In summary, hydrocarbons and pesticides were either not detected or detected at low levels. Metals and inorganics generally resemble naturally occurring levels in the Delta. Cadmium was detected above typical background, but below environmental screening levels for health or ecological impacts, so this will be paid close attention to as the project moves forward. The RTM Management approach included a holding period of up to four weeks for all of the RTM generated through the project. The material will come out of the ground and sit in quarantine while testing is done before it moves on to the next step. If the material is determined to be unusable, it will be disposed of and hauled offsite. If it is cleared, it will move forward to the drying process to be made suitable for reuse.

Soil moisture content will be the most difficult part of reusing material. Soil strength does vary with water content. The ideal water content is typically between 17 and 23% moisture. The RTM from tunnel operations may be between 30 and 45% water content, depending on the tunneling method, how much conditioner has been added, and how that conditioner is affecting water content. Moisture must be removed to use the RTM for structural fill.



Several drying methods have been evaluated to dry the RTM. For natural drying, after the quarantine process has cleared the soil for reuse, it would be spread in 18-inch lifts and require daily tilling and discing to mix the soil. Hot, dry weather conditions are needed to get the moisture to evaporate in a reasonable timeframe. As a result, a significant wet storage containment will be necessary. It would be a land intensive operation with a lot of equipment running.

The alternative system is mechanical drying, specifically heated drying. This would use thermal dryers to remove the moisture directly from the conveyors. It's a series of heated interlocking paddles that the wet material would be fed into and the moisture would be removed quickly as it moves through. The material comes out as small, dry granular material. This system would require more power at a greater capital cost, with up to 9 dryers per tunnel. It does allow year-round drying, so the process would not be dependent on the weather. Significantly less heavy equipment would be required. It could also be compatible with secondary natural drying method, so a small section could be used for natural drying while using the dryers as well.

The project team sees a great opportunity with RTM as there is a tremendous need for soil fill and the project will produce excess quantities of RTM. The project circumstances are unique to drive creative thinking about use of available resources. The challenge is associated with logistics and access. Based on testing done to date, the pre- and post-conditioned samples meet State and Federal embankment requirements. Additional testing for strength and permeability show RTM to be viable as embankment fill.

Further study is needed on potential dispersive effects of the conditioners; zoned embankments resolve the issue for the time being. An ongoing item of further study will be to continue to analyze and evaluate geotechnical and environmental properties of the RTM. The biggest issue is the moisture content as the material comes out wet, but processes for drying the material before use have been included.

Ms. Barrigan-Parrilla said one of the departments not listed on the presentation was CalEPA's Department of Toxic Substances Control (DTSC). Will standards that would be evaluated by a department like that for pollution and soil by CalEPA be used?

Mr. Bradner said yes, DTSC would be one of the considered agencies looking at screening levels and thresholds.

Ms. Barrigan-Parrilla mentioned that in WaterFix, one of the engineering reports stated there were levels of Chromium-6 found in the soils. That has not been mentioned in this presentation.

Mr. Bradner said there were values of Chromium-6 detected, as well as other metals but the key difference is whether or not they exceeded the various standard thresholds that they are evaluated against. [Editor's Note: The verbal response provided by Mr. Bradner



during the meeting was incorrect; Chromium VI was not detected in previous samples analyzed, but rather the laboratory detection limit was above the screening level for the constituent. For the correct information, please refer to question 9.05 on the Question Tracking Master Log.] There are federal and state standards, specifically DTSC. They key question is if they were detected at levels above background levels or levels exceeding threshold values.

Ms. Barrigan-Parrilla asked if there is a list of ingredients for the conditioners? Has work been done with any groups like the California Native Plant Society? Everything could be done legally and correctly, but there could be room for harm because the SEC is not aware if conditions are changed further. What will soil conditions be for native plants? Want to ensure that conditions won't cause anyone to get sick.

Mr. Bradner said this question should be answered by a toxicologist. This will require someone with that background to answer effectively.

Mr. Moran asked in regard to the 15 million cubic yards, what accounts for the large difference? Is it evaporation? Is it differences between the two alignments? How confident are you that the cores being used for reference would apply to the actual alignment?

Mr. Bradner said the variation is based on tunnel diameter. There is a range of potential tunnel diameters associated with the range of potential flows. There are differences in tunnel lengths depending on Central and Eastern. The smallest generated quantity would be the smallest diameter tunnel along the Central Alignment.

Mr. Moran said in regard to drying, evaporation is a large percentage of water. What impact does that have on the total resulting RTM? From what comes out of the ground to what is actually reusable later, is there a dramatic difference?

Mr. Bradner said built into the soil balance are the factors associated with bringing that material to the surface, as it will bulk and expand. As the moisture is taken out, it will reduce and shrink. Then it will be taken to a compacted fill where it will shrink again.

Mr. Wallace said it looks like there could be a short fall of material somewhere between 5 and 14 million cubic yards. Where could that come from? Are these new borrow pits or existing? If it's not coming out of the Delta, maybe Eastern San Joaquin County or down by Mount Diablo. Curious as to where borrow material is coming from and if enough has been identified as available.

Mr. Bradner said there is some borrow material that has to be imported because it cannot be derived on site. This could be AB road base, rip rap or large diameter rock used for sion protection around the Forebay. There are a variety of materials for different uses. Some are planned to import from around the area, not within the Delta. In other instances, intend to borrow locally, but keeping it within the project like Twin Cities. . The native



material excavated there would provide good reusable fill for either that location or others within the project. Another example is Lower Roberts Island. The Southern Forebay has a lot of material that can be excavated on site through the foundation excavations on that embankment. There are a couple million yards of material at the South Delta Conveyance Facilities.

Mr. Wallace said the presentation says that metals and organics generally resemble naturally occurring levels. Arsenic is very high naturally occurring in the Delta and it is a water quality issue. Although they might be naturally occurring, doesn't mean they meet environmental standards or environmental minimums for soil contamination.

Mr. Bradner said it will take more attention. Arsenic is a problem throughout the Central Valley, as well. It is naturally occurring in the rivers and we do deal with it. What the testing currently shows can be shared and what has been done on similar projects. It will take more analysis to ensure all requirements are met.

Mr. Hsia said at the beginning of SEC meetings in November, there were a lot of questions regarding the usability of RTM. After listening to this presentation, it seems this is no longer an issue. Is this correct?

Mr. Bradner confirmed that is correct. After much study, it appears to meet the geotechnical requirements. The biggest challenge will be getting the moisture out of it. That will take some energy, but it appears to be worth it. The alternative of hauling and importing all of this material in to then dispose of the material elsewhere would have a tremendous effect and environmental impact.

Ms. Mallon added that the hope is that any excess RTM will be made available for the reclamation districts.

Ms. Mann said this is not very good for the environment. Regarding EPA, this seems a lot like mining. The photos on the presentation show a lot of equipment. Where is the energy coming from to transport the RTM? Concerned about the EPA requirements. PG&E has been having a lot of trouble.

Mr. Bradner said it would generally be electrical power. Electrical connections and power would be brought in. At the tunnel launch sites, the TBMs are also electrical. There are other power providers besides PG&E.

Ms. Mann asked if the cost of electric come out of taxpayer money? Who will pay for the cost of electrical use? Why won't generators be used?

Mr. Bradner said it's part of the project so it would be part of project costs. Some of the sites will use backup generators. However, the RTM processing systems, including the conveyors and heaters would be dedicated electrical.



Ms. Mallon added that it is work beyond what a generator could do on site.

Ms. Mann asked if the power companies are aware of this anticipated draw of electricity at the proposed sites? It's shocking considering the hydro-electrical troubles in California.

Mr. Bradner informed that coordination is happening with the power companies.

Mr. Cosio said that this is a big construction project so the power lines, sub stations, etc. are not surprising. It doesn't look like there will be material left over for levees which isn't a bad thing after seeing what the material is made from. A lot of money will be spent getting the water out of the material, then at some point, the water will have to be put back in to compact it. The work it will take to keep the moisture at allowable limits will be tough. A couple of rainstorms could shut down the operations for a while. What are the conditioners made from? What do they do physically or chemically to material? At which process will it be put in?

Mr. Bradner said that the conditioners are introduced at the tunneling operation. This helps moisture stay within the material so it's workable and helps to break it down so that it doesn't clog the operation. It's really just to facilitate the tunneling operation. Once it gets up to service the moisture has to be removed from the material. Depending on timing of when material becomes available, there will be some leftover.

Ms. Giacoma said she is concerned about the toxic metals. Chromium-6 and arsenic will become airborne when they're dried, blowing around the area. The levels of the boring samples were found to be hazardous. Methyl mercury, a threat to rivers in the Delta, was not mentioned in the presentation. These all exceed levels that are hazardous to human health, as well as fish and the rest of nature. It's important to address that. What are the ingredients in the conditioners? What are the hazardous levels of Chromium-6, arsenic, and methyl mercury?

Mr. Bradner said tunnel conditioners are surfactants with properties to break down the tunneling material and separate the bonds. The chemical makeup will depend on the contractors as they all use different blends. The testing that was done took three commonly used conditioners and incorporated them into the soils, then tested them for their effects on the material. More of this testing will happen as time goes on. If present, naturally occurring metals will have to be contended with. Testing done thus far appears to be good. It's one thing for it to be detected and another thing for it to be exceeding health standards. There are a variety of thresholds and they're being used to compare the results. Testing has been done to date and consistent with other water projects in the valley.

Ms. Swenson said the presentation didn't have any exploration on the Eastern alignment. Will that be done? If the conditioners will be put down in the tunnel boring holes, how will ground water be protected? There are proprietary chemicals being put into the ground



with very interconnected systems. Although Chromium-6, arsenic, and methyl mercury are being used at approved levels, cumulatively how will they affect the community? How loud are the dryers? How often will they run? What will the operations be? How much productive farmland will be put out of production to dry tunnel muck?

Ms. Mallon said these items will be put in an agenda for a future meeting.

Mr. Gloski said the water vapor will likely cause a cloud of condensation so it would be good to have a discussion about this so that local people will understand.

Ms. Mallon said the team is considering shrinking the sites and footprints that are required from the land drying and tilling instead of condensing the site with the dryers.

Mr. Robertson said the presentation mentioned spreading the material out to dry on land. How tall will the lifts be? Do you anticipate the dryers to run at night?

Mr. Bradner said to spread the material out, the calculation was 18-inch lifts to dry it quickly. The area is hundreds of acres. The team is working to shrink the footprint which is why the focus is on mechanical dyers. The dryers are quiet compared to other equipment running often. The dryers would be working 20 hours a day.

Ms. Mallon said they will be running with the RTM. Two 9-hour shifts during the day, no RTM production on Saturday, only maintenance, and no work on Sunday.

Ms. Barrigan-Parrilla asked what is the plan for containment of blowing dust during the natural drying process? She is confused about where peat soils are at the surface. Levels of peat soil will be hit when excavating 150 feet. There is documented history of peat soil causing lung disease in the Delta, particulate number 2.5-10. This is a concern because funding for monitoring of this issue is being cut for COVID-19 budget. By the time the project starts, there could be a different type of budget for monitoring air quality. There would be particulate matter issues whether or not there is peat soil.

Mr. Bradner said the peat is not down at the tunnel excavation depth. The shafts that would provide access to the tunnel would be excavated through the peat. That material is not what's currently being discussed and that will be managed separately. The peat will be contained, compartmentalized, and managed as its own issue. The RTM is what is being discussed to be processed because of the moisture of the material. Dust control would have to be part just like any other construction operation. Water application is used for dust control. For a period of time, the material will be saturated so it won't generate dust but as it dries there would be a process of introducing moisture back in to maintain dust control.

Mr. Hsia asked how many embankments will be built with the RTM?



Ms. Mallon said this is part of the next slides in the presentation.

Dr. Lytle said the analysis done in the 2014 report by DWR showed a list of 16 heavy metals in this material. It's anticipated that that could change if the Eastern alignment is selected. Can the ingredients of the soil conditioners be listed so can the DCA find this out for the committee? At least what was in the 2014 report because one conditioner from EASF called MasterRoc ACP 127's composition on MSDS sheet has glucopyranose and glycosides which are sugar compounds. Because they are sugar compounds, 2,4,6-Trichlorophenol is put in which is a fungicide material and could be anticipated to be in the tunnel muck when it's brought to the surface. The materials in that report should be provided to the SEC.

Ms. Mallon said that will be put in the Q&A. We do have some MSDS sheets. Although it is unknown which conditioner will be used ultimately as it's up to contractors, the team will give as much information as possible.

Mr. Bradner continued his presentation with materials balance along both corridors and began with the Eastern alignment. It is an overview identifying all of the various fill material needs within the project and also identifying which materials are flagged for import. Imported quantities would be hauled in.

Mr. Bradner explained that in presenting each of the sites, the site name and an aerial view of the site with a simplified construction footprint will be displayed on the left of the screen with a summary table at the bottom of the screen. The summary table will include logistics details and the Truck Hauling Schedule will show imported sources identified in color.

Starting with Intake 3 at the north end, there is a need for about 1.8 million CCY and all of this material, minus the fine grain core material for the embankment, will be derived at the site. Importing the fine-grained core material would result in about 10 trucks per day over a period of five quarters.

Intake 5 is a similar approach with mostly all material being derived on-site with the exception of fine grain core for levee embankment.

The Twin Cities Complex is a large site that also includes a shaft. This site will first be used as a borrow site to generate the materials needed at this site and other locations within the project. Some excess material from other sites will be brought back to Twin Cities to be reused elsewhere.

The next location is the New Hope Maintenance Shaft that needs 69,000 CCY with most of the material being imported as borrow from Twin Cities and the excess material returning to Twin Cities for reuse.



Canal Ranch Maintenance Shaft needs 107,000 CCY, Terminous Reception Shaft needs 236,000 CCY, and King Maintenance Shaft needs 147,000 mostly imported from Twin Cities.

Lower Roberts Launch Shaft has some levee repairs on the west side of the island to increase their standards and all of the material needed for the work will be produced onsite. No imports will be needed to this site. Lower Roberts would supply material to Upper Jones Maintenance Shaft.

Southern Complex Launch Shafts needs about 404,000 CCY that would all be derived locally.

The Southern Forebay needs a significant amount of material at about 8.5 million CCY, however the trucking hauling schedule shows that the only material that would need to be hauled in is the specialty embankment material. This is the sand, rock, and other material needed to complete the construction of the reservoir. Some excess material from the Upper Jones Shaft would be imported for reuse. 980,000 CCY of material would be brought in from Twin Cities on rail to complete the reservoir. The vast majority of the material for the site will be derived on-site through excavation and RTM.

The South Delta Conveyance Facility is a self-balancing site that will have a lot of excess to send to the Southern Forebay. There will be dedicated routes by Byron Highway for moving material so there will be no truck traffic.

Logistics would be mostly some road repairs with 496,000 CCY of material needed to be spread to 14 sites. The truck trips are the total truck trips that would be feeding all of those sites.

There are some sites that are shared with the Central Alignment. The first that is not shared is the New Hope Maintenance Shaft, it needs about 66,000 CCY with the majority coming from Twin Cities and the excess returning to Twin Cities. Staten Maintenance Shaft needs 156,000 CCY also coming as borrow from Twin Cities and excess being returned.

The Bouldin Launch Shaft is similar to Lower Roberts. The center is the launch shaft and RTM area. The dashed lines are all the haul routes to get around the site. There are some sot repairs to get the levees up to standard. 505,000 CCY of material is needed for the shaft pad and another 225,000 CCY is needed for the levee repairs.

Mandeville and Bacon are all import material from Twin Cities.

The Southern Forebay on the Central Alignment doesn't change in need of material but there is a difference in the balance as the need is being made up with RTM. The length of the tunnel drives change between the two corridors. Truck trips and import remain the same. The surplus material will come from Mandeville instead of Upper Jones.



The Central Alignment does require more logistics as the quantity needed is about 842,000 CCY for 15 sites across the project.

Ms. Barrigan-Parrilla said the charts on truck traffic loads are just for the RTM. When will all the sources of truck traffic together be discussed?

Ms. Mallon said that at the last meeting, all the different types of trucks were discussed and all the histograms were shown. This is just for hauling of the RTM or borrow material.

Mr. Bradner said rail will be another way to move the material, but this is just truck trips.

Mr. Wallace said the Twin Cities complex is about 640 acres and it has been identified as a borrow pit. If borrow material wasn't needed, would Twin Cities still be used as a borrow area? Is it specifically identified as a borrow area? If it's identified as a borrow area, does it become subject to SMARA? To what depth are you excavating?

Mr. Bradner said this site is a reduced footprint, closer to about 450 acres total. It was closer to 650 acres in the past, but the team is working to shrink the footprint and the current outline reflects that. The site would be selected based on its logistical advantages, borrow being used or not. Appears to be good useable material according to available data. More geotechnical investigations will be done in the future. Borrow depth could go broader and more shallow or smaller and deeper, looking to optimize space as best as possible. Depends on site constraints and how the facility lays out. The current assumption is to borrow down at about 10 feet. The land would then be restored using RTM material. Post construction treatments is on next month's agenda.

Ms. Giacoma asked what is SMARA?

Mr. Wallace informed that it is the Surface Mining and Reclamation Act. It is a California requirement. In this case it would be administered by Sacramento County.

Ms. Giacoma asked do the levee improvements on Bouldin Island take sea level rise into account?

Mr. Bradner said projections of sea level rise depend on construction phase and timing. The DCA is evaluating them against their commonly used design criteria which is 100-year return period event. Sea level rise hasn't been included in the analysis water surface elevation for evaluation of existing levees, but it was considered. As the project develops over time, it will be something to coordinate with the reclamation districts because it would be inappropriate to assume they haven't continued to maintain and strengthen their levees.



Ms. Swenson said air quality should be a topic of discussion in the future. What will be done with all the water that comes out of these sites? Will the existing sloughs be used? Who owns the land at Twin Cities? Does DWR own it? If it's privately owned, what is the plan to obtain it?

Ms. Mallon said these topics will be added to future meeting as they're not pertinent to this particular presentation. The questions will be reflected in the Q&A packet.

Dr. Lytle said the location on Twin Cities Road is historically rich in montmorillonite clays. This should be investigated more closely as a preferred site. Those clays extend well into the depths being estimated. At this point, it seems arbitrary to assume the RTM material can be used because of a lack of geotechnical work done on the Eastern alignment. When the analysis is being done, it would be assumed that the calculations would be based on the use of RTM and without the use of RTM, otherwise it's unreliable numbers and estimates. If additional material is being sought after, the South Delta agencies are proposing a large river dredging project to take river spoils from various sections of the San Joaquin to Old River or Middle River because of high sediment. In the future, there may be a supply of dredge materials.

Mr. Bradner said the team will have to evaluate the site conditions and compare them to specifications in the earlier presentation.

Ms. Mallon added if the team was not certain that this material could be used for the embankments then it would not be proposed. The DCA is confident of its use. Validation of that will be done in the upcoming field work. The team is comfortable with the work that has been done and the data collected. There are other drive sites that could be switched to if need be.

Mr. Bradner said the team is very familiar with the general characteristics and properties of those formations. They will yield material very similar to what was tested. Several investigations have been conducted with a range of projects. The consistency found in the Modesto and Riverbank Formations allow for the expectation of useable material.

Ms. Liebig said she is concerned regarding viability of RTM. Regarding Twin Cities, even with a shrunken footprint, a lot of land is still being taken out of production, even if it's not within the highlighted yellow area. The parcels being cut in half will be unfarmable because of water impacts and land disturbances. Although it may not fall into the actual footprint, doesn't mean the land around it will be left in the same capacity. These concerns are with all of the construction sites throughout the project, whether it's on the Central or Eastern alignment. There are many more impacts to farmland than just eminent domain and other areas of the footprint.

Ms. Martinez said that is a good CEQA comment in terms of extended impacts. This will be logged and included in the discussion moving forward.



c. Update on DCA Follow-Up Studies in Response to SEC Comments

Mr. Ryan presented an update on siting changes. The first change is to shift the Glanville Shaft onto the Twin Cities site. The original plan was to have the Glanville shaft located on Dierssen Rd. approximately a mile away from the Twin Cities site. The conveyor system across I-5 required to divert RTM from the launch shaft to the Twin Cities site for processing and off-site transport. There would be heavy truck traffic from Twin Cities to Glanville to deliver tunnel liner segments. The updated plan is to shift the Glanville Shaft ono the Twin Cities site which would increase the total tunneling length by approximately half a mile. There are some benefits to doing this, for example, it eliminates the construction activities associated with the shaft, conveyor, and truck traffic within the Stone Lakes Refuge boundary to reduce the overall impacts. It eliminates the need for a new I-5 bridge and is more efficient with construction logistics with all tunneling operations on a single site. The impact boundaries have been changed on the site due to managing the forebay and the shaft has been moved onto that site.

The second change is a Final Logistics Plan for the intakes. The original plan as discussed at past meetings was to split construction and worker traffic between Hood-Franklin Rd. and Lambert Rd. to get to the intake sites. It would improve the I-5 interchange at Hood-Franklin Rd. with a new interchange at Lambert Rd. and expand both roads to 12-ft lanes with 6-ft to 8-ft shoulders. The updated plan is to utilize Hood Franklin Rd. for only worker buses and light trucks/vehicles to keep traffic very light. There is a Park-and-Ride for workers to use there. Some big trucks would utilize the Twin Cities exit, Franklin Blvd. and Lambert Rd. to access haul roads to intake sites. Only ready-mix trucks would come into the site as needed. A section of Franklin would be relocated, and Lambert Rd. would be expanded to 12-ft wide lanes with 6-ft shoulders. The benefits with this change are that it minimizes construction within the Stone Lakes Refuge boundary and eliminates the expansion of Hood Franklin Rd, which would help with traffic. It also eliminates the new interchange that was going to be put on I-5 at Lambert Rd. and utilizes a route with less existing traffic (Lambert Rd.)

The third change is to eliminate the barge landing on Bouldin Island. The original plan was to have a barge landing located on Potato Slough for transport of tunnel liner segments to the Bouldin Island Launch shaft by barge. The updated plan eliminates the barge landing, so tunnel liners would be trucked in. It also widens Hwy 12 from a 2-lane to a 4-lane from the I-5 Interchange to the Bouldin Island construction exit, including the expansion of Potato Slough Bridge. The benefits of this change include congestion for widening Hwy 12, as the expansion to a 4-lane brings it to a good Level of Service. It provides a permanent infrastructure asset for the region and avoids river traffic affecting "The Bedrooms."

The fourth change is to shift the Brack Tract Maintenance Shaft north to the Canal Ranch Tract. The original plan was to have the Brack Tract shaft located about half a mile radius of the South and North Units of the Woodbridge Ecological Reserve. The updated plan is to move the shaft about a mile north of the northern boundary of Woodbridge Reserve, for



the terrestrial species between the two sites. The benefits are that the shaft will be further away from the Reserve and truck traffic will be shifted further from the influence area of the Reserve. There will also be easier access to the site from I-5 along W Peltier Rd.

The fifth change is to eliminate the barge landing at Lower Roberts. The original plan was for the Lower Roberts launch shaft site to include rail spur and barge landing on the San Joaquin River for transport of tunnel liners. The updated plan is to eliminate the barge landing and the associated haul roads and to transport the tunnel liners to the site via a proposed rail spur connection. The benefits include eliminating the aquatic and terrestrial effects of barge construction along the San Joaquin River and reduced construction impact area on the island. A more detailed map will be shared in the future.

Changes six through eight are all interconnected. The sixth change is to shift the Southern Complex launch shaft north. The original plan was for the Southern Complex to include two launch shafts adjacent to each other to isolate tunnel construction from the pump station construction and start-up activities. This was going to have the contractor tunneling for several years. The updated plan is to shift the second Southern Complex launch shaft approximately a mile north to be able to eliminate the Byron Tract Shaft on the Central Alignment and the Victoria Island Shaft on the Eastern Alignment. This will reduce construction traffic on Hwy 4 and eliminate construction truck traffic on the Victoria Island bridges.

The seventh change is to eliminate the Byron Tract Shaft on the Central Alignment. The slight shifts made along the alignment between shafts still remains in that 4-mile to 6-mile reach between maintenance shafts. The extra distance is what allowed for the removal of a shaft. There is no need to cross Hwy 4 into Victoria Island across the bridge on the Central Alignment. The tunnel is not too far away from Discovery Bay.

The eighth change is to eliminate the Victoria Island shaft on the Eastern Alignment. This is a significant change as it eliminates all the previous work that was going to need to take place between the Old and Middle River bridges. No heavy construction traffic will be necessary on that part of Hwy 4 anymore.

Ms. Mallon clarified that although the bridge is eliminated on the Eastern Alignment, it will still need to be used to access Bacon on the Central Alignment.

Mr. Robertson said the maps are still missing some aids to navigation on the waterways. Boaters are going to come up on construction and a lot will look different to them. Even with electronic charting and mapping, it's different. He requested that those aids to navigation be properly plotted on the land maps by comparison on the water areas. Also, some coordination will be needed with the Coast Guard, with notice to mariners. They are very good about putting out notices when there are going to be changes in the river, such as when bridges aren't running, ferries aren't running, etc. The proposed project will be going on for a long period of time and this information is needed.



Mr. Wallace said it appears that this will be the first time that tunnels will go under I-5 if the Twin Cities Glanville Shaft is moved to the east. Where is the tunnel going to cross under I-5? What is the height of the crane going to be at that location? Now Caltrans and federal highways will probably have to be included.

Mr. Ryan said the tunnel comes in north of Dierssen Rd. and crosses I-5 then swings down and heads back in a straight line. Curves right before the shaft and will come out of the launch shaft. When the process of replotting is taking place, drawings will be provided.

Ms. Mallon said next month's presentation includes the final yellow and red boundaries with the final alignment dotted in. There are two I-5 crossings now which is predicted to be easier than getting the conveyor crossing over I-5. Participated in a call with the Director of Caltrans this week.

Mr. Ryan said Caltrans and federal highways would have to be engaged with regardless. The team is engaged with Caltrans. Unclear how high shaft will be during construction. The finished shaft will be at elevation 31. The crane would be about another 20 feet above that but will get an answer from the tunnel team.

Mr. Moran asked will moving the Glanville Shaft over to Twin Cities depot extend the footprint, or will it remain the same?

Mr. Ryan said the footprint has been reduced due to other issues. If shaft wasn't there, it would be able to be reduced further but it's more important to reduce on the west side in the reserve boundary and the footprint associated with the bridge and conveyor on Pearson Rd. It has consolidated the project functions into one spot.

Ms. Barrigan-Parrilla said to expand on impacts to the Cosumnes Preserve, the farmland around the Preserve is a place for feeding and roosting for Greater Sandhill Cranes. It's a concern if this is getting bigger near the Preserve.

d. SEC Questions or Comments on May 27th Presentation

Ms. Swenson said folks across from the intake are interested to see the potential impacts of traffic and noise on their side of the river, so will impacts of raising levees be addressed? When can that be expected? To confirm, there will be no construction impacts on the Clarksburg side? Will noise impacts on that side of the river also be studied?

Ms. Mallon said this is a CEQA question. Traffic near Clarksburg is not anticipated. Access to these sites will come off of I-5.

Mr. Ryan said there is no plan to work on the Clarksburg side of the river. The flood impacts analysis has been done to date and that will be enhanced to better modeling. There are insignificant impacts the intakes are making to the flood levels of the river so there is no



need for levee work upstream of the river. There is no reason for construction traffic to go to other side. Perhaps there would be unexpected traffic for emergency access.

Ms. Mallon said there will be no construction traffic allowed in Yolo County to the site. It will come from I-5. Next meeting will be to discuss work done at the intake locations.

Mr. Ryan said noise impacts are part of the environmental analysis.

Ms. Barrigan-Parrilla said she is confused about the sourcing of truck materials. If there are x amount of trucks and there are all these different projects, trying to figure out the total number comprehensively for the communities where we are pursuing the correct funding and measures for mitigation on this end of the Delta. Even if a range could be given, that would be helpful.

Ms. Mallon said it would be helpful to look at Mr. Hubbard's presentation from the last meeting. He presented a model of where traffic is coming from and how it's loading the highways. That question will be recorded and then Don could help with a model run for a specific location. The team cannot yet share how much will be coming out of the Port since nothing has been purchased. Certain deliveries for certain sites will need to get to Hwy-4 or Byron Highway. A conference call with Mr. Hubbard could be helpful to walk through the model at different points in time.

Mr. Wirth said it's a great idea moving to the other side of I-5 because for years there has been an effort trying to connect Stone Lakes crane population, with the cranes at the Preserve and points further south. Not having the shaft there would help to do that but the new position of the shaft is a problem.

e. Public Comment on Item 5

Ms. Des Jardin commented that sea level rise is expected to be median 1 foot by 2050 with the high projection being up to 2 feet. It's shocking to hear that where levy improvements are being done, this isn't being taken into consideration. No analysis has been shown on the performance of the tunnel shaft mound of shaft on Bouldin Island. If levees are overtopped, it's an average of 17 feet below sea level. There would be quite a bit of wave wash on that mound over time. Riprap would be needed on the outside and those kinds of consideration are not shown in the design for the Central Corridor. The project can see delays so it should be done with sea level rise considered. There is no state funding for providing upgrades to the levees for sea level rise. Property owners will be responsible for their levee maintenance and improvements. The design should take care of flooding due to sea level rise.

Ms. Meserve expressed concern about Mr. Nelson advising folks not to communicate. It's troubling that this body is subject to the Brown Act, yet not empowered to make decisions or make formal advisory recommendations because nothing is voted on. Continuing during the pandemic wasn't even voted on. It seems that limiting communication between the



members is not being done for an adequate reason. It's great that this process is open and may allow members of the public to be a part of it but the members not being allowed to have their own communication when they have nothing to vote on doesn't make sense. Public comments should not have to be submitted at the start of the meeting. It's a big commitment to sit through a three-hour meeting to wait to comment at the very end. A cut-off so early in the meeting is restrictive and makes it difficult for the public to weigh in.

Ms. Mallon asked for a specific recommendation to improve the process.

Ms. Meserve suggested allowing for public comment further into the meeting, as has been done in the past at in-person meetings.

Ms. Palmer reminded that comments can be sent in via email and they will be considered.

Ms. Moreno expressed concern about the new hauling road areas going through the back of Hood. This is something the community just recently learned about. Homes and property will have to be removed. The SMUD facility that is the main access to electricity for the entire town might be removed and if it is, what accommodations will be made for this? It's concerning that Hood has been disregarded in this process and doesn't have much information. There are intakes on either side of Hood. It's a community of low income, elderly, and marginalized people. It's been said that all that will be there is a park-and-ride for workers, but how many workers are there? How many trucks and cars will go through?

Ms. Martinez clarified that DWR is going through the CEQA process.

Ms. Buckman said the project is still in the beginning phases of the CEQA process and EIR. The NOP was released in January with about three months of scoping. The work now is to compile and publish those scoping comments. From there, the Draft EIR will be worked on and analysis of the types of impacts mentioned will be included.

6. FUTURE AGENDA ITEMS

a. SEC Tour Updates

Ms. Parvizi said the virtual tour will be finished in about two weeks. The DCA is implementing new sites on the tour based on conversations had in the previous meeting. They're making these virtual tours as a template so that as conversations are had, sites can be added, removed, or updated easily. This might mean for the tours to be offline while they make these changes. The SEC member requested tour of the **T**-screen factory, so they were emailed about the date of July 16th for a possible tour in the morning. The interested members can email her to let her know they're interested. If many members want to participate, she can figure out a second date for a tour so that they don't run into Brown Act issues. She will send out protocols because this is an in-person, outdoor tour. The T-screen manufactures are going to stop production during the tour to make sure visitors are safe.



b. July 22nd SEC Meeting Topics

Ms. Mallon mentioned that Ms. Buckman wanted to do an update on the scoping process since the DWR is hoping to have a draft report in July. Ms. Buckman wanted to do a report of the results of the draft report. The DCA wants to talk about the work that has been done on how to rehabilitate the construction impacted land to return it back to original land use designations. To show the final, temporary, and permanent boundaries for sites from the map book with yellow boundaries. The DCA has gone through all of the sites and are trying to limit the space of land needed since there has been concern from the members regarding this. Mr. Bradner showed how much material that has to be hauled in between sites to build the pads. They will come back with final calculations for the amount of soil needed. Mr. Ryan and his team have spent a lot of time trying to reduce the footprint and the noise impacts around the pile driving near the river. The DCA hopes to have an updated map book to the members prior to the next meeting which will have both the red and yellow line boundaries and the updated locations that were in this presentation today. A new map book will be produced because of the shifting and re-sizing of sites.

Ms. Swenson asked if the members would drive themselves to the locations rather than driving together.

Ms. Parvizi responded that you could drive yourself to the location to do the self-guided tour or do the virtual tour option. For the T-screen tour everyone is responsible for getting themselves to the factory if they want to join.

Mr. Gloski asked for a report back from the members who are communicating with the DCA board and what was presented. What are the members taking away from the from the committee meetings? He wants the opinions of the members on this meeting and if they felt like they were listened to or if they got any take-aways.

Ms. Parvizi said she could send a video out to everyone of the meeting since the responses were so long and she doesn't want to take time away from these SEC meetings. Ms. Runquist noted she drafts minutes a few weeks after the meeting so once she finalizes them, she can send them to whoever wants them. It says what each speaker said.

Ms. Parvizi asked if Mr. Gloski wants more of the opinions of the SEC members on the board meeting.

Mr. Gloski said that is important and wants to know if the speakers felt like they were listened to and if anything was taken away from them.

Mr. Nelson said that the board has flexibility with the next report and is willing to talk to Chair Palmer about what did and what didn't work well with past participants.

Ms. Palmer suggested that during item 6c, they can talk about what worked for the past participants. Would participants want to provide their own written report and a follow up of what they wanted to say so that their true views would be represented?



Ms. Keegan announced that a webinar starting tomorrow at 11, is happening for two weeks on the topic of history of the tribes in the Delta and communities of color and their relationship with the Delta. A lot of the research is primary sources that haven't been told before, you can find information on Twitter and their website, where videos will be put up. This might help clarify what drives some of their primary concerns.

Ms. Parvizi commented that she thinks this is important and is looking forward to it tomorrow.

Ms. Mallon said David should have some SEC members comment on what they thought and gathered from the last meeting. They could comment on the effectiveness of their participation from the last meeting was.

c. July 18th SEC Report to DCA Board

Ms. Palmer noted that in item 6c, they are going to identify members who are going to representatives to the DCA board and hear from past presenters and get their notes on what they thought did and did not go well last time.

Ms. Martinez said the DCA is going to have a report out on members who spoke and have them speak to the process and how it can be improved, if they feel heard and if they have comments from the last meeting. Anna, Sean, and Gil are going to report.

Mr. Cosio said he introduced himself, brought up history concerns with regard to COVID in the process. Brought up different examples of environmental impacts. The hall roads in the northern part of Stone Lakes and moving the shaft. Can't tell if people were listening due to the video format but there weren't a lot of questions. It wasn't a waste of time, however.

Ms. Swenson talked a lot about the community and the aspects that will be forever lost due to this project, no matter how well it is planned. The relationship with the farmers and the land is unique and highlighted all the things they're going to lose that will be detrimental to the community. After their presentation, they did a presentation on consultants on intakes from people all outside the Delta. Tried to gage body language but it's hard to do. She didn't feel heard because if they felt the way she and the community felt about this project they couldn't go through with it. However, she didn't feel it was a waste of time because good will eventually overcome bad. It's my duty to tell the truth about what will be lost in these communities. I want to know why they didn't do the roundtable because she found it beneficial.

Ms. Martinez said that's item 7.

Mr. Cosio wanted the DCA to hear Ms. Swenson and Mr. Wirth because of their passion because the committee is filled with passion and diversity throughout the Delta. The people he represents have been through this for a lot of years and they don't need a lot of information, but they want to know what the impacts are. The ability to explain that is interesting because it's not known what is done in the Delta. Anytime you get up and explain what you do to the DCA is helpful.



Ms. Palmer noted that she listened to the board members speak and noted that if people go over the time limit due to passion, she doesn't mind. I don't think the board members minded this. Listening to what is going on, like Mr. Wirth providing real changes, was excellent. Hearing Ms. Mallon give some of the reduction of impacts due to the changes is nice to hear. These changes come from the SEC members which is crucial to this process. The SEC members are definitely listened to and extra time due to passion isn't a bother.

Ms. Keegan thinks that all presenters were accurate of what she heard at the meeting. A lot of the presentations had to do with global concepts, history, and values. I had expected that more feedback on presentations would be given, like if traffic analysis was useful or if providing input on this process is useful to the project. There may be a need to express these big picture concepts in a way that's value driven.

Ms. Martinez noted that there really wasn't a time limit during the last meeting and that people needed to express themselves. There needs to be 2 or 3 volunteers for the next meeting. Mr. Gloski volunteered for the next meeting. If anyone else wants to present at the next board meeting, chat with Nazli to gather thoughts and visuals. The DCA doesn't out together presentations so that they don't filter what is being presented.

Ms. Palmer noted that Mr. Wirth used some slides given from the DCA.

Ms. Mallon said a public comment noted that Hood is being affected and it's true that a lot of construction is near Hood. Wondered if Ms. Whaley, who is in and familiar with Hood is available for the July board meeting.

Ms. Whaley said she would check her schedule and get back to them.

There was no public comment on item 6.

7. NON-AGENDIZED SEC QUESTIONS OR COMMENTS

Ms. Barrigan-Parrilla opened item 7 to the members.

Mr. Hsia shared that he compiled 2 reports since the lockdown and the link is posted on the Delta news and the Facebook pages of the Delta News and Water Grove. He recommended for people to go and look at them.

Ms. Parvizi said she can get the link from Douglas and send it to everyone.

Ms. Swenson said she's gotten a lot of public comment from members of Hood. There is a large amount of people who aren't fully informed about this project and need individualized information due to the deep impact happening there. Is there some way to hold a forum or something that would be helpful to disperse this information to them? COVID has limited her in-person abilities to inform them. Since they are getting affected so much, they have a right to know in order to prepare.



Ms. Parvizi asked if the DCA could work with Angelica and Anna to gather folks from Hood since Angelica works with small businesses and is a resident of Hood.

Ms. Swenson noted that she isn't a resident of Hood and she has left the meeting.

Ms. Parvizi would be happy to work with residents and Angelica and wants to create an update on effects on Hood to open discussion and do it in a webinar format.

Ms. Swenson said it would be humane to do that.

Mr. Hsia would like to also work with them.

Ms. Parvizi said she would love to work with anyone who is interested.

Ms. Mallon said that an open call and presentation would be great so that anyone from Hood can join.

Ms. Swenson noted they may need to setup a hotspot because Hood is an internet blackhole, which is why Hood residents aren't engaging in this conversation.

Mr. Robertson noted that infrastructure of bridges and ferries cannot handle all of the new traffic that is going to happen. Big construction and repair is happening but most of the infrastructure are one lane roads and I don't think people are questioning the fact that we need to look at those things. Every time I present, the number one discussion topics are the bridges and ferries and how people are going to get from point A to B.

Ms. Tabaya said that there was a tribal engagement meeting yesterday and they remained concerned about destruction of cultural and natural resources. The DCA are aware the tribes are paying a higher price and had a lot of questions for the DWR and are still waiting for responses. They had a meeting with the DWR and reconnected, there was discussion on what they want to do, like having the DWR report directly to the tribal group and the DCA. We were hoping that they could meet the Thursday before the SEC meeting. The reason for that is because the materials are hard to obtain. It's hard to understand engineering items and DCA would explain better. A lot of the materials I'm going to end up hand carrying to the tribes, we can see the ones who need extra help. Trying to determine where people are at having visitors in their areas. I stand behind the conversation regarding Hood because the intakes are on tribal boundaries. Their next meeting is on July 15th at 10 a.m.

Ms. Parvizi said that is the board meeting date so they will try to be flexible and find a date but the DCA will continue to try to coordinate with Melissa to get her the materials.

Ms. Martinez asked for more of the new map books to be printed and delivered to the tribes.

Ms. Parvizi said she would work on that.

8. PUBLIC COMMENT ON NON-AGENDIZED ITEMS



No public comment.

9. NEXT MEETING

Ms. Keegan said the next meeting will be on July 22nd, 2020 from 3-6 PM. The topics include a scoping update on the DWR, the rehabilitation of construction impacted land, final temporary and permanent boundaries, and intakes updates. At that point we will have heard from the next group at the DCA board so if you're giving a presentation you will be giving your thoughts on how that went.

Ms. Giacoma asked if she could get a hard copy of the meeting materials as you did in the past.

Ms. Parvizi said she would do that and asked that if anyone else wants this to please email her.

Ms. Swenson asked how many more meetings are expected and if there is an end date that has been chosen.

Ms. Mallon said these meetings are budgeted for the next fiscal year, through June of 2021. There will come a time when we can scale the time back to 2 hours.

10. ADJOURNMENT

Ms. Keegan adjourned at 6:49 PM.



Cover Memo

Contact:	Nazli Parvizi, Outreach Director
Date:	July 22, 2020 SEC Meeting
Subject:	Tunneling ITR & Response

The attached Independent Technical Review (ITR) document is being provided to the SEC for information only. This ITR is the third in a series that will be developed over the life of this project. ITRs are considered a best practice in providing outside expert opinion on complex technical work and are most often associated with large infrastructure projects and programs. This ITR is the second ITR focused on tunneling; previous documents released were focused on tunnels and shafts and intakes.

Important things to note about this ITR document.

- The ITR panel is not a policy or decision-making body.
- ITRs are not expected to provide definitive comments or recommendations, but rather ideas for consideration.
- ITR comments are based on the experience of members of the ITR panel, rather than on the details of a specific conveyance project in California. This nuance is important in ensuring those reading the document do not assume ITR recommendations will be accepted exactly as presented. In fact, beginning on page 76 there is a matrix delineating ITR comments, followed by DCA or DWR engineer responses to those comments.

If there are questions about this document, they can be addressed during the SEC non-agendized comment portion of the July 22 meeting.

INFORMATIONAL ONLY



Board Memo

Contact: Kathryn Mallon, Executive Director

Date: July 16, 2019 Board Meeting

Item No. 7d

Subject: Tunnel Independent Technical Review No. 2 – Findings and DCA Response

The Delta Conveyance Design and Construction Authority (DCA) has assembled world-class experts to develop conceptual engineering work to help define the project alternatives and to identify ways to avoid or minimize impacts that will be analyzed as a part of the environmental review process.

As part of any world class delivery organization, we seek the advice of other experts, both formally and informally, to share their insights and experience with our team. The Independent Technical Review (ITR) process, managed by DWR, has been implemented as part of the Delta Conveyance program to provide formal reviews of the DCA work at key delivery milestones. ITRs are considered a best practice in providing expert opinion on complex technical work and are most often associated with large infrastructure projects and programs.

The ITR sessions are structured to encourage open dialogue and brainstorming where all ideas are welcome. Since the experts meet for a relatively brief period of time, they are not expected to provide definitive comments but rather ideas for consideration. Some of the recommendations or considerations may be prudent to pursue providing significant benefit to the program while others may be dismissed for a variety of technical or other reasons that the experts may or may not have considered.

In today's package, you will find the Tunnel ITR Findings Report No. 2 and the DCA Response. Similar to the previous ITR workshops, there was a healthy exchange of ideas between the panelists and the engineering teams. The team in part, focused on the maintenance requirements of the tunnel boring machine (TBM) and implications to the size and location of maintenance shafts, appropriate drive lengths, and accommodating the potential for maintenance access from within the tunnel. The report validates much of the work that has been done to date and provided a few interesting concepts for further exploration, particularly during the detailed design phase of the proposed project.

Recommended Action:

Information only.

Attachments: Attachment 1 - Tunnel ITR Report No. 2 Attachment 2 - DCA Response Dan Adams adams@mcmjac.com

Gregg Korbin gekorbin@earthlink.net Edward Cording cordingconsult@gmail.com

Ulrich Rehm ru@tunnelling-consultant.de Doug Harding HardingD@robbinstbm.com

Jon Kaneshiro jykaneshiro57@gmail.com

May 29, 2020



Mr. Tony Meyers Executive Director Delta Conveyance Office Department of Water Resources 901 P Street, Room 428 Sacramento, CA 95814

DELTA CONVEYANCE INDEPENDENT TECHNICAL REVIEW PANELS (ITR) DWR AGREEMENT NO. 4600013418, TASK ORDER ITR-04

TUNNELING AND SHAFTS ITR PANEL REPORT – MEETING 1 MAY 13 TO MAY 15, 2020

Dear Sir:

This letter report presents the findings of the Delta Conveyance Tunneling and Shafts Independent Technical Review (ITR) Panel from its May 13 to 15, 2020 Skype meeting. In addition to the ITR Panel, representatives from the Department of Water Resources (DWR), the Delta Conveyance Office (DCO), Jacobs Engineering (Delta Conveyance Authority's (DCA's) Engineering Design Manager (EDM), and ICF (DWR's Environmental Services Contractor) participated in the meeting. The meeting agenda is included as <u>Appendix 1</u>. A daily listing of meeting attendees is included as <u>Appendix 2</u>. <u>Appendix 3</u> presents a discussion on handing and processing the Reusable Tunnel Material (RTM). <u>Appendix 4</u> presents information on potentially handing and processing excavated tunnel material transported via slurry pipelines, while <u>Appendix 5</u> presents information on other considerations regarding the O&M shafts. (Note: the ITR Panel did not have the opportunity to visit the site prior to the meeting.)

Due to the size of this letter report an index with hyperlinks is provided to facilitate access to the Panel comments/considerations in the body of the report and to supplemental information in the appendices.

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EXECUTIVE SUMMARY

The following are the ITR panels key recommendations for consideration. The reader is referred to Section 10. Summary, Key Conclusions and Recommendations for reasons, other recommendations, and details of- and for- the recommendations.

Reach Lengths:

- TBM reaches from 14 to 15 miles are practical and have been achieved in the industry. However, TBM maintenance must be performed on a regular basis.
- Providing surface access for TBM maintenance every 4 to 6 miles for major repairs in free air is recommended, which aligns generally with the EDM's current approach.
- A prudent approach is to equip TBM equipment in a manner that allows for underground Safe Haven development for early and routine cutterhead checks and unanticipated TBM maintenance issues. This would likely include compressed air entry and/or grouting or freezing from the TBM.

Proposed Corridors and Alignments:

- The geotechnical data reports should be expanded for the Eastern Corridor and should include soil profiles for each tunnel reach in addition to what was previously generated for the Central Corridor. The current and next phase of programs should focus on exploration at critical locations along the Eastern alignment.
- The alignment reaches in the two corridors should be further optimized considering the geotechnical, environmental and community challenges; hydraulics, schedule, and oil & gas well exploration program.
- A detailed risk-based cost estimate/schedule should be performed along both corridors for an impartial comparison as input to the final selection decision of corridor/alignment.
- The ITR recommends raising the tunnel alignment by a half a diameter to one diameter (if possible) as there are benefits in terms of shallower shafts, tunnel and TBM operations (especially, for interventions for machine maintenance). The impact of up to one diameter raise is unlikely to adversely affect the liner design for net internal pressure, but it is understood that raising the tunnel could impact other aspects of the vertical alignment and should be carefully weighed as to its advantages and disadvantages.

Overall Construction Sequence and Schedule

- Provide clarification of logic required to develop the borrow pits for the construction of the Maintenance Shaft pads.
- Check the availability of a stable power supply in light of rolling blackouts, which are of high probability in the Delta during warmer months.

Tunnel Lining Design and Constructability Considerations:

- Provide probabilities or percent operating time for surge events, steady state gravity event, etc. and tie into engineering judgment as to how much net pressure must be designed for.
- Require in areas of net internal pressure that the TBM operate with face/shield/grout pressures that balance groundwater pressure plus an increment of earth pressure to balance the net internal pressure and lock in stresses around liner as segments are installed.
• Recommend further investigation into benefits of longitudinal bolts/dowels on liner for carrying internal pressure and potential (negative) effects, and if used, radial bolt/reinforcing connection (designed to prevent cracking).

Reusable Tunnel Material (RTM) Handling and Identified Re-uses:

- Verification of the practicability of the RTM transport, handling and processing is critical to the success of the project as currently presented and it is concluded that further investigations need to be conducted to assess and develop alternatives for high capacity drying. It is recommended that full-scale trials be carried out.
- Issues with respect to transporting the excavated tunnel material in a slurry form via temporary pipelines for drying at the RTM processing facility and/or delivery to settlement ponds are described in Appendix 4.

Contracting and Packaging:

- Design-build contracting approach is appropriate for the tunnels and shafts.
- Consider using best value for contractor selection where the technical proposal is scored separately from the price.
- Investigate taking the work associated with the RTM out of the Tunnel and Shaft contracts and contracting it separately in one or more contracts.
- The ITR Panel does not recommend a separate contract for manufacture of the segmental lining and does not recommend pre-purchase of the project's Tunnel Boring Machines.

Understanding and Satisfying O&M:

• The minimum requirements for mandatory O&M Shafts need to be defined in terms of minimum spacing (e.g. 4 to 6 miles seems tied to tunneling not O&M), type of equipment used, duration and extent of maintenance activity, operational controls, and seasonal demand constraints, to provide a better determination of the minimum spacing, diameter, and height above existing ground surface required for each O & M Shaft.

Other Relevant Topics:

• Modern tunneling technology with pressurized TBMs (earth pressure balance or slurry TBMs) combined with a coordinated program of ground and TBM monitoring has proven to mitigate concerns related to tunneling with large diameter TBMs and/or at shallow depth adjacent to, or below structures.

1.0 INTRODUCTION

Prior to the May 2020 Meeting, the ITR Panel was provided with the following documents:

- A. DCA Tunnel Alignments Map dated March 27, 2020
- B. DCA Drawings: Central Corridor Combined-Optimized dated April 2, 2020
- C. DCA Drawings: Eastern Corridor Combined-Optimized dated April 2, 2020
- D. DCA Long TBM Tunnel Drives Technical Memorandum (Draft) dated November 15, 2019

- E. DCA Conceptual Tunnel Lining Evaluation Technical Memorandum (Draft) dated February 20, 2020
- F. DCA Shaft Conceptual Design Technical Memorandum (Draft) dated March 27, 2020
- G. DCA Seismic Design Criteria Technical Memorandum (Draft) dated April 15, 2020
- H. DCA Field Work Execution Plan (Draft) dated August 20, 2019
- I. DCA Central Bid Item Schedule (Preliminary) dated April 10, 2020
- J. DCA Eastern Bid Item Schedule (Preliminary) dated April 10, 2020
- K. DCA Dec. 2019 Tunnels and Shafts ITR Panel Memorandum (Final) dated January 31, 2020 and DCA Presented Responses to Items
- L. DHCCP Draft Pipe-Tunnel Option Geotechnical Data Report dated April 2013 **
- M. DHCCP Isolated Conveyance Facility East: Geotechnical Data Report dated July 2010
- N. DHCCP Reusable Tunnel Material (RTM) Testing Report (Final) dated March 2014
- O. Bouldin Island Geotechnical Data Report (GDR) (Final) dated May 2018. EDM Field Work Plan Comments - All to be addressed

Comments by DCO on the following documents:

- EDM Long TBM Tunnel Drives TM
- EDM Tunnel Lining Evaluation TM
- EDM Shaft TM
- EDM Field Work Plan

** including Appendices L.1 to L.8

The ITR panel reviewed the above documents and developed responses to the following eight categories in the form of ideas, suggestions or recommendations followed by commentary on the benefits or challenges associated with each concept or consideration.

Specific feedback requested from the Panel in advance of the First Meeting were:

- 1. Proposed Tunnel Reaches Drive Lengths/Shafts/Logistics Concerns
- 2. Comments on Proposed Corridors and Alignments
- 3. Overall Construction Sequence and Schedule
- 4. Tunnel Lining Design and Constructability Considerations
- 5. Reusable Tunnel Material (RTM) Handling and Identified Re-uses
- 6. Contract Packaging Approach
- 7. Recommendations Related to Understanding and Satisfying O&M Needs
- 8. Other relevant topics

Definitions:

Reach: Length between the launch shaft and the retrieval shaft. Drive: Length between shafts (launch, intermediate or retrieval).

2.0 "Proposed Tunnel Reaches - Drive Lengths/Shafts/Logistics Concerns"

2.1 Reach Lengths

Issue:

Reach lengths up to 14 to 15-miles as a single TBM heading, are practical so long as regular maintenance is performed on the new TBM.

- Large diameter rock tunnel reaches have been driven over 15miles and provide acceptable evidence that a single, serviced, new TBM can drive over 15 miles (see Appendix 5). Rock projects require stronger, heavier TBM mechanical components and design as compared to a soft ground machine. Maintaining face pressure during the drive, cutter tool replacement and maintenance while under face pressurized conditions will be required in soft ground. Cutterhead maintenance and repairs while under "free air" conditions along the drive length will be required, as with rock machines.
- TBM manufacturers will guarantee the main bearing for a minimum of 20,000 working hours, which by far exceeds the time to dive a 15-mile tunnel reach.
- Appendix 5 includes information on the Tokyo Ring Road (51 ft. Diameter) & the Caracas Guarena Guatire project (27 ft. Diameter). The Tokyo Ring Road EPBM drives (2) are both 5.72 miles long. The Caracas EPBM project had a reach of 9.4 miles.
- TBM Maintenance includes a host of activities. The primary focus of the ITR was on the cutting head/face tools of the TBM. All panel members agreed that maintenance would be required throughout the TBM operation, and that access for free-air maintenance at an interval of 4-6 miles will likely be required if ground conditions are assessed to be abrasive. Panel members agreed that key elements of the TBM, such as the main bearing, should last the entire reach, and further that if for some reason these major elements fail, there is no way to predict where that failure will occur.

Benefits:

• Fewer contracts to manage, TBMs to purchase, fewer performance consuming learning phases to overcome and machine launch sites.

Challenges:

- Size of the contracts (Contract values above \$2B will limit competition).
- Logistical operation and maintenance of TBM (i.e. fresh bentonite to the face needs 2-3 hrs pumping, long travel times from portal to heading, etc.)

Delay risk associated with a major TBM breakdown outside of a pre-planned maintenance shaft/safe haven.

2.2 TBM Maintenance Shafts

Issue:

Provide real estate for the shaft site, access to the shaft site, and necessary permitting for TBM maintenance at intervals of 4-6 miles between launch and receiving shafts. Contractor can determine what type of access to provide.

- ITR was split on "the best" way to do this. Some believed contractors would build a shaft, while others would use ground improvement. Both methods would work, and both depend on the overall approach chosen.
- ITR agreed that if a shaft is required for permanent access (see section 8.0 below) then putting it in the Tunnel Contract and having the Tunnel Contractor build it makes sense, as it will serve dual purposes. However, ITR also agreed that the 80 ft. diameter shafts as presented, are too large.

Benefits:

- The Contractor is in the best position to determine the appropriateness of a TBM maintenance shaft, or safe haven, depending on the type/design and operation of the TBM.
- Allows full access for maintenance and personnel (some of whom might not be able to work in hyperbaric intervention) to replace and/or refurbish TBM cutterhead (CH), plenum chamber, seals and bearings, and tail seals. Access can be provided before the TBM arrives, a significant benefit to schedule.
- Contractor determines size required (diameter or safe haven space), and the means and methods; potential cost savings.
- If the contractor chooses to use a safe haven, a number of proven ground modification methods exist including grouting, soil/cement mixing and freezing.

Challenges:

- The shafts as proposed are large and require significant fill to build, for example the time required for consolidation of fill requires early installation of fill and/or ground treatment.
- Determining optimum size during design vs. obtaining ROW (Right of Way); e.g. smaller diameter shafts that provides access around TBM may be a plan of one contractor for his means and methods but not another.
- Commonly used approach is for the designer to show the permanent structure required for O&M and allow the contractor to select means and methods of construction and shaft dimensions.

2.3 TBM Maintenance within Tunnel

Issue:

Provide capability for drilling through ports within the TBM for ground treatment (e.g. freezing, grouting) ahead of the face to create a safe haven from within the tunnel where surface access ROW is anticipated to be restricted. This is a tunneling industry standard of practice.

Benefits:

• The plan would allow for access to the cutterhead in the event repairs are needed, between the pre-planned TBM maintenance locations.

Restricted access and lack of permission to install safe havens from surface would be done from TBM.

Challenges:

- Time required for creation of safe haven in tunnel heading.
- Difficulty in uniform treatment of ground with grouting to provide a secure/safe environment during construction.
- It is possible that freezing cannot be done from within the TBM using liquid nitrogen (not allowed in the tunnels in Europe), therefore, it may have to be done with much more complicated Calcium Chloride Brine techniques which requires more time to freeze and complicated in-and-out-flow tubes.

2.4 Safe Haven 1 Mile from Launch

Issue:

Allow contractor the option to construct a TBM safe haven within 1 mile from the long-reach the launch shafts by providing pre-acquired/approved real estate.

• If an early CH check is required, compressed air intervention or safe heaven near or adjacent to the launch shaft is more common and cost effective.

Benefits:

- Early check of TBM operational parameters confirm/disprove contractor's assumptions in terms of cutter head wear, cutting tool lifetime, etc.
- Cutting tool can be changed/modified to reflect performance.

Challenges:

- Pros and Cons of surface ground treatment vs from TBM
- Environmental restriction, construction approval for real estate and access
- Economic advantage of an extra shaft is questionable if not further used as O&M maintenance shaft.

2.5 Additional Suggestions for Long Tunnel Drives

Issue:

- Figure 1 of the December 2019 ITR Panel Report is a table of case histories for long tunnel drives, which provides their justification for longer tunnel drives without required TBM maintenance shafts. Suggest that the DCO or DCA request the case histories provided in the Figure (i.e. table and/or literature references with salient TBM drive features, TBM machine characteristics, tunneling conditions, etc.). Our findings are included in Appendix 5.
- Look at "State of the Art" procedures for cutting tool changing while under face pressure. These procedures include robotic arms for tool handling, accessible

cutterhead spokes for changing tools in free air. Cutting tool design using high wear abrasion resistant materials, additional wear plating and soil conditioning to improve wear resistance to the cutting tools and cutterhead structure.

Benefits:

Provides additional justification for reach and drive lengths contemplated.

Challenges:

3.0 "Comments on Proposed Corridors and Alignments"

3.1 Central versus Eastern Tunnel Alignments

Issue:

The panel is not prepared at this point to identify a preferred corridor and the Eastern Alignment should continue to be developed. The panel does recognize the importance of optimization of the alignment in terms of logistics of TBM assembly, servicing, supplies and other tunneling operations.

Benefits:

- Eastern alignment has the advantage of better access, and better geology at shallower depths. If there is less peat and denser r soils, this is favorable in terms of higher average unit weight, and therefore, higher earth pressure at lower depth. However, if there is more coarse- grained sand or gravel (especially SP and/or GP depending also on mineralogy (Quartz or Calcium)), this is not favorable for TBM wear (either EPB or slurry). A lower water table goes both ways, less confinement on lining but lower TBM intervention pressure for same depth.
- For the Central alignment, MWD/DWR/State own or control the majority of the property along this corridor, which in certain situations could afford surface access for safe havens, if required (e.g., level roads). Also, the RTM from the Reach 3 tunnel drive can be disposed of on Bouldin Island, and if it was important to reduce the overall schedule, the very long 14-mile drive for Reach 2 (the critical path) could be cut in half by adding a second heading to the north from Bouldin Island.
- ITR report dated January 31, 2020 recommended a "Far East" alignment", not the Eastern alignment currently under consideration. Therefore, some of the conclusions and recommendations in the January 2020 report may be applicable to the Eastern alignment. However, that panel did recommend not pursing the Central alignment due to "logistical" or access concerns.
- Central alignment is about 2.3 miles shorter than the Eastern, but costs are reportedly about the same.
- It should be emphasized that no fatal flaw was identified by this panel for either of the two alternative alignments under considerations. Less favorable aspects

identified in the maintenance/reception shaft siting evaluations can be mitigated as part of the risk-based cost estimate and alignment evaluation/selection.

- With regard to tunnel excavation, the ground conditions along the Central alignment are generally favorable, especially for EPBM, and similar is expected for the East alignment, but if more coarse coarse-grained soils it would be slightly less favorable for EPBM but more favorable for slurry TBM; however, a shallower depth will be an advantage for both.
- ITR panel has not had opportunity to visit sites, and no clear preference at this time. A detailed, cost/schedule-based risk analysis needs to be carried out to better evaluate the two alignments (discussed below).

Challenges:

- Bringing the Eastern alignment site exploration up to the level of the Central. It should be emphasized that the exploration on the Eastern alignment need not be as comprehensive as the Central to make decisions about alignment options if the program focuses on the critical elements (i.e., river channels, levies, rail crossings, low cover areas),
- Consider geotechnical exploration techniques, which have a potential for optimizing subsurface conditions information (e.g. geophysical techniques):

Consider capability of seismic refraction/reflection techniques, gravitometer surveys, etc. for locating the top of denser soils, or bottom of peat deposits.

• Project has performed in-hole suspension shear wave velocities which should be the reference for evaluating soil stiffness, for both static loadings around a TBM (using G/Gmax relationships) as well as for seismic ground motions due to earthquakes.

3.2 Vertical Alignment

Issue:

• The ITR recommends raising the tunnel alignment by a half a diameter to one diameter (if possible) as there are benefits in terms of shallower shafts, tunnel and TBM operations (especially, for interventions for machine maintenance). The impact of up to one diameter raise is unlikely to adversely affect the liner design for net internal pressure, but it is understood that raising the tunnel could impact other aspects of the vertical alignment and should be carefully weighed as to its advantages and disadvantages. Raising the alignment more than one diameter could adversely impact the segment design and similarly should be weighed against its advantages and disadvantages.

Benefits:

- Reduces shaft depth.
- Improves ability to perform TBM maintenance at lower pressure (preferably invert elevation at or below 3.5 bar groundwater head).
- Reduces TBM wear (tools and cutterhead wear, especially machine seals)

• Hyperbaric interventions can be better executed (shorter duration for pressurizing/depressurizing crews, reduced health risk for staff).

Challenges:

- Consider ground conditions (e.g., liquefaction), ship channel cover requirements (or consider use of inverted siphon), and effective ground load on lining system to resist internal pressure from surge.
- Raising the alignment will reduce the confining pressure. As an example, tunnel depths on the order of 110 ft to springline would provide sufficient earth pressure to equal the factored surge pressure when the at rest earth pressure, Ko=0.5 (appropriate for 30-degree effective friction). If the soils are over consolidated, an upper bound of Ko=1, the tunnel depth to balance is reduced by half, 55 ft (see notes for background).
 - For saturated soil unit weight of 120 pcf.
 - Maximum surge is from the "no IF" hydraulic model case and occurs within Reach 2 (other Reaches have lower surge pressure).
 - Δ head = surge elevation @ +37' GWT @ -5' = about 42 ft head or 18 psi; with load factor: 1.2 x 18 psi = 22 psi)
 - For the surge pressure, a load factor less than the typical 1.6 can be considered (for surge, 1.0-1.2 is commonly used in hydro design depending on conservatism incorporated in resisting elements and the probability of occurrence approximately one event per year).
- The potential need for designing a segmental lining in which dowels and/or bolts can take a portion of the tension will depend on the height of ground cover as well as the ground conditions (average unit weight, Ko, and GWT).
- Over pressuring the face and shield gap and tail void grout, above Ko and approaching overburden pressure, to obtain higher confinement may not provide additional confinement due to soil creep.
- Stockton deep water ship channel and EBMUD aqueduct are issues that have a major impact on the tunnel depth.
- Softer bedding of segments within lower density soil requires more reinforcement

4.0 "Overall Construction Sequence and Schedule"

4.1 Production Rates

Issue:

The assumed tunnel production rates are reasonable

Benefits:

• The assumed production rates are reasonably conservative (i.e. the winning contractors will likely have higher production rates).

Challenges:

• Not clear where "rehab/recondition" time is at each TBM maintenance shaft

- Check the schedule for TBM pass through the maintenance shaft, and where appropriate, include on the schedule
- Tunnel production rate to be clearly defined (penetration rate is more TBM related, advance rate is more logistically related). What interruptions/stoppages are foreseen?
- The longer the reach the more impact due to wrongly estimated production rates
- TBM drive always on the critical path of a project
- Production rates depending on impact of gas and oil wells as well as on logistical site-installation and experience of TBM contractor and also RTM concept.

4.2 Schedule Logic

Issue:

Clarify the logic used for time required to develop the material supply and construction of the shaft pads.

Benefits:

• Potential improvements to the construction schedule

Challenges:

- Identify source/time to deliver at South Forebay.
- 2-years for maintenance shafts show logic (particularly if they require RTM).

4.3 RTM Mass Balance

Issue:

The Panel recommends checking the mass balance logic with RTM at the South Forebay

Benefits:

• Improved construction schedule

Challenges:

- Eastern Alignment generating RTM well after Forebay is "done"
- Central Alignment tunnel done long before Forebay (run out of RTM?)
- Balance seems like need more RTM early, but need to discard excess RTM later

4.4 Concurrent Tunnel Drives

Issue:

All 5 Tunnel Drives Concurrent

Benefits:

• Improved planning

Challenges:

- This produces a tremendous volume of RTM "tidal wave" due to interdependence of RTM
- Different types of TBM (EPB or slurry) require totally different logistic concepts (excavated tunnel material handling, servicing of TBM, O&M, etc.)
- Check availability of stable supply of electrical power (e.g. due rolling blackouts)
- Public traffic restrictions which also have impacts on TBM performance (e.g. due to community-imposed restrictions on delivery trucks, etc.)

4.5 Other Possible Schedule Considerations

Issue:

The construction start date and completion date for the project does not appear to be fixed and or driven by any sort of external mandate, but the use of RTM for construction of the Southern Forebay does.

If extending the overall duration of the project is feasible, consider changing the sequence for the Reach 3 and Reach 4 tunnels, to allow Reach 4 to be completed prior to tunnel excavation commencing for Reach 3. Excavated tunnel material from Reach 3 could be transported through/via Reach 4 conveyors to the Southern Forebay RTM facility for treatment and ultimately use at the building the site.

Benefits:

- Excavated tunnel material removal directly to the Southern Forebay location, in time for construction of forebay (Reach 4 would be done).
- Substantially reduced need for trucking/rail and or other transport (and associated upgrades) for Reach 3.

Challenges:

- Total project duration would be extended by several years.
- Moves two tunnel contracts into a linear path, and any delays on Reach 4 would impact the Reach 3 Contractor's ability to complete their work (due to inability to transport excavated tunnel material).

5.0 "Tunnel Lining Design and Constructability Considerations"

5.1 Lining Design for Net Internal Hydraulic Surge Pressure

Issues:

- Pre-stress lining with specified operation of pressurized TBM to compensate for differential water pressures in tunnel.
- Current hydraulic analysis gives maximum heads during surge of up to 42 feet above natural groundwater levels for a 36-ft I.D. tunnel. The internal pressure will be balanced by groundwater pressures plus effective soil pressures acting against the tunnel lining and by hoop stresses in the lining. Pressurized tunneling (EPB or slurry balance) will develop pressures on the shield perimeter due to injection of

slurry or conditioned muck in the overcut gap which balance with the face pressures. Pressures on the tunnel lining develop due to grouting of the annulus at pressures higher than the face/shield pressures.

- Earth pressure cells on the shield perimeter and grout pressures at the tail are used to confirm the pressures, and borehole extensometer/vibrating wire-piezometer combinations monitor the ground response.
- The TBM pressures should exceed the pressures due to any loosening ground loads and will pre-stress the lining and minimize tensile hoop stresses in the lining during surge events.
- Maintaining upper face/shield pressures at groundwater + ~ 1 bar for a 40 ft O.D. tunnel, along with pressurized grouting around the lining would reduce pressures to: 42 -14.77/(62.4/144) = 42 34 = 8 ft head = 3 psi, significantly reducing tensile hoop stresses in the segmental lining. A shield pressure of approximately 1.5 bars in excess of groundwater would compensate for the full 42 ft of differential internal pressure including a load factor of 1.2 so that there is no tensile stress within the lining.
- Recommend plotting the differential heads under operation as well as during surges.
- Evaluate radial displacement and tangential strains due to differential pressure.
- Determine cracking strains and strains that could cause opening of a joint. Consider effect of adjacent dowels on interaction between rings. Evaluate key segment piece with respect to shear transfer (consider placing key at springline locations to deal with potential loss of ring continuity at the crown; the crown is the most vulnerable portion of the lining region of relatively low thrust).
- Prevent potential failure mechanism where tensile crack can form and propagate in location without any reinforcement, such as between a bolt pocket and the steel cage: Connect bolt pocket to reinforcement or provide embedment length of bolt pocket.
- Conduct tests of segments and connections between segments. Consider ways to simulate ground loads around liner during test with bands or in buried earth.
- Opening of radial joints more than allowable gap would allow flow in between the gaskets.
- Consider secondary grouting especially where excessive ground loss has occurred.
- Specify operating the TBM face/shield pressure at or near at rest earth pressure (Ko) to reduce ground disturbance and to maximize the resting earth pressure.
- Estimate probabilities of or percent operating time for surge events, steady state event and length affected
- Connections: Design longitudinal dowels to carry some portion of the net internal pressure (by shear)



Benefits:

- Increases the effective ground load on the lining system and to improve the overall stiffness of the surrounding ground and maximizes confining pressure, thereby reducing the risk of segment joint opening and leakage or segment damage from internal pressure due to surge (or tension).
- Tied into engineering judgment as to design for net internal pressure and assessment of risk.

Structural details of the connections for net tension case is required as well as a realistic analysis of soil-structure interaction using reasonably conservative soil stiffness (derived from a combination of lab data and values from shear wave velocity with appropriate adjustments for strain).

Challenges:

- Prescriptive elements of the lining design and operating pressure requirements need to be specified and enforced during construction.
- Structural design requires close coordination with hydraulic analyses and should be Reach specific, considering the local GWT and surge pressure.
- Structural:
 - Weighing the amount of confinement obtained from depth of cover vs. raising the alignment (see 3.2 above)
 - Benefits of single vs. double gaskets and allowable gasket gap; a second gasket is often used just to provide even loading/seating on thick segments for concentric thrust on circle as well as radial joint surfaces.
 - Radial bolts weighing pros and cons of "leave in vs. take out".
 - Prevent cracking at connections (steel fiber).
 - Variation in shop drawings for each contract package
 - EBMUD issues concerning security of their aqueduct and a segmented liner design and consideration of various acceptable mitigation measures to EBMUD (net internal pressure design solution varied near aqueduct).9
 - Loss of confinement due to settlement, ground loss or soil creep

- Consideration of secondary grouting to check or lock in confinement
- Single-component vs. double-component grouting (recommend two component).

Comment:

Please note that the seismic memo regarding tunnel design for seismic and fault movement needs to be revised to include references by Hashash et al. (2001) and the Chapter 4 of the MCEER-FHWA (2006) report. Also, with respect to EBMUD issues possible approaches include a secondary liner under Mokelumne Tunnel. A hazards analysis for consequences of various leaky liner scenarios could be performed to demonstrate capability of a single pass segmental lining.

5.2 Other Design Issues related to Net Internal Pressure

Issue:

Consider providing probabilities or percent operating time for surge events, steady state gravity event, etc. and tie into engineering judgment as to how much net pressure must be designed for.



Consider benefits of using longitudinal dowels to transfer stresses in adjacent segments to help carry net internal pressure and in 3 D analysis.

Consider not using radial bolts/consider removing, that way O&M doesn't have to worry about them. Radial bolts can be a source of cracking if indeed, some of the internal pressures are carried by the liner rather than the ground. If required, best to let the longitudinal dowels do the work. Steel fiber will help prevent cracking, but just avoid the bolts if possible.

Benefits:

- Provides level of risk understanding.
- Saves costs and schedule in design and construction.

Challenges:

- Reduce tensile stresses and strains, and the potential for cracking of the lining during surge events.
- Provide reinforcement design that is efficient and prevents tensile failure mechanism.
- Finding most beneficial segment ring design in terms of providing high ring-stiffness (i.e. lesser segments per ring) and low sensitivity to ring deformation (i.e. high degree of segment symmetry (X+0 instead Y+1) avoiding instable of using a smaller keystone.
- Cannot count on an assumed effective earth pressure unless the lining is pre-stressed. Maintain consistent pressures on the TBM, not dropping pressures to ground water pressures between shoves (specify minimum operating and resting pressures).
- Provide reinforcement design where concentrated tensile cracking cannot occur and are limited to in size, as specified for water retaining structures.
- With time, if bolts were to corrode: Check that during a surge, any opening of joint would be small or the load would be transferred to adjacent segments, and the strains would not be high enough to decompress the gasket.
- Design and modeling of effective ground load to resist internal pressure.
- Proof of concept must show clear benefits over risks.

Note:

For SDLAC PDWF 10% of time, internal pressure is 25 psi; PWWF 1% of time is 41.4 psi. In addition to DC Water with no internal steel, reference, Aguas Argentina, SDLAC modeling, flood control tunnels in Europe. Also, please note that 17 psi net for SBOO in San Diego is incorrect. Correction to memo Section 3.5.2 net internal differential of 3 bar, 89 ft of head x 0.43 = 38.7 psi = 2.7 bar. Not .43 ft/psi, but .43 psi/ft

6.0 "Reusable Tunnel Material (RTM) Handling and Identified Re-uses"

6.1 Perform an RTM Testing Test Program

Issue:

ITR recommends a test program be established to confirm the assumptions for mechanical drying and to confirm feasibility of mass drying and the rate to do so.

- The mass balance approach to the project (e.g. using RTM for levies and berms) relies on processing schemes to work effectively and is critical to project success
- The approach contemplated has never been done before, a philosophy that is contrary to the other major decisions on the project (e.g. Reaches, O&M requirements, etc.).
- A delay in the ability to process the excavated tunnel material into RTM appears to impact the entire program.

Benefits:

• Improved cost and schedule certainty.

- Confidence in the overall design approach.
- Identifies issues/fatal flaws (if any) early.

Challenges:

- Full scale testing programs take time and effort to scope and execute, often far more time that "originally envisioned".
- Finding suitable tunnel material, from another project, or from the Delta area will require identifying a source, then contracting for delivery of a large volume of excavated tunnel material (foam, water, polymer, etc.) with proposed equipment for both mechanical and natural processing of the RTM.
- Testing program, if thorough, will need to address the suitability and "dryability" of slurry tunnel material as well.
- Testing program will need a facility (e.g. lab or field space), with all that's necessary to "run a mechanical dryer" at full speed.

6.2 Consider Natural Processing and Other Ideas

Issue:

ITR identified several other ideas for the RTM work:

- Evaluate the practicality of pumping the excavated tunnel material in a slurry pipeline to the RTM processing facilities.
- Incorporate climate and potentially large shelters (e.g. Sheds) to enhance performance of natural processing (e.g. spread, and dry);
- Identify if local developer and or landfills/quarries could use the material for future fill/projects.
- Consider steps to "partially process or reduce moisture" along the conveyor system of an EPB/Transfer belt.
- Look into case histories, such as SBOO (San Diego) where more than half of spoils were CH/CL/ML and the other SM, SC, SP, GM, GC, GCB used surfactants and bentonite respectively. The CH/CL/ML material were used for structural fill for housing development nearby in the South Bay.
- Engage with companies that provide "slurry processing equipment' to determine if they can produce suitable customized equipment for this application. (See Appendix 4).

Benefits:

- Potential for reduced volume of mechanical drying.
- More flexibility in resolving the RTM surplus management

Challenges:

- Available disposal sites will/may change (e.g. land use changes, developers' needs change, etc.)
- Specification and testing requirement considering possible changes in regulatory and environment statutes for disposal or reuse of RTM.
- How to deal with oil/gas contaminated tunnel material.
- Conditioning of excavated tunnel materials to suitable RTM end use.

7.0 "Contract Packaging Approach"

7.1 Design Build for Tunnels and Shafts

Issue:

ITR considers design-build contracting approach appropriate for the tunnels and shafts.

Benefits:

- Large complex projects can merit the design-build approach.
- Potentially starts the tunnel and shaft construction work sooner than if bid-build.
- Provides early contractor engagement on design development.
- Allows for cleaner best-value determination (price and approach together)
- Highly unknown risk factor of RTM better controlled by early planning with contractors; risk shifting to the contractor side

Challenges:

- Require change in California Law
- Could add costs not currently contemplated (e.g. risk allocation, etc.).
- Institutional resistance within DWR.
- Developing the RFQ/RFP and the evaluation process are difficult and time consuming.
- Incorporating prescriptive elements of the precast segmental lining design.

7.2 Combine the Northern Drives

Issue:

ITR Consider advantage of one contractor for both Reaches 1 and 2

Benefits:

- Operation out of the double shaft would not require sequencing and handover and potential delay of start-up of a separate contractor.
- Site does not have to be broken into two construction yards
- Facilities for support, supply and excavated tunnel material removal can be consolidated

Challenges:

• Larger contract: may be advantageous for some JVs; however, would be significantly larger than the \$2B recommended limit for contact size.

7.3 Best Value - Contractor Selection

Issue:

Consider using best value for contractor selection where a technical proposal is scored separately from the price. Gain and pain contract model in order to motivate the contractors to keep time (and cost) plan.

Benefits:

- For the long tunnel drives proposed the risks are high. An experienced Contractor proposing highly qualified personnel and employing superior equipment should be recognized for the lower risk profile.
- Avoiding cheap and under-equipped TBM (which have a key role)
- Contractors being kind of shareholders of the project success

Challenges:

- Developing the RFQ/RFP and the evaluation process are difficult and time consuming.
- Changes to CA law.
- Adequate bid assessment

7.4 Alternate Contracting Plans

Issue:

ITR discussed the following ideas for carving scope out of the proposed Tunnel and Shaft Contracts.

- TBM Procurement (early before the Tunnel Contracts are let);
- Project-wide Segment Manufacturing/Supply;
- One or two contracts established for the processing and transport of excavated tunnel material and RTM.

The ITR does not recommend early TBM Procurement or a project-wide Segment Contract. Primary reasons are that both elements of the work are intimately related to the tunnel design and the construction means and methods.

ITR does recommend that one or more separate contracts associated with treatment of excavated tunnel material into RTM be considered.

Benefits:

- Obstacles to permits, etc. taken out of big money, linear schedules of tunnel contractors
- Would attract "earthwork and material processing" contractors;
- Could include the "Borrow production" as part of the contract (e.g. advance of tunnel contracts):
- Creates flexibility for RTM supply, which could de-couples the inter-dependence of tunnel reaches (on the rest of the program).
- Removes substantial "pass through" work from each Tunnel Contract, which will help keep each contract under the \$2B threshold.
- Could simplify the sequence at the South Forebay, particularly if RTM and levy building were in the same contract.

Challenges:

- Permits, handover issues innovation to tunnel contractor
- RTM contractor dictates price for TBM contractors
- RTM contractor to be experienced with handling of tunnel material of both TBM types EPB and slurry
- RTM contractor being the bottle neck of logistical chain of the whole project

8.0 "Recommendations Related to Understanding and Satisfying O&M Needs"

8.1 Spacing & Size of Inspection and Maintenance Shafts

Issue:

The ITR recommends the minimum requirements for mandatory O&M Shafts be defined in terms of minimum spacing (e.g. 4 to 6 miles seems tied to tunneling not O&M), type of equipment used (e.g. ROV equipment was discussed as well as rubber tired/human entrance), duration for such an inspection, anticipated maintenance activity (e.g. removal of sediment was mentioned), operational controls (e.g. it was mentioned it will take 2 weeks to un-water the tunnel), and seasonal demand constraints (e.g. duration tunnel can be dry). This will provide a better determination of the minimum spacing, diameter, and height above existing ground surface required.

The ITR panel agrees that at some point, the tunnels will need to be inspected and will need reasonable access for future maintenance. However, limited work to date has been done on how that will occur, and little consideration appears to have been given to logistics, equipment, and purpose of such inspections. Further, the approach contemplated (dedicated facilities at eight, or more, locations along the alignment) seems more significant (capital expenditure) than the ITR has seen in the industry for what could be a once-in-25-year event.

- Water/wastewater industry has no standard for tunnel inspection, in either process to use or duration between inspections. Several agencies ITR members work with do not inspect their tunnels, and do not have plans to do so. A few agencies which ITR members have worked with perform inspections in 30 to 50-year intervals, whereby a major shutdown (months, not weeks) occurs. The time period is less a function of "access points" and more a function of the planning, staffing, seasonal demand, equipment procurement, and data collection effort required for inspection of tens of miles of tunnel. See Appendix 6 as some case histories for consideration.
- This is a significant issue in terms of cost and schedule impact on the project, because the shafts (shown below) require a tremendous amount of fill and ground improvement to address the 200-year flood design criteria.
- The shaft design contemplated what will appear as hills where they do not currently exist, which will change the horizonal view/existing conditions along the tunnel alignment. This seems contrary to the tunneling approach, which is typically considered a way to minimize or eliminate impacts to the ground surface along the alignment. Accordingly, this may be difficult to permit.
- Investigate the maximum practicable length that an ROV can efficiently survey a tunnel and then evaluate whether the maximum distance between O&M shafts can be designed to match this length. It is noted that the Snowy Mountain tunnel in Australia

utilizes a 12km (7.5mile) single pass ROV to inspect their tunnels (built in 1960's). If the underwater inspection single pass length is determining the distance between O&M access shafts, then the EDM could more thoroughly research the current practicable single pass length of ROV inspections in order to determine whether one, or more, intermediate shafts could be eliminated.

- Instead of designing O&M pads around service shafts, evaluate the practicability of designing containment dikes around such service shaft of sufficient height to resist the 200-year design flood elevation and with sufficient contained volume that when dewatering the tunnel for maintenance supplemental siphon pumps could be used to drain a useful volume of tunnel water to accelerate the dewatering process.
- While the ITR Panel was not provided with a detailed dewatering plan for the tunnel, if the DCA desires to dewater the tunnel more rapidly than currently planned, then the EDM could evaluate the option of providing water holding ponds at O&M shafts selected to assist in dewatering the tunnel using temporary syphon pumps. Possibly borrow from such ponds could provide fill for the construction of the pads.

Benefits:

- Documents decision process and criteria for O&M Shaft needs by separating hydraulic design issues (surge pressure mitigation and dampening benefits) and constructability issues (TBM maintenance shaft) from O&M requirements
- Possible savings in costs for increased spacing and for use of smaller diameter shafts and possible installation by drilling rather than shaft sinking.
- Possible reduction in fill required at all the sites.

Challenges:

- Safety and risk issues associated with entry, ventilation, and equipment access.
- Keeping with standard of care as related to other projects.

8.2 Inspection of Segmentally Lined Tunnel

Issue:

ITR is not aware of any other segmentally lined tunnels where bolt pockets created either tripping hazard or a concern over catchment for sediment. However, if sediment within segment bolt pockets remains a concern, ITR is aware of one or two projects in North America where bolt pockets were filled, so a detail could be worked out if needed.

With respect to hydraulics, diameter is large compared to other projects with filled bolt pockets or no bolt pockets.

Ideas to Consider:

- Sediment within segment bolt pockets issues can be assessed by comparison to other tunnels using precast segment to determine if filling is needed
- Determine if tripping hazard exists by having O&M staff visit a BGS tunnel under construction.
- Optimus system or other systems without bolt pockets could be considered. TRex (Denver) UNWI (Sacramento) both have 12 ft. ID tunnels without pockets, also

Interceptor Sewer Projects along the Seine River including Chantiers Interceptor (13 ft. at 3 bar)

- Can fill pockets of invert with concrete patch or pre-cast insert if determined the need to do so exists.
- DC Water and LACSD did not require bolt pocket filling

9.0 "Other Relevant Topics"

9.1 Oil/Gas Wells along tunnel alignment

Issue:

• Locating abandoned oil/gas wells prior to tunneling, and adjusting alignment to avoid (1) zones of concentrations of wells, (2) known well locations or known circles of uncertainty

Benefits:

- Prevent risk of gas inflows due to intersecting well during tunneling
- Prevent delay required to abandon well intersected in the tunnel.
- Avoid oil/gas (hydrocarbon-)contaminated tunnel material

Challenges:

- On LA Metro jobs in 90's, probe holes were drilled ahead of the face, usually on maintenance shift, for magnetometer surveys in locations with oil fields. This is more difficult with Pressurized-TBMs and will delay tunnel if a well is encountered. On several current tunnel projects, magnetometer surveys are being conducted in casings installed with horizontal directional drilling (HDD) or to tunneling. With current technology, three HDD holes are being used for magnetometer surveys above the crown of a single 20-ft-diameter tunnel.
- How can information be obtained that will allow magnetometer surveys with HDD to be employed in limited areas rather than over long reaches of tunnel? Depends on:
 - Ability to locate abandon wells, well fields, and areas that can be cleared of wells.
 - Availability of records: More recent well installations along the alignment may have more information on their location and procedures used for abandonment. Define uncertainty of location for known wells, potential for unknown wells in a field.
 - As noted by project personnel: Consider remote sensing, aerial recon, to \determine if there is any surface expression of abandoned wells or well support facilities.
 - Conduct surface magnetometer surveys that might help pinpoint an abandoned well, recognizing that the surveys are limited in the depth that they can sense, and that many anomalies will be due to debris.
- Coordinate with Cal Gen for requirements for re-abandoning wells that cannot be avoided. Recognizing a low probability of encountering a well, as well as the

difficulty in determining that all reaches of the alignment have been cleared of wells, consider investigating current or developing technologies for sensing a well ahead of the TBM with instrumentation on the cutterhead so that advance can be stopped before a well is intersected, thereby preventing the hazard of gas flow into the tunnel.

9.2 Pressurized Tunneling to Control Surface Ground Movements and Protect Adjacent Structures

Issue:						
Controlled Tunneling with Pressurized TBMs						
Pres Enve	surized elope:	Face	Shield	Tail	,, ₩●	
i. Pressurized TBM, either Earth Pressure Balance (shown) or Slurry Balance. Balance groundwater pressures & prevent inflow of sands & silts into face.						
ii.	Fill & pressurize gaps to prevent ground loss into gaps around shield and tail.					
iii.	Provide consistent monitoring & control of TBM throughout the drives.					
iv. Use well engineered gasketed segmental concrete tunnel lining. U						
engineered geotechnical monitoring program coordinated with key TBM						
operating parameters, such as pressures and volumes injected around the						
TBM.						
v.	Be sure to consistently EPB-chamber in order to achieve totally chamber					
filling for comprehensive face pressure control						



achieved with settlements on order of 1 to 2.5 mm at covers of one diameter (20 ft for 20-ft diameter earth pressure balance TBMs.

Challenges:

- Selection of experienced Contractors with proven performance (possible use of best value selection process), enforcing Specifications, and demonstrating performance throughout the tunnel drive, including in test sections at start up, and monitoring and coordination with TBM operations along alignment and prior to excavation under critical structures.
- Different TBM types provide different face pressure control quality; depending on contractors' experience with various TBM types slurry-TBM supposed to have a better controllable, more precisely and safer (face)pressure keeping system

9.3 TBM Early Procurement

Issue:

TBM Pre-purchase: Not recommended.

Benefits:

• Can improve schedule

Challenges:

- Significantly increases Owner's risk (Contractor can blame Owner for all machine related problems).
- If Contractor purchase of TBM, desirable to be available when launch shaft has been constructed.
- Features required or recommended by owner can be included in Contractors contract documents rather than in purchase agreement with manufacturer.
- TBM type choice only obvious if geology would be obvious, which is not the case here

10.0 SUMMARY - KEY CONCLUSIONS AND RECOMMENDATIONS

The Tunneling and Shafts ITR Panel is pleased with the quality of the current conceptual designs for the tunneling and shafts, and offers the following summary, key conclusions and recommendations:

Reach Lengths:

<u>Summary</u>

• TBM reaches from 14 to 15 miles are practical and have been achieved in the industry

- The ITR panel is only aware of two comparable long drive, large diameter soft ground TBM case-history; i.e., the Tokyo Ring Road, 5.78 miles by 51.6 ft OD and Caracas Guarena Guatire EPBM, 9.4 miles by 27ft OD.
- Current industry experience and technology_is that major TBM maintenance on the cutterhead wear plates and cutting tools should be-anticipated every 4 to 6 miles.

Key Conclusion and Recommendations

- Provisions for spacing of surface access of TBM maintenance every 4 to 6 miles is recommended, which is in keeping with the EDM's current approach.
- A prudent approach and in keeping with industry standard of practice is to make provisions for underground Safe Haven development for early and routine Cutterhead checks and unanticipated TBM maintenance issues, such as the requirements for equipping the TBM with compressed air entry, ability to grout or freeze from the TBM and is the tunnel contractors' responsibilities.

Proposed Corridors and Alignments:

Summary

- The geotechnical information is much more developed on the Central alignment including detailed geotechnical reports and developed alignment profiles with geologic stick logs.
- In the EDM's presentation on May 13, noted that tunneling ground conditions appeared slightly more favorable on the East Alignment using a five-scale screening matrix in terms of better geologic conditions shallower depth and thickness of peat, and a deeper groundwater table. Also, based on the December 2019 ITR panel report an alternative far Eastern alignment was preferred in terms of access to the site and stability of the surface soils, therefore, potentially requiring less site improvement.

• While the East Alignment is 2.3 miles longer the capital costs of each are about the same. Key Conclusions and Recommendations

- The soils from the data provided thus far are not appreciably different from an TBM excavation rate and machine wear standpoint.
- East Alignment has better access.
- Central Alignment has better RTM disposal access (on-site at Bouldin Island), and MWD/DWR/State own or control majority of the property along the tunnel alignment.
- Geotechnical data reports should be expanded for the Eastern Corridor and should include soil profiles for each tunnel reaches as well as the Central Corridor. The current and next phase of programs should focus on exploration at critical locations along the Eastern alignment.
- The alignment Reaches in the two corridors should be further optimized/refined considering the geotechnical, environmental and community challenges; hydraulics, schedule, and oil & gas well exploration program.
- A detailed risk-based cost/schedule estimate should be performed along both corridors for final decision making.
- The ITR recommends raising the tunnel alignment by a half a diameter to one diameter as there are benefits in terms of shallower shafts, tunnel and TBM operations (especially, for interventions for machine maintenance). The impact of up to one diameter raise is unlikely to adversely affect the liner design for net internal pressure, but raising the tunnel more than one diameter could impact the segment design and should be carefully weighed as to advantages and disadvantages.

Overall Construction Sequence and Schedule:

Summary

• Production rates and schedule are reasonably conservative with respect to tunnel drives. Key Conclusions and Recommendations

- Provide clarification of logic required to develop the borrow pits for the Maintenance Shafts pad construction.
- The RTM for South Forebay requires a check on the mass balance logic.
- Check the availability of a stable power supply due to rolling blackouts, which are probable in the Delta during warmer months.
- Slurry and EPB TBM's require different logistics, equipment, and have advantages and disadvantages. A comprehensive comparison between EPB and slurry TBMs in regard to influence of geotechnical conditions, logistics, site accessibility, excavated tunnel material/and ensuring RTM, and performance rates should be undertaken prior to finalizing the design.
- For the Central alignment, RTM from the Reach 3 tunnel drive, is understood to be allowed to be stockpiled on Bouldin Island. If it is important to reduce the overall schedule, the 14-mile drive for Reach 2 (the critical path) could be cut in half by adding a second heading to the north from Bouldin Island.

Tunnel Lining Design and Constructability Considerations:

Summary

• Hydraulic analysis for transient conditions indicated that the tunnel lining will experience a net internal pressure; i.e., the total internal pressure minus the ambient external groundwater pressure.

Key Conclusions and Recommendations

- The avoidance of using continuous hoop steel within the precast concrete segment across segment joints designed to carry internal pressure is preferred as the precedence for such an application in this diameter is limited and the detailing is quite complex.
- Provide probabilities or percent operating time for surge events, steady state gravity event, etc. and tie into engineering judgment as to how much net pressure must be designed for. Clarify/provide (stations) as to where net internal pressure occurs.
- Require in areas of net internal pressure that the TBM be operated in pressurized conditions to lock in stresses around liner as segments are installed.
- Recommend further investigation into benefits of longitudinal bolts/dowels on liner for carrying internal pressure and potential (negative) effects and need for radial bolts in the same function
- Recommend a structural "balancing of load" or second gasket on liners, which provide the additional benefits of possible gas intrusion from surrounding ground. Balancing gaskets to distribute load is standard of practice for thick liners to keep installation, erection, and final position loads concentric. For gas/water considerations a combined EDM and bentonite strip gasket are also common in -practice.

Reusable Tunnel Material (RTM) Handling and Identified Re-uses: <u>Summary</u>

• Handling of RTM excavated tunnel materials is major area of risk in terms of efficient schedule and contracting logistics, acceptable reuse, and permitting,

Key Conclusions and Recommendations

- Establish a test program to confirm the assumptions for mechanical drying and to confirm feasibility of mass drying and the rate to do so.
- Evaluate the practicability of transporting the excavated tunnel materials in a slurry form via temporarily pipelines and to process the slurry into RTM, to confirm suitability of Slurry TBM and compare with conveyor transport.
- Investigate the interest/market for RTM by developers.

Contracting and Packaging Approach:

<u>Summary</u>

• The packaging of separate tunneling contract by Reaches of less than about \$2 billion is currently underway by the EDM.

Key Conclusions and Recommendations

- Design-build contracting approach is appropriate for the tunnels and shafts.
- Consider advantage of one contractor for both Reaches 1 and 2 for more efficient use and elimination of schedule conflicts at the single site for launching and servicing the two TBM drives.
- Consider using best value for contractor selection where the technical proposal is scored separately from the price.
- Smaller separate contracts for infrastructure development (access, bridge improvements, docks, pads, ground improvement, power, and other utilities) should be investigated/developed.
- Separate contracts for Early TBM Procurement or a project-wide Segment manufacture/supplier are not recommended.
- Consider separating RTM work (transport and conditioning of excavated tunnel material into RTM) into one or more separate contract(s) to a specialist company, or companies.

Understanding and Satisfying O&M:

<u>Summary</u>

• Access to inspect the Delta Conveyance tunnel is required and the needs are undergoing documentation by the DCO.

Key Conclusions and Recommendations

• The minimum requirements for mandatory O&M Shafts should be defined in terms of minimum spacing (e.g. 4 to 6 miles seems tied to tunneling not O&M), type of equipment used (e.g. ROV equipment was discussed as well as rubber tired/human entrance), duration for such an inspection, anticipated maintenance activity (e.g. removal of sediment was mentioned), operational controls (e.g. it was mentioned it will take 3 weeks to un-water the tunnel), and seasonal demand constraints (e.g. duration tunnel can be dry). This will provide a better determination of the minimum spacing, diameter, and height above existing ground surface required.

Other Relevant Topics:

Summary

• The tunneling alignments face challenges crossing under stakeholders' right-of-way.

Key Conclusions and Recommendations

• Modern tunneling technology with pressurized TBMs (earth pressure balance or slurry TBMs) combined with a coordinated program of ground and TBM monitoring has proven to mitigate concerns related to tunneling at shallow depth adjacent to, or below structures.

11.0 NEXT ITR PANEL MEETING

The participants agreed that at this point it would be premature to set a firm date for the next Tunneling and Shafts ITR Panel Meeting.

12.0 CLOSURE

This was a productive meeting. The Tunneling and Shafts ITR Panel acknowledges the efficiency with which the First Meeting was organized and conducted, and also the hospitality afforded to all. We compliment the presenters and facilitators, and also note the willingness of individuals from all parties to present findings and opinions, and to provide technical and strategic leadership to the project.

Respectfully submitted,

Dale Berner

Dale E. Berner



Connor Most

Dan Adams

Edward Cording

Doug Harding

fortin

Gregg Korbin

l. O Gal

Ulrich Rehm

Jon J. Kaneshino

Jon Kaneshiro

Appendix 1: Daily Agendas

Delta Conveyance Project Tunnels and Shafts ITR Panel - Meeting No. 1 May 13-15, 2020

SKYPE-TIME 8:00 AM Start each day

Meeting Goal and Objectives

- 1. Develop Common Understanding of Project's Tunnel and Shaft Approaches in Order to Recognize and Comment on Critical Issues
 - Delta Conveyance Overview; Investigated Project Alignments/Tunnel Conveyance Needs/Features; Single Pass Tunnel Liner/Depth and Profile/General Construction Sequencing; Hydraulics and Operational Considerations; Geotechnical Overview and Planned Data Gathering
- 2. Thoroughly Investigate Critical Project Issues:
 - Be able to summarize and evaluate technical topics presented including recommending future analyses, assessing solutions, commenting on the progress of engineering work, and recommending prioritization of future work.
- 3. Tunnels and Shafts ITR Feedback on Proposed Approach, Reaches and Designs
 - Focus on DWR Identified Questions:
 - Proposed Tunnel Reaches Drive Lengths/Shafts/Logistics Concerns
 - o Comments on Proposed Corridors and Alignments
 - o Overall Construction Sequence and Schedule
 - o Tunnel Lining Design and Constructability Considerations
 - Reusable Tunnel Material (RTM) Handling and Identified Reuses
 - o Contract Packaging Approach
 - Recommendations Related to Understanding and Satisfying O&M Needs

Day 1 - AGENDA for May 13, 2020

8:00- 8:10 Introductions (including introductions of panel members) - Safety Moment

– Dale Berner

8:10-8:15 Opening Remarks – *Tony Meyers*

8:15-9:30 **Delta Conveyance Project Overview Presentations**

- Delta Conveyance Overview (John Caulfield)
- Investigated Project Alignments & Reaches/Tunnel Conveyance Needs/Features (John Caulfield)
- Geotechnical overview/Depth/Profile/General Construction Sequencing (John Caulfield)
- Hydraulics and Operational Considerations (Tony Naimey)
- 9:30-9:45 Questions *All*
- 9:45-10:00 Break All

10:00-12:15 Tunnel and Shaft Construction Approach Presentations

- Shaft Siting Criteria/Locations (G. Bradner)
- Shaft Functions & Layouts/Work Activities/Logistics and Construction Methods/Safety *(Steve Dubnewych)*
- TBM Considerations & Drive Lengths (Steve Dubnewych)
- Tunnel Lining Single Pass/Preliminary Cross Sections/Precast Segment Sizes – Loading Cases /" Hoop Stresses" Segment Design – (Stev

Loading Cases /" Hoop Stresses" Segment Design – (Steve Dubnewych)

- Precast Facilities Supply, Production and Transportation Considerations (*Jim Lorenzen*)
- Road/Rail/Barge/Power Improvements (*Jim Lorenzen*)

12:15-12:45 Lunch Break - All

12:45-2:45 **Tunnel and Shaft Construction Approach Presentations (cont.)**

- Schedule Assumptions/Early Works/Contract Packages/Advance Rates - (Martin Ellis)
- Reusable Tunnel Material (RTM) Quantities/Handling/Spreading/Storage/Drying Assumptions/Reuse – (Shaun Firth)
- Construction Safety Considerations (gas/flooding/etc) J. Caulfield
 - Permanent Facilities Shaft Sites/Instrumentation/O&M Considerations/Inspection and Access Needs - (Jesse Dillon)
- 2:45-4:30 Questions and Discussions *All*

Day 2 - AGENDA for May 14, 2020

- ITR Panel Review and Discussions ITR Panel and Selected DCA and DCO Reps
- Summary Recommendations and Presentation Preparation *ITR Panel and* COWI

Day 3 - AGENDA for May 15, 2020

10:30- 12:00 ITR Panel Summary Presentation – *ITR Panel* Adjournment (noon)

Appendix 2: Lists of Daily Attendees

Wednesday (5/13/2020)

- Graham Bradner
- Carolyn Buckman
- John Caulfield
- Dan Adams
- Jesse Dillon
- Doug Harding
- Steve Dubnewych
- Edward Cording
- Martin Ellis
- Andrew Finney
- Gregg Korbin
- Anthony Meyers
- Ulrich Rehm
- John Bednarski
- Tony Naimey
- Jay Arabshahi
- James Lorenzen
- Ryan Phil
- Shaun Firth
- Jon Kaneshiro
- Dale Berner
- Christoffer Brodbaek
- Valerie Sazo
- Darryl Hayes

Friday (5/15/2020)

- Praba Pirabarooban
- Jesse Dillon
- Anthony Meyers
- Darryl Hayes
- Arasan Singanayaham
- Carolyn Buckman
- Marcus Yee
- Dan Adams
- Doug Harding
- Ulrich Rehm
- Jon Kaneshiro
- Gregg Korbin
- Edward Cording
- Dale Berner
- Christoffer Brodbaek
- Valerie Sazo
- Phil Ryan
- Tony Naimey
- Steve Dubnewych
- Kathryn Mallon
- Janet Barbieri
- Hong Lin
- Terry Krause
- John Caulfield
- Joh Bednarski
- Shaun Firth
- Graham Bradner
- Steve Minassian

Appendix 3: RTM Processing Considerations

The ITR Panel views the excavated tunnel material handling and RTM processing as being critical activities that merit further evaluation.

The ITR Panel is concerned that the excavated tunnel material heating screw device presented for decreasing the moisture content of the excavated tunnel material may very likely not work efficiently. The panel is concerned that cohesive spoil which is planned to be reduced in water content, may change its consistency to the point where it may clog the processing equipment.

Given the spoil properties in the DCA presentation slide no 77 in terms of water content – the increase by approx. 10% of natural water content (from 31% to 41,5%) through operation is related for example to an EPB application with FIR (foam injection rate) of approx. 60% and FER (foam expansion rate) of approx. 12 which are average reasonable numbers. If one were to only assume more sticky conditions which would realistically change the FIR to approx. 100% and the FER to 7-8, the spoil water content could increase by approx. 30% as some TBM driver may do in order to protect their TBM; which would require far more drying activities by the screw dryer (or by a natural stock piling).

In one panel member's opinion is that it is not possible to adequately reduce the water content satisfactorily either in an TBM screw conveyor or along the tunnel on the conveyor belt, because one cannot deliver sufficient lime powder into a screw conveyor. Furthermore, the use polymers to dry the excavated tunnel material do not work properly and produce unacceptable environmentally conditions. Additionally, while some panel members believe that it is worth contacting selected manufactures to evaluate the practicability of design the mechanical RTM processing equipment to be positioned within the length of the bored tunnel drive; while other panel members advise that such an approach is not practicable and not worth evaluating.

The situation for a slurry excavated tunnel material is comparably challenging, i.e. depending on the amount of fines content of the natural ground the residual water content of separated spoil from filter presses or hydro cyclones lies within 30-40% which is close to the assumption of the DCA whereas this is related to separated highly cohesive filter cakes only. One will get the other separated fractions of gravel, sand and silt separately with various water contents but for using it as reclamation material you will have to mix the separated fractions again in order to get a suitable material for reclamation purposes which can be difficult. This would be a further argument to contract the spoil handling separately to an experienced contractor.

Additionally, the power requirements for a 40-foot EPBM draws approx. 6-7 MW whereas the slurry TBM requires a bit less (some 5-6 MW – without slurry pumps) just for the shield machine and back up – but also requires the use of a number of slurry pumps along the length of the tunnel.

Regarding the length of the longest reach of 14-15 miles, the panel believe that this as possible but would require the talents of a world-class tunnel contractor. Therefore, it is not only the engineering of the TBM that has to be world-class but also the technical support during tunneling and the innovative approaches for outstanding long reaches.

Appendix 4: Considerations forHandling Slurried Excavated Tunnel Material

One or more of the tunneling contractors may select the use of a Slurry TBM, or a contractor using a EPBM TBM may elect to convert the excavated tunnel material into a slurry (as described in the following discussion) if the excavated tunnel material is allowed to be used (or disposed of) as a beneficial fill material, instead of converting the excavated tunnel material into material for levee construction.

The following write-up contains selected consideration on means and methods for liquefying of EPB excavated material (EM) with the variable density (VD) TBM:

The VD TBM uses a slurrifier box (or flushing box, see figures below) at the outlet of the screw conveyor to mix the EM from the face with additional Bentonite slurry that has to be provided along the whole tunnel length. This EM-slurry should have a density of maximum 1,3t/m³ otherwise, pumping along the tunnel gets problematic as the slurry requires slurry pumps of some 800kW-1MW each every approx. 1-1,3km intervals. The proper mixing process of EM and slurry in the slurryfier box depends on the composition of the EM; the more cohesive it gets the higher the risk to plug the outlet of the slurrifier box. Another critical point in the case of the spoil being conditioned with foam (which is state of the art for EPBM); which would then very likely re-foam in the slurrifier box due to the high energy potential generated by the slurry being flushed into the box which could cause, beside an increase in slurry-air-bubble-volume, also cavitation in the slurry pumps. This is one of the reasons why a VD TBM might utilize a conveyor belt instead of a slurry pipeline.

The stone crusher shown in Fig. 2 between the screw and a slurriyfier box is only needed if bigger stones are expected (which shouldn't be the case for the Delta); which also could become a critical point in terms of spoil flow jam in case of cohesive ground.

Thus, a pumped slurry would have a density of approx. 1,3 t/m³ of which approx. a third would be of solids and 70% of the slurry would have to be separated before disposing of the EM (possibly as a fill material). IF the EM were to be used for levee construction then the separated soil components would have to be re-mixed in order to achieve best soil-composition for compaction. Slurry pipelines may be supported by steel struts along the surface which might require solid concrete foundations each 20-30m (see figures below)er, or alternately the temporary slurry transport pipeline, and booster pumps, could be designed to float on the breaded river channels. Furthermore, EM treatment requires special knowledge of earth moving, mixing and handling and electric power.



Fig. 1 Variable-density TBM

SLURRYFIER BOX | SIZER - ROTARY CRUSHER



Fig. 2: Slurryfier-box with stone crusher



Fig. 3: Slurryfier-box with stone crusher for 7m diameter TBM (Kuala Lumpur)



Fig. 4: Principal logistical effort for VD TBM (Kuala Lumpur)





Fig. 5: Elevated slurry lines through Berlin/Germany
Appendix 5: Presentation of Selected Existing Long Drive Tunnels



Table of Long-Drive Large Diameter Tunnels thru Rock by Robbins

Abstract of Selected Information on the Tokyo Ring Tunnel Project Under Construction



Report of the Tunneling and Shafts ITR Panel – Meeting 1

Construction of 16 km Tunnels

Main Tunnel is composed of the North-Bound Tunnel extending the north from Tomei JCT* and the South-Bound Tunnel extending south from Diami JCI, forming the rate of James for each direction, and Banes in tratal. The vort sunds will be excivated from Tome Vertical Barta tead Journu Vertical Barta, and will join eart the lockshire-tic construction work also includes assembling of labes to form the road surfaces and construction of ross passages to consert between the North-Bound and the South-Bound Tunnels. ri Road.



Report of the Tunneling and Shafts ITR Panel – Meeting 1

Comparison of Shield Machine	Tunnel Outer Diameter 15.8m	Launching pit for Tokyo Ring Road at Tomei - Launching pit at Oizumi	About 9.2km About 7.0km
Distance and Tunnel Cross	12.3m 🚷 🔪 🚺	Central circular Shinagawa Route	About 8.0km
Section per Machine		12.8m () Central circular Shinjuku Route	About 2.7km
		14.7m Madrid Ring Road	About 2.5km

For additional information about the Tokyo Ring Road project, please see the May 17, 2017 TunnelTalk article entitled: 'Mega TBMs begin Tokyo ring road drives', as well as the following three associated references:

- Tokyo Bay highway engages eight mega TBMs *TunnelTalk*, August 1994
- Tracking the world's mega-TBMs *TunnelTalk*, May 2016
- Mitsubishi TBM business consolidation *TunnelTalk*, May 2015

DCA Response to May 2020 Tunnel Independent Technical Review Panel Recommendations

Item	ITR Recommendation	DCA Response
2. Proposed Tunnel Rea	ches	
2.1	Reach lengths up to 14 to 15 miles as a single TBM heading are practical so long as	Agree. Regular maintenance shafts have been added at approximately 4 to 6 mile
	regular maintenance is performed on the new TBM.	intervals.
2.2	Provide real estate for the shaft site, access to the shaft site, and necessary	Agree. For purposes of CEQA, proposed designs have been included. Note: These
	permitting for TBM maintenance at intervals of 4 - 6 miles between launch and	shafts also serve as access points and surge relief during long term operations.
	receiving shafts. Contractors can determine what type of acces to provide.	
23	Provide capability for drilling through ports within the TBM for ground treatment	Noted Will study implementation during detailed design Does not affect
2.5	ahead of the face to create a safe haven from within the tunnel where surface	conceptual design.
	access may be restricted.	
2.4	In response to previous recommendations to allow the tunneling contractor the	Noted. Will investigate methods to provide safe haven and maintenance access
	option to construct a TBM safe haven within 1 mile from the long-reach launch	from within tunnel for unplanned events which include an early intervention at 1
	shafts by providing pre-acquired/approved real estate, this ITR Panel recommends	mile. See above.
	compressed air intervention or safe heaven near or adjacent to the launch shaft is	
	more common and cost effective.	
2.5	Additional Suggestions:	Noted. Will follow up.
	a) Review case histories of long drive implementations.	
	b) Review procedures for cutting tool changing while under pressure.	
3. Proposed Corridors 8	Alignments	
3.1	a) The panel is not prepared to identify preferred corridor and the Eastern	a) Noted. DCA is responsible for preparing conceptual designs for all alternatives
	Alignment should continue to be developed. The panel does recognize the	identified by the DWR and addressing areas such as logistics to accommodate the
	importance of optimization of alignment in terms of logistics of TBM assembly,	work.
	servicing, supplies and other tunnel operations.	b) Noted.
	b) The alignment Reaches in the two corridors should be further optimized/refined	
	considering the geotechnical, environmental and community challenges;	
	hydraulics, schedule, and oil & gas well exploration program	

DCA Response to May 2020 Tunnel Independent Technical Review Panel Recommendations

Item	ITR Recommendation	DCA Response
3.2	The ITR recommends raising the tunnel alignment by a half a diameter to one	Noted. Will study in detailed design. Current tunnel depth controlled by surge
	diameter as there are benefits in terms of shallower shafts, tunnel and TBM	analysis and the resolution passed by the Port of Stockton for minimum separation
	operations (especially, for interventions for machine maintenance). The impact of	below San Joaquin River.
	up to one diameter raise is unlikely to adversely affect the liner design for net	
	internal pressure, but raising the tunnel more than one diameter could impact the	
	segment design and should be carefully weighed as to advantages and	
	disadvantages.	
4. Overal Construction S	equence and Schedule	
4.1	The assumed tunnel production rates are reasonable	Agree.
4.2	Clarify the logic used for time required to develop the material supply and	Noted. DCA team has reviewed and is comforable with their current logic.
	construction of the shaft pads.	
4.3	The panel recommends checking the mass balance logic with RTM at the South	Noted. DCA team has reviewed and is comforable with their mass balance
	Forebay.	calculations.
4.4	Review the schedule for concurrent tunneling operations	Noted. DCA team is confident in current sequence but will also review and
		confirm in the detailed design phase.
4.5	Other Schedule Considerations	a) Noted. DCA team has reviewed the schedule and has appropriately sequenced
		the work at Twin Cities and construction of the embankments at the Southern
	a) The construction start date and completion date of the project does not appera	Forebay.
	to be fixed and or driven by any sort of external mandate but the use of RTM for	
	construction of the Southern Forebay does.	b) Disagree. This change would require a launch shaft on Bacon Island for the
	b) If extending the overall duration of the project is feasible, consider changing the	Central alignment which is not feasible from a logistics perspective and is not
	sequence for the Reach 3 and 4 tunnels to allow Reach 4 to be completed prior to	necessary for the Eastern alignment as there is ample supply of material for the
	tunnel excavation commencing for Reach 3. Excvated material from Reach 3 could	Southern Forebay embankments from the existing configuration.
	be transported through/via Reach 4 conveyors to the Southern Forebay RTM	
	facility for treatment and utlimiante use at the site.	
5. Tunnel Lining Design	and Constructability Considerations	
5.1	Lining Design for Net Internal Hydraulic Surge Pressure	Noted. Comments will be addressed during detailed design. They do not affect
		the concept design required for CEQA analysis.
5.2	Other Design Issues Related to Net Internal Pressure	Noted. Comments will be addressed during detailed design. They do not affect
		the concept design required for CEQA analysis.
6. Reuseable Tunnel Ma	terial (RTM) Handling and Identified Re-Uses	
6.1	Perform an RTM Testing Program	Agree. Test program will be conducted to validate design assumptions.
6.2	Consider Natural Processing and Other Ideas	Noted. Will be evaluated further in design phase. For conceptual design, we
	-	believe we have the right balance of mechanical and natural drying to minimize
		construction area, reduce air emissions, and manage risks.
7. Contract Packaging Re	eport	

DCA Response to May 2020 Tunnel Independent Technical Review Panel Recommendations

Item	ITR Recommendation	DCA Response
7.1	ITR considers design-build contracting approach appropriate for the tunnels and	Noted. Will conduct contracting alternatives analysis during future design phase.
	shafts	Does not affect Conceptual Engineering Report.
7.2	Consider advantage of one contractor for both Reaches 1 and 2	Noted. Will conduct contract packaging alternatives analysis during future design
		phase. Does not affect Conceptual Engineering Report.
7.3	Consider using best value for contractor selection where a technical proposal is	Noted. Will include in contracting alternatives analysis described above.
	scored separate from the price. Gain and pain contract model in order to motivate	
	the contractors to keep time and cost plan.	
7.4	The ITR does not recommend early TBM procurement or project wide segment	Noted. Will include in contract packaging analysis described above.
	contract. ITR does recommend that one or more separate contracts associated	
	with treatment of the excavated tunnel material into RTM be considered.	
8. Recommendations Re	lated to Understanding and Satisfying O&M Needs	
8.1	a) The ITR recommends the minimum requirements for mandatory O&M shafts be	a) Noted. Additional work will be done to optimize permanent shaft diameter and
	defined in terms of minimum spacing, type of equipment used, duration for such	pad size needed for operations access. Shafts currently shown are of size and
	an inspection, anticipated maintenance activity, operational controls, and seasonal	location to facilitate tunnel construction.
	demand constraints.	b) Noted. We will study methods to reduce the amount of fill required at shaft
	b) The imported soils are a significant issue in terms of cost and schedule impact	site. Currently, this fill prevents artesian flooding durng shaft excavation but we
	on the project.	may be able to reduce the working platform area to reduce overall volume of
		imported soil needed.
8.2	ITR is not aware of tunnel project where bolt pocket created a tripping hazard or	Noted.
	concern over catchment of sediment. ITR is aware of other projects where the	
	bolt pocket was filled.	
9. Other Relevant Topics	5	
9.1	Recommend locating abandoned gas/oil wells prior to tunneling and adjusting	Agree. Gas well studies will be conducted as part of future field work efforts and
	alignment to avoid zones of concentration of wells, known well locations, or	gas surveillance requirements will be in the contract specifications.
	known circles of uncertainty.	
9.2	Pressurized tunneling has been demonstrated on projects to prevent damage to	Noted. Will study in detailed design. Current design accomodates various types of
	structures and can be accomplished with reduced cover without surface impacts.	machines.
9.3	TBM Pre-purchase not recommended.	See Comment 7.4

Appendix 6: Other Considerations and Case Histories Regarding O&M Shafts

As noted, in Section 8.1, the need for Operations and Maintenance Shafts for tunnels varies by type of tunnel and Owner's requirements and programs. It is understood that the DCO is weighing the needs of the program and comparing to demands of other water projects in the industry. The following are some additional thoughts that the ITR panel is offering for the DCO to consider for information, when assessing the needs for the Delta Conveyance Project.

Tunnels in general, and water tunnels especially, have a longer life cycle than other conveyance facilities (e.g. pipelines, pump stations, aqueducts). They are typically designed to account for corrosion, and as such maintenance can be expected to be minimal with proper details in the design. This is particularly true for tunnels through mountains which have long (e.g. over 10 miles) distances between access points. Examples include the North Fork Stanislaus Hydroelectric Project (ca. 1989) which has access intervals at about 11 miles or MWD's San Jacinto tunnel (ca. 1930) with access at about 13 miles. It is noted with this second example that MWD inspections are every 5 years, because San Jacinto required it as the original 1930's grouting program did now work so well. But now they have Inland Feeder so they can have longer shutdowns for repair.

Interceptor sewer tunnels, have less life expectancy, and typically will have manhole spacings of 500 to 2000 ft, mainly drops and tie-ins. The added benefit of this spacing is for hazards of sewer gases during inspections and due to maintenance required associated with sewerage. But for long crossings of rivers or mountains Owner's accept limited access and they will accept larger spacings. Recent examples include King County's Brightwater interceptors, St. Louis Deer Creek Sanitary Sewer Overflow (SSO), and Austin Downtown tunnel SSO where there is limited access

Effluent outfall tunnels are long by sewer design standards, and like mountain tunnels, do not have access, i.e., shaft access due to the ocean. Ventilation during a manned inspection (if ever) carry significant safety risk, but nevertheless, the O&M manuals typically addressed such scenarios of dewatering and manned inspection, in the unlikely event they are ever needed. As an example, the Sanitation Districts of Los Angeles (SDLAC) inspected their existing outfall by ROV several decades ago, and it was lost; likely stuck in a diffuser. The entire length of the existing outfall, about 70 years old had never been inspected by humans. The new tunnel under construction now, will provide the redundancy needed to inspect the existing outfall.

Consideration of size of equipment to access the tunnel for inspection is an important aspect. The SDLAC 18 ft ID by 7-mile-long tunnel has a 12 ft diameter lid at the drop shaft. Restrictions at fault crossings and the connection to the drop shaft is 16 ft. Maximum anticipated equipment was on the order of 10 ft.



Memo

Contact: Andrew Finney, Geotechnical Engineer

Date: June 26, 2020

INFORMATIONAL IONLY

Subject: Appendix to Question Tracking Master Log (dated 06.24.2020): Soil Conditioner Material Safety Data Sheets (MSDS)

The following MSDS for commonly-used soil conditioners are provided in response to SEC member requests for information (see ID#'s 4.78, 6.51 and 6.52). As explained in the SEC 9 meeting, soil conditioners are often proprietary mixes selected by tunneling contractors and periodically modified in their composition. The provision of the attached information does not indicate a selection or decision by DCA or DWR.

As previously indicated by DCA and stated in the Question Tracking packets provided to SEC members, "many different types and brands of conditioners are used in tunneling based upon soil conditions present along the alignment. Conditioners are generally categorized as foams, polymers and bentonites. On recent projects, DCA consultants have observed the use of Soilax S surfactants (i.e. detergents), available from the manufacturer Boraid Products, mixed with clean water as a foaming conditioner. Sometimes, a cellulose product, like Soilax C, is added into the conditioner mix to provide added strength to the soap bubbles, which helps when the conditioner is injected into certain soil formations. Thickening agents, such as polymers and a bentonite (a naturally occurring clay), are also used for different soil conditions. These include such products available from Mapei Products. These are just examples of some products that could be used. The construction specifications would require any conditioners to be inert (chemically inactive)."

Precautionary statements	 P264 Wash contaminated skin thoroughly after handling. P280 Wear protective gloves/ protective clothing/ eye protection/ face protection. P302+P352 If on skin: Wash with plenty of water. P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P310 Immediately call a poison center/ doctor. P321 Specific treatment (see medical advice on this label). P332+P313 If skin irritation occurs: Get medical advice/ attention. P362+P364 Take off contaminated clothing and wash it before reuse.
Contains	Sodium Lauryl ether sulphate, Alkyl C10-13 benzenesulfonic acid, sodium salt
Other hazards	
HSNO Classification	
3. Composition/information on	ingredients
Mixtures	
Sodium Lauryl ether sulphate	10-30%
CAS number: 3088-31-1	
Classification Skin Irrit. 2 - H315 Eye Dam. 1 - H318 Aquatic Chronic 3 - H412	
Alkyl C10-13 benzenesulfonic	acid, sodium salt 1-5%
CAS number: 68411-30-3	
Classification Acute Tox. 4 - H302 Skin Irrit. 2 - H315 Eye Dam. 1 - H318 Aquatic Chronic 3 - H412	
The full text for all hazard state	ments is displayed in Section 16.
4. First-aid measures	
Description of first aid measure	<u>19</u>
General information	Move affected person to fresh air and keep warm and at rest in a position comfortable for breathing. Get medical attention. Treat symptomatically.
Inhalation	IF INHALED: Get medical attention immediately. Move affected person to fresh air and keep warm and at rest in a position comfortable for breathing. Do not induce vomiting.
Indestion	IF SWALLOWED: Get medical attention immediately. If throat irritation or coughing persists

IN SWALLOWED: Get medical attention immediately. If throat irritation or coughing persists, proceed as follows. Rinse mouth thoroughly with water. Promptly get affected person to drink large volumes of water to dilute the swallowed chemical. Stop if the affected person feels sick as vomiting may be dangerous. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs.

 Skin Contact
 IF ON SKIN (or hair): Rinse immediately with plenty of water. Continue to rinse for at least 10 minutes. Get medical attention if irritation persists after washing. Remove contaminated clothing.

Eye contact	IF IN EYES: Remove any contact lenses and open eyelids wide apart. Continue to rinse for at least 15 minutes and get medical attention. Get medical attention if irritation persists after washing.	
Protection of first aiders	First aid personnel should wear appropriate protective equipment during any rescue.	
Most important symptoms and	effects, both acute and delayed	
General information	Treat symptomatically. See Section 11 for additional information on health hazards.	
Inhalation	Irritating.	
Ingestion	May cause stomach pain or vomiting. May cause irritation. Gastrointestinal symptoms, including upset stomach.	
Skin contact	May cause skin irritation.	
Eye contact	Causes skin and eye irritation.	
Indication of immediate medica	l attention and special treatment needed	
Notes for the doctor	Treat symptomatically.	
Specific treatments	Treat symptomatically.	
5. Fire-fighting measures		
Extinguishing media		
Suitable extinguishing media	Use fire-extinguishing media suitable for the surrounding fire. Extinguish with alcohol-resistant foam, carbon dioxide or dry powder.	
Special hazards arising from th	e substance or mixture	
Specific hazards	The product is not flammable. Irritating gases or vapors.	
Hazardous combustion products	Irritating gases or vapors.	
Advice for firefighters		
Protective actions during firefighting	No action shall be taken without appropriate training or involving any personal risk. Stop leak if safe to do so. If leakage cannot be stopped, evacuate area. Move containers from fire area if it can be done without risk.	
Special protective equipment for firefighters	Use air-supplied respirator, gloves and protective goggles.	
6. Accidental release measures	3	
Personal precautions, protectiv	e equipment and emergency procedures	
Personal precautions	No action shall be taken without appropriate training or involving any personal risk. Keep unnecessary and unprotected personnel away from the spillage. Avoid contact with skin, eyes and clothing. Avoid inhalation of vapors. Follow precautions for safe handling described in this safety data sheet.	
For non-emergency personnel	No action shall be taken involving any personal risk or without suitable training. Evaluate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.	

Environmental precautions

Environmental precautions	Spillages or uncontrolled discharges into watercourses must be reported immediately to the Environmental Agency or other appropriate regulatory body.	
Methods and material for conta	inment and cleaning up	
Methods for cleaning up	If leakage cannot be stopped, evacuate area. Move containers from spillage area. Large Spillages: Absorb spillage with sand or other inert absorbent. Collect and place in suitable waste disposal containers and seal securely. Absorb small quantities with paper towels and evaporate in a safe place. Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Disposal Authority. Label the containers containing waste and contaminated materials and remove from the area as soon as possible.	
Reference to other sections	For personal protection, see Section 8. For waste disposal, see Section 13. See Section 11 for additional information on health hazards. See Section 12 for additional information on ecological hazards.	
7. Handling and storage		
Precautions for safe handling		
Usage precautions	For professional users only. Do not handle until all safety precautions have been read and understood. Use only in well-ventilated areas. Protect from moisture. Keep container dry. Container must be kept tightly closed when not in use. Do not eat, drink or smoke when using this product.	
Advice on general occupational hygiene	Do not eat, drink or smoke when using this product. Provide eyewash station. Wash promptly with soap and water if skin becomes contaminated. Promptly remove any clothing that becomes contaminated.	
Conditions for safe storage, inc	luding any incompatibilities	
Storage precautions	Store at temperatures between 4°C and 30°C. Store in tightly-closed, original container in a dry, cool and well-ventilated place. Do not store near heat sources or expose to high temperatures. Store away from the following materials: Acids. Alkalis.	
Storage class	Chemical storage.	
Specific end uses(s)		
Specific end use(s)	The identified uses for this product are detailed in Section 1.2.	
8. Exposure Controls/personal	protection	
Control parameters		
Exposure controls		
Protective equipment		
Appropriate engineering controls	Provide adequate ventilation.	
Personal protection	Use protective clothing, hand gloves and goggles.	
Eye/face protection	Use safety glasses (with side shields). Safety glasses (with side shields) should be consistent with EN 166 or equivalent.	
Hand protection	To protect hands from chemicals, gloves should comply with OSHA 1910.138 and be demonstrated to be impervious to the chemical and resist degradation. It is recommended that gloves are made of the following material: Nitrile rubber. Butyl rubber.	

Other skin and body protection	Wear appropriate clothing to prevent skin contamination.
Hygiene measures	Wash hands thoroughly after handling. Promptly remove any clothing that becomes contaminated. Do not eat, drink or smoke when using this product.
Respiratory protection	If ventilation is inadequate, suitable respiratory protection must be worn.
Environmental exposure controls	Keep container tightly sealed when not in use.

9. Physical and Chemical Properties

Information on basic physical a	and chemical properties
Appearance	Viscous liquid.
Color	Colorless to pale yellow.
Odor	Detergent.
Odor threshold	Not determined.
рН	pH (concentrated solution): 7.0 ± 1.0
Melting point	Not applicable.
Initial boiling point and range	Not determined.
Flash point	Not determined.
Evaporation rate	Not determined.
Evaporation factor	Not determined.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	Not applicable.
Other flammability	Not applicable.
Vapor pressure	Not determined.
Vapor density	Not determined.
Relative density	1.03 ± 0.01 @ 25°C
Bulk density	Not applicable.
Solubility(ies)	Not determined.
Partition coefficient	Not determined.
Auto-ignition temperature	Not determined.
Decomposition Temperature	Not determined.
Viscosity	Not determined.
Explosive properties	Not applicable.
Explosive under the influence of a flame	Not considered to be explosive.
Oxidizing properties	Not applicable.
Density	

10. Stability and reactivity

Reactivity	There are no known reactivity hazards associated with this product.
Stability	Stable at normal ambient temperatures and when used as recommended.
Possibility of hazardous reactions	No potentially hazardous reactions known.
Conditions to avoid	Avoid exposure to high temperatures or direct sunlight.
Materials to avoid	Avoid contact with the following materials: Strong acids. Strong alkalis.
Hazardous decomposition products	Carbon dioxide (CO2). Carbon monoxide (CO). Nitrous gases (NOx).
11. Toxicological information	
Information on toxicological effe	ects
Acute toxicity - oral ATE oral (mg/kg)	34,364.26
Skin corrosion/irritation Skin corrosion/irritation	No information available.
Serious eye damage/irritation Serious eye damage/irritation	No information available.
Respiratory sensitization Respiratory sensitization	No information available.
Skin sensitization Skin sensitization	No information available.
Germ cell mutagenicity Genotoxicity - in vitro	No information available.
Genotoxicity - in vivo	No information available.
Carcinogenicity Carcinogenicity	No information available.
Reproductive toxicity Reproductive toxicity - fertility	No information available.
Reproductive toxicity - development	No information available.
Specific target organ toxicity -	single exposure
STOT - single exposure	No information available.
Specific target organ toxicity - r	repeated exposure
STOT - repeated exposure	No information available.
Aspiration hazard	
Aspiration hazard	No information available.

Inhalation	May cause irritation.
Ingestion	Irritating.
Skin Contact	The product is irritating to eyes and skin.
Eye contact	May cause serious eye damage.
12. Ecological Information	
Ecotoxicity	There are no data on the ecotoxicity of this product.
Toxicity	
Persistence and degradability	
Persistence and degradability	There are no data on the degradability of this product.
Bioaccumulative potential	
Partition coefficient	Not determined.
Mobility in soil	
Mobility	No information available.
Results of PBT and vPvB asses	ssment
Results of PBT and vPvB assessment	No information available.
Other adverse effects	
13. Disposal considerations	
Waste treatment methods	
General information	Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Disposal Authority. Waste should be treated as controlled waste.
Disposal methods	Dispose of contents/container in accordance with national regulations. Waste should be treated as controlled waste.
14. Transport information	
General	The product is not covered by international regulations on the transport of dangerous goods (IMDG, IATA, DoT).
UN Number	
Not applicable.	
UN proper shipping name	
Not applicable.	
Transport hazard class(es)	
No transport warning sign requ	ired.
Packing group	
Not applicable.	
Environmental hazards	
Environmentally Hazardous Su No.	bstance

Special precautions for user

Not applicable.

Transport in bulk according to Not applicable. Annex II of MARPOL 73/78 and the IBC Code

15. Regulatory information

International Regulations

Inventories

EU - EINECS/ELINCS

All the ingredients are listed or exempt.

16. Other information

General information	Only trained personnel should use this material.
Revision date	10/19/2015
Revision	1
SDS No.	5168
Hazard statements in full	H302 Harmful if swallowed.H315 Causes skin irritation.H318 Causes serious eye damage.H412 Harmful to aquatic life with long lasting effects.

This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is, to the best of the company's knowledge and belief, accurate and reliable as of the date indicated. However, no warranty, guarantee or representation is made to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability of such information for his own particular use.





1. Identification

Product identifier	CLB F5/AW - US	
Other means of identification		
Product code	NC01540	
Recommended use	See Technical Data Sheet.	
Recommended restrictions	None known.	
Manufacturer/Importer/Suppli	er/Distributor information	
Manufacturer		
Company name	CONDAT CORPORATION	
Address	250 South Industrial	
	Saline, MI 48176	
	United States	
Telephone	Tel:	+1 734-944-4994
Website	www.condatcorp.com	
E-mail	arp-us@condatcorp.com	
Contact person	Products Regulatory Affairs Dpt.	
Emergency phone number	Emergency Tel. (24h):	+1 734-944-4994

2. Hazard(s) identification

Physical hazards Health hazards OSHA defined hazards	Not classified. Serious eye damage/eye irritation Not classified.	Category 1
Label elements		
Signal word	Danger	
Hazard statement	Causes serious eye damage.	
Precautionary statement		
Prevention	Wear eye protection/face protection.	
Response	If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center/doctor/.	
Storage	Store away from incompatible materials.	
Disposal	Not available.	
Hazard(s) not otherwise classified (HNOC)	None known.	
Supplemental information	None.	

3. Composition/information on ingredients

Mixtures

Chemical name	Common name and synonyms	CAS number	%
ALKYL D-GLUCOPYRANOSIDE		110615-47-9	2.5 - 10
Mono-C10-16-alkyl, sodium sulfate		68585-47-7	2.5 - 10

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret. **Composition comments** Occupational Exposure Limits for constituents are listed in Section 8.

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4. First-aid measures	
Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.
Ingestion	Rinse mouth thoroughly. If swallowed, do NOT induce vomiting. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Severe eye irritation.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Dry chemical, CO2, or water spray. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable extinguishing media	Not relevant.
Specific hazards arising from the chemical	None known. See also section 10.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	In case of fire and/or explosion do not breathe fumes.
Specific methods	In the event of fire and/or explosion do not breathe fumes.
General fire hazards	No unusual fire or explosion hazards noted. None known.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Prevent entry into waterways, sewer, basements or confined areas. Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.
Environmental precautions	Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS. Local authorities should be advised if significant spillages cannot be contained. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.
7. Handling and storage	
Precautions for safe handling	Provide adequate ventilation. Do not get this material in contact with eyes. Wear appropriate personal protective equipment. Observe good industrial hygiene practices. Wash hands after handling. Handle in accordance with good industrial hygiene and safety practice.
Conditions for safe storage, including any incompatibilities	Store in closed original container in a dry place. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).		
Biological limit values	No biological exposure limits noted for the ingredient(s).		
Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Ensure adequate ventilation, especially in confined areas. Provide eyewash station.		
Individual protection measures	s, such as personal protective equipment		
Eye/face protection	Wear safety glasses with side shields (or goggles) and a face shield. Avoid contact with eyes.		
Skin protection			
Hand protection	Use protective gloves made of: Nitrile. Polyvinyl chloride (PVC). Suitable gloves can be recommended by the glove supplier.		
Other	Wear suitable protective clothing.		
Respiratory protection	In case of insufficient ventilation, wear suitable respiratory equipment.		
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.		
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.		

9. Physical and chemical properties

	Cashalaur	
Appearance		
Physical state	Liquid.	
Form	Liquid.	
Color	Colorless. to Blonde.	
Odor	Mild.	
Odor threshold	Not available.	
рН	6.7	
Melting point/freezing point	Not available.	
Initial boiling point and boiling range	Not available.	
Flash point	> 212.0 °F (> 100.0 °C) Closed Cup	
Evaporation rate	Not available.	
Flammability (solid, gas)	Not applicable.	
Upper/lower flammability or e	xplosive limits	
Flammability limit - lower (%)	Not available.	
Flammability limit - upper (%)	Not available.	
Explosive limit - lower (%)	Not available.	
Explosive limit - upper (%)	Not available.	
Vapor pressure	Not available.	
Vapor density	Not available.	
Relative density	1.014	
Relative density temperature	68 °F (20 °C)	
Solubility(ies)		
Solubility (water)	Not available.	
Partition coefficient (n-octanol/water)	Not available.	
Auto-ignition temperature	Not available.	
Decomposition temperature	Not available.	
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Viscosity	Not available.
Other information	
Explosive properties	Not available.
Flammability class	Combustible IIIB estimated
Oxidizing properties	Not oxidizing.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.		
Chemical stability	Material is stable under normal conditions.		
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use. Hazardous polymerization does not occur.		
Conditions to avoid	Contact with incompatible materials.		
Incompatible materials	Strong oxidizing agents.		
Hazardous decomposition products	Under common conditions of use (see technical data sheet) At thermal decomposition temperatures, carbon monoxide and carbon dioxide. Sulphur compounds.		

11. Toxicological information

Information on likely routes of exposure

Inhalation	No adverse effects due to inhalation are expected.
Skin contact	Not classified.
Eye contact	Causes serious eye damage.
Ingestion	Expected to be a low ingestion hazard.
Symptoms related to the physical, chemical and toxicological characteristics	Severe eye irritation.

Information on toxicological effects

Acute toxicity		
Components	Species	Test Results
ALKYL D-GLUCOPYRANOSIDE (CAS	5 110615-47-9)	
Acute		
Derma		
LD50		> 2000 mg/kg
Oral		
LD50		> 5000 mg/kg
* Estimates for product may b	e based on additional compo	nent data not shown.
Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.	
Serious eye damage/eye irritation	Causes serious eye damage	
Respiratory or skin sensitizatio	n	
Respiratory sensitization	Not a respiratory sensitizer.	
Skin sensitization	This product is not expected	to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate mutagenic or genotoxic.	e product or any components present at greater than 0.1% are
Carcinogenicity	Not classified.	
IARC Monographs. Overall	Evaluation of Carcinogen	city
Not available.		
US. National Toxicology Pro	ogram (NTP) Report on Ca	arcinogens
Not available.		
Reproductive toxicity	This product is not expected	to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure	Not classified.	

Aspiration hazard

Ecotoxicity

12. Ecological information

The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Components		Species	Test Results		
ALKYL D-GLUCOPYRANOSIDE (CAS 110615-47-9)					
Aquatic					
Acute					
Algae	EC50	Algae	5 - 38 mg/l, 72 hours		
Crustacea	EC50	Daphnia	7 - 14 mg/l, 48 Hours		
Fish	LC50	Fish	2.95 - 5.9 mg/l, 96 Hours		
Chronic					
Crustacea	NOEC	Daphnia	1 - 4 mg/l, 21 days		

* Estimates for product may be based on additional component data not shown.

Persistence and degradability	No data is available on the degradability of this product.
Bioaccumulative potential	
Mobility in soil	No data available.
Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

-	
Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not discharge into drains, water courses or onto the ground. Dispose of contents/container in accordance with local/regional/national/international regulations.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory information

US federal regulations

This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazarc Communication Standard, 29 CFR 1910.1200. All the components of this product comply with the U.S. EPA TSCA inventory requirements.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

SARA 304 Emergency release notification

Not regulated.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

No

Hazard categories

Immediate Hazard - Yes Delayed Hazard - No Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act Not regulated. (SDWA)

US state regulations

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100) Not listed.

US. Massachusetts RTK - Substance List

Not regulated.

- US. New Jersey Worker and Community Right-to-Know Act
- Not regulated. US. Pennsylvania RTK - Hazardous Substances

Not regulated.

US. Pennsylvania Worker and Community Right-to-Know Law

Not listed. US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

16. Other information, including date of preparation or last revision

Issue date	03-25-2016
Revision date	12-14-2016
Version #	2.0
HMIS® ratings	Health: 3 Flammability: 0 Physical hazard: 0
Disclaimer	This document complements the technical sheets but does not replace them. The information contained herein is based on our knowledge of the concerned product on the date indicated. It is offered in good faith. Furthermore, the regulatory requirements referred to must not be considered as exhaustive. They do not exempt in any form the user from knowing and applying all regulations related to the possession and use of the product. The user takes as their sole responsibility the implementation of precautions relating to storage and their use of the product. CONDAT cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.
Revision Information	This document has undergone significant changes and should be reviewed in its entirety.

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