Comment Letter O7

From: Donna Tisdale
To: Harris, Susan; Koutoufidis, Nicholas
Cc: Jacob, Dianne; Wilson, Adam
Subject: Boulder Brush / Campo Wind DEIR PDS2019-ER-19-16-001
Date: Sunday, January 12, 2020 10:34:35 AM
Attachments: BPG Campo Wind DEIS comments 7-8-19.pdf
ECO Substation Amended Construction Water Supply Plan 7-3-13.pdf
Bethany Wind Turbine Study Committee Report 1-25-2007.pdf
Soitec DPEIR Dudek v Ponce_Tisdale 2-3-14.pdf

Hello Susan and Nicholas,

Please include the attached formal Campo Wind Boulder Brush DEIS comments as part of the formal record for the Boulder Brush / Campo Wind DEIR: PDS2019-ER-19-16-001, PDS2019-MUP-19-002. They were formally and timely submitted to the Bureau of Indian Affairs and previous PDS Boulder Brush project manager, Bronwyn Brown, on July 8, 2019 as part of the formal record for the Campo Wind / Boulder Brush DEIS. O7-1

According to Appendix A of the County's Boulder Brush / Campo Wind DEIR, released on 12/12/19, these comments were not included in preparation of the Boulder Brush / Campo Wind DEIR that includes analysis of the Campo Wind project proposed for tribal land. This is a significant failure on behalf of the Planning and Development Services that must be corrected. O7-2

Please confirm receipt of these documents and that they will be included in the DEIR record. O7-3

Regards,
Donna Tisdale, Chair
Boulevard Planning Group (BPG)
619-766-4170

---------- Forwarded message ---------
From: **Donna Tisdale** <tisdale.donna@gmail.com>
Date: Mon, Jul 8, 2019 at 10:31 AM
Subject: Blvd PG - Campo Wind DEIS comments
To: Hall, Harold <harold.hall@bia.gov>, <amy.dutschke@bia.gov>, Brown, Bronwyn <Bronwyn.Brown@sdcounty.ca.gov>

Good Morning,

Please find the attached Boulevard Planning Group's comments on the Campo Wind / Boulder Brush DEIS with 3 attachments. O7-4

Please confirm receipt.

Regards,
Donna Tisdale
619-766-4170

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Report from the Bethany Wind Turbine Study Committee

25 January 2007

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A) Introduction and Scope

In November 2005, the Town Board of the Town of Bethany enacted a twelve (12) month moratorium on commercial wind energy conversion systems (CWECS) in the Town of Bethany. In November, 2006, the moratorium was extended for six (6) months. This moratorium was enacted and extended to allow the Town to take the time necessary to understand the possible ramifications of the placement of CWECS within the Town.

To facilitate the gathering, compilation and understanding of available information on CWECS, the Town selected a citizens committee comprised of seven (7) residents, representing the diverse interests, occupations and viewpoints within the Town. Within this report are the findings of the committee to date, outlining major issues to be concerned with and recommended mitigation strategies.

How to read this report: This report is divided into sections, each concerned with a major issue: Environment, Legal and Financial. Some topics cross lines and have been discussed in more than one location. A recommendation, in layman's terms, can be found at the end of each discussion. A summary of the committee's final recommendations, written in more formal language, can be found in *§ H – Summary of Recommendations*. Section titles, article titles, names of organizations and companies have been italicized. References take the form of [A:F.1], meaning go to Appendix F.1 for details or further information on the topic. The book of appendices has not been reproduced for each recipient of the report, but is available at the Town Hall.

The scope of this report is the potential impact of CWECS facilities within the Town of Bethany. Members of this committee have studied other towns, limiting research to those with similar configurations to Bethany – rural in nature. The conclusions of this report are applicable for the Town of Bethany, and perhaps for towns with similar configurations [A:D.1], but are not universal truths.

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This report is not intended as a memorandum on the suitability of wind energy as an industry. While many members of the committee have researched the usefulness of wind energy in general, that research has not been included here, except where it directly impacts the Town. The suitability of wind energy in general and/or in theory is left for others to evaluate.

The committee has not directly addressed non-commercial turbines, believing those to be adequately handled by the Town in the past. That topic is addressed indirectly, however, by simply extrapolating data downward to the lower end of the spectrum.

The Town should also note the prevailing nature of the discussion in Albany. At some point in the future, New York State officials may choose to draft legislation, including zoning rights and limits, of their own. However, it is the belief of this committee that the Town should enact legislation to protect its residents now; and let Albany take legal liability for any actions they may override in the future.

B) Definitions

As used in this report, the following terms have the meanings given to them.

Associated facilities. "Associated facilities" means facilities, equipment, machinery, and other devices necessary to the operation and maintenance of a Commercial Wind Energy Conversion System, including access roads, collector and feeder lines, maintenance buildings and substations.

Commercial Wind Energy Conversion System. "Commercial Wind Energy Conversion System (CWECS)" means a facility consisting of one or more Wind Energy Conversion Systems with a rated capacity of more than 50 kW; or that is the primary use on the sited parcel. A facility shall be considered commercial if it supplies electrical power primarily for off-site use; or if net revenue is produced by such electrical power.

Construction. "Construction" means to begin or cause to begin as part of a continuous program the placement, assembly, or installation of facilities or equipment or conduct significant physical site preparation work for installation of facilities or equipment. Entering into binding power purchase contracts, obtaining wind easements from property owners, conducting an EIS or gathering wind data is not construction.

Developer. "Developer" means the entity or entities involved in the construction of a CWECS facility.

FAA. FAA means the Federal Aviation Administration.

Facility Owner. "Facility Owner" means the entity or entities having an equity interest in the Wind Energy Conversion System, including their respective successors and assigns.

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Hub Height. "Hub Height" means the vertical distance from ground level to the top of the nacelle.

Local Provenance. "Local provenance" means plants which grow "in the wild" within ten miles to where they are going to be planted.

Native Vegetation. "Native vegetation" means plants of local provenance, where there is little to no possibility that the plants were planted or introduced and originated from somewhere else.

Non-commercial Wind Energy Conversion System. "Non-commercial Wind Energy Conversion System (NWECS)" means a facility to convert wind movement into electricity, with a rated capacity of not more than 50 kW; and that is incidental and subordinate to another use on the same parcel. A facility shall be considered non-commercial only if it supplies electrical power solely for on-site use, except that when a parcel on which a non-commercial WECS is installed also receives electrical power supplied by a utility company, excess electrical power generated by the WECS and not presently needed for on-site use may be used by the utility company in exchange for a reduction in the cost of electrical power supplied by that company to the parcel for on-site use, as long as no net revenue is produced by such electrical power.

Occupied Building. "Occupied Building" means a residence, school, business, hospital, church, public library or other building used for public gathering that is occupied or in use when the permit application is submitted.

Operator. "Operator" means the entity responsible for the day-to-day operation and maintenance of the Wind Energy Conversion System.

Person. "Person" means an individual, partnership, joint venture, private or public corporation, association, firm, public service company, cooperative, political subdivision, municipal corporation, government agency, public utility district, or any other entity, public or private, however organized.

Right-of-Way. "Right-of-Way" aka "right of way" means 1) the right to pass over property owned by another, usually based upon an easement; 2) A path or thoroughfare over which passage is made; 3) A strip of land over which facilities such as highways, railroads or power lines are built.

Rotor Diameter. "Rotor diameter" means the distance measured across a circle representing the full sweep of the turbine blades.

Shadow Flicker. "Shadow flicker" results from the position of the sun in relation to the blades of the wind turbine as they rotate. This occurs under certain combinations of geographical position and time of day. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the potential site.

Tip Height. "Tip Height" means the vertical distance from ground level to the tip of a wind turbine blade when the tip is at its highest point. This is approximately equivalent to the hub height plus one-half of the rotor diameter.

Viewshed. "Viewshed" means an area composed of land, water, and cultural elements which may be viewed and mapped from one or more viewpoints and which has inherent scenic qualities and/or aesthetic values as determined by those who view it.

Wind Energy Conversion System. "Wind Energy Conversion System (WECS)" means a facility consisting of a tower, wind turbine generator with blades, guy wires or other support structures and anchors, access roads, and associated control and conversion equipment to convert wind movement into electricity.

Wind Turbine. "Wind Turbine" means a single facility consisting of a tower, wind turbine generator with blades, guy wires or other support structures and anchors. Wind Energy Conversion Systems (WECS) may consist of one or more Wind Turbines.

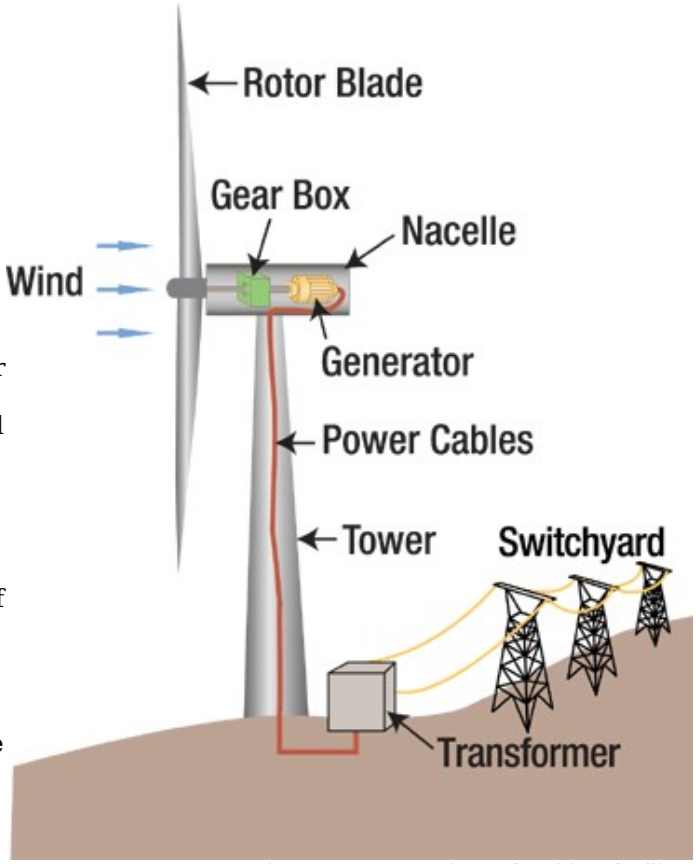

Figure B.1: Overview of turbine facility.

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C) Work to Date

Beginning on February 6, 2006, the committee has met at least monthly for a total of 22 meetings. Altogether, committee members have reviewed approximately 2,800 documents plus countless web pages, local, state, federal and international reports and newspaper clippings. Committee members have served as a sounding board for each other, examining all evidence critically.

On May 3, 2006, committee members arranged a teleconference with Scott Rowland, Vice President of Construction and Engineering with *UPC Wind Partners*, to discuss critical technical and geologic issues.

On June 17, 2006, committee members arranged and participated in an unannounced trip to the Maple Ridge Wind Farm and the Town of Lowville. During this visit, committee members interviewed residents as well as tourists, visited several turbines and associated facilities, and arranged an impromptu tour from an on-site *Vestas* staff member.

Figure C.1: Chris, a Vestas employee, explains how remote monitoring works while inside the turbine.

The committee has also interviewed other Town officials already in the CWECS approval process. Several committee members also attended the spring *Local Government Workshop* which included a presentation from a NYS Agriculture & Markets expert on the lasting impact of wind turbine construction on farmland. One member also attended a zoning presentation at that same conference and was able to ask several questions regarding possible and non-possible zoning for CWECS.

Individually, members have also attended wind turbine informational meetings – both pro and con – in Alexander, Batavia, Oakfield, Maple Ridge, Perry, Stafford, and Sheldon. Findings from these meetings have been delivered to the committee verbally.

At this time the committee would like to note that *UPC Wind Partners*, the only company to have approached the Town of Bethany for CWECS development, has not been as forthcoming as the committee would prefer. In particular, *Noble Environmental Power* and *Horizon Wind Energy* have both provided significantly more information regarding proposed projects to the Towns of Bliss and Stafford/Sheldon, respectively. The committee has had to operate from a theoretical perspective, which has the advantage of application to any wind developer who might approach the Town, yet has made the committee's work tedious and frustrating.

The committee asks the reader to keep in mind that we do not, at this time, know what type of equipment is proposed for Bethany – in terms of size, configuration, capacity and even location. To provide concrete examples, the committee has frequently referenced the proposed *UPC Wind Partners* project – to whit, between 30 and 40

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wind turbines of model GE 3.5mW (approximately 330ft hub height and 450ft tip height), placed primarily north-south along East Bethany Center Road and East Road, with offshoots north along Bethany-Stafford Townline Road and Brown Road. In general discussions, the committee has attempted to address the impacts of various types of equipment, making the report somewhat longer but more complete.

The committee has identified a list of significant issues, identified later in this document. Over the last four months, committee members have been writing, individually, reports on each of these issues. These reports have been integrated into this final report.

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D) Summary Findings

The committee finds that CWECS facilities have both positive and negative impacts on any Town. Our recommendation is to work to accentuate the positive impacts while eliminating significant negative impacts in consideration of any CWECS project. Particularly, the Town should act immediately to protect the health, safety and quality of life for its residents from negative impacts of any CWECS project.

Based on the information gathered, the committee recommends that the Town of Bethany immediately work to enact zoning legislation designed to protect the health, safety and quality of life for Town of Bethany residents prior to considering any CWECS project(s).

This legislation shall not draw a conclusion on the presence of CWECS within the Town of Bethany, but rather guide any such presence along safe, secure lines.

To accomplish this goal, the committee has completed this comprehensive report providing, in the committee's opinion, undisputed facts and reasonable estimates around which successful zoning legislation can be drawn.

Questions regarding the report or any section thereof can be directed to Francis Ashley, the committee chair, for referral to the appropriate committee member. In addition, the committee offers its continued assistance for the duration of the extended moratorium to assist the Planning Board and/or Town Board in creating such zoning legislation.

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E) Environmental / Health & Safety

1. Aesthetic / Quality of Life Impact

Visual

One of the controversies over wind turbines is the massive size and placement of these structures, where such an industrial view/operation may change residents' lifestyles. These are industrial machines and will have significant impact wherever they are sited for decades. Few people would object to siting them on the shores of Patagonia where the wind is fearsome; whereas in a bedroom community such as Bethany the situation is different.

Commercial turbines such as the 450ft GE models proposed cannot always be placed so that they are not visible from doors and windows of nearby residences. Curiosity-seekers currently stop at local residences, asking repeatedly about them. This would be part of the lifestyle change Bethany residents would be expected to make.

The placement of these turbines in Bethany is proposed to be as close as 1,000ft from property lines and other occupied buildings. Our committee saw, first-hand, a place of business literally surrounded by turbines on three sides, with the closest 1,100ft away. When you look over the rolling hills of Bethany you may see a farm silo or two, which in most cases are less than 100ft tall and are part of the agricultural district we live in – part of the expected view. Up to forty commercial turbines would definitely take away from the aesthetics of the countryside. Many members of our committee were struck by an 'alien' or 'industrial' feeling when viewing the Maple Ridge project. turbines dominated the landscape and our committee members felt out of place.

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It may be the case that residents get used to the view, however, many Bethany residents moved here to get away from the city hustle and bustle; from towering structures and constant movement. Indeed, Bethany's peace and quality of life may be its strongest and sole attraction to new residents.

Turbines in other countries have been painted alternating red and white stripes for air safety, which makes them stand out. Turbines sponsored by certain groups in the US have been painted with the group's logo or identifying marks, which stand out against the non-reflective surface of the turbine tower. After trips to Wethersfield and Tug Hill, it became apparent that turbines, even when painted so as to be unobtrusive, will never blend entirely into our rural country setting, due to their space-age look and constant motion.

Service Disruption & Nuisances

In addition, turbines and associated facilities placed in line with occupied buildings result in low frequency noise, flicker effect, loss of TV, cell phone, and local networking reception. See *§ E.14 – Noise including Infrasonic*, *§ E.17 – Shadow & Flicker Effects*, *§ E.5 – Electronic and Electromagnetic Interference* for details on each of these effects.

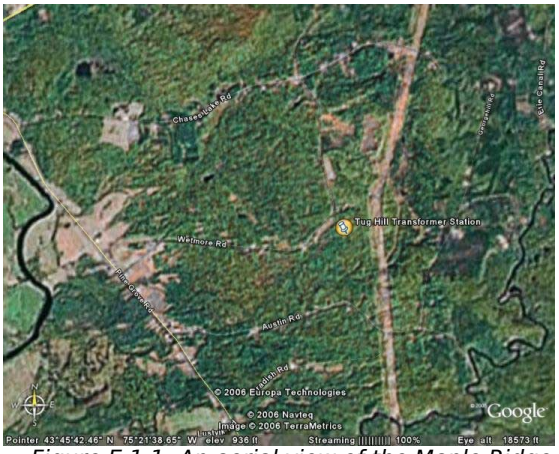

Figure E.1.1: An aerial view of the Maple Ridge Project location. Orange dot is the Maple Ridge power substation.

Figure E.1.2: an aerial view of the Town of Bethany; scale matches the Maple Ridge photo at left.

Careful placement of the turbines can mitigate these problems, however, in a town as densely populated as Bethany, there is some question as to whether such careful placement would result in a viable project. Turbines require a fair distance from occupied buildings, and Bethany may be too densely populated to fully mitigate visual and noise disturbances (there seems to be sufficient room to mitigate shadow flicker; electromagnetic disruption is an unknown). See figures E.1.1, an aerial view of the Maple Ridge Project locale on Tug Hill and E.1.2, an aerial view of Bethany at the same scale.

In the opinion of this committee, noise and destruction of the viewshed are quality of life issues that Bethany residents will simply have to live with, should a CWECS project be approved.

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This committee recommends that the Town consider the viewsheds of adjoining and surrounding neighbors when considering any proposed turbine location. A non-confrontational method for determining each neighbor's opinion regarding the turbine should be developed, perhaps with a questionnaire.

Clean Air

One of the strongest arguments for wind power is that it is "green" energy, displacing CO2 emissions and other pollution from existing coal-fired plants. This could impact the quality of life not only for Bethany residents, but globally.

Elsam, the Jutland power generator, stated in May 2004 at a meeting of the *Danish Wind Energy Association* with the Danish government that increasing wind power does not decrease CO2 emissions. Ireland has drawn similar conclusions based on its experience that the rate of change of wind speed can drop faster than the rate at which fossil-fueled capacity can be started up. Hence spinning reserve is essential, although it leads to a minimal CO2 saving on the system. *Innogy* made the same observation about the operation of the UK system (note the *Innogy* report, by engineer D. Tolley in 2003, is no longer available online but is referenced over 1,000 times in both pro- and anti-wind literature of the period).

The result is that, while wind-generated power itself is CO2-free, the saving to the whole power system is not proportional to the amount of fossil-fueled power that it displaces. The operation of fossil-fired capacity as spinning reserve emits more CO2/kWh than if the use of that plant were optimized, thus offsetting much of the benefit of wind.

Recommendations: Wind turbines shall not be used for displaying any advertising except for reasonable identification of the manufacturer; colors and surface treatments shall be non-reflective in nature and minimize visual disruption; turbines shall not significantly impair a scenic vista or scenic corridor as identified by the Town or other published source; all cable shall be buried underground unless poles are in place to accommodate them at the time of the CWECS permit application. The Town shall carefully review proposed CWECS projects from the standpoint of destruction of the viewshed and quality-of-life for nearby residents.

2. Backup Power Issues

It is the determination of this committee that the efficiency and reliability of wind-generated power, while a valid concern for Albany and New York taxpayers, is not an issue directly related to the Town at this time. See also *§ E.1 – Aesthetics: Clean Air*.

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3. Construction Disruption

CWECS facilities, particularly the turbines themselves, are extremely large construction processes, resulting in infrastructure impacts to the Town as well as to the individual landowners. Considerations include:

Roadways: Disruption to existing traffic patterns; wear and tear on roadways; temporary and permanent access roads.

Utilities: relocation and/or addition of power lines, communications lines and poles; possible relocation or addition of cell and/or TV transmission towers.

General: generation of dust; quarry operations; drainage issues; water well impact; construction noise.

Installation will require transporting heavy equipment and significant quantities of stone, gravel and concrete by trucks in rapid succession for each turbine base. Wind turbine components are also delivered to the installation site by truck. Trucks carrying turbine components and blades may require regular interruptions of traffic patterns, wide turning lanes and specific routes based on bridge weight capacities and

overhead obstructions. In Bethany, the intersections of Fargo Rd and Route 63 as well as East Rd with Route 20 are particularly dangerous and may be inadvisable as potential routes unless detours or restricted hours of operation were put into place.

Damage to existing roadways is a factor addressed under *§ E.15 – Road Upkeep & Repair.*

Existing power lines, communication lines and poles may have to be reconstructed to accommodate transportation and placement of equipment. This is in addition to the new transmission lines the CWECS developer is expected to construct for use with the project.

Portions of the construction involving heavy equipment will not be quiet. Sample CWECS leaseholder agreements allow for heavy equipment access 24 hours per day. Limitations on the use of such equipment to the hours of 7:00am to 6:00pm with no Sunday or holiday operations (except in the case of emergency or repair) will help reduce the negative impact of construction on nearby residents.

Creation of permanent new access roads may introduce new hazards to existing traffic patterns. In our Maple Ridge interviews, we learned of a Danish engineer who was run over by a local resident when he walked from the access road out onto a main road. While this accident occurred at approximately 3:00am and may not have been avoidable, heavy brush partially obscured the view of the access road from the main road. Consideration should be given to the safety of all new access roads with respect to existing traffic patterns.

Please see also *§ E.15 – Road Upkeep & Repair* and *§ G.1 – Agricultural Impact*.

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Recommendation: The developer shall be required to submit regular scheduling reports to the Town, indicating work completed to date, in progress and scheduled; this report shall include locations, construction routes and impacted property lots. The developer and/or an independent oversight agency should be required to actively monitor and address dust levels via standard construction techniques. Any impact reports submitted with application should address proposed routes, overhead obstructions and any necessary electrical or communications lines changes that would be made. The Town shall specify a limit on hours of heavy operation to a reasonable time frame. The Town shall consider the safe placement of new access roads.

4. Earthquake / Seismic Effects

Figure E.4.2, the map of New York Faults, shows that the area extent of the wind turbine project proposed by *UPC Wind Partners* is directly on the main traces of the Clarendon-Lindon fault in western New York.

Historical seismic data shows that major structural damage was recorded in the 1920s and 1930s, including the area proposed for the wind turbine project. Significant structural damage was observed in buildings and masonry in an area bounded by Attica to the hamlet of Little Canada, a damage trajectory which cuts directly through the proposed wind turbine project area.

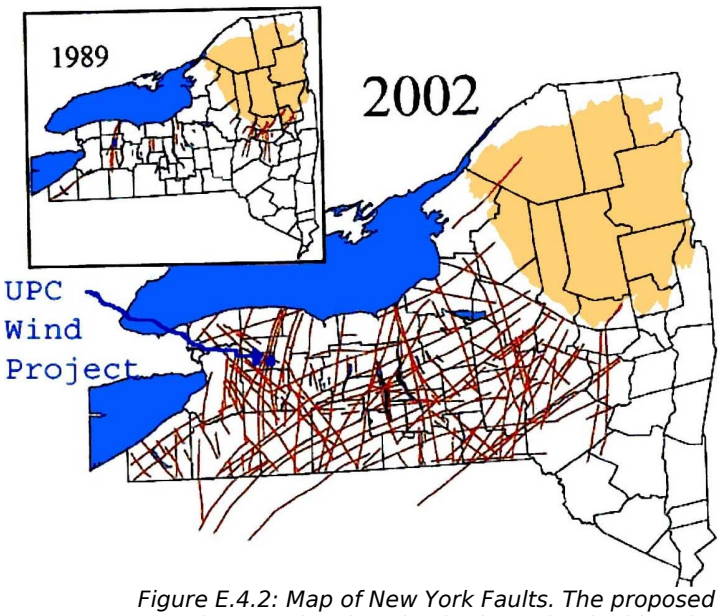

Figure E.4.2: Map of New York Faults. The proposed UPC Bethany project location is shown by the blue dot on the map. Courtesy SUNY at Buffalo Geology Department, Earthquake Data USGS

Mr. Swartley organized a teleconference at which town officials and committee members were able to ask technical questions from a *UPC Wind Partners* engineer, Scott Rowland, Vice President of Construction and Engineering. At that conference it became obvious that the issue raised above pertaining to possible seismic activity in the area proposed for turbine installation had not been addressed by *UPC Wind Partners*. Mr. Briggs specifically attempted to get some quantitative assessment of the probability of turbine failure in the event of a local earthquake, to no avail.

While a complete seismic assessment would be difficult to obtain due to rare harmonic frequency accidents such as the Tacoma Narrows Bridge incident of 1940, it seems clear that *UPC Wind Partners* is unprepared for the possibility of seismic complications in this area.

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Recommendation: the Town shall require that the CWECS developer and at least one independent engineering firm produce a complete report on the likely effect of seismic activity consistent with historical data on each proposed wind turbine and all associated facilities. The Town shall notify any CWECS developers expressing interest of the seismic history of the town.

5. Electronic & Electromagnetic Interference

Upon notice from the Quebec Ministry of the Environment of a proposed 70 turbine CWECS facility in Murdochville, Quebec, the Canadian Broadcasting Company (CBC) conducted pre- and post-wind turbine television interference studies including satellite pickup [A:E.9]. The wind turbine configuration in this situation included 90 meter towers with non-metallic blades 40 meters long.

The CBC has two television stations in Murdochville: Channel 10 and Channel 21, with both transmitters located on the outskirts of the town. The CBC performed signal quality measurements before and after the installation of the CWECS facility at 14 locations around the affected area. Qualitative and quantitative measurements included signal levels, waveform measurements, tape recordings and subjective signal quality evaluations. The problems found were:

Static interference or "ghosting" which occurs when the signals are reflected off the turbine towers. Following turbine construction, an increase in the numbers and severity of ghosting was seen at 11 of the 14 Channel 10 locations and 3 of the 14 Channel 21 locations. The difference in the results between the two channels is attributed to their different antenna patterns.

Dynamic interference caused by the production of a secondary or interference signal reflected from the rotating turbine blades, seen as a periodic variation in picture brightness or color. Dynamic interference was found at all 14 Channel 10 locations and at 4 out of 10 evaluated locations for Channel 21.

Based on previous studies with NTSC, signals theory suggests that interference may occur with HDTV. It is expected that HDTV would be less likely to suffer the static (tower-related) effects but more likely to suffer dynamic (blade spinning) interference which would take the form of frozen frames and pixelation. Research papers suggest that other wireless and/or broadcast consumer services would suffer similarly, including cellular and wireless networking services [A:E.2].

O7-5 Cont.

Preventative measures can reduce or even eliminate these issues, but they must be taken during CWECS project planning stages. Wind energy companies need to factor in the location of all local radio communications towers, over-the-air RF links and areas of served populations. Mitigation measures, when signal degradation results from wind turbines, include: 1) replacing off-air reception with cable or satellite, 2) relocating television transmitters and 3) relocating or eliminating wind turbines.

Recommendation: the Town shall require the CWECS operator and at least one independent engineering firm to conduct pre- and post-construction signal evaluations for television, cell phone and wireless network interference. The Town shall require the CWECS operator to restore signals to pre-construction levels at its own expense.

6. Fire Risk & Fire Department Needs

While wind turbine fires are relatively rare, they do occur. Normal causes are lightning, overheating and/or lubrication failure, oil leaks and structural failure.

In Powys, Wales in 1997 a 4 year old turbine overheated and caught fire inside the nacelle. Witnesses reported "balls of fire" coming from the turbine as burning parts flew out of the nacelle. The turbine's rotors were impossible to stop as the brake controls were aflame. Rotating, burning debris was thrown 150m (495ft), setting the hillside and a public right-of-way on fire. With hub heights calculated proportionately, Bethany could potentially be facing 620ft of fire debris.

Figure E.6.1: Turbine fire in east Germany. Fire brigade has cordoned off the area to allow the fire to burn out.

Due to the height and danger of falling debris, the fire brigade could only cordon off the area and wait for the fire to burn out.

Note that fires in associated facilities can be treated as normal electrical fires; these repercussions only occur with turbine fires.

This committee has been able to locate evidence of California fire departments actively fighting turbine fires – using helicopters designed to fight forest fires. Such equipment is not currently available in Bethany and may be cost-prohibitive to acquire.

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Finally, in consideration of possible accidents at wind turbine locations, and the fact that these may or may not be near to any dwellings, concerns arise with the reporting of fires or other emergencies. The 911 emergency system in the US is keyed to postal addresses – as an example, help was delayed to the Atlanta, GA Olympic bombing site because the 911 operator could not find a physical address for the park in which the bombing took place. Each turbine, therefore, should be given a postal address compatible with the 911 emergency system and clearly labeled with that address against such necessity.

Recommendation: the Town either require any CWECS developer to provide the necessary fire-fighting equipment and fire department training at its own expense and/or require setbacks of at least 150% of the turbine tip height from any road, right-of-way, designated historic area, and wildlife preserve. The Town shall require that each turbine be clearly labeled with a postal address compatible with the 911 emergency system. See also *§ E.9-- High Wind Failure & Other Breakdowns*.

7. Ground Water Impact

Surface features in the town are a complex mix of fluvioglacial and ice contact features which yield a great variety of soil types and drainage patterns. From what has been disclosed to the Town, *UPC Wind Partners* -- the proposed CWECS developer, has made only a superficial review of existing geological information on the town. Major field investigation of the proposed project area is essential if hydrologic impacts are to be addressed.

Figure E.7.1, the proposed wind turbine project map, shows that close to one-quarter of the town of Bethany would be under the control of CWECS leases.

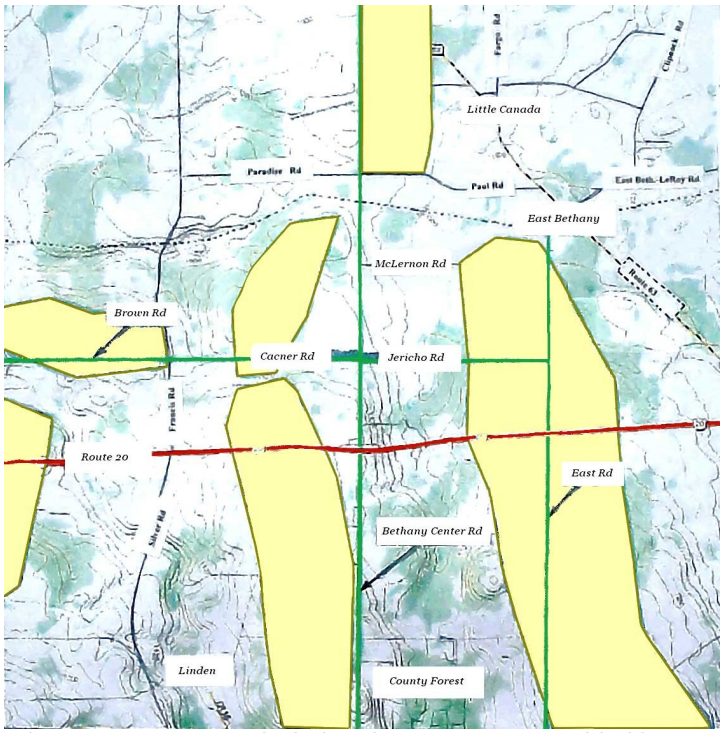

Figure E.7.1: Proposed wind project area map provided by UPC Wind Partners. Yellow areas are potential turbine placements.

Of significance is the fact that these leased areas are in or surround the Black Creek drainage system. To date, the CWECS developer has provided no field-based studies on the effects of excavation for turbine bases, roads, staging areas, buried or surface cables and/or subsequent removal of vegetation.

Regardless of wind turbine density or distribution, there is a major potential for disruption of both surface and groundwater flow due to the proximity of project excavation to Black Creek. Aquifer recharge, perched water tables and wildlife could be severely affected, especially if a north-south configuration is utilized. Such a configuration would effect a continuous, parallel disruption of flow to and from recharge areas.

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Recommendation: the Town shall require an independent assessment, by one or more qualified Engineering firms, of possible hydrologic impacts and that the CWECS project commence in a manner consistent with minimal anticipated impact. The Town shall require compensation and/or infrastructure improvements to offset any actual hydrologic impacts. This may include the construction of water systems to replace destroyed aquifers.

8. Hazards to Aviation

This topic is still under investigation. Information solicited from the FAA and the Department of Defense has, so far, not been made available.

There are three main concerns: 1) possible collision hazards of approaching (landing) aircraft, especially in bad weather; 2) possible interference with military aircraft operations; and 3) possible interference with low-altitude air operations in Bethany such as crop dusting and recreational paragliding.

As for the first concern, we note that there are no major airports in Bethany, although there is at least one uncontrolled airstrip. Considering the impact to that airstrip, the FAA defines an obstruction to navigation as being 200' or taller above ground level and within three miles of a runway longer than 3,200ft. The Bethany Airport is less than 3,200ft long; the committee has been unable to determine the exact length.

As for the second, inhabitants of our town are aware of large military aircraft from the Niagara Falls Air Reserve Station occasionally passing low overhead (less than 1,000ft AGL).

The Town should consider the impact of any CWECS facility on low-level aviation such as crop dusting and paragliding. Adjoining agricultural parcel owners may be compensated for the inability to dust their fields. Bethany is also a known route for at least one paragliding business, which does not (to the best of our knowledge) operate from the Town directly. Future paragliding, ballooning and glider activities may be curtailed due to the CWECS facility. This is an issue that must be evaluated, however, at the time of application.

O7-5 Cont.

Wing tip vortices may also impair aviation by creating vast horizontal fields of air turbulence. This could result in potentially damaging effects, particularly on smaller and/or lighter aircraft including balloons and gliders.

Additionally, commercial wind turbines are recognized as a source of interference to VOR (VHF Omnidirectional Ranging) Systems used for aircraft navigation. Existing FAA rules prohibit a structure the size of a typical utility-scale wind turbine from being erected within 1km of a VOR station.

Note: there is the rare but still possible chance that a piece of ice, or turbine blade, could become detached while the turbine is spinning, and impact a low-flying aircraft. The maximum height such could possibly achieve, which could be significantly higher than the tip height, can be calculated.

Let **R** = turbine rotor radius, **H** = hub height, and now let **h^** = vertical height above hub height an object could be thrown in a vacuum, **f** = rotation frequency of turbine (Hz), **G** = acceleration due to the force of gravity at the Earth's surface, and finally **H^** = total height above the ground (grade) that an object detached from a turbine could reach in a vacuum: one finds that **H^** is closely given by

$$H^ = H + h^ = H + [2/G] [\pi R f]^2$$

where the asterisk denotes exponentiation. With a hub height of 330ft and 120ft blades turning at 1/3 Hz, we get 400 meters (about 1,312ft).

We know that in the real world, where aerodynamic drag must be considered, no object could reach this. A good sized chunk of steel, however, say a 1 kilogram bolt, could be thrown up an appreciable fraction of h^, perhaps more than 50%. Relevance to aircraft: the current germane FAR (2006 Federal Aviation Regulations, Part 91.119, Minimum safe altitudes, General, page 167) states:

> *Except when necessary for takeoff and landing, no person may operate an aircraft below the following altitudes:*
>
> *(a) Anywhere. An altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.*
>
> *(b) Over congested areas. Over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.*
>
> *(c) Over other than congested areas. An altitude of 500' above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, or structure.*
>
> *(d) Helicopters. Helicopters may be operated at less than the minimums prescribed in paragraph (b) or (c) of this section if the operation is conducted without undue hazard to persons or property on the surface. In addition, each person operating a helicopter shall comply with any routes or altitudes specifically prescribed for helicopters by the Administrator.*

O7-5 Cont.

Conclusions

Fixed wing pilots *who are complying with the FARs* and *are flying over "congested areas, etc."* could not possibly be hit by anything thrown by one of the turbines proposed for Bethany.

Fixed wing pilots flying over "congested" areas *not complying with FARs*, fixed wing pilots not flying over "congested" areas, and helicopter pilots in general, could be hit by a dense object, with potentially fatal consequences. If such an admittedly rare event should occur, lawyers would focus on the meaning or/and definition of *"congested areas, etc."* and also *"operations conducted without undue hazard...",* and other factors.

Recommendation: the Town shall require that any CWECS project receive clearance from the Niagara Falls Air Reserve Station. The Town shall require the developer to notify local airstrip operators, recreational aviation businesses and MercyFlight of proposed turbine locations and flight risk areas prior to construction. The Town shall evaluate the potential for disruption of and the danger to crop dusting and recreational flight businesses prior to approval of any CWECS project.

9. High Wind Failure & Other Breakdowns

CWECS facilities are among the safest energy generation methods available. Accidents are rare and usually do not result in death or severe injury, only property damage. That said, accidents do occur; here are the most common types.

High Wind Failure

High Wind Failure occurs when the braking system fails. The braking system in a turbine is designed to stop the rotors in the event the wind is too strong. When the brakes fail, the turbine spins out of control. This is the most dangerous failure by far.

In Germany in multiple years including 1999, 2000 and 2003, the brakes on wind turbines failed in high wind, causing the rotor to hit the tower at high speed. This resulted in anything from parts of the blade to the entire nacelle (rotors attached) flying off the tower structure. Blades and other substantial parts have landed as far as 1,650ft away in typical cases.

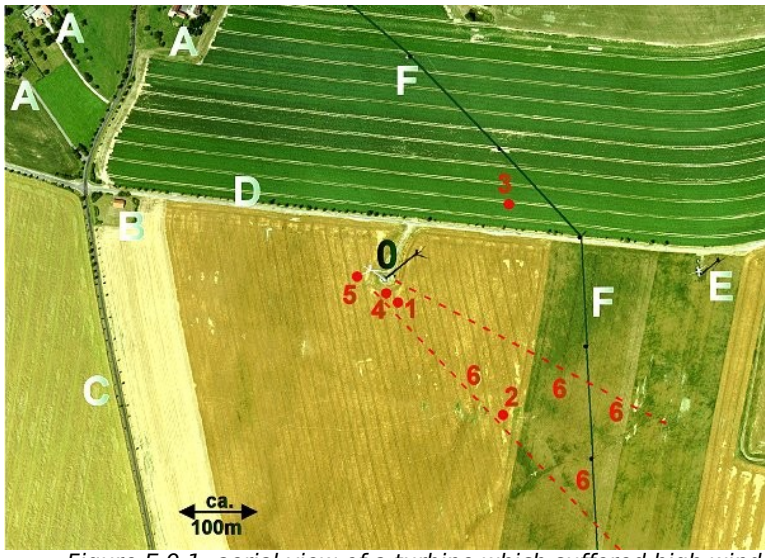


Figure E.9.1: aerial view of a turbine which suffered high wind failure. Significantly-sized debris is plotted in numerals.

Note that some researchers have calculated theoretical distances for high wind throw based on ice throw. These calculations do not match recorded damage assessments from actual incidents as they fail to recognize the aerodynamic nature of the blade segment and the force of the wind necessarily present in a high wind failure. In layman's terms, a blade segment doesn't fall like a rock; it falls like a loose kite. See diagram E.9.1: a plot of turbine debris following high wind failure.

Beginning in 2001, there are numerous counts of residents being evacuated and motorways closed anywhere from several hours to overnight under these same conditions. These turbines were model V80s, which have an 80m (264ft) hub height compared with *UPC Wind Partner's* proposed 330ft hub height. The GE model 3.5mW turbines proposed in Bethany have the potential to throw debris farther.

Structural Failure

Structural failure can be anything from a failure in the concrete base to a failure of the blades themselves. A bolt shears; a load-bearing brace buckles; these are physical, structural accidents. Damage is typically limited to the turbine and anything within its falling distance.

O7-5 Cont.

In France, in 2000, a turbine mast broke and toppled over during a storm with no further information available from the wind company. This was the first in a series of such incidents that led to a formal investigation. In Germany, 2000, four turbines experienced sudden and total collapse due to "concrete damage" at the base. Forty-four similar turbines were shut down pending investigation.

Figure E.9.2: Structural failure in western Germany.

In Germany, 2002, a blade broke in mid-turn with an audible "crack." Pieces were found scattered throughout surrounding fields. The cause was later found to be metal fatigue. The most common reasons for structural failure are improper installation and manufacturing defects.

Oil Spills

The hydraulic system inside the nacelle includes many gallons of oil in a sealed system. Sealed systems sometimes leak.

In Germany, 2003, a turbine destroyed by a storm was found to have been leaking oil into the ground. Three other turbines were found to leak that same year. As these were situated in an area protected for municipal drinking water supply, the municipality sued the turbine company. No information is available on the result.

Mitigation of the potential for loss of life and property is primarily available through regular maintenance and setbacks. In considering the type and distance for physical setbacks, it is useful to remember that should damage be caused by turbine operation, non-operation or falling down, a plaintiff could include the town in a potential lawsuit based on inadequacy of setbacks. See also *§ E.13 - Monitoring* and *§ F.7 - Setbacks*.

O7-5 Cont.

Recommendation: The Town shall institute setbacks between turbines, between turbines and overhead utility lines, roadways, public and utility right-of-ways (165% of hub height plus rotor diameter), and occupied buildings (450% of tip height) consistent with safety goals. The town shall require a minimum distance between ground level and any part of the rotor blade. The Town shall require the facility Operator to submit regular maintenance reports. See also *§ F.7 – Setbacks* and *§ G.10 – Success in Other Countries – Trends*.

10. Ice Throw

Ice throw results in falling lumps of ice – usually described as about the size of tennis balls. It is commonly trotted out as a reason to deny turbines within a community with many anti-turbine groups touting distances of 1,800ft or more.

Assuming for the sake of argument that ice is thrown at maximum rotation with no deceleration due to aerodynamic drag, the maximum distance is 2,438ft. This number is based on a hub height of 330ft, radius of 120ft and motion of 20rpm – maximums for the GE 3.5mW turbine proposed. This theory makes major assumptions that don't pan out in the real world. Aerodynamic drag would be increased by ice clinging to the blades, friction would reduce the size of the ice throw, altering its curve and modern turbines typically include safeguards to limit rotation under icy conditions.

Figure E.10.1: Ice throw captured on film in Denmark.

While the committee acknowledges that such distances are theoretically possible, we reject the theoretical in preference to a study which measured actual throw distances.

Damage has occurred as far away as 80m (264ft), including smashed windshields and windows; dented cars and roofs; and accidents on roadways. Typically, accidents are not caused by the ice hitting the car, but by the car hitting ice chunks which partially melted on the road. Ice throw has also been recorded as severing overhead utility lines, particularly television cables. This damage could conceivably occur with electrical, telephone or other overhead cables.

O7-5 Cont.

Building or structure damage from ice throw, on the other hand, is almost nonexistent. Ice throw, due to typically larger distance, the angle of the fall, and the density of the ice as it is thrown, does not seem to have the impact necessary to damage building materials including house windows; although the rare broken home window has occurred. Ice throw does not, therefore, seem to be of major risk to structures.

German scientists Henry Seifert, Annette Westerhellweg and Jurgen Kroning have put together a simplified equation for calculating the area of most likely risk in their study *Risk Analysis of Ice Throw from Wind Turbines* [A:E.12]. They plotted the throw distance of ice pieces observed to radius, and also included the weight of the ice pieces. Their calculation for ice risk area is d = (D + H) * 1.5, meaning add the diameter of the rotors to the hub height, then multiply that number by one and a half. With *UPC's* proposed 3.5mW turbines, that means (240' + 330') * 1.5 or 855ft. Because the German scientists designate this as a rough calculation and recommend further local studies to determine the exact conditions in a given area, some communities are adding a 10% margin of error (which would make our calculation 941ft.). This allows for local topographical features.

The only known method to protect roadways, right of ways, and utility easements is a setback; and should be based on ice throws which may interfere with traffic or the activities of persons not related to the project, or damage property. This setback is normally not applied to the access roads or transmission lines built by the wind com-

pany for the purpose of the CWECS project itself.

In reading various town and county ordinances available online, it is not clear whether the setback is applied to established public trails or snowmobiling paths (most likely this information is found in the communities' base zoning definitions, which are not included in the turbine document). In only one Minnesota document was this committee able to find a direct reference that snowmobile and walking trails were specifically included (that was a proposal from a wind turbine company, not a zoning paper). Given that New York snowmobiling paths are created, mapped and maintained with public money, the town should consider including them in any right-of-way setbacks.

Recommendation: The Town shall establish a minimum setback distance between each turbine and overhead utility lines, roadways, public right-of-ways including marked trails, utility easements, and uninhabited structures, of no less than 165% of the proposed hub height plus the rotor diameter.

11. Lighting

Aesthetics

O7-5 Cont.

To maintain the rural characteristics of the Town, lighting of CWECS facilities should be the minimal amount necessary for safety. This includes strobe lighting on the turbines themselves, safety lighting at the base and at all associated facilities.

FAA lighting requirements for wind turbines are specified in document AC 70/7460-1K [A:E.14]. Daytime, twilight and nighttime lighting and/or marking of wind turbines is required. As painting in conspicuous colors is contrary to aesthetic considerations, FAA requirements should be met through appropriate lighting. Options include the use of flashing white lights or a combination of red and flashing white lights, with the combination used to reduce/mitigate environmental concerns in populated areas.

It is usually not necessary to apply lighting to every turbine in a project; *UPC Wind Partners* informs the committee that they typically light every third tower. FAA regulations further stipulate that the locations of all turbines be adequately marked on aviation maps. This committee further recommends that a map of turbine locations be sent to all local airports, whether FAA-regulated or not.

Electrical Pollution

As to the lighting itself, new research suggests that strobe lighting, such as typically employed on cell towers, is a source of electrical pollution resulting in measurable distress of those repeatedly exposed [A:E.15]. From Dave Stetzer's website:

> *In May 2001 some very high frequency signals appeared on equipment monitoring electrical ground currents at a few dairy farms in Wisconsin. The signal was traced to a nearby cell tower whose rotating beacon light had just recently been changed to a strobing light. The origin of the signal was verified by shutting off the strobing light momentarily.*
>
> *The signal starts at about 25 MHz and rings down from there. It is produced when the capacitors, which store up the 1000 volts or more needed to strobe the light, release that energy all at once to strobe the light. Therefore, a high frequency and high voltage impulse is released each time the light flashes. If an RF Choke is in place and the utilities wires are adequate to carry the current back to the substation, there is no problem.*
>
> *However, many companies, not realizing the problem they cause, have opted to save the approximately $30 and omit the filter. The utility system, in many areas, cannot return such a high frequency high voltage impulse to the substation on the neutral wire, as it should. Therefore, it takes the path of least resistance back to the substation. The path of least resistance is not always the shortest path. Problems have been found as far as 6 miles from the tower.*

O7-5 Cont.

The solution to this is a simple RF choke placed on each strobing light; the committee does not believe this to be an expensive or burdensome solution [A:E.16].

Recommendation: The Town shall require the CWECS developer to select a configuration of minimal lighting which meets FAA requirements. Furthermore, each strobing light will be required to be equipped with an RF choke and an adequate neutral pursuant to IEEE 519 standards.

12. Lightning Protection

Lightning occurs when the electrical potential between the ground and a storm cloud becomes great enough to exceed the breakdown potential of the air between ground and cloud. The mechanisms responsible for the charge separation, after decades of study, are still not well understood. Nonetheless the potential difference can exceed several million volts and the current flow can reach over 200,000 amperes. The heat energy released in a large flash, if converted to mechanical energy, is adequate to lift a railroad freight car from the ground to the base of the cloud.

The conducting path will follow that of least resistance, although the potential difference is so great that current will flow even in "non-conductors" such as fiberglass and wood turbine blades. The Joule heating is so great that unless conductors are built into the turbine blades, they will catch fire and/or explode, with obvious potential for fatal injury to anyone near the turbine (see *§ E.6 – Fire Risk & Fire Department Needs*). There is no way to prevent the turbine from being hit by lightning. The best one can do is provide a robust conducting path to ground.

Contrary to popular sayings, lightning can and does strike the same place twice and it is a known problem with wind turbines, particularly where the developer protected the hub and not the blades [A:E.4].Recent studies have shown that over 90% of damaging lightning strikes occur on the rotor blades, usually but not always near the tip.

John Korsgaard and Ivan Mortensen, in their article for *Windpower Today* [A:E.10], recommend a multireceptor system be used. Multireceptor systems include lightning receptors on each side of the rotor blade, one near the tip and one near the base, both connected to a robust ground path. They also recommend that the receptor system be rated for the longest possible service life as the rotor blade to minimize maintenance disruption. While lightning receptors on aircraft are designed to be replaced after each strike, turbine receptors should be more robust, remaining in place and functional past the first, and perhaps more, strikes.

O7-5 Cont.

Finally, hidden damage can occur to lightning protection systems with each strike. A thorough maintenance inspection is recommended following any lightning strikes to prevent blade shatter on a future occurrence.

Recommendation: the Town shall require an adequate conducting path from the tip of each turbine to the ground, using a multireceptor system, to help prevent lightning damage to turbines. The Town shall require turbines be sited away from residential, historic and wildlife refuge areas to prevent significant losses from fire. The Town shall require the facility Operator to submit regular maintenance reports including descriptions of lightning damage. See also *§ E.6 Fire Risk & Fire Department Needs*.

13. Monitoring

Monitoring of CWECS projects includes evaluating the energy production of the turbines as well as the observation and interpretation of effects the turbines the turbines and associated equipment have on the environment.

Wind energy projects require continuous monitoring for oversight and evaluation of:

1. Impacts of wind turbine production on the operation of the grid.
2. The wind project's ability to meet reserve and firm power commitments.
3. Grid stability and safety considerations.

Due to the size and complexity of wind turbine projects much of their monitoring is accomplished remotely with the use of satellite-based telecommunication systems.

Other forms of wind turbine monitoring involve environmental hazard analysis. These numerous hazards are described elsewhere in this report and use varying technologies for data collection and analysis. An example of such monitoring is the microseismic study by the British Wind Energy Association (BWEA) to detect infrasound vibrations from wind turbines, both ground and airborne (southern Scotland). Previous BWEA studies have been conducted to assess the effect of low-frequency noise on populations in wind turbine areas.

It is important to distinguish between monitoring and oversight. Oversight, supervision and the patrol of CWECS projects need to be carefully detailed for the various stages of construction and operation to ensure that the project developer adheres to all requirements-federal, state and local. Oversight requires locally based personnel working on a continuous basis to assess and mitigate, on site, maintenance and emergency issues. [A:E.3]

O7-5 Cont.

Recommendation: the Town shall not attempt to directly inspect or monitor turbines due to the dangers inherent in their operation; rather the Town shall require regular inspection reports, perhaps with an independent analysis of each.

14. Noise, Including Infrasonic

Wind turbines generate noise in various ways, both mechanical and aerodynamic. As technology in the wind energy industry has advanced, wind turbines have become audibly quieter. However, sound from wind turbines is still a major siting issue. Wind turbines produce two major categories of sound – audible and infrasonic.

Audible

Although sound levels can be measured, the public's perception of wind turbine noise – noise being defined as any unwanted sound – is often a subjective determination. The intensity of sound is measured using units known as decibels (dB). On the decibel scale the smallest audible sound is 0dB. A sound ten times louder is 10dB. A sound 100 times louder is 20dB. Some common sounds and their dB ratings follow:

Silence	0 dB
A whisper	15 dB
Normal conversation	60 dB
Lawn mower	90 dB
Jet engine	120 dB

Note: A 6dB increase is equivalent to moving half the distance toward the sound source.

Wind turbine noise perceived at any given location is a function of wind speed, wind direction, distance to turbine(s), precipitation (if any) and ambient (background) noise levels [A:E.25]. Other factors which may affect wind turbine noise include landscape features and vegetation. Valleys have a channeling effect and tend to intensify and extend the range of wind turbine noise. The numerous and variable factors which affect wind turbine noise mandate an extensive investigation of each proposed location to determine the magnitude and direction of potential turbine noise.

O7-5 Cont.

At present, noise standards and regulations for wind turbines vary from country to country. Numbers listed in Fig. 1 define the upper bounds for the noise to which people may be exposed (Gipe, 1995).

Country	Commercial	Mixed	Residential	Rural
Denmark			40	45
Germany (day)	65	60	55	50
Germany (night)	50	45	40	35
Netherlands (day)		50	45	40
Netherlands (night)		40	35	30

Fig. 1 Noise Limits of Sound Pressure Levels in dB(A) in Various countries.

Notice that, with one exception, acceptable noise levels are lowest for the rural setting and for night. These numbers reflect the inclusion of ambient noise levels calculated for those areas and time periods.

Tonal noise, or sounds produced at discrete frequencies may require stricter noise standards. Turbine gearbox grinding is an example of tonal noise.

Infrasound

Infrasound, also produced by wind turbines, is below the limit of human perception (sound below 20 Hz or cycles per second). Infrasound travels farther than higher frequencies. Infrasound may be perceived as a tactile sensation or feeling of pressure. Some effects of infrasound include fatigue, hypertension and abdominal symptoms.

Infrasound is an especially important consideration for rural-agricultural areas such as Bethany. G. P. Van den Berg, in his study of a wind turbine park on the Dutch-German border found that *"Residents living 500m (1,500ft) and more from the park have reacted strongly to the noise; (and) residents up to 1,900m (5,700ft) distance expressed annoyance, particularly at night."*

Van den Berg has pointed out that, although inaudible, turbine blades passing their towers produce higher frequency sounds which are periodic with the effect strengthened at night. If several turbines are in the area, such as proposed for several projects in western New York state, there can be an amplification effect of the rhythmic thumping caused when turbine blades pass the towers on which the are mounted [A:E.5]. Some residents have experienced noise levels 15dB higher than expected.

Assessment

Noise assessment studies to determine appropriate levels should include:

1. An estimation or survey of existing ambient background noise levels at various times of day and seasons of the year [A:E.7].
2. Prediction (or measurement) of noise levels from the turbine(s) at the site.
3. Identification of a model for sound propagation-modeling software.
4. Comparing calculated sound pressure levels from the wind turbines with background sound pressure levels at the locations of concern.
5. Specification of frequency ranges to be addressed.

O7-5 Cont.

If a wind turbine is proposed within a distance equal to three times the turbine blade tip height (approximately 1,200ft for the proposed 3.5mW turbines) of houses, barns, stables or other noise-sensitive sites, a noise study should be conducted and publicized. Appendix A:E.7 has a measurement protocol which the Town may use as a guideline.

Noise mitigation is typically accomplished with setbacks and acoustic dampeners. The exact nature of the noise mitigation will be left to the CWECS developer; a thorough assessment study prior to and immediately following construction is the best way to prevent and mitigate noise issues.

Recommendation: Noise, both audible and infrasound, shall be limited to a maximum of 35db [A:E.1], measured at the property line of any non-participating landowner. Quarterly reviews of noise levels and mitigation of these shall be an ongoing requirement for renewal of CWECS operating permits.

15. Road Upkeep & Repair

Components delivered to the installation sites by truck would be of significant weight. Nacelles, typically transported in two sections, can have a total weight of 80 tons. Assembled cranes, typically transported in as many as 15 trucks, can weigh as much as 450 tons.

The Town of Bethany is criss-crossed with both town- and county-maintained roads. As of this writing, Bethany's town roads are not sufficiently engineered and/or constructed to support the weight of turbine parts, cranes and other construction equipment necessary for CWECS installation, possibly requiring road improvements prior to construction. County roads are likely adequate, as turbine parts bound for nearby projects have already been seen on them, although that is not a guarantee. Generally speaking, county roads are painted with stripes, whereas town roads are not.

Due to the weight of parts and equipment, it is likely that damage would occur to any roads used by the CWECS developer, even with the infrastructure improvements prior to construction. Several methods are used to mitigate this damage. If any road is found to be unsafe for travel during construction, temporary repairs must be effected immediately to allow regular vehicular traffic.

CWECS developers are often required to submit proposed construction routes and timetables to the Town for approval. The Town may choose to have construction routes posted primarily on county roads or primarily on a few central roads to contain the damage. The Town should consider, for example, the advisability of hauling large components in a north-south direction through Suicide Corners.

O7-5 Cont.

Also, developers are typically to return the roads to town/county specifications once the project is completed. Standard language in ordinances suggests that roads should be completed to the satisfaction of the Town Highway Supervisor and that a surety bond or other financial instrument should be established to ensure the completion of this task [A:E.18].

> Recommendation: the Town shall require the CWECS developer to submit proposed construction routes to the Town for approval; restore all roads to county or town specifications, as appropriate, within one month of the developer's last use of such road; and submit a surety bond or other financial instrument to ensure that road repair is completed.

16. Security (Vandalism / Terrorism)

In computer security, trade offs are a necessity. The safest place for data is burned on a CD, located in a safety deposit box. That makes it extraordinarily difficult, however, for legitimate users to get to that data. Making computer controls accessible to legitimate users and inaccessible to hackers is a best-effort process.

CWECS developers and turbine manufacturers have worked together to create a reasonably safe but accessible system. Turbines are placed on a local network, allowing for central monitoring and control in case of emergencies and/or unforeseen situations. This network is placed, behind a firewall, on the Internet. This allows for remote control of the turbines in the event the central monitoring site is unmanned or becomes inaccessible (due to adverse weather, etc).

To secure the Internet-connected turbine controllers against hackers, CWECS developers use a technology called an authentication token. This piece of hardware is linked to the firewall at setup, then distributed to each user wishing to pass through it. Randomized tokens enables two-token authentication of users through the firewall, and is difficult to crack.

However, one of the largely neglected security efforts in computers (and so it seems in CWECS facilities) is physical security. As an example, a web development firm in Buffalo opted for three layers of authentication to prevent hackers from breaking into the servers via the Internet; these same servers were physically stolen from the premises and all sensitive data within them laid bare.

During our trip to Maple Ridge, committee members walked right into the central monitoring station unchallenged. Such lax physical security is not acceptable for a facility providing electricity to our national grid. Each turbine should be secured and provided with remote intrusion monitoring as well as the central monitoring point.

O7-5 Cont.

Recommendation: the Town shall require the CWECS operator, in addition to randomized two-token authentication for Internet protection, to enact and maintain physical security protocols including locks and remote intrusion monitoring.

17. Shadow & Flicker Effects

Flicker takes two forms – Shadow Flicker aka the Disco Effect or Strobe Effect, and Reverse Flicker or Blade Glint. Shadow Flicker is caused when the rotating wind turbine blades cast moving shadows that cause a flickering effect. Reverse flicker occurs when glossy blades reflect light in a moving pattern, causing a sharp reflection.

Shadow flicker occurs under a combination of conditions at particular times of the day and year. It happens when the sun shines from behind a turbine rotor. This can cause the shadow of the turbine blades to be cast onto roadways, buildings and other objects; which appears to flick the sun on and off as the turbine rotates. Reverse flicker, or Blade Glint, occurs likewise under certain conditions. It happens when the sun reflects off turning rotor blades, reflecting a bright light back to the sun ward side of the turbine. An excellent animated image is available at http://www.windpower.org/en/tour/env/shadow/index.htm

The distance between a wind turbine and a potential shadow flicker receptor affects the intensity of the shadows cast by the blades, and therefore the intensity of flickering. Shadows cast close to a turbine will be more intense, distinct and 'focused'. This is because a greater proportion of the sun's disc is intermittently blocked.

Sources of Flicker, for Comparison

Fluorescent Lights:	120Hz
Computer Screens:	75Hz
Vehicle Turn Signals:	13Hz
Wind Turbine Shadow:	1.25-5Hz

O7-5 Cont.

Most people notice flicker up to about 50Hz, after which the brain's response to the flash lasts longer than the flash itself. Flicker vertigo, while not well referenced in medical literature, has been experimentally studied in the psychology laboratory. It is relatively well-known by experienced helicopter pilots. One definition is "A steady light flicker, at a frequency between approximately 4 to 20Hz can produce unpleasant and dangerous reactions in normal subjects, including nausea, vertigo, convulsions or unconsciousness. The exact physiological mechanisms are unknown." (US Naval Flight Surgeon's Manual: Third Edition). The Epilepsy Association (US) sets the lower bound at 3Hz.

Effects of Flicker

Shadow flicker is one of the 'annoyance' or 'nuisance' effects of wind turbines, similar to noise and view complaints, however it is unique among these. While all are somewhat subjective and tolerated by different percentages of nearby residents, shadow flicker is by far the least well tolerated. Residents impacted by flicker complained of headaches, migraines, nausea, flicker vertigo and disorientation after only 10 minutes of exposure [A:E.22]. This is consistent with our interviews in Lowville and our observances of shadow flicker while there.

As with car or sea sickness, this is because the three organs of position perception (the inner ear, eyes, and stretch receptors in muscles and joints) are not agreeing with each other: the eyes say there is movement, while the ears and stretch receptors do not. People with a personal or family history of migraine or migraine-associat-

ed phenomena such as car sickness or vertigo are more susceptible to these effects.

While the annoyance factors are obvious, yet subjective, other medical factors are measurable. Photosensitive epilepsy is triggered when the visual disturbance is within certain frequency ranges. Older model turbines generate flicker at about 1.1Hz, which is outside the boundaries of photosensitive epilepsy (although it may still cause nausea and migraines). Newer six-bladed turbines, however, can generate disturbances of 2.5Hz, theoretically approaching the realm of neural dysfunction.

Calculating Flicker Areas

While some wind developers tout a flat distance (usually 10 rotor diameters) as a radius, the best calculation of seasonal timing and duration of flicker effects uses computer software to accurately calculate amount of shadow per year in the area around the turbine. The relevant data points are the latitude and longitude of the site, used to create a shadow map. This map will clearly outline affected areas by distance and direction from the turbine. Any properties which may potentially be affected can be identified and the risk calculated.

For purposes of zoning, it may be sufficient to create one shadow geometry for the center of the Town and use it as a guideline for all areas. Our committee has calculated a shadow map for the center of the town, figure E.17.1. The complete distance from the turbine base (the red dot) to the outside flicker effect area (medium gray) is about 1,800ft based on the proposed 3.5mW turbines.

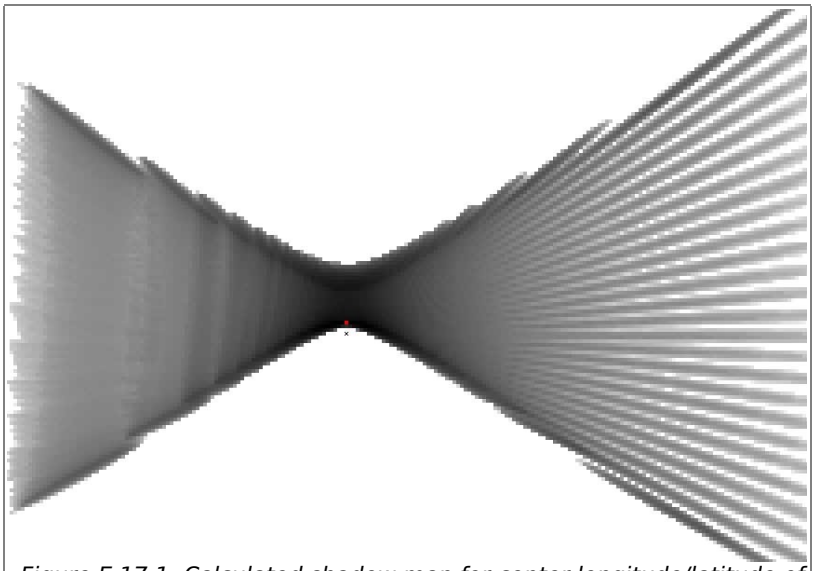


Figure E.17.1: Calculated shadow map for center longitude/latitude of Town of Bethany, courtesy Danish Wind Assoc. online calculator.

Note, regardless of final size, the shadow map primarily effects areas to the east, west and immediate north of the turbine site. The eastern direction is most impacted, while western locations are more solidly covered but affected for a lesser distance.

Reducing Flicker

Wind turbines can be painted by the manufacturer so that they blend with the natural environment. In most cases turbines are painted gray so that they will blend well with the skyline, but some are also painted green or are two-toned. Other turbines are manufactured with a galvanized metal so that the metal will weather and turn gray naturally. Zoning can require the turbine to be painted with a blending color that is non-reflective in nature, removing Reverse Flicker effects altogether.

O7-5 Cont.

One of the simplest and most controversial ways to reduce shadow flicker on an existing turbine is to plant tall vegetation in the shadow path. This overrides the flickering shadow and provides relief from its effects. However, vegetation taller than ¼ the hub height cannot be planted near the turbine as it will disrupt the wind stream [A:E.23] and many property owners object to this strategy as they desire sunlight on their home and/or yard.

Installing special controllers on the turbine which automatically turn it off during peak times of flicker is a common and reasonably inexpensive solution.

Moving the turbine is the most expensive option and one that is nearly impossible to effect without strict zoning laws. Proving the annoyance factor of flicker is difficult as it is often viewed as a subjective determination and property owners are typically asked to sign "hold harmless" clauses with the wind developer, preventing many suits from coming to court.

The most effective way to reduce flicker effects is to zone them away from occupied buildings prior to construction, via materials requirements and setback requirements.

Some communities also take care to prevent flicker from distracting drivers on the road. Irish guidelines state that turbines should be set back from the road by up to 300 m (990 feet) depending on circumstances. A report by the Michigan State University Extension suggests that a shadow flicker study be commissioned and included with each turbine permit application [A:E.20].

In any case, it is recommended that turbines be limited to a flicker frequency of less than 3Hz, regardless of whether an occupied building is affected [A:E.17].

O7-5 Cont.

Recommendation: the Town shall specify coating materials or effects in zoning and either a) a distance from occupied buildings and roadways sufficient to eliminate shadow flicker from such, as determined by a shadow map overlay or b) require shutdown of the turbines during periods of peak flicker. Also, flicker frequency shall be limited to less than 3Hz. The Town shall require the CWECS developer to mitigate any unexpected shadow flicker effects at its own expense. See also *§ F.7 - Setbacks*.

18. Siting & Placement Issues

As the report developed, the committee determined that this section is redundant with several other sections; this information was moved to the appropriate location. See *§ E.6 – Fire Risk & Fire Department Needs, § E.8 – Hazards to Aviation, § E.9 High Wind Failure & Other Breakdowns, § E.10 – Ice Throw, § E.17 – Shadow and Flicker Effects*, and *§ E.21 – Wildlife Effects*. Most of the siting concerns are also summarized in *§ F.7 – Setbacks*.

19. Storm Water Runoff, Erosion & Sedimentation

The proposed *UPC Wind Partners* CWECS project for the Town falls within portions of the Black Creek watershed. Requirements set in the New York State Standards and Specifications for Erosion and Sediment Control mandate that an erosion and sediment control plan be prepared when industrial disturbances are imminent - in this case industrial-scale wind turbines and associated transformers, substations, transmission lines and cables which will disturb one or more acres.

The physical characteristics of each turbine site must be assessed to preclude disturbance to wetlands, stream corridors and other environmentally sensitive areas such as Genesee County Park. Site development plans must also include provisions to control suspended and colloidal solids to meet water standards (NYCRR, Part 703.2). Project developer plans must also include provisions for stabilization of disturbed areas such as re-seeding and other structural erosion control measures.

Soil loss predictions for each turbine location must be made using the RUSLE equation. Some state-required studies require a full-year data set using a plan to address all points covered by the Storm Water Pollution Prevention Plan (SWPPP) check list as per New York state standards.

Recommendation: Construction site monitoring and inspection by a professional who is independent of the project developer is essential for effective storm water and erosion management control. Because of the hydrologic variability and scope of the proposed project area, a standard site-specific EIS should be required.

O7-5 Cont.

20. Stray Voltage AKA Ground Current

Apprehension over stray voltage has been expressed by committee members and other concerned members of the community. Extraneous voltage or ground current appears on grounded surfaces in buildings, barns and other structures. It is also present on the surface of the earth. It is classified as a low-frequency form of conductive electromagnetic interference.

In most buildings stray voltage is not considered a problem, because the levels are generally below the perception level of humans. Usually there is no sensitive electronic equipment which can be affected by it.

Concern in the agricultural field: In the 1970s, stray voltage became a concern in the agricultural field with dairy farmers. Cattle are ten times more sensitive to electricity and electronic interference than humans, as they are constantly standing in water or on moist areas of the barn. Concerns in the Midwest with stray voltage on farms and their connection to wind farms are not conclusive at this time. While a large volume

of anecdotal evidence is present, accepted documentation concerning herd health and reproductive problems is unavailable at this time.

Proper Installation/Grounding: if equipment is properly installed and properly grounded, evidence does not lead to CWECS projects as being a major source of stray voltage [A:E.29].

Conclusion

The Town should be concerned about stray voltage, however, if the CWECS project is properly installed and maintained according to IEEE standard 519 (which has been law since 1992), the wind turbines should not themselves dictate a major concern in the community.

Recommendation: the Town shall require any CWECS project to meet IEEE 519 standard for the life of the project. See also *§ E.11 - Lighting* recommendations.

21. Wildlife Effects

Concerns should include *"noise, and impact on wildlife, rare plants, native vegetation, historical resources and wetlands"*. *"Placing a priority on these issues during the planning stage can be key to the eventual project approval"* (North American Wind Power Magazine, Dec 2006).

O7-5 Cont.

Cattle Impact

Observation of existing structures in the Midwest seems to indicate that cattle are not bothered by any aspect of the CWECS facility. Ranchers routinely observe cattle, including dairy herds, congregating in the shade of turbine towers on hot days.

Avian Impact

The nationwide estimated mortality rate is 2.19 birds per turbine annually. This average is considerably less than the number of birds killed annually due to collisions with motor vehicles, tall buildings and homes, and lighted communication towers [A:E.26]. However, there are far more motor vehicles, tall buildings and homes than CWECS facilities. The percentage of kills per turbine is higher than any of these.

Local resident and avian authority, Mr. Douglas Beattie, said that although Bethany is not a major flyway, local, low flying migrating birds such as thrushes and the endangered wood warbler risk collision, especially at night, with structures in the 100 to 300ft height range [A:E.24].

UPC Wind Partners reports that "siting" is the key to mitigating the disruption of migrating birds. *UPC Wind Partners* said they [have] extensive studies to ensure that an area does not have a high concentration of migrating birds. We recommend the re-

search company be one of the Town's choice, and the study completed prior to construction [A:D.1].

Mr. John Flicker, President of the National Audubon Society recently wrote in favor of wind turbines, however, Mr. Flicker *"emphasized the importance of prudent siting...if (turbines) are located in the wrong places, they can still be hazardous and fragment critical habitat"* (RenewableEnergyAccess.Com. National Audubon Society, Dec 14,2006).

In wind power projects, mitigation *"generally means changing the location of the turbine, often shifting turbine strings away from important wildlife habitat or, avoiding certain highly sensitive areas"* (American Bird Conservancy, Wind Turbines and Birds).

In addition, The American Bird Conservancy recommends *"attention should be paid to impacts on specific species, not just general number of kills. The use of guy wires should be avoided. Transmission lines should be placed underground to minimize project footprint. Lighting should be minimized, with a limited number of towers being lit using only white or red strobes at no more than 24 pulses per minute. Sites should be monitored for avian impact using scientifically rigorous methods and data should be published."*

Bats

Bat fatalities are an expected effect; studies are currently in progress to determine fatality levels and whether they should be of concern. [A:E.6], [A:E.8].

Recommendation: while domesticated animals do not seem affected by CWECS facilities, a variety of wild creatures can be severely impacted. This committee recommends that the Town requisition several wildlife impact studies, including avian and bat, as part of the permitting process.

O7-5 Cont.

F) Legal

1. Decommissioning

One of the major issues with wind turbine engineering is the decommissioning of these units – whether it is at the end of their service life or the unit is out of commission for some reason. The committee asked UPC Wind Partners the following question about decommissioning a unit:

> *If a wind turbine is placed on the landowner's property and is not producing or has not produced for several months for some reason, what would UPC do? Remove?*

UPC's answer:

> *Yes, we would, and often town codes stipulate this. We would be interested in speaking further with you regarding our experience with towns that have produced wind code. The town of Cohocton is one such town. I think our ideal picture would be to work with Bethany to develop a code that works for Bethany and the wind farm. There are quite a few precedents out there. Please take a look at the following link from NYSERDA for a start. This was especially developed for towns and communities and includes examples of wind codes http://www.powernaturally.org/Programs/Wind/toolkit.asp*

O7-5 Cont.

Should the Town decide to allow CWECS facilities to be placed in Bethany, the following issues should be addressed within the contract:

Responsibility for the removal of the unit [A:E.19]. The committee suggests the Town have a clause written into the contract that states the owner of the CWECS facility be responsible for all costs involved in the removal of the turbine units and restoration of the property. The wind developer shall also be responsible for the restoration of any Town, county or state property that may be affected by the decommissioning. These issues and costs should be addressed along with a surety bond or other financial instrument in the name of and held by the Town. This financial instrument should also have an annual escalation clause.

Figure F.1.1: California Wind Farm. Derelict wind turbines can be seen in the distance, behind their modern counterparts.

The degree to which the property should be restored. The contract should read that the property is to be restored to the same condition as it was prior to construction, includ-

ing the removal of buried concrete to a depth of 4ft. Based on another town's responses and investigation, developers typically remove all components to a depth of 2ft. This doesn't seem acceptable and the concrete structure should be removed to a depth suitable for a more varied range of future purposes.

Final disposition of overhead and underground transmission lines. Again, we suggest a written agreement which specifies the final disposition of any lines laid as part of the CWECS project and states that the CWECS developer will be responsible for these costs. A surety bond with annual escalation clause would be the best way to address this issue.

Along with the above issues the town needs to develop a contract that will cover any and all ownership changes that may take place from the time that the initial contract and turbines are installed until they are decommissioned. This would include the transfer of the bond money and the annual escalation factor.

Decommissioning is also a construction process. This committee recommends that any regulations, such as limiting the time of heavy equipment operation, applied to the construction of CWECS facilities should also be applied to decommissioning.

While there are no fixed-wording guidelines in the US, UK, European and Australian best practice documents, all suggest that inactive turbines be completely decommissioned (or repaired / replaced / repowered) within six (6) months of their production stoppage. Specifically, no turbine should sit idle for more than six months. Evidence in the UK and other locations suggests that this time frame is adequate.

AusWEA suggests that at sites where native vegetation was removed during the turbine's construction and removal, the operator should re-vegetate the site with native plants of local provenance. This is a subtle but important detail – damage done to our environment by non-native plants is already quite serious. Seeds for native plant restoration are often more expensive than seeds traditionally used to quickly establish a ground cover, making this requirement a necessary one to have in writing.

O7-5 Cont.

In the event that the funding to remove CWECS facilities is inadequate or unavailable at the time removal is required, the responsibility for removal should fall upon the landowner. The Town may suggest that landowners place a percentage of their annual lease payments aside against this need.

Recommendation: the Town shall require any CWECS developer to post a separate surety bond or other financial instrument with annual escalation factor to fully decommission a turbine for each turbine constructed. The Town shall require any CWECS developer to generate a suitable agreement with each landowner giving right-of-way to transmission lines as to the final disposition of those lines, and shall post a financial instrument, as above, for each property owner who requires their removal. The Town shall require any CWECS developer to create a new property survey map, showing underground features of the CWECS, including but not limited to concrete bases and underground cables.

2. Independent Oversight

Previous sections have discussed the need for independent sourcing of information related to the CWECS application process. Also the identification of appropriate enforcement agencies and methods should be clearly defined prior to the permitting of any CWECS project. Independent oversight is required in at least the following areas:

Pre-Construction: Engineering evaluations; site selection and access road placement; television and other wireless signal quality testing; water well quality and quantity testing; identification of enforcement agencies.

Construction: construction locations and techniques; inspections along a predetermined schedule; permit limitations compliance.

Post-construction: engineering inspections; television and other wireless signal quality testing; water well quality and quantity testing; agricultural impact assessments; road reconstruction and impacts.

Independent oversight or regulation of the permitting and construction processes are particularly important. This oversight should be the responsibility of one or more independent engineering firms which are directly answerable to the Town. Status reports at predetermined stages of construction should be delivered to the Town to ensure that the installation has been properly completed at meets all safety requirements. Compensation to this firm(s) should be provided by the CWECS developer in the form of a surety bond, escrow account or other autonomous financial instrument which the Town will control. The CWECS developer shall have no direct contact with the engineering firm to ensure non-biased results.

O7-5 Cont.

The Town may wish to consider creating a salaried position(s) to oversee the many aspects of the project that require external oversight, coordination and review. Compensation for this position(s) should be provided by the CWECS developer and should be guaranteed in the event of transfer of ownership or abandonment of the project. The duration of this position may be only during the construction and decommissioning phases or a continuous position for the duration of the CWECS operation.

Recommendations: the Town shall create an escrow account to compensate one or more independent engineering firms and one or more salaried personnel who will oversee the CWECS project permitting, construction and decommissioning. The salaried personnel may also be responsible for reviewing regular maintenance reports during CWECS operation and serving as a liaison between the facility owner and residents.

3. Landowner Contract Control

While the Town may not be able to negotiate between the CWECS developer and the landowner, this committee recommends that Town officials familiarize themselves with typical lease, easement and nuisance contracts as well as other typical contracts associated with CWECS development.

Attached please find a lease agreement used in the Maple Ridge Project [A:F.2], a Neighbor Agreement with Easements [A:F.3], *Wind Turbine Land Leases and Options*, a position paper for landowers [A:G.6] and the *Canastota Wind Power Property Value Assurance Plan* [A:G.9].

4. Legal Views from Albany & Elsewhere

In the roughly five months since this report was initiated, the development pressure, itself a function of factors both local and international in scope, has continued to increase relentlessly.

Middle East cognoscenti believe that Israel is now preparing to use both conventional and nuclear warheads to attempt to destroy Iran's blossoming nuclear capability. Such could easily ignite a conflagration of uncertain scope, since the United States and Russia back opposite sides, and both countries have enough warheads to retard civilization. Even without a doomsday scenario, or an attack on Iran, instability in the region could cause the price of oil to skyrocket with minimal provocation. In the future, turbines could be used to create hydrogen-based power, lessening the need for oil.

O7-5 Cont.

At a more local level, the state of New York has committed itself to the development of alternative energy sources including wind. A recent position paper by the law firm of *Thomson/West of Rochester* cites numerous instances in case law to show that wind turbine farms meet the three essential criteria required to have them enjoy the relaxed zoning laws applicable to public utilities [A:F.4]. While CWECS facilities remain private domain at the moment, there is some legal grounds for publicizing them in the future, giving them rights of eminent domain.

On June 16, 2006, a conference titled *Siting Wind Power in New York* was jointly presented by the Government Law Center of Albany Law School and the NYSERDA. There were three main take-home messages: 1) wind energy is becoming increasingly competitive with other sources, 2) whether a town government is pro or con, new York state is committed to developing wind energy. If development lags behind state expectations, it was implied that steps will be taken to ensure it, 3) town and local governments are strongly advised to get the best lawyers they can afford when dealing with wind developers, as the latter will surely have them.

Recommendation: the Town shall keep abreast of the legal debate in Albany,

to the extent that CWECS facilities may become public utilities with all the rights thereof. The Town may additionally publish such information via the Town website or newsletter for the benefit of voters within its borders.

5. Potential Lawsuits

This is an extremely light analysis due to time constraints.

For the landowner, the liabilities are many and it appears that standard home, business and farm policies will not cover damage or loss of use due to CWECS facilities operations. The testimony of an insurance underwriter at a Stafford presentation confirmed this in early 2006. Certainly landowners are not insulated against lawsuits [A:F.1].

The Town has somewhat less risk, the main being precedent. In creating zoning and approving permits, the Town should review all data formally presented and recorded to establish precedent for types of accidents or other damage and act in accordance with lessening the risk from such occurrences. Failure to do so will open the Town to negligence claims in accordance with NYS law.

The Town should also be aware that New York law prohibits the transferral or elimination of certain types of liability. Liability waivers and the deep pockets of the CWECS developer are not enough to prevent a plaintiff from including the Town on a list of defendants in any CWECS case.

O7-5 Cont.

Recommendation: the Town shall provide a summary of precedent and existing zoning law to the Town attorney for liability review prior to the approval of any zoning instrument. An additional review of each permit application and Town response may be ordered at the expense of the CWECS applicant.

6. Wind Rights

Lease agreements stipulate distance from the turbine to any large feature and prohibit the landowner from building or planting any such feature within a fixed distance of the turbine(s). Wind rights between properties are typically protected by property line setbacks.

The *Town of Spring Valley, North Dakota* has passed regulations based on landowner rights, to whit: the turbines must be placed at least their tip height away from the property line. Turbines must be twice their tip height away from each other for engineering/performance reasons per *UPC Wind Partner's* informational meeting in Bethany. If the Hatfields and McCoys (neighboring landowners) both sign leases, and the wind company first determines the best placement for Hatfield is within a tip height of McCoy's property line, that limits McCoy's ability to lease land to the wind company See Figure F.6.1.

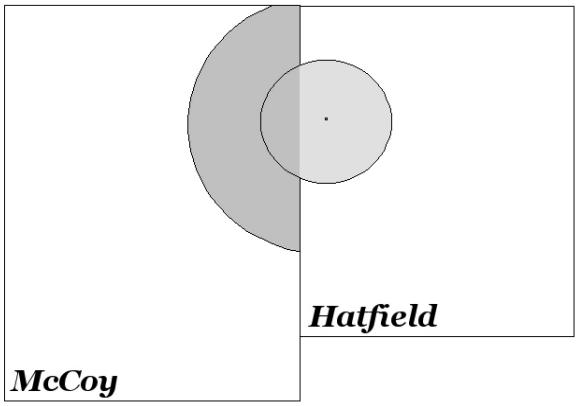


Figure F.6.1: Hatfield's turbine infringes on McCoy's ability to place turbines on his property.

In addition, if the turbine is located close to a property line, McCoy might, later on, build an obstruction which would affect wind flow and possibly make the turbine ineffective. While the turbines are tall, certain regular sizes and shapes of objects can severely impact wind flow at higher altitudes. UPC Wind Partners specifies anything taller than one-quarter the tip height as being a potential interference. Communities using this reasoning allow an exception where adjoining landowners have signed a joint lease sharing revenues.

NYSERDA's own document "Wind Energy Development: A Guide for Local Authorities in New York" specifies 1.5 times the tip height of the turbine.

Recommendation: the Town shall implement language protecting neighboring wind rights, specifying a minimum setback distance between each wind turbine and all surrounding property lines of no less than 150% of the tip height per NYSERDA regulations. This may be reduced when a joint lease or neighbor easement agreement has been signed and accepted by the Town.

O7-5 Cont.

7. Setbacks

Location ... location ... location. This is the key to determining the best-for-all placement of wind turbines. Location, or more specifically, the distance wind turbines are placed from residential areas may mitigate some of the issues and/or problems reported with wind turbines.

In Pavilion, NY, the setback distance from occupied buildings is 1,000ft for non-commercial (smaller) turbines. Perry and Cohocton have set 1,500ft setbacks for turbines somewhat larger, but still smaller than those proposed for Bethany. As wind turbine sizes have grown, siting concerns have become more commonplace especially in areas of higher population.

Globally, we see more variation, with reasoning typically covering safety and infrasonic health issues:

US NWCC	0.50mi
France	1.5km (.932mi)
German RETEXO-Rise	1.24mi
Nina Pierpont, MD, PhD	1.5mi

France's National Academy of Medicine cites significant health hazards caused by turbine noise and infrasound for their setback, although this research is not universally accepted at this time. Nina Pierpont [A:E.22], also cites health issues as the reason she recommends 1.5mi setbacks from any CWECS facilities.

Wind Turbines are relatively new to our area and the available information is based, in part, on other people's experiences with smaller turbines. Unfortunately, *UPC's* proposed 450ft turbines have never been installed anywhere before, so our setbacks and siting concerns must be extrapolated from existing facilities.

O7-5 Cont.

Types of Setbacks

Most (if not all) ordinances for CWECS facilities include distances from occupied buildings and property lines, while others include these plus roadway, right-of-way, livestock barns and pastures, and others. Obviously, not all communities measure the same types of setbacks and some clearly place more value on livestock and outbuildings than others.

Some communities have setbacks for occupied buildings, but none for business or livestock "homes." Some have two of the three and some have all three. This committee believes that, in keeping with our image as a caring agricultural community, any setback which applies to residences should also be applied to businesses, schools, libraries, public meeting facilities and barns housing livestock of any kind.

Roadways, Right of Ways

Roadways and Right-of-Ways, including roads, train tracks, hiking trails and published snowmobile trails, require protection from ice throw, fire, flicker effects and structural failures. Of these, the greatest length is ice throw at 165% of the sum of the hub height plus the rotor diameter. The ice throw setback may also be applied to overhead utility cables. Roadways also should be protected from flicker by use of a flicker shadow overlay map.

Figure F.7.1: Road map of Bethany with estimated setback marked for proposed 3.5mW turbines.

Historic Areas

Designated historical areas are often covered under setbacks for occupied buildings. Historic Areas, here, means those historic areas that are not occupied buildings such as the County Park (State Historic Register). These require protection from fire at 150% of tip height.

Wildlife Areas

Wildlife areas require protection from fire and, depending on the type of wildlife, noise. Both protections should be enacted, at 150% of tip height and a maximum of 35db measured at the wildlife boundary if applicable. See also *§ E.21 – Wildlife Impact* for impact report recommendations.

O7-5 Cont.

Occupied Buildings

Occupied Buildings need protection from fire, flicker effects, high wind and other structural failures, and noise. Only fire and structural failure are measured in setbacks; noise is typically limited by a decibel/property line figure while flicker effects are determined through use of an overlay map. Of the two remaining, high wind failure is the larger setback, at 450% of tip height.

Occupied buildings setbacks in current zoning ordinances range from the full tip height (hub height plus rotor length) to a fixed 1,000 meters (3,300 ft). Fixed numbers between 1,200' and 1,850' are common – note that in all instances these were ultimately applied to smaller turbines. A town in West Virginia attempted a fixed mile setback with modern, taller

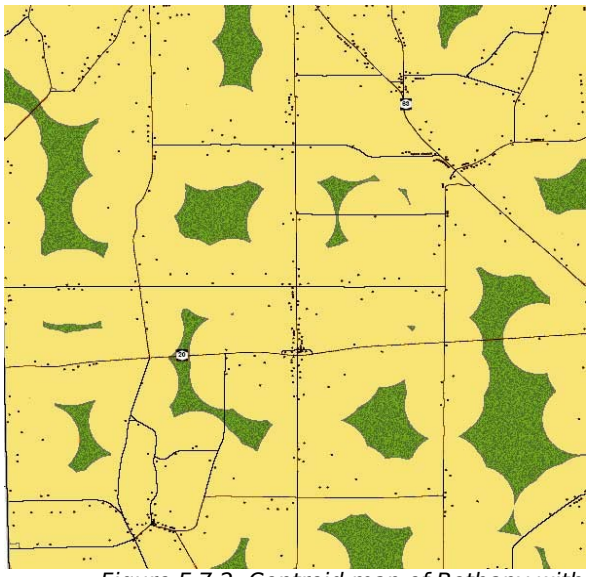


Figure F.7.2: Centroid map of Bethany with estimated occupied building setback marked based on proposed 3.5mW turbines.

turbines, which was challenged in court; a judge ordered it down to ½ mile.

In the USA, this particular setback represents extremely esoteric concerns – goals include: a) reducing noise by insisting on a minimum distance; b) reducing flicker in the same manner; c) preserving real estate values; d) appeasing residents who don't want tall spinning objects too close to their homes; e) preserving quality of life.

In Europe, occupied building setbacks in the range of 1,650ft have come after hard lessons of property damage and near loss of life. Germany, in particular, suffered as it did not – initially – require sufficient setbacks.

The NWCC's Permitting of Wind Energy Facilities Handbook notes that ideal setbacks measure at least 750-1,000 ft – written in 2002 when a typical turbine measured 80 meters. Proportionately for *UPC's* proposed 100 meter turbines, that setback would equate to 937-1,250ft.

The European Best Practices document [A:E.21] does not set a fixed distance, but suggests a safety assessment including distance to occupied buildings and roadways prior to the installation of any turbine facility. This practice, put into effect for more recent installations, has resulted in average setbacks from occupied buildings of about 600m or 1,980ft.

Property Lines

Property lines need protection from fire, noise, structural failure and to protect wind rights. Noise is typically determined by measuring decibel level at the property line of non-participating landowners. This committee recommends a limit of 35db. Of fire and structural failure, fire is the largest risk radius at 150% of tip height.

O7-5 Cont.

There is ample precedent for determining setbacks at least equal to the height of any construction within most communities' existing ordinances, in case of the structure falling over. Turbine companies will tell you that the chances of a turbine falling over is extremely slim, and they are correct. However, fire and wind rights are both good reasons for keeping property line setbacks to at least the tip height of the turbine.

Property line setbacks can also be problematic in their impact on potential land use on adjoining properties. This could adversely affect the property value of the adjoining property. It may also require the Town to rewrite building codes to match the CWECS facilities setbacks.

At least five towns border Bethany; impact on these towns should also be considered. One CWECS ordinance this committee reviewed included a provision stipulating compliance with applicable zoning ordinances of adjoining towns.

Cost-Effectiveness of Larger Setbacks

Any CWECS developer would likely take a public position that larger setbacks would be cost prohibitive. However, one can show that increased line loss (power loss from the turbine to the grid) is not the major problem. Jeffrey Pfaff, an electrical engineer and contractor who is not affiliated with any wind development company, notes that such line losses are deliberately engineered. Appropriate choice of conductor size, insulation and distribution voltage lowers line losses to less than about two percent.

Simple arithmetic shows that the revenue generated, compared to the revenue of-

fered to towns and/or landowners, can easily absorb this two percent (see *§ G.8 – PILOT – Approach* and *§ G.9 – Depreciation and Financial Effects*). The main concern would likely be the initial cost of installation and limiting the number of turbines which can be constructed.

Recommendations: The Town shall institute all setbacks in terms of a percentage of the turbine dimensions, with fixed footage as a minimum; e.g. "1500ft or 150% of the tip height, whichever is greater."

The minimum setback distance between each wind turbine and overhead utility lines, roadways, public and utility right-of-ways, and uninhabited structures shall be equal to no less than 165% the sum of the proposed hub height plus the rotor diameter.

The minimum setback distance between each wind turbine and dwellings, active places of business, and structures housing live animals shall be equal to no less than 450% of the tip height.

Property line setbacks shall be no less than 150% of tip height. The property line setback requirement may be reduced by the Town Board when it finds that the following circumstances apply: the owner of the parcel for which the reduced setback is sought executes and presents for recording a development easement satisfactory to the Town in which the reduced setback is consented to, and construction within, and use of, the easement area is appropriately restricted.

O7-5 Cont.

8. Zoning

This is a fairly light overview due to time constraints.

The choices for the Town to zone CWECS facilities seem to be overlay districting, incentive zoning or standard setbacks with land-use restrictions.

Overlay districting is most commonly used to simplify zoning. Given that the restrictions in this document are primarily designed around safety and quality-of-life, any overlay district should be located in the same effective area that applying these restrictions would create. A rudimentary map, constructed for this very section, reveals that a) any overlay district created by safety setbacks would be tremendously fragmented and b) new construction of homes and businesses would either be severely restricted or would severely impact the overlay zone. For this reason, an overlay zone does not seem appropriate for the Town.

Incentive zoning can and is used to realize tremendous gains for any Town or County accepting CWECS facilities into its midst. The Town can most easily accomplish the longtime goal of town-wide water by incentive zoning. This method, however, presents Town officials with years of confrontational meetings. Each CWECS facility, change and expansion would require additional sets of public meetings on a controversial topic, possibly fragmenting an already-divided community. That is not to say that incentive zoning is not a desirable means to regulate CWECS facilities – only that the consequences must be kept clearly in mind.

Standard setbacks are complex, due to the number of variables and the many impacts such large structures will have on the Town. However, standard setbacks have several advantages: a) they can be applied to a variety of different turbine types and sizes – including non-commercial models – with no change to regulations; b) they are justified in safety and quality-of-life concerns with less risk of legal challenge; c) they apply easily to reconfiguration and repowering of the CWECS facility and d) this committee has already done much of the leg-work for them.

O7-5 Cont.

Recommendation: The committee recommends standard setback zoning restrictions designated for agricultural and commercial overlay districts.

G) Financial

1. Agricultural Impact

A conference on the effect of Wind facilities on Agricultural districts brought forward a number of potential problems. Done properly, CWECS facilities can be a great tool to generate income for farmers with minimal disruption to field and/or herd. However, improperly installed CWECS facilities have the potential to take away more income than they generate through soil compaction, increasing un-tillable areas and increasing man-hours needed to tend the same land.

Specifically, siting concerns include turbines located in the middle of fields rather than along hedgerows; access roads that cut across fields rather than along the edges; guy wires that cut across active fields; drainage and erosion control issues caused by soil disturbance during construction or by the reconfigured contour.

Construction concerns include access roads constructed considerably higher than the surrounding fields; soil erosion caused by inadequate controls during construction, topsoil separation from subsoil; construction and equipment vehicles parked on topsoil; construction and equipment vehicles operating on areas other than the access/staging area; less than 48in of cover for buried electric cables in cropland and improved pasture; less than 36in of cover for unimproved pasture; improper disposal of excess subsoil and rock; unfenced work areas allowing livestock access to the construction site; wire, bolts and other unused metal objects left on the ground; excess concrete piled on the surface; concrete residue from trucks rinsed in an active agricultural area.

O7-5 Cont.

Restoration concerns include soil compaction to an inappropriate depth; surface location of rocks 4in and larger; improperly graded access roads not allowing farm equipment crossing and providing inadequate drainage patterns; non-seeding or seeding with non-native vegetation resulting in overgrowth of weeds; improper restoration of existing drainage structures damaged during construction; and remaining construction debris.

All these translate into dollars lost as the farmer is forced to increase man-hours to work around the obstructions and will not reap maximum harvest on compacted soil.

The state Agricultural department has come up with guidelines to be adhered to in all County-adopted, State-certified agricultural districts [A:G.1]. These guidelines protect the landowner with minimal interference in the CWECS construction process.

> Recommendation: the Town shall require that the state's agricultural guidelines be adopted throughout the Town, regardless of the land's status as a certified Agricultural district.

2. Effect on Property Values

In our visits to other towns that have turbines installed we found that generally those properties with turbines have increased in value. This is to be expected due to the fact that they are now producing a greater amount of income.

For those properties in the immediate area the picture is far from clear. We have learned of property owners trying to sell and not being able to locate buyers due to CWECS or even the potential of future CWECS facilities.

Of published data, the REPP report states no loss of property value. However, this report uses assessed value to make its determination, which may or may not have any relevance to the ability to sell the parcel and realize its value. Other documentation suggests that properties in the immediate vicinity to a CWECS facility are difficult to sell and may realized reduced sale prices [A:G.5], [A:G.10], [A:E.25].

However, because of relatively little hard data on this subject, the committee believes it is much too early to make a definitive statement on this topic, regardless of what the wind development companies and wind opponents would like us to believe.

There is precedent for CWECS developers and/or operators to provide property value assurances [A:G.9]. While this does not mitigate the disruption involved in moving families, it does at least assure a fair market value for any home within the viewshed of such a facility. We have learned, however, of developers in Fenner signing such contracts which became invalid when the facility was sold to a new owner. Any such contracts must be worded as to pass liability to any subsequent owners of the CWECS facility.

O7-5 Cont.

> Recommendation: if the Town requires a Property Value Assurance plan from the CWECS developer, it should be written such that responsibility passes to each subsequent owner(s) of the facility.

3. Employment Issues

It is the opinion of this committee that any CWECS project will have no significant impact on employment in the Town. One new job may be created within the Town offices itself – the project coordinator. A handful of jobs may be created at the CWECS central monitoring station.

Our trip to Maple Ridge and interviews with residents near other CWECS facilities reveal that most employment is temporary in nature and/or filled with outside personnel. While CWECS developers may suggest that new turbine plants are being constructed near CWECS facilities, such plants happen rarely and are often are located overseas due to labor costs. At any rate, the Town lacks the proper infrastructure to operate such a plant, leaving the employment situation essentially unchanged.

4. Lack of Competition

It seems to be the case with most towns that only one wind development company has shown any interest in developing wind energy in our town. While several likely theories have emerged, this committee has not been able to come up with any solid information on the lack of competition in any given area.

Wind developers typically purchase commercial-scale turbines from manufacturers, requisition engineering reports from outside firms and contract out much of the construction, leaving no appreciable special talent required for the project. Given the profit potential in developing wind energy, competition for the right to reap these profits should be intense.

The Town can only benchmark success against other New York communities that have negotiated CWECS projects.

5. Loss of Property Use

Loss of property use includes losses suffered by both the lessor and neighboring non-lessors (abutter-owners). Losses include a wide range of immediate and future bans and/or restrictions and hardships on wind project area residents. The following list illustrates the nature and scope of typical losses-hardships that have been included in some lease agreements:

O7-5 Cont.

- Access: wind company motorized access to property at all times-day or night
- Line Placement at Will: unlimited placement of electrical lines and removal of trees without notice; unlimited placement of cables, above and below ground, foundations, substations
- Building Restrictions: all building plans of lessor subject to review by wind company along with height restrictions
- Zoning Restrictions: land use restrictions based on appropriate turbine setbacks of varying lengths.
- Claims Forfeiture: forfeiture of any right of claims against wind company regarding noise, flicker, ice throw
- Wind Rights: exclusive rights to wind resources go to wind company
- Length of Agreement: period of agreement varies from 17-40 years
- Easement Succession: sale of property subject to lease restrictions-lessor restrictions go with the property if lessor decides to sell

Recommendation: as each CWECS permit is reviewed, the Town shall consider current use of the parcel as well as potential future use.

6. Operating Permits

Operating permits are one method to reach two major goals: a) maintaining a safe facility and b) realizing local fees for the Town specifically.

The EPA recommends the use of operating permits whenever on site systems need to provide or maintain treatment to achieve environmental safety goals. While CWECS facilities are not on the standard list, environmental safety including oil spills, nuisance disturbances and other issues abound with their operation. Regular permitting requirements related to CWECS safety and nuisance issues can be used as a means to assure that the issues are addressed to the Town's satisfaction.

PILOT arrangements (see *§ G.8 – PILOT – Approach*) are often split along tax percentage lines, leaving Bethany with about 10% of PILOT revenue. The Town may not be able to realize needed infrastructure changes with so small a percentage. Operating permit fees, requested up front, will allow the Town to set a budget commensurate with needs and goals.

Some towns have tied operating permits to the rated capacity of the turbines. A fee per mW capacity would adequately address the issue of the number of turbines installed, future expansions and repowering.

> Recommendation: the Town shall require an annually-renewable operating permit, along with fee per mW capacity, for any CWECS facility. Operating permits shall be renewed at the Town's discretion.

O7-5 Cont.

7. Payments to Landowners

The installation of wind turbines and the requirements to install high voltage transmission cables above and/or below ground requires right-of-way permission from private landowners and possibly the Town and state for use of their land [A:F.2]. There is also the issue of restoring the property to its original configuration post-construction.

The committee contacted *UPC Wind Partners* about this requirement; *UPC Wind Partners* stated they would pay the landowner a right-of-way payment for an easement on their property.

The committee also requested information from *UPC Wind Partners* regarding so-called 'nuisance' payments to neighboring landowners and easement payments for relaxed property line setbacks. Attached, please find a similar letter initiating that process from *Noble Environmental* [A:G.7] and a similar contract associated with the Maple Ridge project [A:F.3].

UPC indicated that they do not consider nuisance payments. Easement agreements

will depend on the nature of the Town's zoning requirements. There was no indication as to how much any payments to landowners might be; rather, *UPC* indicated it would review payments on a case by case basis.

> We suggest the Town provide payment and restoration guidance to the landowners and/or include payment structure and restoration requirements into the Town contract or zoning statutes. A legal firm, *Stamp, Jackson and Procter*, have produced reasonably comprehensive guidelines for landowners in dealing with CWECS developers [A:G.6], which the Town may use as a template.

8. PILOT – Approach

If a CWECS facility were to be installed in Bethany, PILOT revenue would be of unprecedented amounts. Developers have, historically, offered as little as two- or three-thousand dollars per mW per year. Recent PILOT agreements with local communities, however, have been as high as $8,000 per mW per year, which should stand as a current benchmark.

PILOT agreements are often touted as the means to a fair distribution between town, county and school district. For example, some counties in western New York, working through their respective IDA/EDAs, have realized roughly the following distribution, based on the tax distribution:

O7-5 Cont.

County:	40%
School District:	30%
Town:	30%

But each county is different: in Livingston County:

County:	30%
School District:	52-58%
Town:	12-18%

The Town of Bethany is located in more than one school district, which districts also extend outside the Town. If reductions (or non-increases) in school taxes are realized from PILOT payments in the Town, they would likely be applied uniformly, benefiting all property owners in the school district, not just in Bethany. Furthermore, a uniform school tax reduction (or non-increase) to all property owners in the Town would not be realized unless negotiated between the Town and all school districts therein.

From conversations with Joe Kushner of Eagle, the committee has learned this process: The Town of Eagle posed the following question: How many new school students result from the installation of a CWECS facility? Essentially none.

Convincing the Wyoming County EDA of the lack of fairness in this distribution, Eagle was able to arrange a licensing agreement between the developer and the Town of Eagle, whereby Eagle, prior to the PILOT payments division, gets 80% of the wind-generated revenue up front. The remaining 20% then goes into PILOT and that portion is divided as follows:

County:	30%
School District:	40%
Town:	30%

By this method, Eagle receives 86% of the wind-generated revenue. This is a new, unprecedented arrangement, and an ideal on which to model any Bethany PILOT arrangements.

9. Depreciation and Financial Effects

Developers can recover their capital investment very quickly, because wind energy facilities are eligible for *five-year double declining balance accelerated depreciation* for federal income tax purposes [A:G.12]. In a sample $500,000,000 facility (the approximate cost of 480kWh capacity), the developer can recover the entire investment through depreciation charges to offset income tax liability in just six years [A:G.2].

To benefit from tax shelters, the wind developer must have income. For this reason, many CWECS developments consist of two or more companies. One company will develop the facility and then sell it to the partner company, using the income for depreciation and presenting an entirely different owner for the community to deal with. On the Lake Erie project, *UPC* is partnering with *Clipper Wind;* in Prattsburgh with *Global Wind Harvest;* in Hawaii with *Makani Nui Associates.*

O7-5 Cont.

Due to these unique tax situations, there is an incentive for facility owners to abandon these projects once the initial term of tax credits have dried up, forsaking their projections and promises of twenty- to thirty-year life expectancies for the project.

At the "informational meeting" in June 2005, Chris Swartley presented a few hard numbers on the proposed project. *UPC Wind Partners* intends to build between 30 and 40 turbines in the Town. For the purposes of our calculations, we will assume the middle, or 35 turbines. They are to be GE 3.5mW turbines, a model just barely on the market, with a quoted price tag of $2.6 million each.

Now, we estimate some numbers based on current and completed CWECS projects. Landowner payments can be as high as $10,000 per year, but are somewhat less in rural areas. The rural range is $2,500 - $5,000. Note that while some landowners tie their payments to mW produced, historically landowner payments have been per annum. We'll assume the high number of $5,000 or $175,000 for the entire project.

Wind farm developers acknowledge that wind electricity costs more than traditional electricity – a cost that is ultimately passed on to consumers. (Note that we are not talking about the SBC credit – that money is used to fund wind developer's preliminary studies.) Let's take a conservative number: two cents more per kWh [A:G.17]. If

the Bethany wind turbines generated electricity 100% of the time, they would produce 1,073,100,000 kWh annually. However, experts acknowledge that wind turbines produce only about 30% of their rated capacity due to lack of wind and other factors [A:G.16], which makes the annual production 321,930,000 kWh.

Electricity from wind turbines will therefore cost consumers an additional $6,438,600/year – with $175,000 of that going to the landowners, or a net $6,263,600 loss for the community.

Developers are eligible for a federal Production Tax Credit of $0.017 per kWh produced during the first ten years of the project. If the wind turbines generate the 321,930,000 kWh listed above, developers will receive an additional $5,472,810 in tax credits.

Conclusion: while Bethany landowners will receive $175,000 in payments, $11,736,410 in electric fees and tax credits will be heading to the developer. Other analysis has produced similar numbers [A:G.3], [A:G.8], [A:G.11] which CWECS developers dispute without offering any unexposed costs of their own [A:G.4].

Many wind power producers try to sell their product on its environmental advantage – fewer emissions for our atmosphere. Yet even a quick analysis of their profitability leads us to more likely motives for large corporations to be involved with such projects. A simple revenue vs. expenses comparison nets us these numbers for the first year:

Costs:	
35 GE 3.5mW turbines:	$91,000,000
Annual Maintenance (first 10 years):	7,000,000
35 Landowner Payments:	175,000
Tax Credits:	
Federal Production Credit:	5,472,810
Federal MACRS Depreciation Credit:	18,000,000
Sales:	
321,930,000kWh x $0.05	16,096,500
Total:	-$58,605,690

O7-5 Cont.

Extrapolating over the six year MACRS deduction gives us:

Costs:	
35 GE 3.5MW turbines:	$91,000,000
Annual Maintenance (first 10 years):	42,000,000
35 Landowner Payments:	1,050,000
Tax Credits:	
Federal Production Credit:	32,836,860
Federal MACRS Depreciation Credit:	91,000,000
Sales:	
321,930,000 kWh x $0.05 x 6yrs	96,579,000
Total:	$86,365,860

While a community cannot zone for lost profits and tax dollars, we have located a number of suggestions made by and for communities such that at least some funds remain local.

PILOT payments should be of an adequate amount. Please see *§ G.6 – PILOT – Approach* for a detailed analysis. The Town may also wish to consider enhanced Operating Permit fees tied to the number of mW produced and/or negotiating an infrastructure improvement via incentive zoning. The Town of Bethany could potentially negotiate a town-wide water project as part of an incentive zoning package with any CWECS developer.

In relation to the lifespan of the project, it is recommended that any "annual" payments, whether to individual property owners or community agents, be contracted for a specified number of years and placed in escrow. Most ordinances are settling on 10 years as a compromise between the 20 years the developers are promising and the five to six year term of the bank loans and tax credits. This prevents the developer from abandoning their financial responsibilities along with the project when the tax credits dry up [A:G.13]. Ten years also tends to be a common length for electricity purchasing contracts, which makes the developer comfortable with that number [A:G.15].

With respect to the depreciated value of the structures over time, it is recommended that insurance covering full replacement value (not actual cash value) be required for the wind turbine during its entire production cycle. Should the structure be damaged after depreciation, any insurance policy which does not cover full replacement cost will likely leave the town and residents with an eyesore.

O7-5 Cont.

Recommendations: the Town should not attempt to override state tax shelters for wind farms, as they will have limited "on the books" income. Instead, negotiate fixed annual payments to the community in lieu of taxes and/or infrastructure improvements via incentive zoning. Contract any annual payments for a fixed number of years and place them in escrow. Require the developer and/or operator to carry full replacement value insurance on all CWECS facilities. Finally, word all contracts so that financial, community and legal burdens of the developer are passed unchanged to any and all subsequent owner/operators.

10. Success in Other Countries – Trends

Size

As turbines have improved technologically, the trend has been toward larger and larger turbines. One reason for this has been the US Government's research funding, which has been directed towards capturing wind in remote areas, allowing for larger

structures. Another reason is to escape wind disturbances caused by objects – both natural and man-made – along the ground. Either way, the trend is toward larger structures that capture wind at higher elevations. It is possible that any turbines introduced within the Town would eventually be repowered (replaced) with larger turbines.

As a counterpoint to this trend, European companies are introducing smaller turbines, specifically, rooftop designs. These standard horizontal turbines, about the size of a ground-mounted satellite dish, provide enough electricity to help offset the cost of the household bill. Londoners, in particular, have adopted this technology wholesale. It is not likely, however, that CWECS facilities would be replaced with this technology – it is not cost-effective on a larger scale.

Setbacks

Overall, the trend in setbacks is upward at a scale outdistancing the size increases of the turbines themselves. German setbacks ranged in the few hundred meters to begin with and have crawled upwards to averages of 1,980ft for 240ft hub height turbines. While wind power is among the safest electrical power generation methods, it is still an industrial method with some dangers. The only known mitigation for most dangers is an adequate setback.

In the UK, public resistance and planning agreement are thwarting the development of onshore wind farms. In 2003, the Irish government placed a moratorium on all onshore CWECS projects. David White, UK engineering consulting with years of research in wind power, believes that the bulk of new renewable capacity up to 2010 is likely to be offshore wind power.

O7-5
Cont.

H) Summary of Recommendations

Based on the information gathered, the committee recommends that the Town of Bethany immediately work to enact zoning legislation designed to protect the safety and quality of life for residents prior to considering any CWECS project(s). This legislation shall not draw a conclusion on the presence of CWECS within the Town of Bethany, but rather guide any such presence along safe, secure lines.

The Town shall provide a summary of precedent and existing zoning law to the Town attorney for liability review prior to the approval of any CWECS zoning.

This committee suggests the Town provide payment and restoration guidance to the landowners and/or include payment structure and restoration requirements into the Town contract or zoning statutes. A legal firm, *Stamp, Jackson and Procter*, have produced reasonably comprehensive guidelines for landowners in dealing with CWECS developers [A:G.6], which the Town may use as a template.

The Town shall keep abreast of the legal debate in Albany, to the extent that CWECS facilities may become public utilities. The Town may additionally publish such information via the Town website or newsletter for the benefit of local voters.

1. Planning Considerations

O7-5 Cont.

Siting

a) Turbines shall not significantly impair a scenic vista or scenic corridor as identified by the Town or other published source

b) The Town shall carefully review proposed CWECS projects from the standpoint of viewshed destruction and quality-of-life impact for nearby residents, perhaps utilizing a questionnaire to evaluate more esoteric concerns.

c) A Property Value Assurance plan should be required from the CWECS developer, written such that liability passes to subsequent owner(s) of the facility.

d) The Town shall evaluate potential disruption of crop dusting and recreational flight businesses prior to approval of any CWECS project.

e) The Town shall institute all setbacks in terms of a percentage of the turbine dimensions, with fixed footage as a minimum; e.g. "1500ft or 150% of the tip height, whichever is greater."

f) The Town shall require setbacks of at least 150% of the turbine tip height from any right-of-way, designated historic area, or wildlife area.

g) The Town shall establish a minimum setback distance between each turbine and overhead utility lines, roadways, public right-of-ways including marked trails, utility easements, and uninhabited structures, of no less than 165% of

the proposed hub height plus the rotor diameter.

h) The minimum setback distance between each wind turbine and dwellings, active places of business, and structures housing live animals shall be equal to no less than 450% of the tip height.

i) The Town shall specify a distance from occupied buildings and roadways sufficient to eliminate shadow flicker from such, as determined by a shadow map overlay and/or require turbines to be shut down during hours of flicker.

j) The Town shall implement language protecting wind rights, specifying a minimum setback distance between each wind turbine and adjoining parcels of no less than 150% of the tip height. The property line setback requirement may be reduced by the Town Board when it finds that the following circumstances apply: the owner of the parcel for which the reduced setback is sought executes and presents for recording a development easement satisfactory to the Town in which the reduced setback is consented to, and construction within, and use of, the easement area is appropriately restricted.

k) Access roads which cross agricultural fields will be located along ridge tops where possible to eliminate the need for cut and fill as well as reduce drainage problems. The Town shall consider the safe placement of new access roads.

l) In agricultural areas or by landowner request, structures will be located along field edges and in nonagricultural areas where possible.

Building

O7-5 Cont.

a) The Town shall notify any CWECS developers expressing interest of the seismic history of the town.

b) Wind turbines shall not be used for displaying any advertising except for reasonable identification of the manufacturer.

c) Colors and surface treatments of wind turbines shall be non-reflective in nature and minimize visual disruption

d) All cable shall be buried underground unless poles are in place to accommodate them at the time of the CWECS permit application.

e) The Town shall require that each turbine be clearly labeled with a postal address compatible with the 911 emergency system; visible from 500ft or from the nearest roadway / right-of-way.

f) The Town shall require a minimum distance of 30ft between ground level and any part of the rotor blade consistent with public safety.

g) The Town shall require an adequate conducting path from the tip of each turbine to the ground using a multireceptor system to help prevent lightning damage to turbines.

h) Flicker frequency shall be limited to less than 3Hz.

i) The Town shall require that the state's agricultural guidelines be adopted throughout the Town, regardless of the parcel's status as a certified Agricultural district.

j) The Town shall require the CWECS operator to notify local airstrip operators, crop dusters, recreational flight businesses and MercyFlight of proposed turbine locations and flight risk areas prior to construction.

k) The Town shall require the CWECS developer to select a configuration of minimal lighting which meets FAA requirements. Furthermore, each strobing light will be required to be equipped with an RF choke and an adequate neutral pursuant to IEEE 519 standards.

l) The Town shall require the CWECS operator, in addition to two-token authentication for Internet protection, to enact physical security protocols to the Town's satisfaction including remote intrusion monitoring.

m) The Town shall create an escrow account to compensate one or more salaried personnel who will oversee the CWECS project permitting, construction and decommissioning. The salaried personnel may also be responsible for reviewing regular maintenance reports during CWECS operation and serving as a liaison between the facility owner and residents.

2. Permit / Application Process

O7-5 Cont.

a) The Town shall require that any CWECS project receive clearance from the Niagara Falls Air Reserve Station prior to construction.

b) The Town shall require the CWECS applicant to place funds in escrow sufficient for the Town to conduct engineering and legal evaluations as outlined below. The Town shall choose the engineering firm(s) and attorney(s); the applicant will have no contact with them.

c) The Town shall require any CWECS developer to post a separate surety bond or other financial instrument with annual escalation factor of sufficient value to fully decommission a turbine for each turbine constructed.

d) The Town shall require any CWECS developer to generate a suitable agreement with each landowner giving right-of-way to overhead or underground transmission lines as to the final disposition of those lines, and shall post a surety bond or other financial instrument for each property owner who requires removal of these lines.

e) The Town shall require that the CWECS applicant and at least one independent engineering firm produce a complete report on the likely effect of seismic activity consistent with historical data on each proposed wind turbine and all associated facilities.

f) The Town shall require the CWECS applicant and at least one independent engineering assessment of possible hydrologic impacts and that the CWECS project commence in a manner consistent with minimal anticipated impact.

g) The Town shall require the CWECS applicant and at least one independent engineering assessment of possible noise impacts – both audible and infrasound. The CWECS project shall commence in a manner consistent with decibel limitations.

h) Any impact reports submitted with application should address proposed routes, overhead obstructions and any necessary electrical or communications lines changes that would be made.

i) The Town shall request a legal review of each permit application and response from an attorney of the Town's choice, at the expense of the CWECS developer.

j) The Town may require any CWECS developer to provide the turbine fire-fighting equipment and fire department training at its own expense.

k) The Town shall negotiate fixed annual payments to the community in lieu of taxes and/or operating permit fees and/or infrastructure improvements via incentive zoning. Any annual payments will be contracted for a fixed number of years and placed in escrow.

l) All contracts between the Town and the applicant will be so worded that financial, community and legal burdens of the developer are passed unchanged to any and all subsequent owners/operators.

3. Construction

O7-5 Cont.

a) The developer shall be required to submit regular scheduling reports to the Town, indicating work completed to date, in progress and scheduled; this report shall include locations, construction routes and impacted property lots.

b) The Town shall specify a limit on hours of heavy operation to a reasonable time frame such as 7:00am to 6:00pm with no Sunday or holiday hours.

c) The Town shall require the developer to submit proposed construction routes to the Town for approval and submit a surety bond or other financial instrument to ensure that road repair is completed.

d) The Town shall require construction site monitoring and inspection by a professional who is independent of the project developer for effective storm water and erosion management control.

e) Construction activity, including soil stockpiles, shall be limited to a specified area agreed upon by the developer and landowner. No construction equipment or personnel shall be found on private property outside of this designated area.

f) All topsoil will be stripped from work areas (tower sites, parking areas, open-cut electric cable trenches and along access roads) and stored separately from other excavation material. At least 50ft of temporary workspace will be alloted along open-cut trenches to allow for topsoil segregation.

g) An independent oversight agency or project manager should be required to actively monitor and address dust levels via standard construction techniques.

h) A minimum depth of 36in of cover will be required for all buried cables in unimproved grazing areas and land permanently devoted to pasture. A minimum depth of 48in of cover will be required for all buried cables in other locations. In areas where the depth of soil over bedrock ranges from 0 to 48in, the electric cables shall be buried entirely below the top of the bedrock or at the depth specified for the particular land use, whichever is less. At no time will the depth of cover be less than 24in below the soil surface.

i) All excess subsoil, rock and construction debris will be removed from the site. On-site disposal of subsoil and rock may be allowed if approved by the landowner and the Town project monitor.

j) The Town shall require the developer to create a new property survey map for each impacted parcel, showing the location of any underground features of the CWECS, including but not limited to concrete bases and buried cables.

3. Pre- and Post-Construction Testing

a) The developer shall be required to restore all roads to county or town specifications, as appropriate, within one month of the developer's last use of such road.

b) The Town shall require compensation and/or infrastructure improvements to offset any actual hydrologic impacts. This may include the construction of water systems to replace destroyed aquifers.

O7-5 Cont.

c) The Town shall require the CWECS developer to restore television, cell phone and wireless network signals to pre-construction levels at its own expense.

d) The Town shall require the CWECS developer to mitigate any unexpected shadow flicker effects at its own expense.

e) Pre-construction modeling and post-construction noise testing will be conducted to determine any adverse effects. The CWECS developer shall mitigate any unexpected noise impacts at its own expense.

f) Disturbed areas will be decompacted to a depth of 18in. In areas where the topsoil was stripped, soil decompaction shall be conducted prior to topsoil replacement.

g) All access roads will be removed or regraded to allow for farm equipment crossing and drainage issues.

h) All restored areas will be seeded with native vegetation of local provenance, satisfactory to the landowner.

i) All surface or subsurface drainage structures damaged during operations shall be repaired.

j) All parts and construction debris will be removed from the site.

4. Operations

a) The Town shall require and issue annual operating permits, with appropriate fees, to each turbine; operating permits shall be renewed based on the operator's compliance with all stated regulations.

b) The Town shall require any CWECS project to meet IEEE 519 standard at any time that they are operating.

c) The operator shall be required to carry full replacement value insurance on all CWECS facilities at any time that they are operating.

d) The Town shall require the facility Operator to submit regular maintenance reports including oil pressure checks.

e) The Town shall require the facility Operator to submit critical maintenance reports following any instance of lightning, fire or structural damage.

f) The Town shall require the facility Operator to notify the town of any turbine which has sat idle for more than three months.

5. Decommissioning

O7-5 Cont.

a) The Town shall require all construction constraints present during installation to apply during decommissioning, including inspections, oversight and hours of operation.

b) Disturbed areas will be decompacted to a depth of 18in. In areas where the topsoil was stripped, soil decompaction shall be conducted prior to topsoil replacement.

c) All access roads will be removed or regraded to allow for farm equipment crossing and drainage issues.

d) All restored areas will be seeded with native vegetation of local provenance, satisfactory to the landowner.

e) All surface or subsurface drainage structures damaged during operations shall be repaired.

f) All parts and construction debris will be removed from the site.

I) Catalog of Attachments

These attachments can be found at the Town Hall in Bethany. A duplication fee may apply for those wishing to obtain a take-home copy.

D.1: Wind Committee Questions, a list of questions and answers between the Stafford Wind Study Committee and UPC Wind Partners.

D.2: Letter to Warsaw Town Board from David Bassett, a letter from a wind-electric equipment patent-holder on the suitability of CWECS installations in small towns.

E.1: Letter to Susan Sliwinski from NewAcoustics of Scotland, a letter detailing noise rulings and possible resident impact.

E.2: White Paper: Wind Farms and their Effects on Public Safety Radio Systems by LJK Wireless Communications Engineering. An analysis of wind turbine effects on public safety, utility and governmental microwave systems.

E.3: News Story: Man Dies in Wind Tower Fire, an account of a recent South Dakota accident involving maintenance workers.

E.4: News Story: Lightning Strikes Wrecks Searsburg Turbine Blade, an account of repeated lightning damage to a CWECS facility and steps local officials are taking to investigate.

O7-5 Cont.

E.5: The Beat is Getting Stronger: The Effect of Atmospheric Stability on Low Frequency Modulated Sound of Wind Turbines by G.P. van den Berg. An article on the variations in wind turbine noise caused by the atmosphere/weather.

E.6: Relationships Between Bats and Wind Turbines in Pennsylvania and West Virginia by the Bats and Wind Energy Cooperative. An assessment of fatalities and behavioral interactions between bats and wind turbines.

E.7: Shawano County Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Wind Energy Conversion Systems. A planning paper outlining best practices for assessing wind noise levels.

E.8: Journal Article: Alberta Bat Fatalities Studied. A summary of the experiences of *Vision Quest Windelectric*'s bat research.

E.9: CBC Technology Review: Effects of Windmills on Television Reception. An article describing signal degradation as measured before and after a CWECS installation.

E.10: Journal Article: Lightning Protection Sought for Wind Turbine Blades by John Korsgaard and Ivan Mortensen. An analysis of different methods of protecting turbines from lightning with their efficacy.

E.11: FAR Part 77 – Obstructions to Navigation by Dr. A.A. Trani, Virginia Tech.

A power point presentation outlining airport planning and describing the size/distance of objectionable features.

E.12: Risk Analysis of Ice Throw from Turbines by Henrie Siefert, Annette Westerhellweg and Jurgen Kroning. An analysis of actual ice throw to determine approximate range for future projects.

E.13: News Article: More Attention Must Be Paid to the Harmful Effects by Dr. Amanda Harry. A medical analysis of noise and flicker effects by a local UK doctor.

E.14: Obstruction Marking & Lighting (AC 70/7460-1K) by the FAA. Regulations concerning the lighting of wind turbines.

E.15: International Association of Firefighters (IAFF) Votes to Study Health Effects of Cell Towers on Fire Stations by Susan Foster Ambrose, M.S.W. A resolution for to study the health effects of RF radiation below cell towers and a moratorium on cell towers over fire stations.

E.16: Eliminating Electrical Pollution Caused by Cell Towers by David Stetzer of Stetzer Electric. Suggested wording for a zoning ordinance to require cell towers be compliant with IEEE 519.

E.17: Photosensitive Epilepsy - Other Possible Triggers by Professors G Harding (Aston University, England) and S Seri, 28 October 2005. Recommendations on lower limits for wind turbine shadow flicker.

E.18: Ordinance for Regulating Energy Generation Using Wind Power in Benton County, Indiana. Drafted by The Advisory Plan Commission. Although this draft version is incomplete, it includes useful language on road routes and repair.

O7-5 Cont.

E.19: Self-Guided Tour to the Wind Farms of the Tehachapi Pass by Paul Gipe. A description of the Tehachapi Pass which includes several fields of abandoned CWECS facilities.

E.20: Land Use and Zoning Issues Related to Site Development for Utility Scale Wind Turbine Generators. A Michigan State University Extension analysis.

E.21: European Best Practice Guidelines for Wind Energy Development by the European Wind Energy Association. Statements about more recent setback increases.

E.22: Health, Hazard and Quality of Life Near Wind Power Installations: How Close is Too Close? By Nina Pierpont, MD, PhD. An analysis of health risks near CWECS facilities.

E.23: Stafford Citizens Wind Committee Report.

E.24: Letter to the Bethany Wind Committee. By Douglas Beattie. An analysis of avian risk to the area.

E.25: Letter from landowners near a CWECS facility by Julian & Jane Davis.

E.26: Putting Wind Power's Effect on Birds in Perspective by Mick Sagrillo. An

analysis of avian impact.

E.28: Why Avian Impacts are a Concern in Wind Energy Development by Gerald Winegrad, American Bird Conservancy. An analysis of avian impact.

E.29: Letter from David Stetzer of Stetzer Electric. An analysis of ground current and its possible impact on people and animals.

F.1: Letter sent to 18 Landowners in Stafford by Arthur J. Giacolone. A legal opinion that turbines may constitute a 'private nuisance.'

F.2: Amended and Restated Lease for Construction of Wind Turbine Generators. A sample lease agreement from the Maple Ridge project.

F.3: Neighbor Agreement and Grant of Easements. A sample 'nuisance payment' agreement from the Maple Ridge project.

F.4: Siting Wind Farms in New York: Applicability of the Relaxed Public Utility Standard by Patricia E. Salkin and Robert Burgdorf. An analysis of the potential for declaring CWECS facilities to be public utilities for zoning purposes.

G.1: Guidelines for Agricultural Mitigation for Windpower Projects by NYS Department of Agriculture and Markets. A set of best practices for preserving agricultural land throughout the construction process.

O7-5 Cont.

G.2: Wind Energy Economics in the State of Washington by Glenn R. Schleede. An analysis of cost/benefits to an area when a wind facility moves in.

G.3: Golisano's Numbers by Tom Golisano. An analysis of the profitability of commercial wind facilities.

G.4: News Article: Invenergy officials dispute Golisano Numbers. A rebuttal by Invenergy, a CWECS developer.

G.5: News Article: Questioning Property Values. An example of a town board requiring a property value protection plan as part of a proposed CWECS facility.

G.6: Wind Turbine Land Leases and Options. A client briefing note from Stamp, Jackson and Proctor. Guidelines for landowners in dealing with CWECS developers.

G.7: Letter from Noble Environmental to residents in the Town of Altona. A sample letter requesting relaxed setbacks from neighboring properties.

G.8: Local Reaction to the Eco-Northwest "Economic" Study of Wind Farms. A study review by the Preservation League of New York State, analyzing Zilkha's economic study prepared for the Kittitas Valley; pointing out flaws to look for.

G.9: Canastota Wind Power Property Value Assurance Plan. A sample property value assurance agreement.

G.10: Testimony of Russell Bounds, Banking and Mortgage Expert. The deposition of a mortgage expert on the probability of property value changes following a CWECS installation.

G.11: Tilting at Windmills: the Economics of Wind Power by Professor David Simpson of the David Hume Institute. An economic analysis of CWECS projects in the UK.

G.12: US Title 26, 168: Accelerated Cost Recovery System. Rules for applying MACRS to CWECS facilities.

G.13: Letter to M. Stolzenburg from NYSERDA. Verifying landowner and town payments can be and are contracted for a specified number of years.

G.14: Danish Wind: Too Good to be True? By David J. White. An analysis of the overall effectiveness of wind power in Denmark.

G.15: Why Should Minnesotans Subsidize the Burning of Poultry Manure? By David Morris. Testimony for wind operations in Minnesota.

G.16: Electricity Output from the Maple Ridge Windplant; July, August, September 2006 by Richard Bolton, Environmental Compliance Alliance. An analysis of actual electrical output.

G.17: Wind Makes Food Retailers Greener by Janet Raloff. Includes some basic information, validated elsewhere, about the extra cost of wind power.

O7-5
Cont.

J) Committee Background

Francis Ashley (Chair): a resident of Bethany for over thirty-seven years, Francis is a retired financial executive with a BS in Accounting and experience in public accounting, not-for profit organizations, manufacturing and petroleum distribution. His community service includes several terms on the *Pavilion Central School Board of Education* as well two terms as assessor for the Town of Bethany; he has also been active as a Little League baseball coach.

Steven Breckenridge: a resident of Bethany for fifty-one years, Steven is currently Warehouse Supervisor for Oatka Milk Cooperative in Batavia and has served four years on the Batavia City Council. He has two grown daughters, both schoolteachers.

Geoffrey A. Briggs: a resident of Little Canada for thirty-six years, Geoff is a retired Junior-Senior High School Earth Science teacher; a science writer, curriculum writer, and consultant for The New York State Education Department; and an American Meteorological Society Atmospheric Education Resource Agent. His research includes many interviews of local residents at Tug Hill, Wethersfield and others; he has produced a 28-minute DVD of interviews regarding the effects of turbines on nearby residents. Geoff is a former President of the *Genesee County Landmark Society* and currently sits on the *Black Rock Watershed* committee.

Ramon J. Cipriano: a resident of East Bethany for fifty-two years, Ray received his MS and PhD in Atmospheric Science from *State University of New York at Albany*, adding research credentials to his teaching certifications B.A. Physics and M.S. Secondary Education, Physics from *State University of New York at Geneseo*. Ray served with the US Army at NATO Supreme Headquarters in Belgium from 1969-1971. He is active with the *Bethany Fire Department* and a volunteer for *LeRoy Ambulance*, as well as serving on the *Bethany Planning Board* and *Assessors Review Board*.

O7-5 Cont.

Loy Ellen Gross: a resident of Little Canada for nine years, Loy is a computer consultant by trade with experience in a wide variety of technology. Relevant experience includes ten years as Marketing Director for a technology firm, newspaper editor in Niagara Falls and technical writer for several publishers of training material. Her research on commercial wind turbines spans at least two years. She is a mother of two, active in the local church and the PTO; as well as a member or former member of the *Wyoming County Chamber of Commerce*, *GO-Art Grant Advisory Committee*, *Greenpeace, World Wildlife Fund*, *Sierra Club* and the *Trust for Public Land*.

Jim Hinkson: a resident of Bethany for eighteen years, Jim works for *Gottogo Electric* in customer service, inside sales, inventory maintenance, and billing/receiving. *Gottogo* has and does work with distributors that provide materials (primarily cable) to some wind farms. He is a former member of the *Bethany Fire Department*.

Paul A Lewis: a resident in Bethany for over fifty-seven years, Paul has a degree in Mechanical Engineering and retired in 2005 as Director of Inspection Services at *Constellation Energy's* Ginna Station Nuclear plant. Paul is the *Quality Inspection Services* Operations Manager for the Rochester facility and Director of Nuclear Services for all plants in the US. His involvement with wind turbines has led to many hours of research over the past two years. Paul has a wife and one son and is active as the Scoutmaster for *Boy Scout Troop 650* and active in the church as well as many other business and community organizations.

K) Acknowledgments / Signoff

The committee would like to thank the following for their services:

Town of Bethany
Town of Lowville
Chris and the *Vestas* wind turbine crew at Maple Ridge
Residents near the Maple Ridge facility

Douglas Beattie, local avian expert
Anne Britton, We Oppose Windfarms
Debbie Douglas, Bethany Town Clerk, for putting up with Loy
Lou Gayton, Town of Bethany Supervisor, construction and road expertise
Daniel E. Gross, resident, for continuity editing of the report
Joe Kushner, Supervisor, Town of Eagle, for sharing his experience
Jeffrey Pfaff, independent electrical engineer from LeRoy
Nina Pierpont, MD, PhD, for interviews and use of her research papers
Scott Rowland, VP Construction and Engineering, UPC Wind Partners
Chris Swartley, UPC Wind Partners

And many others. This report is factual to the best of our knowledge on the date it was completed.

Respectfully submitted,

O7-5
Cont.

Francis Ashley – Chair	Geoffrey A. Briggs
Ramon J. Cipriano – Planning Board	Loy Ellen Gross
Steve Breckenridge	Jim Hinkson
	Paul A. Lewis

DATE: 2-3-14

TO: Robert Hingtgen, San Diego County Planning and Development Services
Via: Robert.hingtgen@sdcounty.ca.gov

FROM: Donna Tisdale, PO Box 1275, Boulevard, CA 91905, 619-766-4170; tisdale.donna@gmail.com

For the Soitec Solar Project PEIR record: In Dudek vs. Dr. Ponce, Dr. Ponce is proven right

Dudek and Dr. V.M. Ponce (SDSU) both produced reports on impacts related to groundwater use for Soitec Solar's Boulevard projects. Dudek was recently proven wrong and Dr. Ponce proven right within a short 60 days after controversial irrigation resumed at Sunroad's Madera Golf Club in Poway. Dudek's apparent miscalculations and errors that golf course wells and homeowners wells were served by different aquifers[1], raises validity concerns for their Soitec Solar investigation.

Like the Poway case, Dudek and Dr. Ponce produced opposing reports on the significance of groundwater impacts for the Soitec Solar projects/DPEIR. Dudek's report claims no significant impact while Dr Ponce's in depth report[2] urges caution saying the projects must rely on imported water to protect existing users, groundwater dependent habitat, and sustainability.

In the Poway controversy, residents linked impacts to their wells to groundwater pumping at Madera Golf course. Dudek won that political contest when the City Council voted 3-2 to support Dudek's report, denying a connection between wells, and allowed Madera to conditionally pump 173 acre feet (56.4 million gallons)[3]. Ironically, the estimated water use for Soitec's Boulevard projects is also estimated at about 50 million gallons.

O7-6

A short 60 days or so later, Dr. Ponce won the Poway reality contest when Dudek was proven wrong about real world groundwater impacts and sustainability when water levels dropped significantly in impacted wells[4]. His Thompson Creek Groundwater Sustainability Report was produced at the request of homeowners living next to Madera's Golf Club in May 2012[5]. Dudek's now invalidated 2013 report was produced for the City of Poway at a reported cost of $64,220 and paid for by Madera.[6]

Dr Ponce closed his Poway report stating that: "The *Thompson Creek homeowners have been pumping about 30% of the current capture. If sustainable yield is reasonably interpreted as about 30% of the gross recharge, it is seen that not much groundwater is left for others to pump. Thus, the use of large quantities of groundwater for extensive turf irrigation should be discouraged, or else reduced to an amount which is more in line with current practices of groundwater sustainability*."

Dr Ponce closed his Boulevard Soitec report stating that: "To remain comprehensive, sustainable (water) yield must include hydrological, ecohydrological, and socioeconomic considerations… No development, no matter how lofty its aim, should place at risk existing natural ecosystems. Other considerations notwithstanding, the Boulevard Soitec projects must resort to imported water to satisfy their needs. **Dr. Victor M. Ponce** has taught hydrology at San Diego State University since 1980 with close to forty years of experience in the water resources field. Review his research and practice at *ponce.sdsu.edu*.

Additionally, the post public comment increase in SDG&E's ECO Substation construction water from the EIR estimated 30 million gallons to 50 million gallons and then to 90 million is also alarming. ###

[1] http://m.utsandiego.com/news/2013/nov/20/maderas-golf-water-poway-council/
[2] http://www.ponce.sdsu.edu/boulevardsoitec.html
[3] http://www.pomeradonews.com/2014/01/27/low-water-level-forces-maderas-golf-club-to-shut-down-wells/
[4] http://www.utsandiego.com/news/2014/jan/28/maderas-golf-water-wells/all/?print
[5] http://ponce.sdsu.edu/tcgwss.html
[6] http://www.pomeradonews.com/2012/10/03/maderas-water-study-gains-approval/

BOULEVARD PLANNING GROUP

PO BOX 1272, BOULEVARD, CA 91905

DATE: July 8, 2019

TO: Harold Hall & Amy Dutschke, Pacific Regional Director, Bureau of Indian Affairs
VIA: harold.hall@bia.gov & amy.dutschke@bia.gov ; cc Interested Parties

FROM: Donna Tisdale, Chair and as an individual; 619-766-4170; tisdale.donna@gmail.com

RE: CAMPO WIND / BOULDER BRUSH DEIS COMMENTS / REQUEST FOR RECIRCULATED OR SUPPLEMENTAL DEIS

At our regular meeting held on June 6th, our Group voted to authorize the Chair to submit comments on the Campo Wind / Boulder Brush DEIS opposing Terra-Gen's projects. We have previously voted to oppose Campo Wind, Torrey Wind and the Boulder Brush Gen-tie projects due to significant and cumulative adverse impacts to our disproportionately predominantly impacted low-income community

From NEPA.gov / CEQ: "The ultimate goal of the NEPA process is to foster excellent action that protects, restores, and enhances our environment. This is achieved through the utilization of environmental assessments (EAs) and environmental impact statements (EISs), which provide public officials with relevant information and allow a "hard look" at the potential environmental consequences of each proposed project"[1].

O7-7

This DRAFT EIS does not comply with NEPA, Environmental Justice, and many other regulations. It is significantly lacking in facts and even the basic information necessary to make an informed decision. It ignores the vast majority of the scoping comments and documentation submitted with those comments, including the important and informative scoping comment letters from our Boulevard Planning Group, the USEPA, Backcountry Against Dumps, Law Offices of Stephan C. Volker, numerous Campo General Council members and more. What is the purpose of scoping if most of it is ignored so the project can move forward unimpeded at any cost?

Dudek has manipulated, obfuscated, buried, or deferred project related data to reach the apparent preordained 'no problem' conclusion likely requested by Terra-Gen and the current Campo leadership. Sadly, this is not unexpected based on Dudek's past history and similar behavior on major local projects including ECO Substation, Tule Wind, Energia Sierra Juarez's trans-boundary high-voltage line, SDG&E Master Special Use Permit, Jacumba Solar, Soitec Solar, and more. At some point their apparent complicity will catch up to them.

This is a formal request for an updated and Re-circulated DEIS or Supplemental DEIS to address the missing critical information and to include the following new information that was not available at the time, or was not analyzed in the DEIS:

[1] https://ceq.doe.gov/

1. **Wilson Ihrig 2019 report:** Results of Ambient Noise Measurements of the Existing Kumeyaay Wind and Tule Wind Facilities in the area of Boulevard and Jacumba Hot Springs Pertaining to the Proposed Torrey and Campo Wind Turbine Facilities: This report documents the significant and cumulatively significant adverse acoustic impacts that are already being inflicted on residents from existing area wind turbines within a 16 or so mile radius where 242 turbines already operate. The report also includes the 2013 report on local measurements, including tribal homes.
2. Terra-Gen's Connected Action Torrey Wind project is not evaluated in the DEIS.
3. Torrey Wind's Draft EIR has not been released by San Diego County for public comment.
4. Campo Wind and Boulder Brush Draft EIR has not been released by San Diego County for public comment.
5. Manzanita Wind (?) Manzanita General Council members voted to pursue a new wind project.
6. Tule Wind II is in process of finalizing turbine siting. That map has not been released.
7. Energia Sierra Juarez Phase II -108 MW expansion is before NADBank but was not included in DEIS: BD 2019-## CERTIFICATION AND FINANCING PROPOSAL EXPANSION OF THE ENERGÍA SIERRA JUÁREZ WIND FARM, BAJA CALIFORNIA[2]:
8. There are two more large solar projects in the CAISO grid queue[3] that were not included in DEIS as cumulative impacts:
    - 90 MW Starlight Solar (#1532) (Empire Ranch, Jewel Valley Road, Boulevard).
    - 50 MW Tecate Hybrid solar with battery (#106A) (location unknown).
    - Both are proposed to connect to Boulevard Substation-ECO Sub 138 kV line between 2020 and 2022.
    - It costs money to stay in the grid queue, so these projects should be considered reasonably foreseeable.
9. No real cumulative impact project map was found in Appendix N or elsewhere that disclosed each project's footprint, their proximity to each other, and proximity to sensitive receptors.
10. Campo Wind plot plans and Grading Plans must be released for public review with the recirculated DEIS in order to determine where each project component is proposed to be located and what the setbacks are. MM-PH&S-4 Wind Turbine Safety Zone and Setbacks is too little too late and it is only *recommended* that Terra-Gen demonstrate to the 'the tribe' not to the General Council—and that is not even required. Terra-Gen has already sent FAA their proposed turbine locations so we know locations have already been determined.

O7-7 Cont.

VALIDTY OF LEASE, RELATED RESOLUTION, AND PROJECT IN GENERAL, WERE CALLED INTO QUESTION BY CAMPO GENERAL COUNCIL MEMBERS AT THE PUBLIC DEIS MEETING ON JUNE 19TH, AND DOCUMENTED BY COURT REPORTER:

- Monique LaChappa, former Campo Tribal Chair, challenged the following:
    - The legality of the 2018 vote to pursue / approve the Campo Wind project lease with Terra-Gen; saying that the meeting where the vote was held had been noticed to General Council members as 'information only' and that the vote was basically illegal.

[2] https://www.nadb.org/uploads/files/draft_bd_2019_xx_esj_expansion_wind_certification_proposal_eng.pdf
[3] http://www.caiso.com/PublishedDocuments/PublicQueueReport.pdf#search=Grid%20queue

- Error on resolution that limited Terra-Gen's working relationship to just Chairman Ralph Goff (resigned June 2019) and Vice Chair Harry Paul Cuero (now Chairman Cuero), saying that is not the way the Campo Band does business.
- She also said that Terra-Gen needs to come back to the table, as promised, to fully inform General Council members of the size, location, and proximity of turbines to existing homes. Terra-Gen previously told members they did not know how big the turbines were or where they would be installed. Now they need to come back to talk to each member and that BIA needs to make sure that happens.

- Campo Tribal Elder, Dennis Largo, also spoke out and loudly challenged the tribal leadership and the project saying "we were duped by a tribal leader who does not care…and he lies a lot." He also shouted to the crowd that 'these windmills will not go up."

The wind industry, including Terra-Gen, has a very slick, lucrative, and mostly successful method of lobbying decision makers, like the Campo leadership and other officials, to take the blood money and ignore those who will suffer and what will be lost. **Ultimately, the Campo Band's General Council has two choices:**

1. Defend the rights and well-being of their members/ families, their environment, and their culture.
2. Or accept the limited blood money that Terra-Gen has offered them to forgo those rights and forfeit the well being of their people, their land, and their resources, while Terra-Gen rakes in the big profits.

We are counting on the General Council members to step up once again and vote to protect what is really important and to terminate this dangerous project just like they previously terminated the Campo Landfill and Shu'luuk Wind.

O7-7 Cont.

TERRA-GEN IS NOT COMMUNITY ORIENTED. THEY THINK THEY ARE TOO BIG TO FAIL AND DON'T NEED TO PARTICIPATE AT GROUND ZERO. THEY HIRE SO-CALLED EXPERTS TO SUPPORT THEIR PRECARIOUS POSITIONS:

- Terra-Gen is owned by Energy Capital Partners, a private equity firm with some $19 billion in energy sector holdings and on May 27, 2019, announced the acquisition of all of Canadian Utilities fossil fuel-based electricity generation assets, which were valued at $621 million[4].
- Terra-Gens' Campo Wind and connected Boulder Brush Gen-Tie and Torrey Wind projects are predicated on the timing of the availability of Production Tax Credits and other significant financial incentives that come at tax and ratepayer expense.
- Terra-Gen's Craig Pospisil is on the Board of California Wind Energy Association (CalWEA) [5]which lends unjustified credibility. Not that CalWEA is credible. They are just another lobbying firm willing to stretch and ignore the facts in order to promote their pro-wind agenda.
- According to their website[6], "CalWEA is a non-profit corporation supported by members of the wind energy industry, including project developers and owners, turbine manufacturers, support

[4] https://www.power-technology.com/news/canadian-utilities-sale/
[5] https://www.calwea.org/about
[6] https://www.calwea.org/

contractors and others. CalWEA represents its members in California's policy forums, seeking to encourage and support the production of electricity through the use of wind generators."

- CalWEA's Nancy Radar chastised local wind turbine victims as 'biased and self-serving' when they are seeking justified redress and relief from wind turbine impacts when it is she that is biased and self-serving. Residents are defending hearth and home. Radar is a paid lobbyist.
- Terra-Gen, or industry front groups, hired industry go-to-schill, Kenneth Mundt, a alleged expert epidemiologist, to tell San Diego Planning Commissioners that wind turbines are safe --*without ever conducting any site-specific studies*. Mundt appears to be part of the 'science-for-sale' contingent researched by publicintegrety.org [7]
- Mundt is the same expert that reportedly manipulated /buried data that helped the Chromium Coalition and others downplay brain cancers /cancer clusters linked to their products. The industry's (and Mundt's) behavior was later compared to that of tobacco and pharmaceutical companies that were found to have withheld damning evidence of risks associated with their products. Mundt has worked for big tobacco, too.
- Mundt also reportedly helped downplay cancer risks linked to the use of talcum powder.
- Despite Mundt's best efforts, juries have found some of his clients products liable for causing harm. In May 2019, after ordering Johnson & Johnson to pay $550 million to compensate 22 talcum powder users for ovarian cancer, jurors in St. Louis told the company to pay $4.14 billion in punitive damages.
- **February 2019 – AC INVESTMENT INC: Terra-Gen Finance Co. LLC Rating Lowered To 'B-' From 'B'; Debt Rating Lowered; Outlook Negative**[8] **(Emphasis added):**
  - *"S&P Global Ratings lowered the issuer credit rating on Terra-Gen Finance Co. LLC to 'B-' from 'B' based on weaker than expected cash flow generation and debt paydown, resulting in projected a debt-to-EBITDA ratio above 10x. This leverage is based on consolidated cash flow and debt that include project-level debt and lease payments.*

    At the same time, we are revising our recovery rating on Terra-Gen's senior secured term loan to '3' from '2'. As a result, we are lowering the issue-level rating on Terra-Gen's senior secured debt to 'B-' from 'B+'. Our '3' recovery assessment reflects our expectation of meaningful recovery (50%-70%; rounded estimate: 65%) in the event of a payment default.

    The negative outlook reflects our expectations that Terra-Gen's cash flow generation profile could worsen further, particularly given the age of Terra-Gen's wind fleet, and that the company may have difficulty refinancing in 2021. Over 250 megawatts (MW) of the portfolio's contracted capacity is expected to be merchant by the end of 2021, which will likely offset positive effects of upcoming additions to the portfolio or recent improvements in California wind production. Based on these challenges, we don't expect meaningful debt reduction through the term loan's cash sweep mechanism. "
- Terra-gen has taken the low road and avoided hosting local on-reservation and off-reservation community meetings, and one-on-one meetings with neighbors, to fully inform and respond to

O7-7 Cont.

[7] https://publicintegrity.org/environment/about-science-for-sale/
[8] https://www.ademcetinkaya.com/2019/02/terra-gen-finance-co-llc-rating-lowered.html

residents who will be most impacted by these community and life-altering projects. This arrogant position will not serve them well in the end.

The local non-profit group, Backcountry Against Dumps, hired Scott Snyder PG 7356, CHG 748, QSD/P 445 Principal Hydrologist, Snyder Geologic, Inc, to review the Campo Wind / Boulder Brush DEIS and related groundwater data to produce a Third Party Opinion: His professional opinion concludes as follows:

- "No groundwater protections were proposed as part of this project because the GRE stated there would be no groundwater impact. Given the data provided and assumptions made in this report, it is premature to make such a statement. Until actual groundwater investigations can be undertaken and more conservative assumptions can be made with regard to groundwater in storage and off-site impacts, it should be assumed that the project will have negative, unacceptable, and avoidable impacts. Along with the investigation and re-analysis of data, groundwater protections including well extraction rate caps and intensive off-site well monitoring should be included in any approval for the project, if it were to move forward. These protections would be necessary to ensure that nearby private well owners would continue to have sufficient groundwater resources to meet their consumptive needs, as the basin is their only resource for a water supply."

Backcountry Against Dumps also hired Richard A. Carman, Ph.D., P.E. Principal Emeritus, **with Wilson Ihrig to review the Campo Wind / Boulder Brush DEIS noise analysis and related noise data to produce a Third Party Opinion. Dr. Carman's professional opinion includes the following conclusions:**

O7-7 Cont.

- The DEIS noise analysis is deficient in many respects.
- The DEIS fails to consider the potential noise impacts from significant increases in ambient noise as addressed by the FTA guidelines.
- The DEIS fails to address the potential impacts on sleep from wind turbine noise that contains substantial continuous low-frequency components.
- The DEIS fails to accurately characterize the existing ambient noise conditions as a result of the noise measuring instrument(s) used and the inadequacy of measuring for only one 24-hour period.
- The DEIS fails to accurately predict Project noise levels by using a computer program based on formulas that have specified limitations and have not been validated for wind turbine noise prediction for wind turbines of the size to be constructed for the Project.
- The DEIS minimizes the Project noise impacts by using inaccurate data while applying only the County noise ordinance criteria and ignoring substantial increases in ambient noise caused by the Project.
- The DEIS not only uses CadnaA, with the program's inherent limitations, to model low frequency noise, it also treats noise emission at all frequencies (in particular at low frequencies) to be omni-directional. Consequently, the DEIS low frequency predictions are inaccurate.
- The DEIS fails in the assessment of Project noise to accurately address amplitude modulation noise and its potential for sleep disturbance.

- The DEIS fails to adequately assess infrasound and its potential for physiologic impacts on the local population especially sleep disturbance.

1. INTRODUCTION:

- 25 year lease plus potential 13 year extension = 38 years. With the current trend of repowering older wind energy projects with even larger turbines[9] the project could basically be considered permanent, and certainly well beyond the average 25-30 year span of one generation.
- To ignore Terra-Gen's proposed Torrey Wind project with 30-4.2MW wind turbines planned immediately adjacent to Campo Wind on private absentee owned ranch land on Ribbonwood Road, is simply unethical, unjust, and wrong.
- Terra-Gen has basically piecemealed one large 90-turbine project with new gen-tie and substation / switchyard into 3 projects with 3 separate and overlapping environmental review tracks.
- This tactic has created the apparently intended confusion among members of the general public who are already frustrated with the process, lack of answers at DEIS meeting, lack of participation with the community by Terra-Gen, their failure to answer valid project questions, and limited comment window.

1.1 Project components:

- Boulder Brush Facilities components should be listed in the Project Description

A. Wind turbines

- This section states that 60-4.2 MW wind turbines (up to 586 ft tall) '***…would be arranged in accordance with applicable industry siting recommendations for optimum energy production and minimal land disturbance***.
- What are those industry standards? Dudek fails to identify what the 'applicable standards' are and where the public can find them.
- Terra-Gen fails to identify the specific wind turbine make and model which further limits transparency and the public's ability to fully research and respond in the limited time allowed.
- Using the entire 16,000 acre figure for the Campo Reservation is misleading since the project is proposed for old Campo which is about 11,000 or so acres.
- Where are these 4.2 MW turbines installed in the US ?
- Are they installed anywhere else; how long have they been installed; where are the site specific acoustic studies at impacted homes?
- To protect our Dark Skies, turbine and power pole lighting should be mandated to use FAA approved automatic obstruction systems similar to Aircraft Detection Lighting Systems[10]: "In response to the Dark Sky initiative to reduce light pollution and customer demand, DeTect developed the HARRIER Aircraft Detection Lighting Systems (ADLS) for automatic obstruction

O7-7 Cont.

[9] https://www.windpowerengineering.com/business-news-projects/shell-energy-signs-repowering-ppa-for-palm-springs-wind-farm/

[10] https://detect-inc.com/aircraft-detection-lighting-systems/

lighting activation for aviation obstructions such as wind farm turbines, high voltage transmission lines and communication towers".

- **Wind turbines can and do cause health problems including vertigo from infrasound and Electromagnetic Hypersensitivity (EHS), a physiological condition, from exposure to electromagnetic fields[11].** It is characterized by neurological and immunological symptoms that noticeable flare or intensify upon, or following exposure to electromagnetic fields (EMF) or one or more types of electromagnetic radiation (EMR) found in the modern environment, including industrial wind turbines and related infrastructure.
- It is accepted as a functional impairment in Sweden and the Canadian Human Rights Commission recognizes it as an environmental sensitivity and classifies it as a disability.
- Some insurance covers these conditions that must be recognized by decision makers:

  - EHS is billable to Medicare & Medical: Billable - W90.0XXA Exposure to radiofrequency, initial encounter
  - Billable - W90.0XXD Exposure to radiofrequency, subsequent encounter
  - Billable - W90.0XXS Exposure to radiofrequency, sequel
  - ICD-10-CM Code **T75.23XA**
  - **Vertigo from infrasound, initial encounter**
  - Billable Code
  - T75.23XA is a valid billable ICD-10 diagnosis code for *Vertigo from infrasound, initial encounter*. It is found in the 2019 version of the ICD-10 Clinical Modification (CM) and can be used in all HIPAA-covered transactions from Oct 01, 2018 - Sep 30, 2019.
  - Use T75.23XA for initial encounter
  - Use T75.23XD for subsequent encounter
  - Use T75.23XS for sequel

O7-7 Cont.

B. ACCESS ROADS

- There is no apparent reference or map showing which roads will be widened or what the finished width will be.
- BIA 10 needs to be paved along with other roads that will impact existing tribal and private homes.

C. Electrical Collection and Communication System

- At page B-5 the DEIS says that in areas where rock prevents trenching overhead circuits would be supported on steel/concrete/wood monopoles up to 60 feet in height that would be spaced approximately 450 feet apart. Junction boxes for access to underground cables for inspection, maintenance, and repair would be installed at approximately 0.2-mile intervals.
- Will this meet strict new fire hardening mandates for height, conductor, and spacing?
- Just more visual clutter and potential fire ignition sources.

D. Collector Substation

[11] http://weepinitiative.org/areyou.html

- It appears that the collector substation will be located at an elevated location just west of Church Road and south of Meridian Ridge Trail on private property at Ranch Finis Tierra that looks very rocky and close to several oak groves.
- A more easily accessible location should be considered in the event of fire or explosions in this fire prone area.
- There should be two ways in and out from this substation.

E. O&M Facility

- O& M facilities proposed on BIA 10 and Old 80 should be moved to the interior of the Campo Reservation at or near the already disturbed Campo Materials on Church Road where water, power, paved road, are already available.
- Proposing O&M facilities for undisturbed areas next to private property on BIA 10 and next to apparent tribal school bus stop at Williams Road and Old 80 and across from private and tribal homes is simply unnecessary, too invasive, and controversial.

F. Meteorological Towers

- The MET towers don't show up on any maps. Where will they be located?
- MET towers will be 374 ft tall the same as the turbine hub height!
- Temporary towers will have guy wires and permanent towers will be lattice. Both will be lighted and all will have negative impacts on birds and bats

G. Water Collection and Septic Systems

- There are contradictions. Will the estimated 210 gpd be sourced from on site ground water or come from a connection to existing on-reservation facilities?
- This needs to be nailed down. Will a new well be drilled? Will a new water line be needed? If so, where will the line connect and how long will it need to be?
- How close to off-site private wells will the water source be located?

O7-7 Cont.

H. Temporary Concrete Batch Plant for Use During Construction

- The Concrete Batch Plant would include a mixing plant, aggregate and sand stockpiles, driveways, truck load-out area, and turnarounds. It would also include cement storage silos, water and mixture tanks, aggregate hoppers, conveyors, and augers to deliver different materials to the mixing plant—all incredibly noisy where the general ambient noise level is around 25-30 NOT the inflated and erroneous figure supplied by Dudek.
- The concrete batch plant proposed on BIA 10 adjacent to private occupied property would and introduce an incredibly noisy, dusty, water intensive, and incompatible use where currently quiet undeveloped land exists next to private occupied properties.
- How will contaminated wash out water be contained on-site and not impact groundwater?
- What are the exact water sources for the BIA 10 and Old Hwy 80 Batch plants sites?
- There is currently no water source on BIA that we are aware of.

- Use of any water from the BIA 10 area could place adjacent marginal domestic wells at risk of interference, overdraft, and / or contamination.

J. On-Reservation Gen-Tie Line

- The portion that crosses through the Old Hwy 80 / Live Oak Springs area and near tribal and private homes should be placed under ground to avoid cumulative impacts related to visual, fire, biological resources. Old 80 / Historic Route 80 is considered scenic as is the trial and private land in the Campo Creek headwaters area.
- Tule Wind's line had to be placed under ground south of I-8 and SDG&E's ECO Substation's 138 kV line had to be placed underground through Jewel Valley and along Old 80 east of Carrizo Gorge Road.
- If installed overhead, the same type of Aircraft Detection Lighting Systems should be required and colored balls used on power lines should be avoided.

K. Boulder Brush Facilities

1. Off-Reservation Gen-Tie Line:

- This line will cross through undeveloped land introducing new contrasting infrastructure into a scenic McCain Valley and Tule Creek floodplain.
- Oaks, wetland, boulder displays, and arroyo areas should be avoided.
- The same to type of Aircraft Detection Lighting Systems should be used to reduce visual impacts, especially at night. Cumulative impacts will be significant.
- Even if the lines are so-called bird-safe, there will always be collisions and electrocutions.
- Tisdale photo below shows mature oaks being bulldozed for SDG&E's new Boulevard Substation-- Oaks sequester carbon, provide oxygen, habitat, beauty, shade, and more

2. High-Voltage Substation

O7-7 Cont.

- Again, a new type of infrastructure is being introduced into a generally pastoral area that will increase noise, radiation and light pollution and increase fire risk.
- The American Bird Conservancy reported the following[12]:
    - In 2011, at the Laurel Mountain facility in the Allegheny Mountains, almost 500 birds were reportedly killed after lights were left on at an electrical substation associated with the wind project. The deaths are said to have occurred not from collisions with the wind turbines themselves, but from a combination of collisions with the substation and apparent exhaustion as birds caught in the light's glare circled in mass confusion[13].
    - On May 23, 2003 at the Mountaineer wind farm in the Allegheny Mountains, at least 33 birds were killed. Some of the deaths were attributed to collisions with wind turbines and some to collisions with a substation.

3. 500 kV Switchyard and Connection to Existing SDG&E Sunrise Powerlink

- Same comments as stated above for High-Voltage Substation
- We have submitted initial and scoping comments on Boulder Brush Gen-Tie / Substation /Switch yard DEIR to San Diego County.
- Campo Wind, Torrey Wind,and Boulder Brush should all have been analyzed in one joint NEPA/CEQA document instead of being piecemealed.

4. Access Roads

O7-7 Cont.

- It is good to see that Terra-Gen has agreed to pave Ribbonwood Road.
- However, more details are needed regarding the improvements to the approximately 1-mile stretch of Ribbonwood Road
- How much of the road will be widened and where?
- Will and private fences or drainages be impacted?
- Does Terra-Gen have all the necessary legal access routes and right to widen road as planned?
- How will the Tule Creek floodplain crossing be handled and will it be required to meet 100 year flood events as it should be?

5. Defensible Space (Fuel Modification Zones)

- What is the defensible space required around project components including wind turbines and related infrastructure?
- Which roads are considered permanent and would be required to comply with fuel modification?

[12] https://abcbirds.org/article/massive-bird-kill-at-west-virginia-wind-farm-highlights-national-issue/
[13] https://abcbirds.org/article/massive-bird-kill-at-west-virginia-wind-farm-highlights-national-issue/

1.2 Construction

Work Force:

- Up to 501 employees on a daily basis seems to just cover Campo Wind and parts of Boulder Brush when in reality that number could double or triple in the event Campo Wind, Torrey Wind and Boulder Brush are under construction at the same time or overlapping schedules.
- When you add in the additional potential for Rugged Solar to also have overlapping construction schedules, you have a real mess.
- Carpooling / van pooling should be required to reduce green house gas emissions, traffic and dust.
- Regardless, all major access routes like BIA 10 should be properly engineered and paved to prevent impacts to air quality for all impacted residents.

Construction Communication and Contacts:

- Project neighbors should also be provided with construction contact information to report accidents and project related issues.
- Just having an Environmental Health and Safety Plan does not guarantee that the project will be in compliance with OSHA requirements. Corners are cut on these projects all the time, according to locals who have worked on similar projects in Imperial County and elsewhere. It is truly alarming!

Materials and Equipment:

- Where are the helicopters? SDG&E has been using helicopters to install the new taller utility poles along Old Hwy 80 and Buckman Springs Road and elsewhere in the backcountry for their so-called fire hardening of their system.
- Helicopters have been used on other energy and infrastructure projects in rural San Diego and Imperial Counties.
- Helicopters use jet fuel and create acoustic and air pollution. They also increase risk for our remaining Golden Eagles and other avian species.

Site Clearing, Grading, and Excavation:

- The grading plans for Campo Wind, Boulder Brush, and Torrey Wind should be provided in the DEIS in order to make fully informed comments and decisions.
- There is no discussion of the explosives and blasting that will be required where turbines are proposed on top of hard rock surfaces. The DEIS aerial photos document that major rock formations are involved.
- Where will the cut and fill take place? How much is involved?
- Where will stockpiling of soil take place? It should not be allowed adjacent to private property where it can cause problems off-site.

O7-7 Cont.

- Where will culverts and run off trenches be placed and how will that impact non-participating property owners that may be impacted? Will storm water be diverted onto private properties and /or public access routes?

Construction Activities, SWPPP, and Erosion Control:

- Extra care needs to be taken with the local decomposed granite type soil that easily erodes creating channels that grow quickly in heavy rain events.
- Protecting off-reservation properties from project runoff and/ or diversion of groundwater recharge is critical. It is a fine line.

Final Road Grading, Erosion Control, and Site Cleanup and Stabilization:

- This section states that the developer would inspect and clean up the Project development footprint following construction to ensure that no solid (e.g., trash) or liquid (e.g., used oil, fuel, turbine lubricating fluid) waste was inadvertently spilled or left on site.
- Terra-Gen and the Boulder Brush land owner Eugene Gabrytch have not even been on-site, by their own admission, so we doubt that 'the developer' would bother to do any inspections or make any efforts whatsoever.

Testing and Commissioning:

- Project neighbors must be notified when testing and commissioning are planned in order to make sure they are home to deal with potentially frightened pets and live stock, and any other related impacts.

O7-7 Cont.

Construction Water:

- ***87 acre feet = 40 million plus gallons of water estimated just for Campo Wind construction to be sourced from the well field near the old Campo Landfill site in the southeastern portion of the reservation and the Campo Wind footprint.***
- 40 million gallons is over three times the 12,181,187 gallons of water that were mined and exported from the same controversial well filed during 2013 for the construction of SDG&E's ECO Substation between July 2013 and November 18, 2013 when sales were curtailed far short of the 53.75 million gallons authorized by Campo's Muht-Hei and Ralph Goff.
- Campo's 53.75 million gallon figure was supported by so-called groundwater expert Jay Jones's Environmental Navigation Services Inc Report (dated 6/14/13) 'Evaluation of Short-term Construction Water Supply Obtained from the Southeastern Portion of the Campo Indian Reservation', that was included in SAN DIEGO GAS & ELECTRIC COMPANY EAST COUNTY SUBSTATION PROJECT AMENDED CONSTRUCTION WATER SUPPLY PLAN REVISED JULY 3, 2013 (attached): (Excerpts-emphasis added):
    - **5.2 GROUNDWATER SOURCES**: Wells located on the southeastern portion of the Campo Indian Reservation - Maximum total volume: 53.75 million gallons A groundwater study and summary report, included as Attachment F: Environmental Navigation Services Inc. Report, was prepared by a qualified hydrogeologist to assess the existing condition of

the underlying groundwater/aquifer and all existing wells located in the southeastern portion of the Campo Indian Reservation. The study evaluated the aquifer properties and storage capacity and found that the aquifer contained sufficient groundwater to support extraction of up to 53.75 million gallons during construction without impacting short- or long-term local groundwater production or wells in the Project area. The study also addressed the potential for subsidence. Attachment 4 to Attachment F: Environmental Navigation Services Inc. Report includes a letter from Muht-Hei, Inc. confirming the legal authority of the Campo Band of Mission Indians to sell water for use off reservation for construction purposes without an MUP from San Diego County.

- **Jay Jones report' conclusion at page 46 of 80 states**:
  - This summary report examines and supports the short-term pumping of 165 AcFt of water from a 1462 acre watershed with a storage capacity of 2559 AcFt. The amount of groundwater in storage greatly exceeds the proposed short-term and existing demand where the proposed demand is approximately 6% of total groundwater in the storage within the water supply area. Rainfall recharge, here calculated to be 230 AcFt/yr on an average annual basis, exceeds the short-term demand on an annual basis and will readily replenish the aquifer system. The shortterm demand is also less than the long-term sustainable demand of 173 AcFt/yr determined using water balance calculations based on historical rainfall data.
- **Jay Jones' report disclaimer states at page 62 of 80:**
  - 1.3 Discussion: The methodology used in this report represents one approach to the evaluation of groundwater recharge and storage and is the approach currently used by the County of San Diego DPLU to examine the potential impact of pumping on groundwater-dependent developments2. It is based on readily-available locally-valid data such as precipitation, evapotranspiration, soil properties, and aquifer extent and thickness. It is recognized that the calculation parameters may vary from those presented herein; however, the overall approach was conservative to accommodate potential variability and uncertainty.

- **SDG&E's Water Supply Report to CPUC for October 2013 includes the following excerpt**
  - In compliance with Section 7 of the Amended CWSP, please find pressure transducer data and manual soundings included in Attachment B: Campo Indian Reservation Monthly Water Report. The report includes Manual Soundings, pressure transducer data and water level hydrographs for each of the four production wells currently being used for construction water and five monitoring wells. The pressure transducer data includes water level readings along with the elevation of the pressure transducer collected every fifteen minutes. However, there are periods of time where the water level fell below the depth of the pressure transducers in production wells PD2, PD3 and PD4, resulting in intermittent gaps in the pressure transducer data. The positioning of the pressure transducers in the wells continues to be monitored by Campo Indian Reservation and the pressure transducers are redeployed as appropriate. In addition, the pressure transducers

O7-7 Cont.

for MW4 and MW5 failed during this reporting period. Data is only available for MW4 through October 16, 2013 and there is no data available for MW5. Nonetheless, manual soundings collected for MW4 and MW5 during this period show no significant impact to the water levels as a result of pumping. Moreover, the overall data collected and analyzed to date indicates no significant negative impact on the aquifer due to pumping.

- **SDG&E's Water Supply Report to CPUC for November 2013 includes the following excerpts:**
  - In compliance with Section 7 of the Amended CWSP, please find water monitoring data included in Attachment B: Campo Indian Reservation Monthly Water Report. The report includes manual soundings and water level hydrographs for the four production wells currently being used for construction water and five monitoring wells. Pressure transducer data collected every fifteen minutes for PD2, PD3, PD4 and MW1, MW2, MW3 and MW4 is also included in the report. The pressure transducers in PD1 and MW5 failed during this reporting period; therefore, pressure transducer data is not available for these two wells, but manual soundings collected for PD1 and MW5 during this period show no significant impact to the water levels as a result of pumping. As previously communicated to the California Public Utilities Commission on December 3, 2013, Campo Indian Reservation (Campo) stopped providing construction water deliveries to the Project on November 18, 2013, so pressure transducer data is available from November 1, 2013 through November 18, 2013. The data also shows periods of time where the water level fell below the depth of the pressure transducers in production wells PD2, PD3 and PD4, resulting in intermittent gaps in the pressure transducer data. The positioning of the pressure transducers in the wells is monitored by Campo and the pressure transducers are redeployed as appropriate. Nonetheless, the overall data collected and analyzed to date indicates no significant negative impact on the aquifer due to pumping. Please note that SDG&E will not be providing data associated with the production or monitoring wells located at Campo until water deliveries to the Project resume."
- **Dust Suppressant**
  - The DEIS specifically states that Magnesium Chloride will be used as a dust suppressant. A quick search finds that there are issues with this type of salt.
  - The DEIS fails to disclose or investigate the effects magnesium chloride may have on our environment in general and especially on those whose properties may be down gradient and/or downwind of Campo Wind and Boulder Brush components where dust suppressant will be sprayed onto surfaces.

O7-7 Cont.

- According to Oxidental Chemical[14]: Under hot, dry conditions, Calcium Chloride remains liquid while Magnesium Chloride does not, resulting in lower dust suppression capabilities under these conditions.
- **According to another site : Negatives Outweigh the Positives[15]**
  - Although magnesium chloride is considered to be less expensive than other dust control agents, the potential negative impact of using salt may outweigh any positive aspects. There are numerous reasons why using magnesium chloride is less than desirable for dust control on unpaved roads. These include:

    - Recognized to be harmful to important road side vegetation
    - The unpaved road may become slippery when wet if clays are present
    - The unpaved road can become a sloppy mess during spring thaw
    - The magnesium chloride washes off readily with rain/snow melt
    - Repetitive applications may be required to control dust
    - Potential to leech chloride into shallow drinking water wells
    - Doesn't work well in low humid conditions
    - Magnesium chloride is very corrosive especially if the salt is more concentrated
    - Attracts wildlife to roads for the salt and create driving hazards

- An alternative suppressant like Earthbind should be considered, it is reportedly:
  - Free of hazardous solvents • Non-flammable
  - Non-corrosive to metal
  - Non-hazardous waste
  - Not considered to be harmful to aquatic and mammal life • Not considered to be carcinogenic

O7-7 Cont.

Campo Wind Facilities

- 60-4.2NW turbines are just too big, too loud and to ugly to be allowed to impact local communities, especially south of I-8 where they are completely incompatible with rural community character, very low ambient noise levels, dark skies and more.
- You really need to include Torrey Wind's 30-4.2 MW turbines to fully realize the cumulatively significant and disproportionate adverse impacts that must be fully and honestly analyzed.
- This DEIS fails on all counts.

Boulder Brush Facilities

- The Tisdale photo below, taken from Ribbonwood Road looking northwest, shows the Boulder Brush off-reservation property. It is a beautiful place with lots of wildlife that Dudek can't seem

[14] https://www.oxycalciumchloride.com/building-better-roads/controlling-dust/how-to-control-dust/choosing-the-right-dust-suppressant
[15] https://www.globalstabilization.com/2017/04/07/why-use-mag-chloride-for-dust-control-if-you-care-about-the-environment/

to locate. The Torrey Wind project would install 30-586 ft tall turbines in addition to the Boulder Brush infrastructure that will totally ruin what is left of this scenic area where Big Horn Sheep, Golden Eagles, Quino Checkerspot Butterflies and many more species once thrived. Many species still do thrive here.

- **DEIS at page 37 (excerpt)**
  - "Protocol surveys for 2019 within the Boulder Brush Corridor were underway at the time of preparing this document."
  - ***How can we make fully informed comments and decisions without having all the necessary information available?***
  - 2018 was a terrible year for butterflies but 2019 has been much better due to increased rainfall and bloom.
  - Denying that no Quino habitat is present on the off-reservation portion of the project does not make it true.
  - If memory serves, not that many years ago, McCain Valley in the Ribbonwood Road area was either part of the Quino critical habitat or close to it.
- **DIES at page 86: Excerpt Emphasis added**
  - "The Project would be required to complete a Section 7 consultation process with the U.S. Fish and Wildlife Service (USFWS) and would require the issuance of a Biological Opinion from the USFWS with identified terms and conditions. Adverse effects on the Quino checkerspot and its habitat would be reduced to less than adverse with implementation of recommended MM-BIO-1 and MM-BIO-3 (see Section 4.5.3). The Off-Reservation portion of the Project would not adversely affect any federally listed plants or wildlife, *because none are present*. An additional set of *Quino checkerspot butterfly surveys are being conducted within the Off-Reservation portion of the Project*."
  - **How can these contradictory statements be true regarding federally listed species saying that *'none are present'* and *'butterfly surveys are being conducted within the off-reservation portion of the project'*?**
  - ***In addition, a Golden Eagle was observed on the off-reservation portion of the project as documented in Figure 14r***.

O7-7
Cont.

1.3 Operation O&M Management Planning

1.4 Decommissioning

- The DEIS statements are generalized and prevent fully informed comments and decisions on the decommissioning plan for Campo Wind and Boulder Brush components.
- What are the 'terms of the Campo Lease" that will be complied with and has the lease even been finalized and approved by the General Council?

2. PROJECT DESCRIPITION:

- Basically, three alternatives are offered, two of which are almost equally destructive and harmful for the already disproportionately impacted predominantly low-income area residents:
    1. 252 MW : 60 - 4.2MW turbines
    2. 202 MW : 48 – 4.2MW turbines
    3. NO PROJECT –community preferred option
- The first two both use 4.2MW turbines, some of the largest and least studied turbines around.
- Alternative 2 is reduced by just 12 turbines. Otherwise they are equally dangerous and represent significant, cumulatively significant and disproportionate adverse impacts overall.
- The DEIS rejects most alternatives, including reduced Minimal Build-Out with 60-2.5 MW turbines, because they would be located off-reservation and not provide economic benefits to the tribe or they would not produce enough profits for Terra-Gen.
- The DEIS was written in a biased and manipulated manner to support the intended target of 252 MW using 4.2MW turbines.

3. AFFECTED ENVIRONMENT AND AREAS NOT FURTHER DISCUSSED:

- We have already provided enough evidence, including local electrical pollution studies conducted at homes around the Kumeyaay Wind and Ocotillo Wind turbines documenting the high levels of stray voltage in and around homes, even with their own power shut off.
- The experts agreed that the only viable source of that stray voltage / dirty electricity was the wind turbines due to their findings and the absence of any other source with that level of power.
- The experts informed us that static / electrical pollution / radiation is the same or similar as that generated by wireless communications, and is currently very controversial with the rollout of 5 G.
- **Please take note that Electromagnetic Field Insurance Policy Exclusion Are The Standard**
    - ***Electromagnetic Fields are defined as a "pollutant" by insurance companies and often require special coverage as a "pollutant" in policy enhancements***
    - Due to the high risk that electromagnetic (EMF) field exposure poses, most insurance companies do not cover electromagnetic fields and have very clear "electromagnetic field exclusions" (see linked list on this page.) EMFs are classified as a "pollutant" alongside smoke, chemicals and asbestos. If you want insurance that will cover EMFs

O7-7 Cont.

you have to purchase additional "Pollution Liability" or "Policy Enhancement" coverage.[16]

- From **Joel M. Moskowitz, Ph.D.**, Director
  Center for Family and Community Health
  School of Public Health
  University of California, Berkeley Sunday, June 2, 2019

- **Effects of Exposure to Electromagnetic Fields: 833 Studies**[17]

  - Feb 1, 2018 (Updated June 10, 2019)

    Note: There are now 1,027 studies in the collection. The abstracts can be downloaded by clicking on the links below.

    Government and industry-linked scientists often claim that the research on the effects of exposure to electromagnetic fields (EMF) is inconsistent, and that more research is needed before precautionary warnings are issued or regulatory guidelines are strengthened.

    In 2011, the International Agency for Research on Cancer (IARC) of the World Health Organization classified radio frequency radiation (RFR) "possibly carcinogenic to humans" (Group 2B). The IARC plans to review RFR again by 2024 because most peer-reviewed studies published in the past decade found significant evidence that RFR causes genotoxicity. Thus, the IARC will likely re-classify RFR to either "probably carcinogenic to humans" (Group 2A) or "carcinogenic to humans (Group 1) at the next expert review.

    Cell phones and other wireless devices also produce static and extremely low frequency (ELF) electromagnetic fields. ELF was classified by the IARC as "possibly carcinogenic to humans" (Group 2B) a decade before RFR received this classification.

Dr. Henry Lai, Professor Emeritus at the University of Washington and former Co-Editor-in-Chief of the journal ***Electromagnetic Biology and Medicine***, has compiled summaries of several areas of the research on the biologic and health effects of exposure to RFR and ELF EMF. His sets of abstracts which cover the period from 1990 to 2019 constitute a comprehensive collection of this research.

Dr. Lai finds that the preponderance of the research has found that exposure to RFR or ELF EMF produces oxidative stress or free radicals, and damages DNA. Moreover the preponderance of RFR studies that examined neurological outcomes has found significant effects.

The evidence for DNA damage has been found more consistently in animal and human (*in vivo*) studies than in studies of cell samples (*in vitro*).

The abstracts can be downloaded from the **BioInitiative web site** by clicking on the links below.

O7-7 Cont.

[16] https://ehtrust.org/key-issues/electromagnetic-field-insurance-policy-exclusions/
[17] https://www.saferemr.com/2018/02/effects-of-exposure-to-electromagnetic.html

Note: The comet assay is a sensitive genotoxicity test for the detection of DNA damage and repair. This is a standard technique used in biomonitoring and genotoxicity testing.

Top Line Results; **Radio frequency radiation:**

- 89% (n=203) of 225 oxidative stress (or free radical) studies report significant effects.
- 64% (n=49) of 76 DNA comet assay studies report significant effects.
- 54% (n=25) of 46 *in vitro* studies report significant effects.
- 80% (n=24) of 30 *in vivo* studies report significant effects.
- 73% (n=222) of 305 neurological studies report significant effects.

Extremely low frequency and static electromagnetic fields:

- 89% (n=203) of 229 oxidative stress (or free radical) studies report significant effects.
- 74% (n=34) of 46 DNA comet assay studies report significant effects.
- 68% (n=21) of 31 *in vitro* studies report significant effects.
- 87% (n=13) of 15 *in vivo* studies report significant effects.

3.1-LAND RESOURCES

- The public is referred to Appendix C for the Campo Environmental Protection Agency (CEPA) statutes, the Campo Band of Diegueño Mission Indians Land Use Code (Land Use Code), and the Campo Band of Diegueño Mission Indians Land Use Plan (Land Use Plan). The Project will be developed in accordance with the Resource Development Plan approved by the BIA as part of the lease approval process.
- Where are all of these plans? They are not in the DEIS or appendices.
- The public has a right to see them if they are the main tribal governing documents. Without them, the DEIS is lacking and fails to provide adequate information to make informed comments and decisions

O7-7 Cont.

3.2-WATER RESOURCES

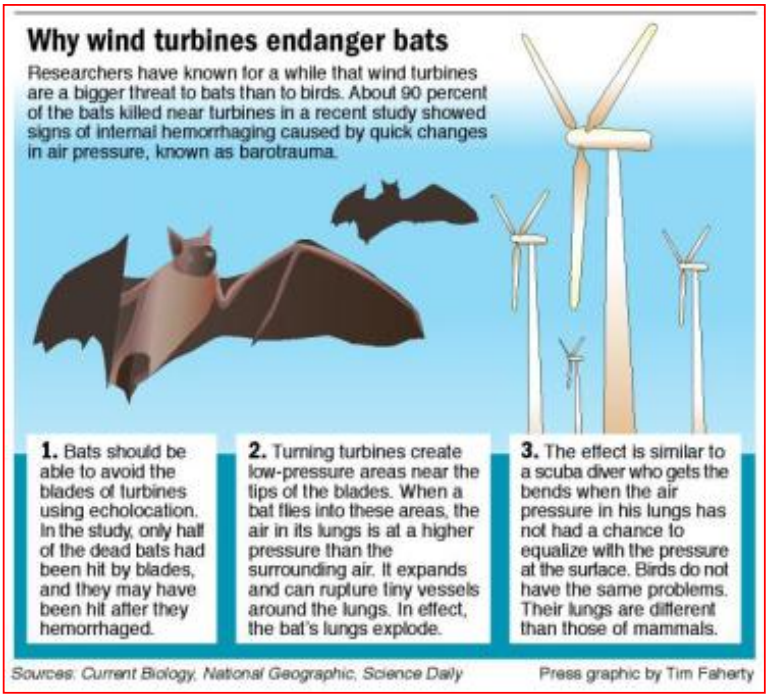
- GROUNDWATER information is lacking in detail and validity to support DEIS conclusions.
- Well field is same as that used for ECO Substation that had to be shut down due to lack of recharge and impacts to wells and springs.
- Need to include private groundwater quality test results – to counter old 2004 tests for landfill
- Sandy soil maps (figure 6 Appendix show more sand near current Campo Materials location NOT near proposed Campo Wind batch plant, O&M building and laydown yard.
- Figure 9: not all wells show up because many were drilled prior to permits being required by the County or no permits were applied for.
- Where are the on-site wells and springs relied upon by residents living on the Campo Reservation? They complained when the ECO Substation water sales impacted their water.
- Figure 10: Only inactive springs are identified. Where are the active springs located on and off the reservation?

- The lay down yards, O & M buildings and batch plants should all be located where existing water sources, power, and area has already been disturbed NOT on areas that need to be graded, import water, string new lines from unidentified connections.
- Plot plans and grading plans should be provided with all these details so impacted residents can make valid and fully informed comments.

3.3-AIR QUALITY

- Turbines create their own forms of air pollution through electrical pollution radiation including increased static electricity, EMI, interference with weather radar, cell service and other forms of communication. SCADA just adds to the pollution that residents and other living beings are / will be subjected to.

3.5-BIOLOGICAL



- **The DEIS at 4.5.1 page 82 includes the following**
  - For purposes of this environmental review, the Project would affect biological resources if it would: • Have an adverse effect on any riparian habitat or other sensitive natural community regulated or protected under federal law or regulation. • Have an adverse effect on federally regulated wetlands as defined by Section 404 of the Clean Water Act, through direct removal, filling, hydrological interruption, or other means. • Have an adverse effect on any sensitive species afforded protection under federal law or regulation. • Interfere with the movement of any federally protected fish or wildlife species or with established wildlife corridors regulated or protected under federal law or regulation.
- The project area is desert transitional which increases the number of species it supports and also makes it more important in relation to potential climate change impacts.

O7-7 Cont.

- ***The DEIS At page 86 states that 'there would be no adverse effects on eagles. How convenient but very wrong.***
  - Golden Eagles have been tracked flying through proposed wind turbine sites, and next door, especially in the southern section south of Hwy 94 as documented in the BTRs.
  - The conclusions made in the DEIS are not supported by the Biological Technical Reports.
  - Adding 60-90 new 586' tall wind turbines in our Golden Eagle friendly area could serve as the tipping point that kills our remaining Golden Eagles through cumulatively significant impacts from multiple wind turbine projects within a 16 mile or so radius.
  - Allowing take of our eagles would be negligent and in violation of public trust and federal regs.
  - The project's impacts cannot honestly be mitigated. To say it can would be lying outright.
  - Some of the information seems to be missing.
  - The DEIS and Biological Technical Reports (BTR) don't seem to match up.
  - The BTR discusses field studies but those studies are not readily apparent.
  - Below left is a photo of a turkey vulture sunning itself on the gate cross member over the driveway at the Fordyce property that abuts the Campo Wind site on the west end of Tierra Real Road on the eastern boundary of the Reservation along BIA 10.
  - On the right is the view from the Fordyc's front porch looking west over the Campo Reservation where 586 ft tall turbines would be in the near and far view from right to left where several rows of turbines are proposed. Looks like good eagle territory.

O7-7 Cont.

3.6-CULTURAL RESOURCES

- We know that the Campo people believe that eagles and redtailed hawks carry their prayers up to the Creator, that owls and coyotes bring warnings and omens that something bad is coming, that rattlesnakes represent some clans and that they continue to use many local plants for medicine and ceremonies.
- Campo elders and many other members recognize that Campo Wind threatens most of their customs and practices, their health and safety and overall quality of life for current and future generations.

3.7-SOCIOECONOMIC CONDITIONS

- **The DEIS fails to comply with Executive Order 12898 on trust responsibilities and the broader predominantly low-income off-reservation community as well.**
- Executive Order 12898: "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, 'provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. " The Executive Order makes clear that its provisions apply fully to programs involving Native America[18]
- "The Executive Order requires agencies to work to ensure effective public participation and access to information…In addition; each agency should work to "ensure that public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible to the public."

3.7.2.2: SURROUNDING SOCIAL AND ECONOMIC ENVIRONMENT:

- Much of the information provided and relied upon in the DEIS seems to be outdated, inaccurate, and/or uses information from a much larger subregion resulting in skewed and misleading data.
- **Regardless, Campo Wind DEIS Appendix D table 2-3 Comparison of Effects for Project Alternatives does confirm that impacts for Alternative 1 and 2 , are 'Adverse unavoidable' for Noise, Visual Resources, Socioeconomic Resources, and Cumulative.**
- Socio economic impacts include increased cost or total loss of fire insurance due to project.
- The project site is located in within the Boulevard Planning Area of San Diego County with the Campo Planning Area located to the west. Both are located within the larger Mountain Empire Subregion.
- Boulevard and Campo data should be used instead of the larger Mountain Empire subregion that artificially dilutes the impacts.
- **Slightly more accurate, but still limited information is available that shows our 91905 zip code area has about 1,700 residents in 652 households, with 21% being Native American, with only 37.6 % of our school kids reported as "white". [19] That means that 62.4% of our school kids are non-white minorities.**
- Why are 2017 poverty levels used for San Diego County and 2009 levels for 'Mountain Empire'?
- The La Posta Casino closed its doors in 2012 as reported by the Union-Tribune.[20]

PROPERTY VALUES ARE ADVERSLEY AFFECTED AS DOCUMENTED BELOW:

- **Terra-Gen should be required to offer property value protection agreements to non-participating property owners within at least a 2-mile radius and probably more.**
- **Here is just one example of many.** The photo below (left) shows the home of the Guy family on Ribbonwood Road with the Tule Wind turbines located about 4,500 ft or so behind them on

O7-7 Cont.

[18] https://ceq.doe.gov/docs/ceq-regulations-and-guidance/One_Federal_Decision_MOU_(M-18-13-Part-2)_2018-04-09.pdf
[19] https://www.zipdatamaps.com/91905
[20] https://www.sandiegouniontribune.com/sdut-la-posta-casino-closes-down-2012oct24-story.html

BLM land. The photo on the right shows sky lined Kumeyaay Wind turbines that are between 2.4 and 3.3 miles west. Turbines have destroyed previously beautiful uncluttered views, dark skies, and quiet. Both turbine projects create acoustic, light, shadow flicker and electrical pollution and nuisance that have negatively impacted the family, their health, their pets, and their horse training facility. Some customers balk at having horses so close to turbines.

- During fire emergencies and these projects significantly increase the risk of wildfire ignition and interference with fire fighting abilities and ability for residents to evacuate with their animals.

- **To add insult to injury, Terra-Gen's Campo Wind and Torrey Wind would be located even closer to the Guy's properties and many others in the same position with their property values in the toilet.** They should probably move to preserve their health but cannot afford to.
- **Terra-**Gen has not contacted the Guys or any other neighbors to discuss the details or realities of these major projects. The Guy's sole legal access is Ribbonwood Road, the main access route for Boulder Brush Gen-Tie and Torrey Wind. It is one way in and one way out. Major issue !
- The Ontario Superior Court ruled in 2013 that landowners living near large wind farms suffer from lower property values. That court said it decreased property values by 22 to 55 per cent, based on expert opinion provided[21].
- Michael McCann of McCann Appraisal, LLC out of Chicago Summarizes Property Value Studies; Michael McCann Literature Review[22]**:** About Michael McCann:
    - 30 years appraisal & consulting
    - Most types of commercial, industrial & residential property
    - State Certified General Appraiser
    - Certified Review Appraiser (CRA)
    - Member – Lambda Alpha International
    - Qualified & testified as expert witness in 21 states, circuit courts & federal court
    - Appraised variety of property value damage situations

O7-7 Cont.

[21] https://www.thestar.com/business/2013/04/23/wind_turbines_have_reduced_property_values_court_says.html
[22] https://windwisema.org/mccann-summarizes-property-value-studies/

- Consultant to governmental bodies, developers, corporations, attorneys, investors and private owners
- Appointed by Federal Court as a Condemnation Commissioner
- Evaluated & consulted 20+ utility scale wind projects in over a dozen states

Summary: Wind Turbine – Property Value Impact Studies

Independent Studies

Author	Type	Year	Location	Method	Distance	Impact %
Lansink	Appraiser	2012	Ontario	Resale[1]	< 2 miles	(39%) Avg. 23%-59%
Sunak	Academic RWTH Aachen University	2012	Rheine & Neuenkirchen	Geographic Weighted Regression [2]	2 Km	(25%)
Heintzelman Tuttle	Academic Clarkson University	2011	Upstate NY	Regression Resale & Census Block	1/10 to 3 miles	Varies to > (45%)
McCann	Appraiser	2009 -2012	Illinois, [3] MI, MA, WI	Paired Sales & resale	< 2 miles	(25%) 20% – 40%
Gardner	Appraiser	2009	Texas	Paired Sales	1.8 miles	(25%)
Kielisch	Appraiser	2009	Wisconsin [4]	Regression & Survey	Visible vs. not visible	(30-40%)(24-39%)
Luxemburger	Broker	2007	Ontario	Paired Sales	3 NM	(15%) $48,000
Lincoln Twp.	Committee[5]	2000-2002	Wisconsin	AV ratio 104% v. 76%	1 mile	(24%)

Wind Industry-Funded Studies

Canning & Simmons	Appraisers (CANWEA)	2010	Ontario	Regression Paired Sales	Viewshed[6]	(7%-13%) (9%)
Hinman	AcademicISU - REP Student thesis	2010	Illinois	Pooled Regression Realtor survey	3 miles1/2 mile	No SS (11.8%) [7]
Hoen	USDOE-funded LBNL	2009	9 states	Pooled regression	5 miles 3k ft – 1 mile	Increases (5.6%) [8]

O7-7 Cont.

(Adapted from "Wind Projects & Land Value" by Michael S. McCann, CRA, McCann Appraisal, LLC. Chicago, Illinois © 2012. Used with permission.)

3.8-RESOURCE USE PATTERN

3.8.2 Tribal:

- This section references Campo Renewable Energy Zone (CREZ)
- ***Where is the CREZ map?***
- Has the Campo CREZ map been approved by the General Council?
- The off-reservation public has a right and a need to see what is planned and where and how it will impact their own properties and physical and economic well being

3.10-NOISE

- **BIA NEPA GUIDEBOOK: 7.4 DISPROPORTIONATE EFFECTS (Environmental Justice) Executive Order (EO) 12898 (February 11, 1994),** "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires Federal agencies to identify and address any disproportionately high and adverse human health or environmental effects their proposed actions might have on minority communities or low-income communities. The BIA must specifically address in the environmental analysis any such communities that might be affected by a proposed action. Detailed guidance is provided in Appendix 18.[23]
- The ambient noise levels in the DEIS are far too high for our quiet rural area based on current and previous monitoring results.
- According to Dr. Carman's DEIS review, improper equipment was used, which resulted in artificially high the levels that changes the impacts of increased noise, and more.
- **Here is a link to a 1.05 minute video clip of Ocotillo Wind turbine noise** from Jim Pelley who recorded on 3/20/19 from his home where the closest 2.3 MW turbine is about ½ mile (2,640 ft) away. He accurately describes the noise as 'Human Torture'[24]:
- **Here is a link to a very annoying 2 minute video clip of wind turbine noise recorded in Aberdeenshire, Scotland**[25]. The person who recorded the video included the following statement: "This video was originally posted on You Tube by "beteigh", who writes: "The sound on this clip is just as it was recorded on my camcorder. The difference in volume and pitch is due to the speed of the gusts of wind and not any tinkering by me. In fact to get any realistic sound I have to turn my computer volume up full. What I can't show is the modulation of the sound, a strange 'whoosh-whoosh' that goes right through you -- it's horrible. I now understand how distressing is must be for people who have to put up with that relentless sound day and night. These huge developments are also ruining our countryside and decimating wildlife habitats."
- **Ontario Canada: May 27, 2019:** The K2 Wind farm in Huron County needs to make some changes, the Ministry of Environment has ordered. The wind farm operators must fix noise

O7-7 Cont.

[23] BIA NEPA Guidebook (2012) @ page 26: https://www.bia.gov/sites/bia.gov/files/assets/public/raca/handbook/pdf/59_IAM_3-H_v1.1_508_OIMT.pdf

[24] https://www.youtube.com/watch?time_continue=22&v=YhLaQ-cuXF0

[25] https://london.ctvnews.ca/wind-farm-ordered-to-reduce-noise-1.4438989

issues with their turbines, after noise testing found some of the turbines were "out of compliance."The order is vindication for Mike and Carla Stachura, who have been complaining about noisy turbines near their Dungannon area home for more than four years[26].

- According to the World Health Organisation (WHO), noise effects on sleep are expected to occur with outside noise levels > 40 dB (A). On the other hand, the WHO guidelines also state that "when prominent low-frequency components are present, measures based on A-weighting are inappropriate"
- A copy of an editorial regarding the fact that the CADNA/A noise model was never intended to measure wind turbine noise[27].
- **<u>Wilson Ihrig REPORT DATED 18 MARCH, 2019:</u> RESULTS OFAMBIENT NOISE MEASUREMENTS OF THE EXISTING KUMEYAAY WIND AND TULE WIND FACILITIES IN THE AREA OF BOULEVARD ANDJACUMBA HOT SPRINGS PERTAINING TO THE PROPOSED TORREY AND CAMPO WIND TURBINE FACILITIES:**
  - **Conclusion**
  - "The results of this study conclusively demonstrate that both the Kumeyaay Wind and Tule Wind facilities' wind turbines generate infrasound at residential locations up to 8 miles away based on the current measurements. Ocotillo Wind infrasound from wind turbines 11 to 12 miles away from Boulevard and Jacumba Hot Springs were measured at levels as high as 66 dB. The current data indicates that there is also significant low frequency noise in the range of 20 to 34 Hz. The measurement results also show excessive amplitude modulation of wind turbine noise. Although Energia Sierra Juarez Wind turbine-generated IS was not detected in the current measurements, under different wind conditions (wind direction and speed) high levels of infrasound from those turbines could impact the residences in the current study."

O7-7 Cont.

- **March 1, 2019: Editorial: Wind Turbine Noise: Real Impacts on Neighbors; Lisa Linowes[28]: (excerpt of piece that discredits report denying turbine noise impacts)**
  - Prediction vs. Actual Measurement ***Prediction noise models under-predict the loudest turbine noise levels heard by neighbors at the point when their sleep is interrupted!***
- **HUMAN RIGHTS AND WIND ENERGY PROJECTS, Prepared by**: Peter R Mitchell AM, BChe March 2016: (excerpt)[29]
  - Matching of the proven impacts with defined and accepted human rights is the purpose of this document.
  - Matching shows that rights involving:
    - Cruel, Inhuman and Degrading Treatment

[26] https://london.ctvnews.ca/wind-farm-ordered-to-reduce-noise-1.4438989

[27] http://wind3.herokuapp.com/posts/32217-the-lie-behind-turbine-noise-models#.XPadrohKiUk

[28] http://www.windaction.org/posts/49514-wind-turbine-noise-real-impacts-on-neighbors#.XQpq_ehKiUk

[29] http://www.epaw.org/echoes.php?lang=el&article=n485

- Discrimination
- Arbitrary Interference
- Working Conditions
- Family
- Children
- Physical and Mental Health
- Homes and Other Assets

are seemingly being both ignored, and breached. It is not necessary that every one of the above identified rights is breached. One alleged breach against one person at one wind project is enough to trigger the obligations of the Human Rights Commission.

- **Startle Reflex and Sensitisation:** ASA Conference presentation, New Orleans, December 2017: Sarah Laurie, Waubra Foundation. Dr Bob Thorne, Acoustar; Steven Cooper, The Acoustic Group[30]:
  - How are these Biological Phenomena relevant to Wind Turbine Noise Exposure?
  - Via acute physiological stress events.
- **Prevalence of wind farm amplitude modulation at long-range residential locations**[31]
  Kristy L.Hansen[a]PhucNguyen[a]BrankoZajamšek[b]PeterCatcheside[b]Colin H.Hansen[c]
  - Abstract
  - The presence of amplitude modulation (AM) in wind farm noise has been shown to result in increased annoyance. Therefore, it is important to determine how often this characteristic is present at residential locations near a wind farm. This study investigates the prevalence and characteristics of wind farm AM at 9 different residences located near a South Australian wind farm that has been the subject of complaints from local residents. It is shown that an audible indoor low-frequency tone was amplitude modulated at the blade-pass frequency for 20% of the time up to a distance of 2.4 km. The audible AM occurred for a similar percentage of time between wind farm percentage power capacities of 40 and 85%, indicating that it is important that AM analysis is not restricted to high power output conditions only. Although the number of AM events is shown to reduce with distance, audible indoor AM still occurred for 16% of the time at a distance of 3.5 km. At distances of 7.6 and 8.8 km, audible AM was only detected on one occasion. At night-time, audible AM occurred indoors at residences located as far as 3.5 km from the wind farm for up to 22% of the time.
  - Note: bigger turbines generate more acoustic energy and amplitude modulation.

O7-7 Cont.

3.11-VISUAL RESOURCES

- Dudek's KOP and visual simulations are worse than worthless because they were selected to falsely portray our beautiful area as already wasted when it is far more pristine than many areas of San Diego County.

[30] https://docs.google.com/viewerng/viewer?url=http://www.na-paw.org/Laurie-Cooper-Thorne-Startle-Reflex-New-Orleans-2017.pdf

[31] https://www.sciencedirect.com/science/article/pii/S0022460X19302718?via%3Dihub

- ***The KOPs showing existing and simulated views should include the before and after photos of the same KOP on the same page to make it easier to visualize the significant alteration.***
- Separating out the before and after shots seems manipulative at best.
- There are no KOPs showing simulations of turbines viewed from the following residential neighborhoods:
  - Campo Reservation homes along BIA 10 and BIA 15, Williams Road, Crestwood Road
  - Manzanita or La Posta Reservation residential areas
  - Campo Valley, Shockey Truck Trail, Live Oak Springs, southern section of Tierra Del Sol Road (south and east of reservation southern boundaries), Hwy 94 looking east.
  - Pacific Crest Trail, Cleveland National Forest, Ribbonwood Road, Tierra Heights.
- The selected Key Observation Points(KOP), fail to fairly or adequately represent the major KOPs adjacent to the closest homes on both tribal and private lands.
  - Figure 3: fails to identify the existing Kumeyaay Wind turbines that help people orient their own locations in comparison.
  - Visual simulation 6d Figure: KOP 7 shows 6 turbines south of Tierra Real Road when 7 are proposed there along BIA 10 next to the Tisdale's Morning Star Ranch and other private properties; KOP 8 photo looks west and fails to show the 5 new and much larger turbines proposed south of I-8 and north of Hi-Pass Road in the Tierra Heights residential neighborhood.

PHOTOS TAKEN LOCALLY SHOWING VISUAL QUALITY OF THE PROJECT-IMPACTED AREA

Below left: Kumeyaay Wind turbines as seen from Tierra Del Sol Road at Sol Wood Road looking north east. Tierra Heights homes are just in front of the turbines and would have more to the north east, north west, and southeast. There are no turbines south of the Golden Acorn Casino at I-8.

Above right: Looking west from Sol Wood Road over private land with Campo Wind site (right to left, across entire mid-photo), and Campo and Hauser Mountain in the distance. The views are expansive.

O7-7 Cont.

Above left: Looking northwest from Shasta Way over private land to the Campo Wind site (right-to-left) proposed for several ridge lines on the horizon, including the cleared fire break area along the nearest ridge. Houses are scattered in the valleys and along hillsides

Above right: Looking south-southwest from Hwy 94, just east of Church Road, into the Campo Reservation with the Campo Wind site along entire horizon on both sides of the valley where BIA 10 runs through the mature oak grove/ habitat. Tribal homes are along BIA 10 just around the curve to the left in oak groves, and to the right along BIA 10 by the historic stone water tank and old stone grain storage building by the Fiesta Grounds and on Hwy 94 just to the right, outside the photo, next to the High Bridge train trestle.

- **In this area, Figure 14bi** shows at least 11 tribal homes within about 1,000 feet or less from unidentified project easement that passes across Hwy 94 between Church Road and the housing complex on Kumeyaay Road.

O7-7
Cont.

Above left: iconic high bridge train trestle with tribal homes in the trees at base on left side.
Above right: Campo Wind site on ridge just south of high bridge. Tribal homes are adjacent.


Above left: looking northwest from Sol Wood Road over oak groves along Campo Creek with Campo housing complex and water tank just under ridge where turbines will be placed. Several rows of turbines would be visible from this view and homes.

Above Right: Looking northwest from Shasta Way just south of Hwy 94 looking over oak grove to Campo tribal housing complex and water tank on Kumeyaay Road. Turbines would fill the same ridge the tank is on as well as ridges behind it and to the north and south.

O7-7
Cont.


Above left: looking northwest from Shasta Way towards I-8 and Crestwood Road. Turbines would line several ridges in the mid section of this photo. Private and tribal homes will be significantly impacted by visual, acoustic, light and electrical pollution generated by the 586 ft turbines.

Above right: Looking southwest from Old 80, just east of Live Oak Springs Road over private ranch land. Turbines would be sited along the near ridge on the right and several ridges between the oaks and the horizon. Numerous homes are located along Live Oak Springs Road, Old 80 and Hwy 94 in this area.

Above right and left: Campo housing complex on Kumeyaay Road. Turbines would be extremely close to these homes. The dirt road on the left appears on maps a Campo Wind access route.

- **In this area, Figure 14w** shows at least 1 tribal home within 1,200 feet and more within 2,200 or so feet or so from a proposed turbine locations. Both are within about 500 feet or so from proposed but unidentified project easements. These homes are already impacted with Kumeyaay Wind turbines within 2,000-2,200 ft or so.

The photo above shows the Campo Clinic on Church Road where turbines would line the ridge line behind it and on the ridge on the west side of the road as well. Some tribal members would be exposed to wind turbine impacts at home and at work or school.

O7-7
Cont.

3.12-PUBLIC HEALTH AND SAFETY

- Acoustic, electrical, and light emissions /pollution generated by industrial wind turbines represent trespass, nuisance, and outright theft of our rights to health and well being.
- See previous comments in this letter and previous Scoping comments.
- To continue to ignore this reality is a form of deceit and negligence that will no longer stand.
- The Bureau of Indian Affairs, Indian Health Services, and the Department of Interior should conduct legitimate Health Impact Assessments at homes already impacted by Kumeyaay

Wind. And investigate the suspicious cancer cases that are clustered around the turbines related infrastructure.

- What does it take to get the powers that be to DO SOMETHING??

APPENDICES:

APPENDIX A-SCOPING REPORT

- The vast majority of valid scoping comments were ignored.

APPENDIX B- PROJECT DESCRIPTION DETAILS

- This section fails to identify the make and model of the proposed 60-4.2 MW wind turbines that will be some of the largest on shore wind turbines available.
- Where are the plot plans that provide critical project details with full disclosure necessary in order to make informed project comments and decisions?
- Setbacks are stated as 'industry standard' but industry standard is not identified or provided.
- 56 mph cut out speed seems incredibly dangerous to allow turbines to operate so close to homes at such high rates of speed. Remember the 2009 catastrophic failure at Kumeyaay Wind where turbine neighbors up to approximately ½ mile away found turbine debris in their yards and drivers on I-8 also witnessed the collection of turbine debris.
- How much does the nacelle weigh on one of Terra-Gen's proposed 4.2 MW turbines? As reported in the East County Magazine, when an Ocotillo Wind turbine collapsed in 2016, neighbors reported the massive crash sounded like an explosion or sonic boom from 5 miles away[32]. (photo by Jim Pelley-Ocotillo)

O7-7 Cont.

[32] https://www.eastcountymagazine.org/wind-turbine-collapses-ocotillo

- Here is a link to drone footage taken by neighbors moments after hearing the turbine crash to the ground.[33]It is very eerie.
- Turbine lighting should be mandated to use FAA compliant radar-activated lighting technologies known as Aircraft Detection Lighting Systems (ADLS). These Aircraft Detection Lighting Systems can reduce light pollution by remaining dark most of the time, lighting up only when necessary to serve as beacons.
- Senator Ben Hueso sent a letter to FAA requesting relief for residents impacted by Ocotillo Wind turbine impacts, including relief from flashing lights[34]. Nothing happened.

APPENDIX C-REGULATORY SETTINGS

- We will ask again: where are the tribal governing documents that are referred to in the DEIS?
- MSCP: Tribal lands are not included in the East County MSCP Plan but the off-reservation portion of Boulder Brush is.
- How will the project impact the MSCP plan and what related requirements will be placed on Boulder Brush?
- The DEIS fails to address this important conservation planning issue

O7-7 Cont.

APPENDIX E- EIS FIGURES

APPENDIX F-GROUNDWATER RESOURCE EVALUATION

- Dudek's groundwater evaluation is basically useless. NO SURPRISE.
- Dudek was the consultant for SDG&E's ECO Substation EIR/EIS. The Final EIR/EIS and Construction Water Supply Plan estimated 30 million gallons of water were needed.
- ***SDG&E's EAST COUNTY SUBSTATION PROJECT MINOR PROJECT REFINEMENT #8, dated 9/20/13[35] requested an increase from the approved 30 million to 90 million gallons!***
- ***Attached is a one-page summary of Dudek's alarming errors[36]***
- Based on past history of the current tribal leadership that has been in office for many years, with just a few years under different leadership, there is little to no trust for any real oversight or enforcement of the Campo Wind project, including use and sustainability of finite groundwater resources.

[33] https://www.youtube.com/watch?v=q6ytUyQtA24
[34] https://www.eastcountymagazine.org/sites/eastcountymagazine.org/files/2014/March/Hueso-Ocotillo-letterstoFAA.PDF
[35] https://www.cpuc.ca.gov/environment/info/dudek/ecosub/MPR_8_Request.pdf
[36] Dudek v Ponce by Donna Tisdale 2/3/14

- We point to need to curtail bulk water sales from the same Campo Reservation well field before they reached the unsustainable 57 million gallon authorization limit.

APPENDIX H- BIOLOGICAL TECH REPORT

- **BTR Part 4 A: Figure 9 USFWS Critical habitat:** Quino Checkerspot Butterfly (QCB) Habitat magically disappears where the Campo Reservation boundaries start because it is sovereign land.
- Previously, it was alleged that USFWS wanted to include most of the Campo Reservation in QCB critical habitat but the tribe objected to that designation.
- QCB is here and has been documented within and near the southern portion of the Campo Wind project numerous times over the years. The DEIS admits to critical habitat on site.
- **Figure 10 & 11** combine USFWS and AECOM QCB observations on one map with at least 43 on reservation and at least 10 off-reservation and QCB Suitable Habitat identified in the area where 7 turbines, Batch Plan, Laydown Yard and O& M building are planned in the southern portion along BIA Rt 10 and adjacent to occupied private property. Those components should be removed. And they excluded a lot or area that probably should not have been excluded.
- **Figure 131 USGS Golden Eagle Bird M007 – 2016** shows numerous Golden Eagle flights through the Campo Wind project. However, not all eagles are tracked.

APPENDIX E-1: PLANT SPECIES OBSERVED:

- This section documents just some of the plant diversity of our transitional high-desert Mediterranean mosaic area between the mountains and the desert floor:
- Here is a list of those that were observed that are also State and Federally listed endangered, threatened, and rare plants of California[37]:

APPENDIX F-1: WILDLIFE SPECIES OBSERVED:

- This section also documents just some of the diversity and number of species, including sensitive and allegedly protected species that are present in the Campo Wind / Boulder Brush /Torrey Wind project areas.
- We know there are many more that were not 'observed'.
- California ESA prohibits the take of any species of wildlife designated by the California Fish and Game Commission as endangered, threatened, or candidate species. CDFW may authorize the take of any such species if certain conditions are met[38].
- Condors have been personally observed, by Donna Tisdale and family members, in flight in the Boulevard / Campo / Jacumba area, and foraging on road kill on Tierra Del Sol Road and the Pine Valley I-8 Bridge in years gone by meaning the area is still suitable habitat for them as documented by the Shu'luuk Wind

O7-7 Cont.

[37] https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109390&inline
[38] https://www.wildlife.ca.gov/Conservation/CESA

- **Here are 57 of the "observed species" that are fully protected, are considered threatened, or special status under California ESA[39]; California Special Animals List[40]; California vulnerable species[41]; and/or Federal ESA[42], listed in alphabetical order**:

1. American Peregrine Falcon
2. Bank swallow
3. Belted kingfisher
4. Big free-tailed bat
5. Black swift
6. Blue-gray gnatcatcher
7. Brewer's sparrow
8. Brush rabbit
9. Cactus wren
10. Common poorwill
11. Cooper's hawk
12. Costa's hummingbird
13. Eared Grebe
14. Golden Eagle
15. Great blue heron
16. Great egret
17. Greater Roadrunner
18. Ferruginous hawk
19. Fox sparrow
20. Fringed myotis (bat)
21. Harris' hawk
22. Hoary bat
23. Horned lark
24. Kangarroo rat
25. Lawrence's goldfinch
26. Lesser nighthawk
27. Loggerhead shrike
28. Long-eared myotis
29. Long-eared owl
30. Mountain Quail
31. Northern harrier
32. Oak tit mouse
33. Olive-sided flycatcher
34. Osprey
35. Pallid bat
36. Pocketed free-tailed bat
37. Quino Checkerspot Butterfly

O7-7 Cont.

[39] http://www.dfg.ca.gov/wildlife/nongame/t_e_spp/fully_pro.html
[40] https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline
[41] http://data.prbo.org/apps/bssc/uploads/images/vulnerable_species_small.png
[42] https://www.fws.gov/endangered/

38. Roufus-crowned sparrow
39. Roufus hummingbird
40. San Diego black-tailed jack rabbit
41. San Diego desert woodrat
42. Savannah sparrow
43. Scott's oriole
44. Sharp-shinned hawk
45. Swainson's hawk
46. Swainson's thrush
47. Townsend's big-eared bat
48. Tri-colored blackbird
49. Vaux's swift
50. Western mastiff bat
51. Western small-footed myotis
52. Western yellow bat
53. White-tailed kite
54. Willow flycatcher
55. Yellow-billed magpie
56. Yellow warbler
57. Yuma myotis

- Along with adding beauty and birdsong to our lives, birds and other critters contribute to regulating services, such as scavenging carcasses and waste, controlling populations of invertebrate and vertebrate pests, pollinating plants, and dispersing seeds; and supporting services, such as cycling nutrients.
- All creatures contribute to and play a role in the cycle of life and their loss can alter entire ecosystems.

O7-7 Cont.

EXISTING BIOLOGICAL RESOURCES

BTR Part 2-A Figures:

- **Figure 8an:** Shows project boundaries less than 400 feet from closest adjacent private property located on Paso Alto Court. At least 20 private off-reservation homes are shown in the aerial photo used. Many more homes are located in that general Tierra Heights area that is not shown.
- **Figures 8ax & 8ay:** Shows the extensive disturbance at the Campo Materials location which is where the Campo Wind Batch Plant, Laydown Yard, and O& M facilities should be located. The area is already disturbed with existing power, water and roads. And the location is much more centrally located and away from homes.
- **Figure 8bf:** At least 20 tribal homes are located in the aerial photograph with the closest appearing to be less than 1,000 feet or so from turbines proposed in Figure 2-1A. There are many more tribal homes in that general area.

Campo Wind BTR_Part4_A_Figures 8bp-14l

- **Figure 14an & 14y:** shows turbine location less than 400 feet from I-8 which places motorists at risk from blade throw or tower collapse. Ocotillo Wind suffered both blade throw and tower collapse in the first few years of operation.
- **Figure 14 m shows the proximity of project components / roads to non**-participating private property where the owners are already adversely and cumulatively impacted by proximity of Tule Wind and Kumeyaay Wind and Terra-Gen's proposed Torrey Wind projects.
- **Figure 14aq** shows where unidentified project components come within about 200 feet or so of non-participating private property.
- **Figure 14r** shows where a Golden Eagle was sited and reported on private land within the Boulder Brush / Torrey Wind project boundaries, within about ½ mile of a Campo Wind turbine site. Since the DEIS fails to include the proposed Torrey Wind turbine sites, it is hard to determine the direct, indirect, cumulative, disproportionate, and cumulatively significant adverse impacts.
- **Figure 14s** shows at least 2 tribal homes within about 1,000 to 1,200 feet or so from at least one turbine site and 400 ft or so from unidentified project components like roads or lines.
- **Figure 14t** shows turbine sites on what appears to be large slabs of granitic boulders that will take major blasting for turbine foundations, but it is not clear how close homes are
- **Figure 14u** shows at least 5 tribal homes that will be impacted by Campo Wind turbines that are within 1,200 feet or so and 200 ft or so from other project components that will divide their little neighborhood.
- **Figure 14w** shows at least 1 tribal home within 1,200 feet and 1 more within 2,200 or so feet or so from a proposed turbine location. Both are within about 500 feet or so from proposed but unidentified project easements. These homes are already impacted with Kumeyaay Wind turbines within 2,000-2,200 ft or so.
- **Figure 14x** shows project easements within 400 feet or so of 1 tribal home where the member is reportedly already suffering from life threatening cancer or other condition. The added stress from project construction and /or operation could alter potential recovery or prove fatal. The project components are also less than 700 feet or so from non-participating private property.
- **Figure 14z** shows private inholding property with at least 2 homes within 1,500 feet or so from turbine locations . The turbine locations are proposed for a ridgeline with large slabs of granite boulders that will take a lot of blasting for turbine foundations. Blasting that close to off-site domestic wells places their water supply at risk. The oak grove also provides habitat that will be disrupted further if additional turbines are installed so close. Previous tenants at that location reported Golden Eagles nesting in their trees, prior to the Kumeyaay Wind turbines.
- **Figure 14aa** shows at least 3 tribal homes within 200-500 feet of proposed project components, the existing Kumeyaay Wind substation /switchyard and within about 1,200 feet of another private inholding property off of Williams Road.
- **Figure 14af** shows unidentified 'disturbance' areas along Old Hwy 80 and Williams Road, including within in the drainage at Campo Creek headwaters. The intended use of the area west of Williams Road is not disclosed. It should be. These project components need to be moved to the area of the majorly disturbed Campo Materials facility location off of Church Road.
- **Figure 14ag** shows another tribal home within about 600 feet of an apparent road and 300 feet or so from the high voltage line route. It also appears that several oaks may be removed at Old

O7-7 Cont.

80 and Williams Road, too. We have lost too many oaks to drought, pests, and over pumping wells already!

- **Figure 14ah** shows at least 1 tribal home less than 700 ft from apparent high voltage lines near the top right of the aerial photo and several tribal homes, oaks and freshwater marsh impacted by an apparent road on the lower right side.
- **Figure 14ai** shows at least 1 tribal home within about 2,000 feet of several turbine locations between Old 80 and I-8.
- **14aj shows 4 turbine locations that do not appear in the photo simulation for KOP shot taken from I-8. It also shows new turbines proposed about 800 feet or so from I-8 east bound. This area is adjacent from the existing Kumeyaay Wind turbine that sits close to I-8 west bound. In a significant wind event travelers on both sides of I-8 could be impacted by blade throw or flaming debris in the event of a turbine fire.**
- **14ak** shows 4 turbines proposed for a ridgeline abutting Rancho Finis Tierra on Miller Road with numerous private homes. One turbine appears to be within 300 feet or so of the private property boundary. A Golden Eagle was also tracked in this area.
- **Figure 14am** shows that 2 off-reservation private properties actually abut the project site. One of these properties belongs to the Good family. Charles Good spoke at June 19th DEIS meeting asking for property value protection guarantees or a buyout. The Live Oak Springs community is also visible in this photo.
- **Figure 14an** shows at least 20 or so private homes with turbines planned within 800 ft or so of the closest home on Paso Alto Court
- **Figure 14ao** shows turbine locations proposed within about 1,000 feet of adjacent private property in the Rancho Finis Tierra area.
- **Figure 14ap** shows routes for unidentified project components crossing Coast Live Oak Woodland and ephemeral stream bed all sensitive resources and habitat.
- **Figure 14aq** shows a road or other project easement through the Campo Creek bed towards the community of Live Oak Springs. Williams Road and Old 80 is where tribal members meet the school bus with their kids. This is a major conflict and unsafe to mix kids, school buses and major project traffic, noise, dust, and potential use of well water that is currently used by the Golden Acorn Casino. Several tribal wells are located between Golden Acorn Casino and the adjacent Live Oak Springs Water wells.
- **Fiugre 14ar** shows Golden Eagle tracked flight through project area along ridgeline proposed for turbines and over valley proposed for other project components.
- **Figure 14as** shows 4 turbine locations proposed for ridgeline with large granite boulders that will require lots of blasting for turbine foundations, and tracked Golden Eagle flight through proposed turbine locations
- **Figure 14at** shows observed Golden Eagle flight path through project footprint.
- **Figure 14au** shows at least 4 tribal homes along Church Road within about 1,800 – 2,000 feet or so from wind turbine sites and 400 or so feet from road or utility line easement. It is unclear.
- **Figure 14av** shows additional 5 or so tribal homes along Church Road impacted by the same unidentified project easement.
- **Figure 14Aw** shows 3 turbine locations with observed Golden Eagle flight path through the turbine locations.

O7-7 Cont.

- **Figure 14ax** shows 3 turbine sites with observed Golden Eagle flight path through them.
- **Figure 14az** shows at least 2 tribal homes within 800' to 1,200 ft or so from turbine sites and unidentified project easements.

Campo Wind BTR_Part5_A_Figures 14ba-16

- **Figure 14bi** shows at least 11 tribal homes within about 1,000 feet or less from unidentified project easement that passes across Hwy 94 between Church Road and the housing complex on Kumeyaay Road.
- **Figure 14bk** shows at least 2 more tribal homes within 500 feet of project road and about 2,000 feet from wind turbine location.
- **Figure 14bl** shows at least 2 homes within 2,800 feet or so from turbine location. South of Hwy 94 and east of the high bridge / train trestle.
- **Figure 14bo** shows 4-5 homes within 2,400 feet or so of turbine location near BIA 15 and railroad track.
- **Figure 14bx** shows proximity of wind turbines and batch plant facilities abutting occupied private property (Tisdale, Dotson, Fordyce), with several more homes just out of the picture.
- **Figure 14bz** shows at least one home within 14 feet of wind turbines and about 900 feet or so from the O&M, batch plant and laydown yard facilities. There are numerous other homes just out of sight on Moon Valley Road and adjacent to BIA 10 on the southeastern portion.
- **Figure 14ca** shows several homes within 2,400 ft or so of turbines and right next to apparent access road on Tierra Del Sol Road near intersection with Shockey Truck Trail
- **Figure 15** vastly misrepresents and understates the impacts to QCB from the project when compared actual observation locations.
- **Figure 16** shows just how undeveloped and natural the vast majority of the Campo Wind project site is. This figure is far too busy and does not serve as valid easily read cumulative impact project map.

O7-7 Cont.

Campo Wind BTR_Part6_A_Figures 14m-14az

- **Figure 14m** shows the Guy family home /horse facility that will be significantly and cumulative impacted by Campo Wind, Torrey Wind, Boulder Brush, Tule Wind and Kumeyaay Wind. Their property will be virtually toxic for family members that are already suffering from existing turbines. They should be bought out if that is their preference.
- **Figure 14n** shows at least 10 homes that are in close proximity to Boulder Brush project and Ribbonwood Road access route and the wetland riparian area where the road crosses the Tule Creek bed. Many more homes are just out of sight of the photo.
- **Figure 14p** shows at least one tribal home about 1,300 feet from Campo Wind turbines. That home on Manzanita Road is already about 1 mile from Kumeyaay Wind turbines that reportedly caused adverse health impacts for the previous tribal tenant.
- **Figure 14r shows location where Golden Eagle observed on the Boulder Brush private property**

APPENDIX K-ACOUSTICAL ANYALYSIS REPORT:

- **We incorporate in full by reference the comment letter on this DEIS from Dr. Richard Carmen of Wilson Ihrig submitted July 8th along with the 2019 Wilson Ihrig report.**
- This DEIS fails to address low-frequency noise, infrasound, and amplitude modulation despite evidence produced that existing turbines generate them and bigger turbine will generate even more low-frequencies, infrasound and amplitude modulation that will impact people and other sensitive receptors within and even broader radius.
- Current evidence documents impacts up to 16 miles or so from the 242 wind turbines that already exist within that radius.
- This purposely oversight can be considered
- Here is a link to a 1 minute video of wind turbine noise documented at the Waubra Wind facility in Australia[43]. Listen to this to understand why our community is so adamantly opposed to even bigger noisier turbines planned at Campo Wind and Torrey Wind.

APPENDIX L-VISUAL IMPACT ASSESSMENT

- **International Archives of Occupational and Environmental Health;** pp 1–20 | The influence of wind turbine visibility on the health of local residents: a systematic review by Alice Freiberg; Christiane Schefter; Janice Hegewald; Andreas Seidler[44]; **First Online:** 23 January 2019
  - Conclusions
  - "In interpreting the results, the differing methodological quality of the included studies needs to be considered. Direct and indirect wind turbine visibility may affect residents' health, and reactions may differ in combination with noise. Further, annoyance by wind turbine visibility may interact as mediator between visual exposures and the health of local residents. To confirm the results, more high-quality research is needed."

O7-7 Cont.

- Below are photos of the additional scenic Boulevard views in the Tierra Del Sol area. The first four were taken on Tierra Real Road / Lane looking towards the Campo Wind project site, KOP site

[43] https://www.youtube.com/watch?time_continue=27&v=rOU39ws1gHo

[44] https://link.springer.com/article/10.1007%2Fs00420-019-01403-w

- Border Patrol needs to fly low to help track down and take illegal immigrants and smugglers into custody. This is a regular occurrence and we appreciate their service.

- On June 17th, several Tierra Real Road neighbors reported seeing two armed smugglers carrying military type assault rifles with shoulder straps and obvious ammo clips—in broad daylight! The Border Patrol showed up in force including a helicopter. It was later reported that the men were taken into custody but no weapons were found on them at time of arrest. That means the weapons were stashed on someone's property and could be used by others later.

O7-7
Cont.

- Helicopters will no longer be able to patrol in the area of the turbines due to potential turbulence and aviation obstacles. This can increase smuggling traffic.
- Placement of turbines this close to the border will reduce the effectives of local law enforcement and place properties at increased risk without adequate access to their services.
- **The project site is also located in the military training route as evidenced by the military helicopter in the photo above captured leaving airspace over the Tisdale ranch and over the Campo Wind project site. The Navy Seals training facility is just a few miles northeast as the crow flies.**

O7-7 Cont.

APPENDIX M-PRELIMINARY ENVIRONMENTAL SITE ASSESSMENT:

Appendix M 1: Campo Wind Project Preliminary ESA

- The Campo Landfill project is mentioned at page 11, with a statement that it 'does not appear to be active'.
- Dudek could have asked basically anyone about the very controversial Campo Landfill. There was even a book written by the former USEPA Region 9 Director, Dan McGovern: The Campo Indian Landfill War.
- A vote was held by the Campo General Council on May 27, 2010 to rescind the landfill leases in order to terminate the landfill project after a two decade or so battle.
- Over seven months later, the Federal Register Notice, dated February 3, 2011, was finally published. It included the following :
  - The BIA is canceling work on the SEIS because the Campo Band of Mission Indians, by Tribal resolution, informed the BIA that the Tribe terminated the amended lease with Muht-Hei (MHI) and amended sublease between MHI and BLT Enterprises, Inc. (BLT), of Oxnard, California, to develop the Campo Regional Landfill Project (Proposed Action). There is no Federal action of amended lease and amended sublease approval for BIA consideration. The Notice of Intent to prepare the SEIS, which included a description of the proposed action, was published in the **Federal Register** on November 8, 2005 (70 FR

67738-67739). The Notice of Availability of the Draft SEIS was published in the **Federal Register** on February 26, 2010 (75 FR 8986-8988).[45]

- The summary and conclusions section includes multiple locations on the Campo Reservation that have violations or unpermitted disposal sites: Golden Acorn, Campo Materials, junk yard.
- The summary section fails to include the Kumeyaay Wind facility where discarded wind turbine blades have been stored on the ground since the catastrophic failure at the project back in December of 2009. The blades are non-recyclable. Some were taken to Jacumba Garage.
- Figure 1 map also includes the "proposed landfill site" as an area of concern when the previously proposed Campo Landfill project at that location has been formerly terminated.
- Figure 1 map also shows Camp Lockett in the area abutting the southwestern boundary of the Campo Reservation. Isn't Campo Locket actually located several miles to the west in Campo Valley?

APPENDIX M- PRELIMINARY ENVIRONMENTAL IMPACT STATEMENT PART 4

- **Appendix F. Interviews @ page 152:** This section discloses that Eugene Gabrych, the absentee land owner where Boulder Brush facilities are proposed, admitted that "owner has not been on property and has limited knowledge". It was signed by Gabrych 6/6/19.
- **It is the height of elite negligence to propose such a massive and harmful wind turbine and related infrastructure project so close to homes in such a Very High Fire Hazard Severity Zone without bothering to set foot on the property itself or to care about the harm he is willing to inflict upon his neighbors.**
- **Appendix M Preliminary Environmental Impact Statement Part 5**
  - The historic aerial photos of the Boulder Brush project show the historic wet years with water in ponds and expanded and much lush wetlands during 1943, 1953, 1955, 1968, 19841994.
  - Wet years come in cycles. What may be dry this year may be under water next year.

O7-7 Cont.

APPENDIX N-CUMULATIVE SCENARIO

Table 1 Cumulative – Reasonably Foreseeable, Approved, and Pending Projects

- Where is the map showing the cumulative impact projects and their proximity to each other and to the disproportionately impacts communities?
- See list of projects at page 1-2 in this letter.
- **Error that increases cumulative impacts:**
  - ***JVR Solar is 691 acres of a 1,345 acre site, NOT 571 acres*** according to JVR ENERGY PARK: PDS2018-GPA-18-010, PDS2018-REZ-18-007, PDS2018-MUP-18-022, PDS2018-ER-18-22-001 – NOTICE OF PREPARATION (3-7-19) & CEQA INITIAL STUDY[46]**.**
  - *JVR Solar footprint contains prime farmland where organic crops were previously grown*.
  - *Decommissioning of some energy projects does not return the area to pre-project conditions.*

[45]

[46] https://www.sandiegocounty.gov/content/sdc/pds/ceqa/MUP-18-022.html

- *Some projects remove and haul away valuable top soil and some solar projects actually sterilize solar killing all the valuable microbes that support crops.*

Table 2-3 Comparison of Effects for Project Alternatives

- **Admitted Adverse and Unavoidable Effects /impacts include NOISE and VISUAL, including Socioeconomic**
- **Adverse and Unavoidable Effects should also include**: cumulative, public health and safety (electrical and light pollution and fire), land resources and land use patterns (reduced potential for new homes and businesses due to necessary set-backs to protect human and economic health), biological, socioeconomic (property values and economic well being), and more.
- **However, they can all be mitigated by selecting Alterative 3 NO PROJECT.**
- Additional mitigation can include reduction in number and relocation of turbines and other infrastructure; increasing turbine set-backs; implementing turbine curtailment at night or during specified weather events and seasons; avian intercept radar; radar triggered Obstacle Collision Avoidance System to reduce impacts to people and other living things from FAA required lighting, and more. Introducing significant light pollution into currently dark sky areas, especially south of Old Hwy 80 disrupts circadian rhythms.

2.1 Land Resources

- This section fails to address the conversion of currently and mostly undeveloped rural scenic and biologically rich land resources, by Campo Wind, Torrey Wind, Boulder Brush and other cumulative impact projects, into unsightly industrial energy complexes that reach almost 600 feet into the sky and string webs of criss-crossing high voltage lines and energy corridors, resulting in significant direct, indirect, cumulative and disproportionate adverse impacts to predominantly low-income and environmental justice communities.

O7-7 Cont.

2.2 Water Resources:

- This section fails to address cumulative impacts to groundwater resources which are the sole source of water available to local tribal and off-reservation residents, wildlife and habitat.
- Added to all the other existing, proposed, and reasonably foreseeable projects, including controversial bulk water sales, cumulative impacts can be significant and basically irreversible.
- Oaks and other water dependent habitat do not always recover once their source of water has been diverted, or altered in any way.
- Over pumping of wells has already occurred at the same well field proposed for Campo Wind and Boulder Brush. Similar issues are present at Torrey Wind and other cumulative impact projects that rely on local finite and rainfall dependent groundwater resources.

2.5 Biological Resources

- This section is seriously lacking in valid cumulative impact project information / details including the actual area of impact and actual cumulative direct, indirect and disproportionate adverse impacts on sensitive biological resources and fragmentation of habitat and movement corridors. Impacts and acreage are downplayed to falsely reduce appearance of cumulative impacts.

- The DEIS fails to include, yet falsely implies that Boulder Brush impacts are evaluated. What are the cumulative biological impacts??
- The DEIS cannot defer to, rely upon or depend upon San Diego County's evaluation under CEQA.

2.7 Socioeconomic Conditions Implementation of the "Project (under either build alternative) …The Project and cumulative projects would not result in cumulatively adverse impacts on socioeconomic conditions".

- Say what??
- This section must recognize and address loss of local property values and economic well being inflicted by the existing and proposed renewable energy projects and related infrastructure.
- The cumulative impacts of Terra-Gen's proposed Campo Wind, Torrey Wind, and Boulder Brush Gen-tie with up to 90-4.2 MW turbines that span almost 10 miles north to south and about 2-3 miles east to west represent the most significantly cumulative adverse impacts to Boulevard and Campo area residents who have invested their life savings in their homes.

2.8 Resource Use Patterns

- This section just talks about agricultural uses and not residential uses that are far too close to proposed Campo Wind, Torrey Wind and Boulder Brush facilities.
- Most agricultural uses include residences as well unless the property belongs to some wealthy absentee land owner like Eugene Gabrych who buys such a beautiful property, admits he has never been there, and then willingly enters into agreement with Terra-Gen to basically throw the community under the bus.

O7-7 Cont.

APPENDIX O-REFERENCES CITED IN THE EIS

- **INDUSTRY BIASED AND IRRELEVANT: This survey admits that some turbines are more than 5 miles away**: American Wind Energy Association. 2018. "New Study: 92 Percent of Wind Project Neighbors Positive or Neutral toward Turbines." Into the Wind: The AWEA Blog. January 29, 2018[47]. Some locals were contacted to participate. The survey questions were vague and not project or site specific making them basically useless. Again, it served its purpose to obfuscate and bury the facts with useless busy work.
- **M.C. Kiskwish Campo Kumeyaay Nation Staff Economist is actually Michael Connolly who calls himself Miskwish [48]and owns Laguna Resource Services Inc, a consulting company that profits from many Campo tribal projects.** Campo Kumeyaay Nation. 2014a. Campo Work Force Plan. Prepared under an Award from the U.S. Department of Commerce, Economic Development Administration Award Number 07 69 06602. Prepared by M.C. Kiskwish, Campo Kumeyaay Nation Staff Economist, and Cota Holdings LLC. April 30, 2014.

APPENDIX P-MITIGATION MEASURES:

[47] https://www.aweablog.org/new-study-92-percent-wind-project-neighbors-positiveneutral-toward-turbines/.
[48] https://www.linkedin.com/in/michael-connolly-miskwish-2b7a7a48/

The DEIS Fails to Disclose and Analyze All Feasible Mitigation Measures. Most measures included are inadequate at best.

- Mitigation proposed in the DEIS *does not* provide an equal or greater benefit to the affected species or people
- **The mitigation measures are similar to those noted for Tule Wind and Ocotillo Wind where they don't seem to make much difference and seem to have very little to no oversight by the feds. We expect the same unethical and lax enforcement at Campo Wind, especially when compared to the lack of apparent enforcement or accountability at Kumeyaay Wind, Campo Materials, Golden Acorn Casino, illegal dump sites that already exist under the recent past and current tribal leadership or lack thereof.**
    - **MM Vis 8:** FFA lighting can and should be further mitigated with reduced with radar activated Aircraft Detection Lighting System (ADLS).
    - The FAA introduced standards for the ADLS technology in December 2015.
    - The technology involves the deployment of radar-based system around a wind farm that turns lights on only when low-flying aircraft are detected nearby. The aim is to mitigate the impact of flashing lights at night on local communities
    - ADLS would avoid light pollution that is demonstrated in the photo below taken of Ocotillo Wind where lights flash constantly all night long creating a nuisance an unnecessarily disturbing neighbors both human and wildlife.
    - The FAA reportedly cannot mandate ADLS but the Campo Band, the Bureau of Indian Affairs, and the Department of Interior can and should mandate them. Those agencies are required to protect the health and welfare of all Campo Band members.

O7-7 Cont.

- **MM-PH&S-4 Wind Turbine Safety Zone and Setbacks:**
    - PH&S-4 Wind Turbine Safety Zone and Setbacks: Prior to approval of final construction plans and as part of the Health and Safety Program (MMPH&S-2), it is recommended that the developer demonstrate to the Tribe adequate setbacks for wind turbine generators from residents and occupied buildings, roads, right-of-ways, transmission lines, and other public access areas, consistent with the Tribe's Land Use Code and sufficient to prevent accidents from the operation of wind turbine generators. Plans detailing the proposed setbacks would be submitted to the Tribe for review and approval prior to construction
    - ***This is what former Campo Chairwoman LaChappa was talking about at the June 19th Campo Wind DEIS meeting at the tribal hall.***

- ***This should be done prior to the Campo Band signing off on the DEIS and lease agreement NOT as a mere 'recommendation' that will likely never happen until construction has already started and it is too late for disproportionately impacted tribal residents and their families!***

MM-NOI-1 Construction Noise Best Management Practices

- ***Where is noise mitigation for operation-turbine noise the most controversial issue raised during scoping and negligently omitted from this lame DEIS???***
- *See all previous comments in this letter and previous Scoping Comments.*
- *We refer you to the 2019 Wilson Ihrig report that includes their 2014 report on measurements taken at local homes documents adverse impacts from existing turbines that are only about ½ the size of Campo Wind and Torrey Wind turbines and are proposed 3-4 times closer than the existing turbines are to already impacted homes.*
- *Mitigation can include removing or relocating turbines that are too close to homes, curtailing turbines during high-wind events and during hours that create shadow flicker at impacted properties.*
- *Who is in charge and how can you sleep at night? We certainly can't!*

MM-TRA-2 Repair and Restoration of Roads:

- Terra-Gen should be required to pave all roads to reduce dust / air pollution and erosion for life of the project, including BIA 10 where O&M, Laydown Yards, and Batch Plants are proposed immediately adjacent to private properties on the south eastern boundary.

O7-7 Cont.

WHERE IS THE MITIGATION FOR OPERATIONAL NOISE THAT WILL BE GENREATED DURING THE LIFE OF THE PROJECT??

Mitigation for avian collisions can and should include something like IndentiFlight, that automatically shuts down a turbine if a large bird gets too close

APPENDIX R-LIST OF PREPARERS:

- The list of preparers fails to identify the preparers specific qualifications or which portion of the DEIS they focused on or are responsible for.

PERSONS & LIST OF ORGANIZATIONS CONTACTED:

- **BIA NEPA GUIDEBOOK (2012) 8.4.11: (emphasis added)** "***List of Preparers List all persons, with position title and area of expertise/discipline, who contributed to the development of the EIS***"[49].
    - What tribal position does Michael Connolly currently hold other than 'tribal member'?
    - Was Connolly acting in his capacity as virtual CEPA Director, or as paid consultant with his firm Laguna Resource Services, Inc, which has had a hand in most if not all major Campo Reservation projects?

[49] https://www.bia.gov/sites/bia.gov/files/assets/public/raca/handbook/pdf/59_IAM_3-H_v1.1_508_OIMT.pdf

- Lisa Gover's name is misspelled as 'Grover', and her CEPA position is not identified.
- The County positions held by Darin Neufeld, Bronwyn Brown, and Greg Kazmer, are not identified. What are their titles, positions and areas of expertise/discipline?

Overall, the DEIS is vastly inadequate and alarming in many ways. It is a shameful and negligent sham and should be withdrawn, revised with necessary information and recirculated, unless the Campo General Council votes to terminate Campo Wind as they can and should do. We are with them.

##

Attachments:

- SDG&E's ECO Substation Amended Water Supply Plan July 3, 2013
- Bethany (NY) Wind Turbine Subcommittee Report (this report is dated but still includes some very important information)
- Dudek v Ponce summary

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Cont.

SAN DIEGO GAS & ELECTRIC COMPANY

EAST COUNTY SUBSTATION PROJECT
AMENDED CONSTRUCTION WATER SUPPLY PLAN

REVISED JULY 3, 2013

PREPARED BY:

BETA

PREPARED FOR:

SDGE

A Sempra Energy utility℠

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Cont.

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LIST OF ATTACHMENTS

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1 – INTRODUCTION

This Construction Water Supply Plan (Plan) describes how San Diego Gas & Electric Company (SDG&E) and its contractors will ensure the availability of one or more confirmed and reliable water sources that, when combined, meet the full water supply needs for construction of the East County (ECO) Substation Project (Project). The Project involves the construction of a new 500/230/138 kilovolt (kV) ECO Substation, rebuild of the Boulevard Substation in a new location, and construction of an approximately 14-mile-long 138 kV transmission line, consisting of overhead and underground segments in southeastern San Diego County.

This Plan was prepared in accordance with Mitigation Measure (MM) HYD-3 of the Mitigation Monitoring, Compliance, and Reporting Program for the Project, which includes a requirement to submit documentation that identifies one or more reliable water sources that, when combined, will meet the Project's full water supply needs during construction.

2 – OBJECTIVES

The purpose of this Plan is to provide a narrative description of how MM HYD-3 is met, including the attachment of separate documents fulfilling the documentation requirement of the MM. The construction water supply sources presented in this Plan accomplish the following objectives:

- Provide a reliable source of construction water to be supplied at a rate required to meet the Project schedule objectives
- Provide documentation from one or more water/utility districts indicating the total amount of water to be provided and the time frame that the water will be made available to support the Project
- Provide documentation from one or more groundwater sources demonstrating SDG&E's ability to legally use water from the source and a study discussing the required elements of MM HYD-3

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Cont.

3 – MITIGATION MEASURE

The full text of MM HYD-3 is provided in the following paragraphs:

HYD-3: Identification of sufficient water supply
Prior to construction SDG&E will prepare comprehensive documentation that identifies one or more confirmed, reliable water sources that when combined meet the project's full water supply construction needs. Documentation will consist of the following:

Preparation of a Groundwater Study. For well water that is to be used, the applicant will commission a groundwater study by a qualified hydrogeologist to assess the existing condition of the underlying groundwater/aquifer and all existing wells (with owner's

permission) in the vicinity of proposed well location/water sources. The groundwater study will evaluate aquifer properties and aquifer storage. The groundwater study will estimate short and long-term well water supplies from each well proposed to be used, and documentation indicating that each well is capable of producing the total amount of water to be supplied for construction from each well. The groundwater study will estimate short- and long-term impacts of the use of the well(s) on the local groundwater production (short-term extraction for construction water and ongoing O&M water), on all project wells, and on other wells in the project area. The groundwater study will include an assessment of the potential for subsidence brought on by project-related water use in the area. The applicant will provide demonstration of compliance will all applicable laws and regulations and will obtain a County of San Diego Major Use Permit for use of any proposed well within the County's jurisdiction prior to construction.

Documentation of Purchased Water Source(s). For water that is to be purchased from one or more water/utility district(s), the applicant shall provide written documentation from such district(s) indicating the total amount of water to be provided and the time frame that the water will be made available to the project. The Sweetwater Authority has provided written confirmation of water availability to support the project. Total confirmed water supplies from the combination of above documented sources shall equal the total gallons of water needed through construction of the project.

4 – CONSTRUCTION WATER SUPPLY NEEDS

O7-8 Cont.

The Project requires construction water for the following activities:

- Dust control
  - Substation pads and access roads
  - Transmission line access roads and tower pads
  - Construction yards
  - Pull sites, guard structure locations and other Project components

- Compaction of earth fill
  - Substation pads and access roads
  - Transmission line access roads and tower pads
  - Backfill of underground transmission line trenches

- Concrete pouring and washout
  - Underground transmission line duct banks

- Other miscellaneous activities
  - Restoration of Project sites and temporary irrigation equipment
  - Equipment/vehicle washing for weed control

The total estimated quantity of construction water required to construct the Project is approximately 50 million gallons over the 16-month construction period. Construction water

will be required at a relatively low rate at the beginning and end of construction and will peak during mass grading of the ECO Substation pad. The peak daily rate of construction water use will be approximately 500,000 gallons. Construction water will be delivered to on-site storage facilities that will allow water to be delivered at a lower rate than the peak daily consumption rate. On-site storage facilities include the permanent detention basin described in Attachment A: Updated Project Description and ECO Substation Alternative Site, which was submitted to the California Public Utilities Commission (CPUC) on March 4, 2011, as part of SDG&E's comments on the Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS). The permanent detention basin will be constructed during initial mass grading activities and will be lined to provide water storage during the later stages of pad grading and throughout construction of the ECO Substation. The maximum daily rate of water delivered to the Project will be on the order of approximately 300,000 gallons.

5 – CONSTRUCTION WATER SUPPLY SOURCES

The following have been identified and determined to be viable and reliable sources that will provide all of the construction water needs for the Project:

5.1 WATER/UTILITY DISTRICTS

- City of San Diego
  - Maximum total volume: 50 million gallons
- Jacumba Community Service District
  - Maximum total volume: 15 million gallons
- Live Oak Springs Water Company
  - Maximum total volume: 35 million gallons

O7-8 Cont.

A service confirmation letter, which is included as Attachment A: Service Confirmation Letter, City of San Diego, was issued from the City of San Diego Water Department confirming that 50 million gallons of water will be made available during construction of the Project. In addition, service confirmation letters have been issued from Jacumba Community Service District and Live Oak Springs Water Company, which are included as Attachment B: Service Confirmation Letter, Jacumba Community Service District Administrative Code and Attachment C: Service Confirmation Letter, Live Oak Springs Water Company, respectively.

SDG&E has also received a copy of Jacumba Community Service District's Domestic Water Supply Permit from the California Department of Health Services, which is included as Attachment D: Domestic Water Supply Permit, California Department of Health Services. The California Department of Health Services confirmed that the Jacumba Community Service District water system meets the criteria for and is classified as a community water system, as discussed on page 2 of the Domestic Water Supply Permit.

The San Diego County Zoning Ordinance requires a Major Use Permit (MUP) for "Groundwater Extraction Operations"; however, the ordinance excludes public water systems permitted by the Department of Health Services from the definition of a Groundwater Extraction Operation. Moreover, Government Code Section 53091(e) provides that "zoning ordinances of a county or

city shall not apply to the location or construction of facilities for the production, generation, storage, treatment or transportation of water," which exempts local agencies from applicable county or city zoning ordinances. As a result, an MUP for groundwater extraction located within the Jacumba Community Service District is not required from the County of San Diego. Confirmation from the County of San Diego that an MUP is not required is included as Attachment E: Withdrawal of Major Use Permit Application, County of San Diego.

5.2 GROUNDWATER SOURCES

- Wells located on the southeastern portion of the Campo Indian Reservation
  - Maximum total volume: 53.75 million gallons

A groundwater study and summary report, included as Attachment F: Environmental Navigation Services Inc. Report, was prepared by a qualified hydrogeologist to assess the existing condition of the underlying groundwater/aquifer and all existing wells located in the southeastern portion of the Campo Indian Reservation. The study evaluated the aquifer properties and storage capacity and found that the aquifer contained sufficient groundwater to support extraction of up to 53.75 million gallons during construction without impacting short- or long-term local groundwater production or wells in the Project area. The study also addressed the potential for subsidence.

Attachment 4 to Attachment F: Environmental Navigation Services Inc. Report includes a letter from Muht-Hei, Inc. confirming the legal authority of the Campo Band of Mission Indians to sell water for use off reservation for construction purposes without an MUP from San Diego County. This interpretation is consistent with San Diego Zoning Ordinance Section 1006(c), which states that "the Zoning Ordinance shall not apply to Indian Reservation lands within the County of San Diego."

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Cont.

The Final EIR/EIS estimated that construction of the Project would require the use of approximately 30 million gallons of water during construction. Although this Plan discusses an increase in the estimated amount of water needed for construction of the Project, this amount is still consistent with the analysis of impacts in the Final EIR/EIS.

6 – PLAN IMPLEMENTATION

Implementation of this Plan will be achieved by pre-construction planning in the following sequence:

1. Identify potential construction water sources
2. Investigate availability and deliverable water volume for each potential source
3. Obtain a groundwater study performed by a qualified hydrogeologist for all groundwater sources
4. Confirm compliance with all applicable laws and regulations
5. Execute service agreements with each approved source prior to construction

All of the sources identified in this Plan have been determined to be available sources with the deliverable quantities listed in Section 5 – Construction Water Supply Sources. It is anticipated

that two or more of these sources will be used during construction. The overall goal is to use the sources closest to the Project site to minimize transportation costs and impacts.

Construction water from the City of San Diego Water Department is assumed to be available at any time over the entire construction period of the Project, and by itself would be able to supply the entire construction water quantity for the Project, but requires long-distance trucking to the site. The Jacumba Community Service District, Live Oak Springs Water Company, and Campo Indian Reservation have been confirmed as compliant with applicable laws and regulations to provide water for construction of the Project, as discussed in Section 5 – Construction Water Supply Sources. In addition, the associated service confirmation letters and groundwater study have been included as attachments to this Plan. The Jacumba Community Service District, Live Oak Springs Water Company, and Campo Indian Reservation are much closer to the Project site, and will be utilized together with water from the City of San Diego to meet the peak daily volume requirements. These sources collectively provide sufficient capacity to meet the Project's construction water needs.

SDG&E will document compliance with MM HYD-3 throughout construction through submittal of a monthly water consumption report to the CPUC.

7 – MONITORING PLAN

Non-water utility/districts (i.e., Campo Indian Reservation) that are not subject to regulation by Title 22 of the California Code of Regulations (CCR) Section 64554, New and Existing Source Capacity, will implement monitoring to assess potential impacts to water levels and sensitive groundwater ecosystems. All groundwater production wells supplying construction water and existing residential/monitoring wells within the 0.5-mile radius of the production wells will be monitored. In the event that a property owner chooses to not participate in the monitoring program, documentation will be provided to the CPUC indicating that the property owner chose to not participate in the testing program.

O7-8 Cont.

Each groundwater production well will be fitted with a meter to document the volume of water pumped. Volumes will be recorded on a daily basis during production and reported weekly to the CPUC. In order to monitor long-term water level trends, pressure transducers will be installed in each groundwater production well and residential/monitoring wells. The pressure transducers will be programmed to record measurements every 15 minutes. In addition to these automatically recorded water level measurements, manual depth-to-water measurements will be taken at each well on a monthly basis during periods of groundwater pumping using a water level sounder. The date and time of measurement, the measuring point elevation (in feet above mean sea level), and the status of well pumping will be recorded, along with depth-to-water measurements. Water level elevation will be calculated by subtracting the depth-to-water measurement from the measuring point elevation. All water level data will be provided to the CPUC on a monthly basis in a digital format (e.g., Microsoft Excel) for the duration of the Project.

8 – REFERENCES

County of San Diego. Zoning Ordinance. Online. http://www.sdcounty.ca.gov/dplu/zoning/index.html. Site visited September 24, 2012.

ECO Substation Project. Final Environmental Impact Report/Environmental Impact Statement. 2012. Online. http://www.cpuc.ca.gov/environment/info/dudek/ECOSUB/ECO_Final_EIR-EIS.htm. Site visited May 23, 2012.

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ATTACHMENT A: SERVICE CONFIRMATION LETTER, CITY OF SAN DIEGO

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Cont.

THE CITY OF SAN DIEGO

January 11, 2013

Mr. Don Houston
Environmental Project Manager
San Diego Gas & Electric

Dear Mr. Houston:

The City of San Diego Public Utilities Department (PUD) has been contacted by San Diego Gas & Electric (SDG&E) regarding construction of the SDG&E East County Substation Project (Project) located near Jacumba, California. The Project will require construction water for grading, fire suppression, dust control and other construction related activities. The permitting authority for the Project, the California Public Utilities Commission (CPUC), requires that SDG&E and its contractors obtain written documentation from all potential sources of construction water stating that a specific quantity of water will be available for use on the Project during a specified period of time.

PUD issued a Fire Hydrant Meter Permit (Permit) to SDG&E's construction contractor, Beta Engineering, on November 14, 2012. The Permit includes a meter install date of November 26, 2012, and is valid for 1 year. An extension may be requested by the applicant prior to expiration of the Permit.

At the request of SDG&E, PUD hereby confirms that up to 50 million gallons of water shall be available for Project use during the period November 26, 2012 through November 26, 2013. Upon approval of an extension of the Permit, the use period may be extended through November 26, 2014.

Walter Cooke
Water Production Superintendent
Public Utilities Department, System Operations Division

TF\jm

cc: Jesus Meda, Deputy Director, PUD, System Operations Division
Stan Medina, Deputy Director, PUD, Construction and Maintenance Division
Johnny Mitchell, Water Systems District Manager, PUD, Construction and Maintenance Division

Public Utilities Department
2797 Caminito Chollas • San Diego, CA 92105-5097
Tel (619-) 527-7470 Fax (619) 527-8098

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ATTACHMENT B: SERVICE CONFIRMATION LETTER, JACUMBA COMMUNITY SERVICE DISTRICT ADMINISTRATIVE CODE

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JACUMBA COMMUNITY SERVICE DISTRICT
JACUMBA COMMUNITY PARK
1266 RAILROAD STREET
PO BOX 425
JACUMBA, CA 91934
(619)766-4359 PHONE
(619)766-9061 FAX

October 2, 2012

Beta Engineering California LP
9990 Mesa Rim Road, Suite 150
San Diego, CA 92121

Attn: Brian Donald, PE
Project Manager

Subject: **SDG&E East County Substation Project**
Construction Water

Dear Donald,
Jacumba Community Service District has been contacted by Beta Engineering regarding construction of the SDG&E East County Substation project located near Jacumba, California scheduled to begin in the near future. The project will require construction water for grading and dust control activities. The permitting authority for the project, the California Public Utilities Commission (CPUC), requires that SDG&E and its contractors obtain documentation from all potential sources of construction water stating that a specific quantity of water will be available for the project construction over a specific time period.

Jacumba Community Service District understands that Beta Engineering is exploring the feasibility of several sources of construction water for the project. It is possible that a significant portion of the construction water needs will be met by obtaining commitments from these other sources.

At the request of Beta Engineering, Jacumba Community Service District hereby confirms that up to 15 million gallons of non potable water, dependent on the water table will be available for project use from the Jacumba Community Service District over a 20 month period beginning November 1, 2012 ending on July 1, 2014.

Sincerely,
Jacumba Community Service District

Tom Lindenmeyer
General Manager

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ATTACHMENT C: SERVICE CONFIRMATION LETTER, LIVE OAK SPRINGS WATER COMPANY

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Live Oak Springs Water and Power Company
37820 Old Highway 80, P.O. Box 1241, Boulevard, CA 91905 * 619-889-8666
nazar@liveoaksprings.com

October 26, 2012

Beta Engineering California LP

Attn: Brian Donald, PE
Project Manager

Subject: East County Substation Project
Construction Water

Dear Mr. Donald,

This is confirmation that water is available at Live Oak Springs Water Company.

Live Oak Springs Water Company has been contacted by Beta Engineering (BETA) regarding construction of the SDG&E East County Substation project located near Jacumba, California scheduled to begin in the near future, and as we understand it water sold to Beta by LOSWC would be used for grading, dust control and other construction related activities.

Based on our experience and production of water for other projects in the past, Live Oak Springs Water Company confirms that up to 35 million gallons of water or more will be available for project use from the Live Oak Springs Water Company over a 20 month period beginning November 1, 2012 and ending on July 1, 2014, or later.

Sincerely,

Nazar Najor

Nazar Najor, Manager
Live Oak Springs Water Company

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ATTACHMENT D: DOMESTIC WATER SUPPLY PERMIT, CALIFORNIA DEPARTMENT OF HEALTH SERVICES

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State of California—Health and Human Services Agency

Department of Health Services

California
Department of
Health Services

DIANA M. BONTÁ, R.N., Dr. P.H.
Director

GRAY DAVIS
Governor

December 30, 2002

Tom Lindenmeyer
General Manager
PO Box 425
Jacumba, CA 91934

Dear Mr. Lindenmeyer:

JACUMBA COMMUNITY SERVICE DISTRICT - SYSTEM NO. 3710011
FULL SYSTEM PERMIT (NO. 05-14-02P-015)

The State Department of Health Services has issued a domestic water supply permit for the Jacumba Community Service District. The permit and engineering report are enclosed. Please advise the Department in writing within 30 days if you do not agree to the permit or the permit conditions.

If you have any questions regarding this letter, please contact Roger Keister at (619) 645-2573 or myself at (619) 525-4497.

Sincerely,

Brian Bernados

Brian Bernados, P.E.
District Engineer
San Diego District

cc: County of San Diego, Department of Environmental Health

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STATE OF CALIFORNIA

DEPARTMENT OF HEALTH SERVICES

Certificate of Issuance

OF A

WATER SUPPLY PERMIT

TO

JACUMBA COMMUNITY SERVICE DISTRICT

This is to certify that a water supply permit (**Permit # 05-14-02P-015**) has been issued to the Jacumba Community Service District on **September 30, 2002**, to supply water for domestic purposes to the City of Jacumba. The permit was issued by the Department of Health Services, pursuant to the provisions of Division 104, Part 12, Chapter 4, Article 7, of the California Health and Safety Code. The permit is subject to the requirements of Title 22, California Code of Regulations, and to the conditions provided in the water supply permit.

A copy of the water supply permit is on file with the Jacumba Community Service District or may be obtained by contacting the San Diego District Office of the Department of Health Services, Drinking Water Field Operations Branch, 1350 Front Street, San Diego, CA 92101.

Brian Bernados

Brian Bernados P.E., San Diego District Engineer

STATE OF CALIFORNIA

DOMESTIC WATER SUPPLY PERMIT

Issued To

JACUMBA COMMUNITY SERVICE DISTRICT

3710011

By The

California Department of Health Services,

Division of Drinking Water & Environmental Management Branch

PERMIT NUMBER 05-14-02P-015 **DATE:** 12/30/2002

WHEREAS:

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Cont.

1. The Jacumba Community Service District water system was inspected on December 13, 2002, by the California Department of Health Services to issue a new public water system permit.

2. This public water system is known as the Jacumba Community Service District whose headquarters is located on 1266 Railroad Street, Jacumba, CA 91934.

3. The legal owner of the Jacumba Community Service District water system is the Jacumba Community Service District. The Jacumba Community Service District, therefore, is responsible for compliance with all statutory and regulatory drinking water requirements and the conditions set forth in this permit.

4. The public water system is as described briefly below (a more detailed description of the permitted system is described in Section 1.3 of the attached Permit Report):

   The water system is a small community water system that supplies water for domestic purposes to approximately 500 residents through 234 service connections. The Jacumba Community Service District obtains water from two wells. The primary source is well No. 4 and well No. 5 is the secondary source. The District maintains 2 different pressure zones with 1 booster station and one 0.2 MG bolted steel reservoir for storage of treated water. There are no interconnections with any other water system.

5. The service area of the Jacumba Community Service District shall be discussed in section 1.5 of the Permit Report.

And WHEREAS:

1. The Jacumba Community Service District has submitted all of the required information relating to the proposed operation of the Jacumba Water System.

2. The California Department of Health Services has evaluated all of the information submitted by the Jacumba Community Service District.

3. The California Department of Health Services has the authority to issue domestic water supply permits pursuant to Health and Safety Code Section 116540.

THEREFORE: The California Department of Health Services has determined the following:

1. The Jacumba Community Service District water system meets the criteria for and is hereby classified as a community water system.

2. The water system has demonstrated that Jacumba Community Service District water system has sufficient source capacity to serve the anticipated water demand for at least 5 years.

3. The design of the water system complies with the Water Works Standards and all applicable regulations except that Well No. 4 does not have a 50 ft. sanitary seal.

4. Provided the following conditions are complied with, the Jacumba Community Service District water system should be capable of providing water to consumers that is pure, wholesome, and potable and in compliance with statutory and regulatory drinking water requirements at all times.

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Cont.

THE JACUMBA COMMUNITY SERVICE DISTRICT IS HEREBY ISSUED THIS DOMESTIC WATER SUPPLY PERMIT TO OPERATE THE JACUMBA COMMUNITY SERVICE DISTRICT WATER SYSTEM.

The Jacumba Community Service District (District) shall comply with the following permit conditions:

Safe Drinking Water Act

1. The District shall comply with all State laws applicable to the District, including, but not limited to the Health and Safety Code and any regulations, standards, or orders adopted there under.

Approved Sources & Treatment

2. This permit authorizes the District to use the following sources: Well No. 4 as the primary source and Well No. 5 as a standby source.

Source	Status	Capacity	PS Code
Well No. 4	Active	200 gpm	3710011-004
Well No. 5	Standby	180 gpm	3710011-005

3. The District shall provide reliable chlorination for Wells No. 4 and Well No. 5 at all times. The only approved treatment includes the following process:

Facility	Treatment	Location/Remark
Chlorinator	Sodium Hypochlorite	At Well Head

O7-8 Cont.

4. The District will generate an Emergency Chlorination Plan and submit a copy to the Department by March 31, 2003.

5. No changes, additions, or modifications shall be made to the sources or treatment in Provisions No. 2 and 3 unless an amended water permit has first been obtained from the Department.

6. By July 1, 2003, the District shall drill, equip, and test a new well.

Maximum Contaminant Levels

7. All water supplied by the District for domestic purposes shall meet all Maximum Contaminant Levels (MCLs) established by the State Department of Health Services. If the water quality does not comply with the California Drinking Water Standards, treatment shall be provided to meet standards.

Cross-Connection Control Program

8. The District must submit a copy of their cross-connection control ordinance to the Department by March 31, 2003.

9. The District must establish a contract with a certified cross-connection control specialist by March 31, 2003.

10. The District shall maintain an active cross-connection control program in accordance with the Regulations Relating to Cross-Connections, California Code of Regulations, Title 17. All cross connections shall be abated within 30 days of their identification.

Annual surveys shall be conducted thereafter. Backflow prevention devices shall be tested at least yearly. The District shall submit an annual report to the Drinking Water Field Operations Branch system outlining the cross-connection control program for the previous year including the name and certification of the person assigned to the program, number of inspections made, number of backflow devices installed in the system and the number of devices tested and repaired.

Water Quality Monitoring

11. The District shall generate a Disinfectants/Disinfection Byproduct rule monitoring plan by March 31, 2003.

12. Prior to using a new source, and to continue using the existing source for domestic purposes, bacteriological and complete chemical analysis of the water produced, including general mineral, general physical, inorganic chemicals, nitrates, and nitrites shall be submitted to the SDHS-DWFOB, San Diego District Office, to determine compliance with the California Drinking Water Quality Standards. The analyses shall be made by an approved laboratory and shall be submitted on state approved forms

13. Prior to using a new well the District shall obtain and submit to the Department, copies of the geological logs (State Well Driller's Report), completed well data forms and plot plan of the well sites showing all sources of contamination within 200 feet of the wells.

14. The District shall monitor the distribution system for bacteriological water quality according to a Department-approved Coliform Sample Siting Plan. A bacteriological analyses report shall be submitted to this office by the tenth of the month following sampling signed by the Manager, Superintendent, or Chief Operator including a list of water quality complaints and any reports of waterborne illnesses received from consumers.

O7-8 Cont.

15. Pursuant to CCR, Title 22, Section 64451, all water quality monitoring results obtained in a calendar month shall be submitted to the Department on paper by the tenth day of the following month.

16. Pursuant to CCR, Title 22, Section 64451, all chemical analysis shall be performed by a State-certified laboratory. The District must require their contract laboratory to report water quality results to the Department using Electronic Data Transfer (EDT) using the Primary Station Code (PS_Code). This requirement excludes bacteriological monitoring, which shall be submitted directly to the Department on paper.

17. The District shall contact this office by phone concerning any acute violation or the occurrence of a hazardous situation in a timely manner. MCL violations will require public notification and corrective action.

Storage Reservoirs Basic Design

18. The storage reservoirs shall comply with the California Waterworks and American Water Works Association (AWWA) design and construction standards. Distribution reservoirs shall be covered. Vents, overflows, drain outlets and other openings shall be located and constructed to protect the water in the reservoir from contamination. Vents and overflows shall be screened and adequately air-gapped to prevent cross-connections. Overflows shall be large enough to dispose of reservoir overflow rates equal to the maximum reservoir-filling rate. Provisions shall be made to facilitate removal of floating material from the free water surface and for dewatering the

reservoir. Outlets shall be designed and constructed to minimize movement of sediment from the reservoir floor to the distribution system water mains. Provisions shall be made for isolating the reservoir(s) and appurtenant facilities from the distribution system without causing pressure problems in the distribution system.

19. Distribution reservoir sites shall not be used for non-water works purposes that would either result in unrestricted public access, compromise security, or create a contamination hazard.

20. Reservoirs shall be disinfected and sampled for bacteriological quality in accordance with the AWWA procedures for disinfecting tanks and reservoirs prior to domestic use.

Storage Reservoir Coating/lining

21. The District shall use only NSF drinking water approved reservoir coatings, linings and their adhesives for its storage reservoirs. Otherwise, a VOC sample shall be collected after the newly coated/lined reservoir is filled and a minimum 5 day soaking period is allowed. In addition to the chemicals on the standard list (Method 524) analyses shall be made for ortho-Xylene, para-Xylene, meta-Xylene, methylethylketone (MEK), methylisobutylketone (MIBK) and any other solvent in the coating/lining adhesive included in the material Safety Data Sheet (MSDS) must also be included in the sample analysis. The results of the VOC analysis must be submitted to the Department.

Distribution System

22. The distribution system shall comply with all applicable California Waterworks and American Water Works Association (AWWA) design and construction standards and in compliance with the SDHS-DWFOB Guidelines for the Separation of Water and Sewer Lines. At least 10 feet horizontal and 1-foot vertical separation shall be maintained between the water and sewer lines. Water lines should always cross above sewer lines. Special construction standards and materials shall be provided where the minimum separation cannot be met.

O7-8 Cont.

Direct Additives

23. Pursuant to CCR, Title 22, Section 64700, no chemical or product shall be added to the drinking water as part of the treatment process unless it has been certified as meeting the specifications of the American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 60.

Annual Report to DHS

24. The District shall submit the Annual Report on the status and condition of the domestic water system as directed by the Department.

This permit supersedes all previous domestic water supply permits issued for this public water system and shall remain in effect unless and until it is amended, revised, reissued, or declared to be null and void by the California Department of Health Services. This permit is non-transferable. Should the Jacumba Community Service District water system undergo a change of ownership, the new owner must apply for and receive a new domestic water supply permit.

Any change in the source of water for the water system, any modification of the method of treatment as described in the Permit Report, or any addition of distribution system storage

reservoirs shall not be made unless an application for such change is submitted to the California Department of Health Services.

This permit shall be effective as of the date shown below.

FOR THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES

Brian Bernados

Brian Bernados, PE
District Engineer

Dated: 12-30-02

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ATTACHMENT E: WITHDRAWAL OF MAJOR USE PERMIT APPLICATION, COUNTY OF SAN DIEGO

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ERIC GIBSON
DIRECTOR

County of San Diego

DEPARTMENT OF PLANNING AND LAND USE

5201 RUFFIN ROAD, SUITE B, SAN DIEGO, CALIFORNIA 92123-1666
INFORMATION (858) 694-2960
TOLL FREE (800) 411-0017
www.sdcounty.ca.gov/dplu

November 21, 2011

ESJ U.S. Transmission LLC.
Alberto Abreu, Director Project Development
Sempra Global
101 Ash Street, HQO8B
San Diego, CA 92101

WITHDRAWAL OF MAJOR USE PERMIT APPLICATION

CASE NUMBERS: 3300-10-014 (P); ER. 09-22-001 PROJECT NAME: ESJ-US Generation-Tie Line Project; Old Highway 80, Jacumba, Mountain Empire Subregional Planning Area; APN; 660-040-32

O7-8
Cont.

Dear Mr. Abreu:

The Department of Planning and Land Use (DPLU) has determined that the Major Use Permit for groundwater extraction located within the Jacumba Community Service District is not required. The zoning ordinances of a county or city shall not apply to the location or construction of facilities for the production, generation, storage, treatment, or transmission of water….." Gov. Code, section 53091(e). This exemption applies to the facilities of public agencies, such as water districts. Therefore, the County has withdrawn your Major Use Permit Application and has reversed $3060 back to your trust PLU trust account 09-0107420, for the time spent processing the application. If you have any questions or need additional information, please contact me at (858) 694-301, Patrick Brown or at Patrick.Brown@sdcounty.ca.gov

Sincerely,

Patrick P. Brown

Patrick Brown, Project Manager
Project Planning Division

cc: AECOM, Inc. Michael Page, 1420 Kettner Boulevard, Suite 500, San Diego, CA 92101
Ed Sinsay, Team Leader, Department of Public Works, M.S.O650
David Sibbet, Planning Manager, Department of Planning and Land Use M.S.O650

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ATTACHMENT F: ENVIRONMENTAL NAVIGATION SERVICES INC. REPORT

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Cont.

Mr. Jed Francis
Jed Francis, Inc. (JFI)
9530 Haggeman Road
Bakersfield, CA 93312

June 14, 2013
8 pages plus attachments

RE: Evaluation of Short-term Construction Water Supply Obtained from the Southeastern Portion of the Campo Indian Reservation.

ENSI has prepared this summary report per your request to evaluate the potential short-term water supply using water wells located within the southeastern portion of the Campo Indian Reservation (**Figures 1 and 2**, the "Site"). This is an area that has been considered to be used to provide construction water for the previously-proposed Campo Landfill, and for the Shu'luuk Wind Project. It is understood that the Shu'luuk Wind Project will not require water for the next two years and the Campo Kumeyaay Nation Government (formerly known as the Campo Band of Mission Indians) has recently approved the use of the Site for your commercial purposes.

Under consideration by JFI is a contract to supply construction water to support the construction of a SDG&E electrical power substation known as the East County (ECO) Substation Project[1]. The 58-acre substation will be located at 47317 Old Highway 80, Jacumba, between Interstate 8 and the U.S./Mexico Border. It is understood the Project will require 150 AcFt of water over an approximately 2-year construction period. Thus this evaluation considers the short-term (maximum 2-year, potentially less) production of non-potable construction water from the Site. Water requirements are expected to vary over time, with the bulk of the water needed this year. The proposed groundwater demand is estimated to be 165 AcFt, assuming an additional 10% to allow for losses prior to use.

O7-8 Cont.

This summary is intended to provide the information request described in mitigation measure MM HYD-3, associated with the San Diego Gas & Electric East County Substation Project (Application A.09-08-003) Final Environmental Impact Report/Environmental Impact Statement. A description of MM HYD-3 is included as **Attachment 1**.

The proposed water supply is located within 1,462 acre watershed within a sparsely inhabited portion of the Camp Indian Reservation. Multiple wells are available for use within the central portion of the watershed (**Figure 2**). As further detailed in this summary report the aquifer system is primarily comprised of highly weathered granitic rock (tonolite) with a storage capacity of 2,559 acre-feet (AcFt[2]). Annual rainfall in the watershed is approximately 15 inches per year, with an annual average recharge rate of 230 AcFt/yr. Based on review of the potential impact of short-term (maximum 2-year) groundwater use, 165 AcFt can be obtained from the Site without significant impacts. Over two years the current residential and proposed demand would total 177 AcFt, approximately equal to the long-term annual extraction rate of 173 AcFt/yr determined from long-term historical rainfall data and recharge rates further described in **Attachment 2**.

[1] A Project description is available at: http://www.sdge.com/key-initiatives/eco-substation/eco-substation-project
[2] This summary reports water volume in acre-feet, the amount of water that can cover one acre to a depth of one foot (approx.. 326,000 gallons). For reference 165 AcFt would be required to irrigate approximately 40 to 55 acres of alfalfa.

Included in this summary letter is supporting information specific to:

- Aquifer Description, Recharge, and Storage
- Proposed Water Supply Wells
- Groundwater Demand and Potential Impact of Pumping
- Potential for Subsidence
- Compliance with Laws
- Conclusion

It is based on the following:

- *Water Supply Evaluation Proposed Campo Landfill Project.* Dated October 8, 2008. Prepared for BLT, Inc. Prepared by Environmental Navigation Services, Inc. (ENSI, 2008) This report was included in the Draft Campo Regional Landfill Supplemental EIS, dated February 2010, prepared by the US Bureau of Indian Affairs (BIA).

  The ENSI (2008) report evaluated whether the proposed landfill project demand could be met over the 30 year landfill operation period - it did not examine the maximum sustainable water extraction rate.

- Re-examination of the impact of water production described in ENSI, 2008 to examine the long-term sustainable pumping rate using significance criteria currently used by the County of San Diego Department of Planning and Land Use. The 2008 study was also updated to include rainfall date through June 2013. The long-term rate of water extraction for the Site has been determined to be 173 AcFt/year for the 1,462 acre watershed.

  Relevant portions of the previous report have been revised, together with updated water balance calculations (Excel spreadsheets), and are included in **Attachment 2**.

- Recent well testing and preparation work conducted by JFI specific to existing wells HG-21A, and HG-60. These wells have a combined tested capacity of 160 gpm, or 256 AcFt per year. Additional capacity may also be provided by well HG-31 and other wells available for use within the area depicted in **Figure 2**. [**Attachment 3**]

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Aquifer Description, Storage, and Recharge

Aquifer Description

The water supply is based on a 1,462-acre watershed located within the southeastern portion of the Campo Indian Reservation (**Figure 2**). Field observations demonstrate the rock exposed within the watershed is a highly weathered granitic rock known as tonolite. The area is generally covered in soils developed in place by extensive weathering (**Figure 3**), with limited exposures/outcrops of rock. The surficial rock, locally described as decomposed granite (DG), transitions with depth to unweathered rock.

From a hydrogeologic perspective, the aquifer (or hydrogeologic unit) is entirely within one granitic rock type- tonolite. Groundwater within the aquifer system is generally described to occur under unconfined conditions with the majority of groundwater in storage occurring within the DG. The depth to groundwater varies from approximately 8 to 90 ft below ground surface, and generally decreases (gets nearer to ground surface) in the lower elevations of the watershed. Water levels within the watershed vary seasonally in response to rainfall recharge that primarily occurs during winter.

Underlying the DG is unweathered bedrock. Water storage and transmission in the bedrock is comparatively limited due to fracture flow conditions. Variable confined to unconfined conditions are expected to occur depending on the interconnectivity of the fracture network and DG relative to wells completed in the aquifer system.

Groundwater Storage

Groundwater occurs in an aquifer system comprised of both weathered and unweathered tonolite (DG). This water supply analysis focuses on the extent and thickness of saturated DG because this is the portion of the aquifer that stores the majority of groundwater. The extent of saturated DG in the watershed is shown in **Figure 4** (from ENSI, 2008). For purposes of this water supply evaluation it is assumed that an average of 30 feet of saturated DG occurs in the watershed. The calculation is based on the contour map of the saturated thickness of DG in the watershed as follows:

Area 0 to 20 ft: 1462 acres, with an average of 5 ft of saturated DG
Area 20 to 60 ft: 671 acres, with an average of 40 ft of saturated DG
Area 60 to 100 ft: 222 acres, with an average of 80 ft of saturated DG
Area > 100 ft: 110 acres, with an average of 110 ft of saturated DG

O7-8 Cont.

Groundwater in storage is calculated based on the types and volume of rock as detailed in **Attachment 2** where DG has a storage capacity of 5%, and underlying rock has a storage capacity of 0.05% (by volume). In total the calculations support a storage capacity of 2,559 AcFt (2,193 AcFt in DG and 366 AcFt bedrock) within the 1,462 acre watershed.

Recharge

An annual average recharge rate of 230 AcFt/year has been calculated for the watershed using a monthly soil moisture balance methodology. Incorporated into the analysis are historical precipitation data (1945 to 2012), evapotranspiration rates, soil moisture capacity, and surface water runoff rates. The analysis was done using historical rainfall data for Campo, CA. Each month a calculation is made to compare the soil moisture content with the historical rainfall rate. The water is either returned to the atmosphere as evapotranspiration, leaves as runoff, or enters the subsurface as recharge when the soil moisture holding capacity is exceeded (i.e. the soil is 'wet'). Further description is included in **Attachment 2**.

The rainfall recharge rate varies monthly and seasonally. There are extended periods where rainfall is insufficient to sufficiently wet the soil and allow water to pass into the ground as recharge. Conversely, during 'wet' years when recharge significantly exceeds the pumping rate, storage is exceeded and recharge is effectively rejected.

The soil moisture balance methodology used here to determine historical recharge rates is based on the extent and type of soils within the watershed. The US Department of Agriculture's Natural Resources Conservation Service (NRCS, formerly known as the US Soil Conservation Service) maintains a library of soils maps for the area. (http://websoilsurvey.nrcs.usda.gov). **Figure 3** shows the surficial soils in the water supply watershed. All of these soils are derived from the in-place weathering of granitic rock and generally reflect the surficial geology. The soils data are further described in **Attachment 2**.

Recharge occurs across the watershed and may be enhanced by water that temporarily accumulates in washes and drainage channels. Stormwater flows following high-intensity rainfall events are infrequent and of short duration. There are no perennial streams or surface waters (ponds or lakes) within the watershed that would be affected by short- or long-term groundwater use.

Proposed Water Supply Wells

There are numerous groundwater monitoring/test wells within the watershed that were installed during the 1990s for a proposed landfill project. JFI has subsequently converted and tested two wells, HG-21A and HG-60, for production well use. These existing landfill monitoring/test wells were converted for use as water supply wells by enlarging the boreholes for the installation of inner well casing.

Follow-up pumping tests conducted by Thing Drilling Company of Alpine, CA have demonstrated short-term production rates of 60 gpm in HG-21A, and 100 gpm in HG-60. The two wells have a total capacity of 160 gpm, approximately 256 AcFt per year. HG-31, described by AECOM (2012)[3] is also available for use with a reported capacity of 25 gpm. Long-term well capacity rates may be less; however, additional wells such as HG-31 are available within the water supply area (depicted in **Figure 2**). Approximate locations are indicated in **Figure 2** - specific location information is considered confidential by the Tribal Government.

O7-8 Cont.

Operation of these two wells at an annual rate 165 AcFt/yr (the total project demand) would be at approximately 64% of their measured short-term capacity.

Groundwater Demand and Potential Impact of Pumping

Current Groundwater Demand

The Site area is sparsely inhabited as a large portion of the southeastern Reservation is commercially zoned and was reserved until recently for the construction of a regional landfill. The recent study conducted by AECOM (2012) for a similarly-sized watershed supports that there are 12 residence served by private wells within the watershed with an estimated demand of 6 AcFt/yr.

[3] Groundwater Resource Evaluation Shu'luuk Wind Project, Campo Reservation, Campo, San Diego County, California. Dated December 2012. (AECOM, 2012) Contained within a Draft Environmental Impact Statement Prepared for the Campo Band of Mission Indians and the Southern California Agency Bureau of Indian Affairs. Prepared by: AECOM, 7807 Convoy Ct, Suite 200 San Diego, California 92111.

Potential Impact of Pumping

Although the County of San Diego has no jurisdiction over land or groundwater use on the Reservation, *the County of San Diego's Groundwater Ordinance and Guidelines for Determining Significance – Groundwater Resources* were used as guidelines for the Site analyses[4]. The County Department of Planning and Land Use (DPLU) significance guidelines were generally developed for application to the California Environmental Quality Act (CEQA). There are two primary significance criteria to be addressed for the Site:

Criteria 1)
Will the short-term groundwater use cause the volume of water in groundwater storage drop to less than 50% of the aquifer capacity based on the projected pumping rates?

Criteria 2)
Will groundwater use cause off-Reservation water levels to drop more than 5%, based on well with 400 feet of water (in this case a 20 foot drop)?

In both cases the wellfield is conservatively assumed to operate for one year or less and pump 165 Acft of water.

Criteria 1 has been conservatively assessed using the water balance analysis described in **Attachment 2**. A maximum annual use of 173 AcFt/yr has been determined to be not significant for long-term pumping. A long-term aquifer water balance was calculated using the historical rainfall record based on the rate of recharge from the soil, the amount of water that can be stored in the aquifer, and the amount of water pumped from the aquifer on an annual basis. In any given year the volume of water in the aquifer will vary depending on the relative recharge rate and groundwater demand. If pumping demand is less than the recharge rate there is no change in groundwater storage. Years with recharge in excess of the aquifer storage and groundwater use lead to a condition where the excess recharge is rejected. Conversely, following periods of low rainfall, continued depletion of groundwater from storage occurs. The overall results of the long-term water balance calculation are shown in **Figure 5** for the 1462-acre watershed. The volume of water in storage decreases in years where the pumping rate exceeds recharge, but never to less than 50% of the aquifer volume as mandated by the DPLU significance criteria.

O7-8 Cont.

The long-term pumping rate is a conservative standard when applied to a 2-year project. Review of **Table 1** demonstrates that the short-term demand represent a small percentage of the overall aquifer storage, is less than the average annual recharge rate, and will be readily replenished by rainfall recharge. A rate higher than 173 AcFt/yr could be supported under Criteria 1 because this short-term water supply analysis differs from long-term sustainable water supply evaluation, for example those done locally for the County of San Diego Department of Planning and Land Use, in that it allows for short-term aquifer depletion provided that the water will be replenished by recharge within a period of a few years.

[4] Dated 3/19/2007 and available at: http://www.sdcounty.ca.gov/pds/procguid.html#Groundwater

Criteria 2 is addressed by examining the short-term impact of instantaneously pumping[5] 165 AcFt from the aquifer system without any offsetting rainfall recharge. Here the focus is on potential off-Reservation water level impacts. (For reference the closest off-Reservation point is 1,250 feet from the wellfield as depicted in **Figure 2**.) Water levels will change proportionally to the amount of groundwater storage, in this case water that is ultimately drained from the overlying DG portion of the aquifer system. The water level declines are greatest at the pumping wells, and form a 'cone of depression' where water levels changes diminish with distance away from pumping wells.

A 20 foot drop in water level within weathered rock (DG) with a storage coefficient of 5% corresponds to the pumping of one AcFt of water per acre. Thus for illustration if the pumping-related water level decline is evenly spread around an area being pumped, 165 acres would produce 165 AcFt with a less than significant 20-ft water level decrease absent any rainfall recharge. This is a conservative approximation- the water levels within the cone of depression will be higher than 20 feet within the well field and less than 20 feet at the outer limits of the pumping influence.

Here the primary concern is whether significant water level decline (i.e greater than 20 feet) will occur off-Reservation. The center of the wellfield area is approximately 2250 feet from the closest Reservation Boundary (to the southwest as shown in **Figure 2**). Thus potential on-Reservation pumping impacts could extend radially over an area of approximately 365 acres if a 2250 foot radius is extended around the center of the wellfield. Pumping would be within the 110 acre wellfield area shown in **Figure 2** within the Campo Reservation where the extent of saturated DG ranges from approximately 40 to 100 feet (see **Figure 4**). If the short-term demand of 165 acre-feet is combined with one year of residential use (6 AcFt) a total of 171 AcFt would be withdrawn from an approximately 365 acre area. Under this circumstance there would be an average water level drop of 9.4 feet over the area based on a 5% storage capacity, much less than the 20-ft significance criteria. Again this is a conservative assessment as the water level changes rapidly decrease with distance.

In summary the proposed 165 AcFt short-term demand (171 AcFt when combined with existing use and obtained in one year) is less than the 230 AcFt/yr annual rainfall, approximately 6% of the total aquifer storage capacity, can be obtained from the Reservation with no significant off-Reservation water level impacts, and is approximately the same as the long-term sustainable rate of 173 AcFt/yr. Based on these findings no mitigation monitoring is necessary. ENSI (2008) did recommend a monitoring program based on the considerations that the proposed project was to be implemented over a 30-year period and included a landfill that would have created a large impermeable area within the watershed and disrupt rainfall recharge.

O7-8 Cont.

[5] The overall volume and potential off-Reservation impact of pumping is generally the same independent of the production rate for the unconfined aquifer system.

Table 1. Summary of Hydrologic Water Balance Calculations

Watershed Area	1,462 acres	See Figure 2
Groundwater Storage (AcFt)	2,559	2,193 AcFt in Decomposed Granite (avg. saturated thickness of 30 feet) 366 from bedrock (avg. saturated thickness of 500 feet)
Average Annual Rainfall Rate (1945 to 2012)	14.58 inches/yr 1,776 Acft/yr in watershed	See Attachment 2
Average Annual Recharge Rate (1945 to 2012)	230 AcFt/yr	See Attachment 2
Long-term sustainable pumping rate	173 AcFt/yr	Based on maximum extraction of 50% of groundwater in storage, 1945 to 2012 (173 AcFt is 6.8% of total storage)
Proposed Extraction Rate and duration	165 AcFt	150 AcFt + 10% Over a maximum of two years.
One-year Extraction Rate, Including Existing Uses	171 AcFt/yr	Includes 6 AcFt/yr existing use for 12 residences.
Net Recharge (Recharge - Pumping)	+ 59 AcFt (1-year) + 283 AcFt (2-year)	If all water obtained in one year, or over two years (including existing use of 6 AcFt/yr)
Percentage of Storage Used (annual demand absent rainfall recharge)	6.4% 6.7% 6.8%	165 AcFt for project 171 AcFt for project and existing uses 173 AcFt based on 50% storage criterion

Potential for Subsidence

Neither study discussed the potential for subsidence as it is generally not of concern because the Site is located in crystalline rock terrain. As described in the Final EIR/EIS for the ECO Substation project (page D.13.8): "The risk factors for groundwater withdrawal induced subsidence—deep, extensive accumulation of soft, unconsolidated alluvial deposits and compressible clay beds—are not present in the project area where groundwater extraction is proposed (ECO Substation and Tule Wind project areas). The underlying rock units are granitic hard rock in these areas, and the alluvial thickness is limited. The granitic rock aquifer is too rigid to subside in response to water-level changes."

Compliance with Laws

The water supply is located within the Campo Indian Reservation and not subject to County of San Diego or State of California jurisdiction. It is subject to laws and regulations applicable to the Campo Reservation. See attached letter (**Attachment 4**) that has been provided to JFI.

O7-8 Cont.

Conclusions

This summary report examines and supports the short-term pumping of 165 AcFt of water from a 1462 acre watershed with a storage capacity of 2559 AcFt. The amount of groundwater in storage greatly exceeds the proposed short-term and existing demand where the proposed demand is approximately 6% of total groundwater in the storage within the water supply area. Rainfall recharge, here calculated to be 230 AcFt/yr on an average annual basis, exceeds the short-term demand on an annual basis and will readily replenish the aquifer system. The short-term demand is also less than the long-term sustainable demand of 173 AcFt/yr determined using water balance calculations based on historical rainfall data.

If you have any further questions, please feel free to contact the undersigned.

Sincerely,

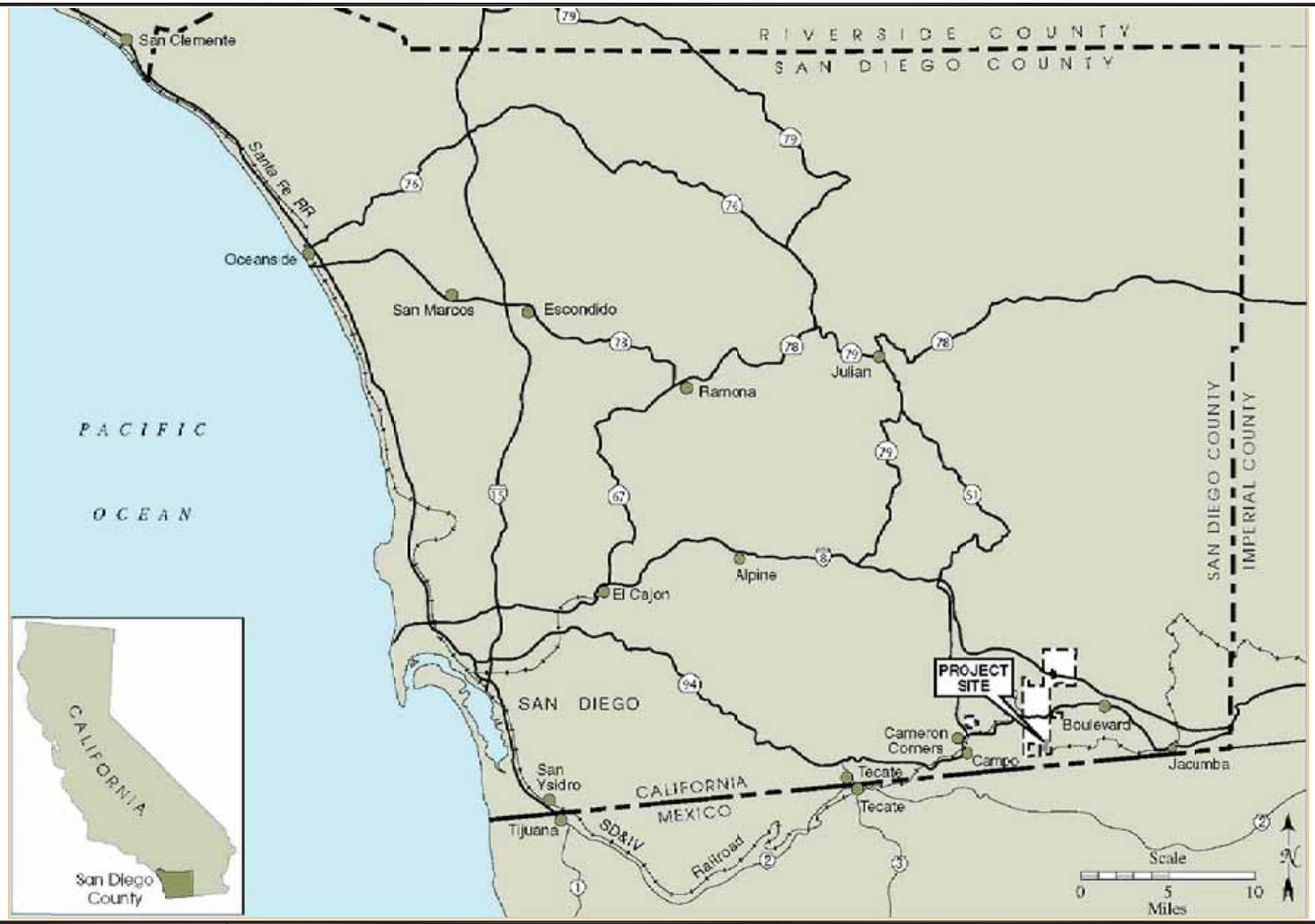
Jay W. Jones PG#4106
Environmental Navigation Services, Inc.

O7-8
Cont.

Attachments:
Figure 1. Site Location Map
Figure 2. Study Area Map
Figure 3. Soils in the Watershed
Figure 4. Extent of Saturated DG in the Watershed
Figure 5. Long-term Water Balance, 1462-acre Watershed

Attachment 1. MM HYD-3 (from the October 2011 Final EIR/EIS)
Attachment 2. Supplemental Water Balance Calculations
Attachment 3. Supplemental Well and Test Logs, Wells MW-21A and HG-60
Attachment 4. Letter to JFI from Muht-Hei, Inc.

C:\Drawing Files\Environmental Navigation Services\SE Campo Water Supply\Rpt Bl\Fig 1, Site Location Map - 06/13/2013



Environmental Navigation Services, Inc.

SCALE: AS SHOWN

EXPLANATION BLOCK

Map Source: SEIS, 2008

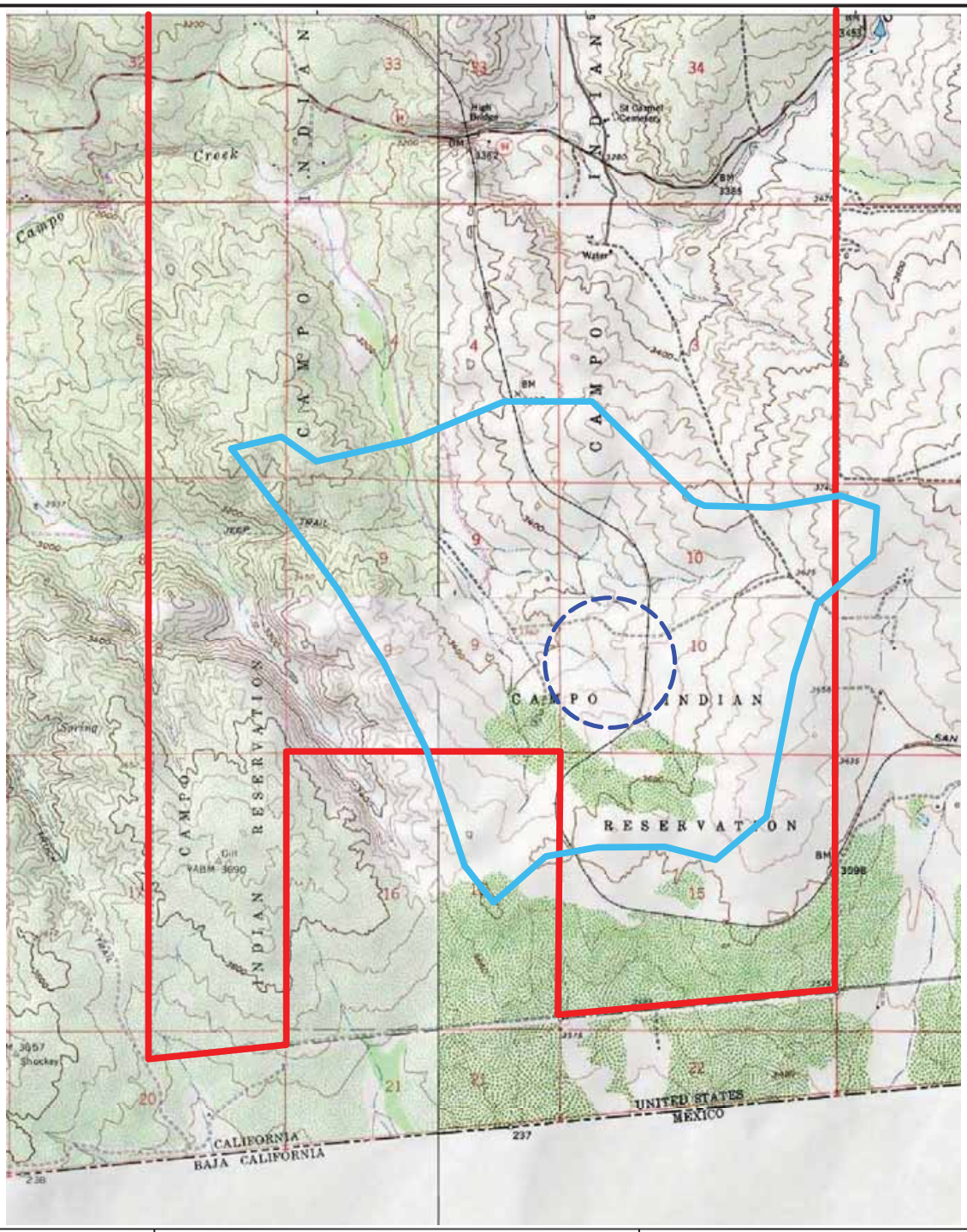
SITE LOCATION MAP

Campo Indian Reservation
San Diego County, California

PE/PG	Project Number		Figure
JWJ	SECWS		1
Project Manager	Drafter	Date	
JWJ	CM	06/13/2013	

O7-8 Cont.

C:\Drawing Files\Environmental Navigation Services\SE Campo Water Supply\Rpt BFig 2. Wtr Supply Area - 06/13/2013



Environmental Navigation Services, Inc.

0 0.25 0.5
APPROXIMATE SCALE (MILES)

EXPLANATION BLOCK

- ENSI 2008 STUDY AREA
- RESERVATION BOUNDARY
- AREA SUPPLY WELL LOCATION

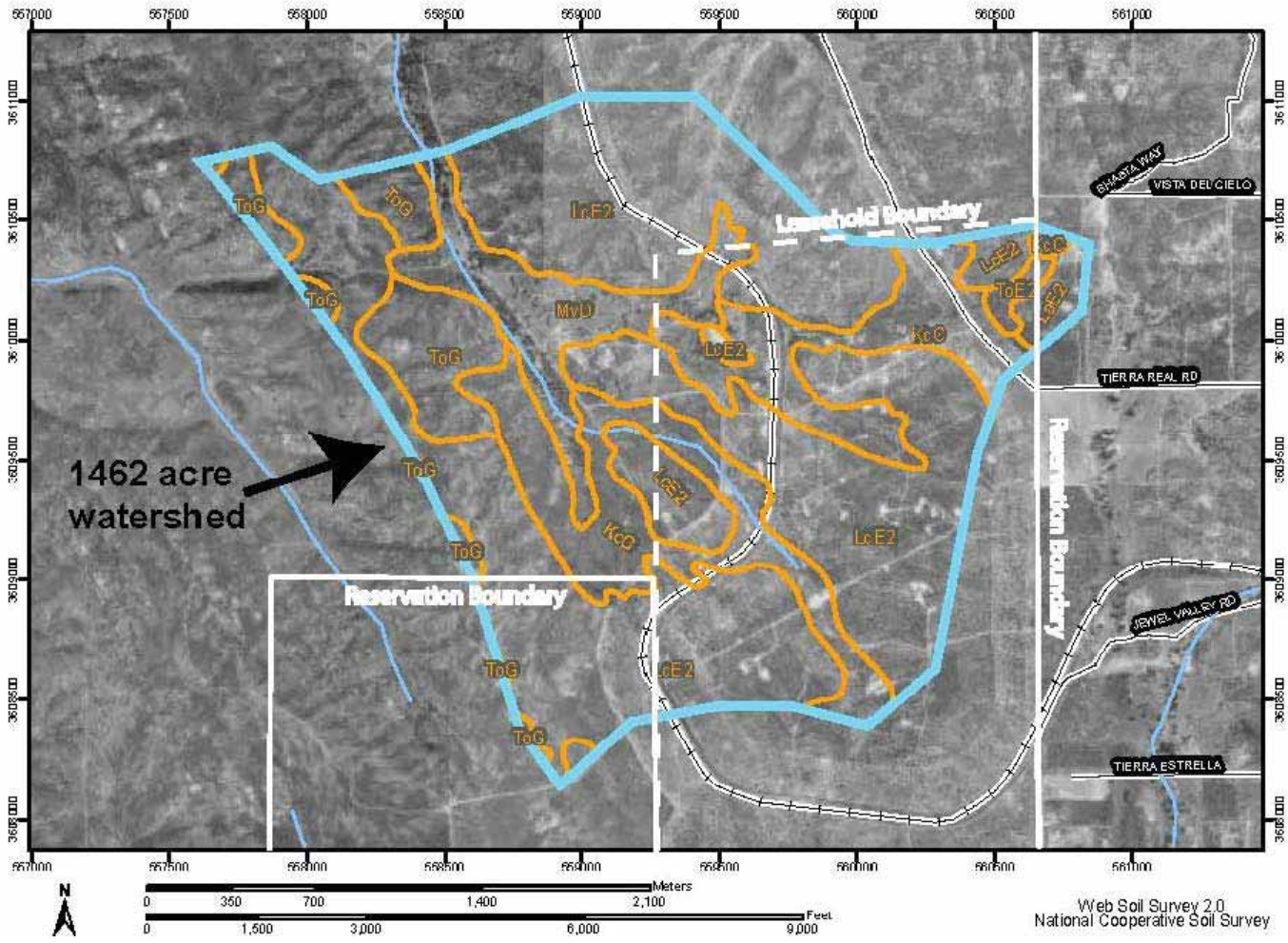
WATER SUPPLY STUDY AREA

Campo Indian Reservation
San Diego County, California

PE/PG	Project Number		Figure
JWJ	SECWS		2
Project Manager	Drafter	Date	
JWJ	CM	06/13/2013	

O7-8
Cont.

C:\Drawing Files\Environmental Navigation Services\SE Campo Water Supply\Rpt Bl\Fig 3. Soils Within The Wtr Supply Wtrshd - 06/13/2013



Environmental Navigation Services, Inc.

SCALE AS SHOWN

EXPLANATION BLOCK

NOTE:

Image Source ENSI, 2008

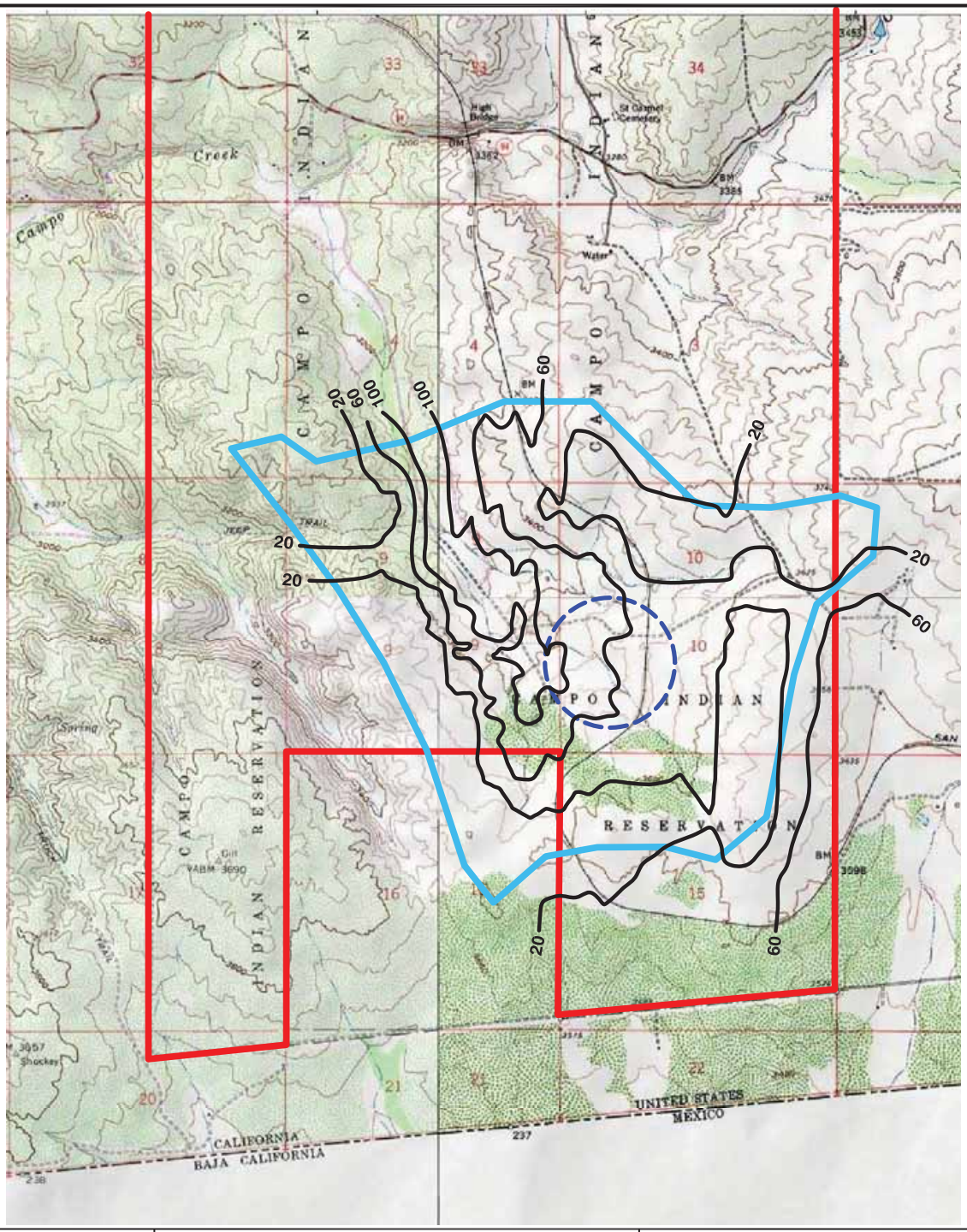
SOILS WITHIN THE WATER SUPPLY WATERSHED

Campo Indian Reservation
San Diego County, California

PE/PG	Project Number		Figure
JWJ	SECWS		3
Project Manager	Drafter	Date	
JWJ	CM	06/13/2013	

O7-8 Cont.

C:\Drawing Files\Environmental Navigation Services\SE Campo Water Supply\Rpt B\Fig 4, Extent Of Saturated DG In The Wtrshd - 06/13/2013



Environmental Navigation Services, Inc.

0 0.25 0.5
APPROXIMATE SCALE (MILES)

EXPLANATION BLOCK

- ENSI 2008 STUDY AREA
- RESERVATION BOUNDARY
- AREA SUPPLY WELL LOCATION

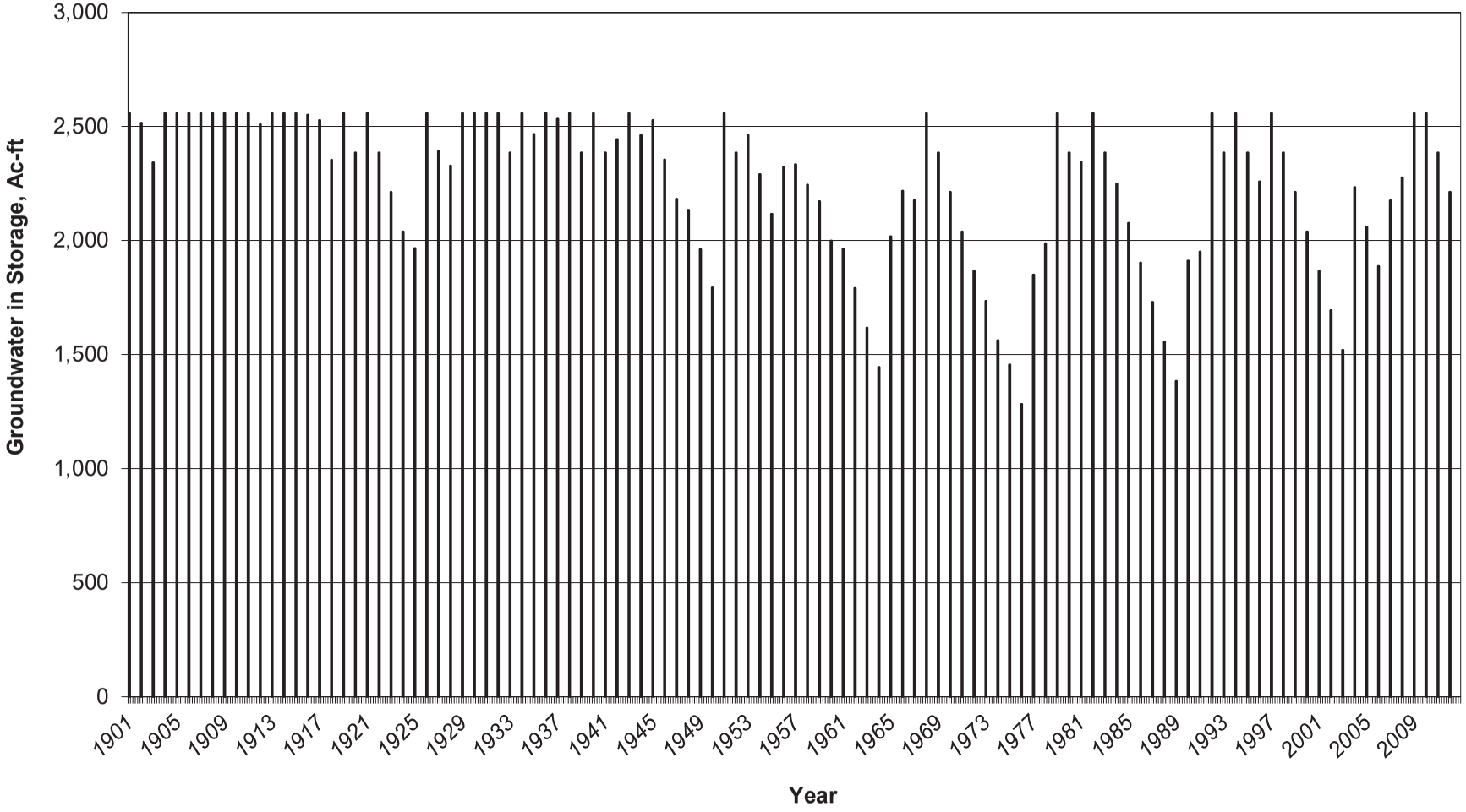
EXTENT OF SATURATED DG IN THE WATERSHED

Campo Indian Reservation
San Diego County, California

PE/PG	Project Number		Figure
JWJ	SECWS		4
Project Manager	Drafter	Date	
JWJ	CM	06/13/2013	

O7-8
Cont.

Figure 5: SE Campo Water Balance
1462-acre Watershed, 2559 AcFt in storage
171 AcFt/yr pumping rate



O7-8 Cont.

Attachment 1.
MM HYD-03

O7-8
Cont.

MM HYD-3 **Identification of sufficient water supply.** Prior to construction, the applicant will prepare comprehensive documentation that identifies one or more confirmed, reliable water sources that when combined meet the project's full water supply construction needs. Documentation will consist of the following:

Preparation of a groundwater study. For well water that is to be used, the applicant will commission a groundwater study by a qualified hydrogeologist to assess the existing condition of the underlying groundwater/aquifer and all existing wells (with owner's permission) in the vicinity of proposed well location/water sources. The groundwater study will evaluate aquifer properties and aquifer storage. The groundwater study will estimate short- and long-term well water supplies from each well proposed to be used, and documentation indicating that each well is capable of producing the total amount of water to be supplied for construction from each well. The groundwater study will estimate short- and long-term impacts of the use of the well(s) on the local groundwater production (short-term extraction for construction water and ongoing O&M water), on all project wells, and on other wells in the project area. The groundwater study will include an assessment of the potential for subsidence brought on by project-related water use in the area. The applicant will provide demonstration of compliance with all applicable laws and regulations and will obtain a County of San Diego Major Use Permit for use of any proposed well within the County's jurisdiction prior to construction.

O7-8
Cont.

Documentation of Purchased Water Source(s). For water that is to be purchased from one or more water/utility district(s), the applicant shall provide written documentation from such district(s) indicating the total amount of water to be provided and the timeframe that the water will be made available to the project. (For possible water district sources, refer to project-specific mitigation measures in the MMRP.)

Total confirmed water supplies from the combination of above documented sources shall equal the total gallons of water needed through construction of the project.

A water tank holding approximately 120,000 gallons of water would be maintained on the ECO Substation site for use during O&M. The water would primarily be used for temporary landscape irrigation, fire protection, and other standard facility uses. Monthly water use would range from 180 to 750 gallons of water, depending on the time of year and weather conditions. The water would be obtained from permitted municipal sources, groundwater sources, or a combination of

Attachment 2.
Water Balance Calculations

O7-8
Cont.

1.0 WATER BALANCE EVALUATION

The purpose of this attachment is to explain and present the water balance evaluation conducted for the 1462 acre watershed within the southeast portion of the Campo Indian Reservation. It is an update of the analysis presented in ENSI (2008) for a long-term water supply to support a proposed landfill project. In this case a long-term (indefinite) aquifer water balance was conducted and is presented as a conservative measure of the potential impact of short-term (2-year) pumping. Although the County of San Diego has no jurisdiction over land or groundwater use on the Reservation, *the County of San Diego's Groundwater Ordinance and Guidelines for Determining Significance – Groundwater Resources* were used as guidelines[1].

A summary of this analysis is provided in **Table 2** after Section 1.3.

1.1 Introduction

This analysis of the long-term available water supply compares groundwater withdrawal rates to the amount of groundwater remaining in storage after groundwater recharge is calculated for the aquifer system based on historical rainfall data. The analysis is based on a constant withdrawal rate. Many years the aquifer remains at or near full capacity since the long-term withdrawal rate is a relatively small percentage of the total volume of groundwater in storage and the average annual rainfall recharge rate is greater than the long-term withdrawal rate.

The extent of the aquifer for the water balance analysis (**Figures 2** and **4**, in summary report) is based on a surface water watershed surrounding a central wellfield.

O7-8 Cont.

1.2 Methodology

The long-term available groundwater supply is primarily limited by rainfall recharge rates and groundwater storage. The groundwater recharge rate is calculated for this analysis using a monthly soil moisture balance methodology. The groundwater storage is based on the interpretation of site-specific data. Incorporated into the analysis are historical precipitation data (1945 to 2012), evapotranspiration rates, soil moisture capacity, and surface water runoff rates.

Precipitation is either returned to the atmosphere as evapotranspiration, leaves as runoff, or enters the subsurface as recharge. During years when recharge significantly exceeds pumping, storage is exceeded and recharge is effectively rejected. Relative to the aquifer water balance, this 'excess recharge' is implicitly incorporated within the conventional water balance components of stream baseflow (surface discharges from the aquifer), and net groundwater outflow from the watershed- both of which will increase during years with high rainfall.

[1] Dated 3/19/2007 and available at: http://www.sdcounty.ca.gov/pds/procguid.html#Groundwater

Each of the water balance components are described in the following sections.

1.2.1 Groundwater Recharge

Groundwater recharge occurs across the entire watershed. The recharge rate is based on rainfall, runoff, and areally- averaged soil properties.

Groundwater extraction for the Project will be limited to the wellfield area shown in **Figures 2** and **4**, the water balance calculations reflect the concentration of pumping from the 1,462 acre watershed.

Rainfall. The historical rainfall record used for this analysis was obtained from the Campo weather station, a site that has been in operation since the 1800s. The period of record used in this analysis is between the years 1900 and 2013, with an emphasis on the years since 1945. The historical data from Campo, CA are shown in **Figure A.1**. It is a combination of data used by the DPLU to develop Figure 5, and rainfall data obtained for the Campo, CA from the Western Regional Climate Center (www.wrcc.dri.edu) for station number 041424. Review of the rainfall data shows that rainfall rates have generally decreased since the mid-1940s in the area. Because the water supply should be reliable under low rainfall conditions, the period of record since 1945 is viewed as the most critical for this evaluation.

The County of San Diego DPLU rainfall map provides contours depicting the average annual rainfall rates across the county and incorporates the effect of terrain and other factors to extrapolate the rainfall station data. **Figure A.2** shows the average annual rainfall for the Project area. Comparison of the Campo rainfall with the rainfall map (for 1971 to 2001) shows that the average Campo rainfall is 15.26 inches per year whereas the DPLU map indicates an average rainfall of approximately 15 to 18 inches per year. While the DPLU map suggests a higher effective rainfall rate could be used for the site, the Campo rainfall data have not been adjusted (i.e. increased) and are conservatively used without revision for this analysis.

O7-8 Cont.

Evapotranspiration. The evapotranspiration rate is the rate that plants and soil lose water to the atmosphere by normal plant respiration and soil drying. Climatic parameters such as temperature, cloud cover, and wind strongly affect hydrologic conditions. The overall effect of these parameters can be seen in the rate of evaporation and plant transpiration (termed evapotranspiration, or ET). The ET rate used in this study is based on a state-wide monitoring system known as CIMIS (www.cimis.water.ca.gov). The California Irrigation Management Information System (CIMIS) is a program in the Office of Water Use Efficiency (OWUE), California Department of Water Resources (DWR) that manages a network of over 120 automated weather stations in the state of California. CIMIS was developed in 1982 by the California Department of Water Resource and the University of California at Davis to assist California's irrigators to manage their water resources efficiently. The ET data published by CIMIS for Zone 16 were used in this report. The annual reference ET rate for Zone 16 is 62.51 inches/yr. For example, based on the reference ET rate, an irrigated turf will require over 5 Acft of water per acre per year.

Soil Types and Soil Moisture Capacity. The soils within the watershed have been mapped on an aerial photograph and classified by the US Department of Agriculture as shown in **Figure 3** in the summary report. The areas for each soil type in the watershed were calculated using the mapping software provided by the USDA on their website (http://websoilsurvey.nrcs.usda.gov). The hillsides of the watershed are predominantly LcE2, La Posta rocky loamy coarse sand, with a relatively low water retention and soil moisture capacity. The soils within the central drainage are mapped as MvD, Mottsville loamy coarse sand. **Table 1,** below, summarizes the acreage of each of the soil types in the watershed together with the typical soil thicknesses and the soil moisture capacity for each soil type. A calculation of the average soil moisture capacity was done based on the reported soil types. A soil moisture capacity of 2.4 inches is judged to be a reasonable value for soils in the watershed.

Table 1. Soil Moisture Capacity for Soils in Watershed

Data source: Natural Resources Conservation Service (http://websoilsurvey.nrcs.usda.gov)

	Acreage	pct	Drainage Class	Hydrologic Soil Group	SM Cap. (in./in.)	Max. Soil Thickness (in.)	Calculated SM Cap (in.)	Water Capacity (in.)
Upland/ Tributary Areas								
KcC Kitchen Creek loamy coarse sand, 5 to 9 percent slopes	289.4	19.8%	SED	B	0.07	54	3.78	4.90
LaE2 La Posta loamy coarse sand, 5 to 30 percent slopes, eroded	19.7	1.3%	SED	B	0.06	29	1.74	1.80
LcE2 La Posta rocky loamy coarse sand, 5 to 30 percent slopes, eroded	908.5	62.1%	SED	B	0.06	27	1.62	1.70
ToE2 Tollhouse rocky coarse sandy loam, 5 to 30 percent slopes, eroded	9.8	0.7%	SED	D	0.11	16	1.76	1.80
ToG Tollhouse rocky coarse sandy loam, 30 to 65 percent slopes	114.9	7.9%	SED	D	0.11	16	1.76	1.80
	1342.3	92%				weighted avg:	**2.10**	**2.40**
Drainage Channel								
MvD Mottsville loamy coarse sand, 9 to 15 percent slopes	119.7	8.2%	ExD	A	0.07	60	4.20	4.20
	119.7	8.2%				weighted avg:	**4.20**	**4.20**
	1462.0	100%				overall weighted avg:	**2.27**	**2.55**
						midpoint:	**2.4**	

Drainage Classes: Excessively Drained (ExD)/ Somewhat Excessively Drained (SED) / Well-drained/ Moderately Well Drained
Somewhat Poorly Drained (SPD), Poorly Drained, Very Poorly Drained

Hydrologic soil groups are based on estimates of runoff potential.
Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.
The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:
Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet.
These consist mainly of deep, well drained to excessively drained sands or gravelly sands.
These soils have a high rate of water transmission.
Group B. Soils having a moderate infiltration rate when thoroughly wet.
These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture.
These soils have a moderate rate of water transmission.
Group C. Soils having a slow infiltration rate when thoroughly wet.
These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture.
These soils have a slow rate of water transmission.
Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet.
These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

O7-8 Cont.

Soil Moisture Balance Recharge Calculations. A soil moisture balance methodology is used in this Report to determine the rate of groundwater recharge. The overall water balance is determined on a monthly basis using historical rainfall data. Each month that rainfall occurs, recharge will occur if the amount of rainfall exceeds the soil moisture capacity, water lost to surface water runoff, and the amount of water consumed by plants and lost to evaporation and plant transpiration (termed potential evapotranspiration, or pET). Note that the pET rate in this case primarily accounts for evaporation from soil since non-irrigated native plants tend to have very low ET rates.

The soil moisture balance equation written in terms of recharge for month i is given by:

$$Recharge_i = ppt_i - runoff_i - pET_i - (SM_i - SM_{i-1})$$

where:
ppt, is the rainfall in month i
pET, is the potential evapotranspiration rate in month i
SM, is the soil moisture in month i and previous month i-1
runoff, is the surface water runoff in month i as given by:

$$runoff_i = ppt_i * pct * (SM_{i-1}/SMcap)$$

where:
runoff, is the volume of runoff in month i
pct, the runoff coefficient,
is the assumed maximum percentage of rainfall runoff in month i
SM, is the soil moisture at the time of rainfall
(The antecedent moisture condition, previous month i-1)
SMcap, is the soil moisture capacity for the soil, a constant

O7-8 Cont.

All values herein are expressed in inches. Volumes are calculated based upon the area of consideration. An Excel spreadsheet developed for these calculations is included at the end of this Attachment.

Recharge occurs when the precipitation exceeds runoff, evapotranspiration, and the soil moisture capacity. Water can be stored in the soil at an amount up to the soil moisture capacity. Each month the antecedent moisture condition is evaluated to determine if the soil moisture capacity has already been met. If the soil is already at the soil moisture capacity, and the next month's rainfall exceeds the amount of water 'lost' by evapotranspiration and runoff, recharge will be immediate. Runoff in the soil moisture balance is calculated as a function of the preceding month's soil moisture condition and is a maximum when the soil is saturated. Here a runoff coefficient value of 20 percent is used.

A long-term aquifer water balance is then calculated using the historical rainfall record based on the rate of recharge from the soil, the amount of water that can be stored in the aquifer, and the amount of water pumped from the aquifer on an annual basis. In any

given year the volume of water in the aquifer will vary depending on the relative recharge rate and groundwater demand. If there is no pumping demand, there is no change in groundwater storage. Years with recharge in excess of the aquifer storage and groundwater use lead to a condition where the excess recharge is rejected. Conversely, following periods of low rainfall, continued depletion of groundwater from storage occurs.

1.2.2 Groundwater in Storage

Groundwater occurs within the void space of the granitic rock that comprises the aquifer. Within unweathered crystalline rock the void space occurs solely within rock fractures. In decomposed granite (DG), the void space occurs in pore spaces created from the weathering of minerals as well as from rock fractures. Fracture zones in the DG are typically highly fractured and deeply weathered.

The groundwater storage capacity of the aquifer system is defined as the ratio of the volume of water released from the aquifer to the volume of aquifer containing the water when water is withdrawn from the aquifer under pumping conditions or as a result of a decrease in water levels. The storage coefficient of an unconfined aquifer is termed the specific yield; for a confined aquifer the value is termed the specific storage. The fractured rock aquifer system may occur under a mix of confined and unconfined conditions, depending upon the character and extent of fracturing within the rock. Here the term storage coefficient is used to define the amount of extractable water available within the aquifer.

O7-8 Cont.

Typically the storage capacity of unweathered crystalline rock is quite low and ranges between 0.1 and 0.01 percent of the rock volume. A value of 0.01 percent (storage coefficient, $S = 1 \times 10^{-4}$) is generally accepted for similar analyses of crystalline rock with low fracture density, increasing to 0.1 percent ($S = 1 \times 10^{-3}$) for highly fractured bedrock. Hydrologic test data obtained at the Project site, as summarized by Golder (2008), generally support a higher storage coefficient of 0.05 because the crystalline rock at the Project site is highly fractured and deeply weathered.

Weathered granite (DG) has a much higher storage capacity than unweathered granite due to the development of intergranular porosity via mineral weathering. The DG is an important element to the water balance and overall hydrology of this and similar watersheds. The hydraulic properties of DG were well-summarized by Davis and DeWiest (1966, p.320) where they note that "Effects of weathering may extend more than 300 feet in regions of intense weathering. Depths of weathering of 5 to 50 feet, however, are normally encountered. Hydrated minerals in weathered rock at the surface will form loose aggregates which have porosities in excess of 35 percent. The porosity decreases with depth to zones in which the original rock-forming minerals are only partly altered." They further state that the overall porosity is on the order of 2 to 10 percent at depth.

A study by Tugrul (2004) examined in detail weathered rock, including granodiorite and tested the rock for both total and effective porosities, and showed that the effective

porosity (the porosity available for water flow) ranged from 3.5 to 9%. Extensive testing of slightly to moderately weathered Oracle granite conducted by Jones (1983) compared total porosity values measured from rock samples with downhole geophysical methods and determined that overall porosity ranged from 2 to 6%, with the highest porosity values corresponding to weathered/altered rock. A site-specific value of 6 to 8% was derived from a streamtube analysis of recharge and water level data for the landfill site provided in an unpublished 1997 BS Thesis by J.A. Crosby at San Diego State. Work done by the USGS in nearby Descanso (Duell, 1994) and Lee Valleys (Kaehler and Hsieh, 1994) for weathered rock within valleys indicated that specific yields of weathered rock under pumping conditions are on the order of 1 to 3%.

The storage coefficient values will locally vary across the site as a function of the degree of fracturing and weathering within the rock mass, so the values used herein represent volume averages. A storage coefficient of 5% (0.05) is used for DG, and an intermediate storage value of 0.05% (5×10^{-4}) is used for the underlying rock in this Report. A value of 5 percent is generally accepted for use in water supply studies locally reviewed and approved by the County of San Diego Department of Planning and Land Use.

Figure 4 (in report) summarizes the DG aquifer system evaluation in terms of the extent and thickness of saturated DG expected to occur in the watershed. The contour map is based on data used in groundwater model prepared by Golder (2008).

DG Storage (2,193 Acft) Based on analysis of **Figure 4** an average saturated thickness of 30 feet has been calculated. The 1,462 acre watershed area is calculated to contain 2,193 Acft of water based on an average 5% storage coefficient. O7-8 Cont.

Bedrock Storage (366 Acft) The calculation of the amount of water in storage within the unweathered rock assumes an average saturated thickness of 500 feet, an area of 1,462 acres, and a storage coefficient of 0.05%. This evaluation assumes that wells up to 500 feet below the water table (or below the DG/bedrock interface where DG occurs) can be installed to provide groundwater from the underlying bedrock aquifer system. Wells drilled in excess of 1,000 feet in depth are increasingly becoming common in the area, so the assumed 500 foot saturated thickness for bedrock is conservative.

Combined Storage. The total volume of groundwater in storage is calculated to be 2,559 Acft.

1.2.3 Long-term Groundwater Availability

Estimates of the amount of groundwater recharge were conducted using an Excel spreadsheet that calculates the soil moisture balance (and recharge) on a monthly basis between July 1900 and June 2013 using the equations explained in Section 3.2.1. The analysis focuses on the period from 1945 to 2012. (The calculation methodology follows that used by a FORTRAN program named Recharge2, written by Dr. David Huntley of San Diego State University and generally accepted for similar projects by the DPLU). The Excel spreadsheet printouts are included at the end of this Attachment.

The basis for the analysis includes the following:

1) Historical rainfall data from the Campo, CA weather station and the DPLU rainfall map.
2) Evapotranspiration rates obtained from CIMIS (climate zone 16).
3) Estimates of the groundwater storage of the DG and underlying crystalline rock.
4) Soils data obtained from the US Department of Agriculture. An area-weighted average value of 2.4 inches is used for the soil moisture capacity in the water balance calculations (see **Table 1**).
5) A general description and field review of the watershed.

The following assumptions were made for the watershed:

1) No significant volumes of groundwater flow are discharged as surface water flow based on an absence of perennial surface water in the watershed.

The calculated change in groundwater storage is shown in **Figure 5** (in the summary report) based on a constant annual extraction rate of 173 Acft/yr. It is based on a 1,462-acre watershed with a total storage capacity of approximately 2,559 Acft. The chart depicts the effect of seasonal recharge and groundwater withdrawal on an annual basis. It shows that there are multiple periods of approximately 5 years or more where demand exceeded recharge and water is withdrawn from storage. "El Nino"-type rainfalls occurred with well-above average rainfall and provided for complete recovery of the aquifer system and are evident in the rainfall record (**Figure A.1**).

O7-8 Cont.

The following observations can be made for the period of record from 1945 to 2012:

- The average recharge rate, 230 AcFt/yr, exceeds the withdrawal rate of 173 AcFt/yr. Thus there are many years where the aquifer is fully recharged by rainfall and no decrease in groundwater storage occurs due to pumping on an annual basis.

- The effect of pumping increases for years where recharge does not offset groundwater use. During dry years water is derived from subsurface storage. On average the aquifer remains at 81.8 percent effect of capacity.

1.3 Discussion

The methodology used in this report represents one approach to the evaluation of groundwater recharge and storage and is the approach currently used by the County of San Diego DPLU to examine the potential impact of pumping on groundwater-dependent developments[2]. It is based on readily-available locally-valid data such as precipitation, evapotranspiration, soil properties, and aquifer extent and thickness. It is recognized that the calculation parameters may vary from those presented herein; however, the overall approach was conservative to accommodate potential variability and uncertainty.

[2] See for example: http://www.sdcounty.ca.gov/dplu/docs/GRWTR-Guidelines.pdf located in: http://www.sdcounty.ca.gov/pds/procguid.html#Groundwater

Table 2. Water Supply Summary

Component	
Watershed Area	1,462 acres
Proposed Wellfield	Centrally located- see Figure 2 in text
Groundwater Storage, Acft (1062 acre sub-area)	2,559 Acft total: 2,193 in Decomposed Granite (avg. saturated thickness of 30 feet) 366 from bedrock (avg. saturated thickness of 500 feet)
Rainfall, 1945 to 2012 (Campo, CA)	14.58 inches/yr 1,776 Acft/yr in watershed
Soil Moisture Capacity	2.4 inches (**Table 1**)
Rainfall Recharge Rate, Avg Annual	230 Acft/yr 8.74% of annual rainfall
Maximum Pumping Rate, not exceeding 50% of storage	173 AcFt/yr
Years with no net Groundwater Depletion	19 of 66 years (29%)
Annual Maximum Pumping Rate, as percentage of Annual Recharge	75%
Annual Maximum Pumping Rate, as percentage of Annual Rainfall	9.7%
Annual Maximum Pumping Rate, as percentage of Groundwater Storage	6.8%
Current estimated demand within the watershed. 12 residences with assumed use of 0.5 AcFt/yr	6 AcFt/yr

O7-8 Cont.

2.0 REFERENCES

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O7-8 Cont.

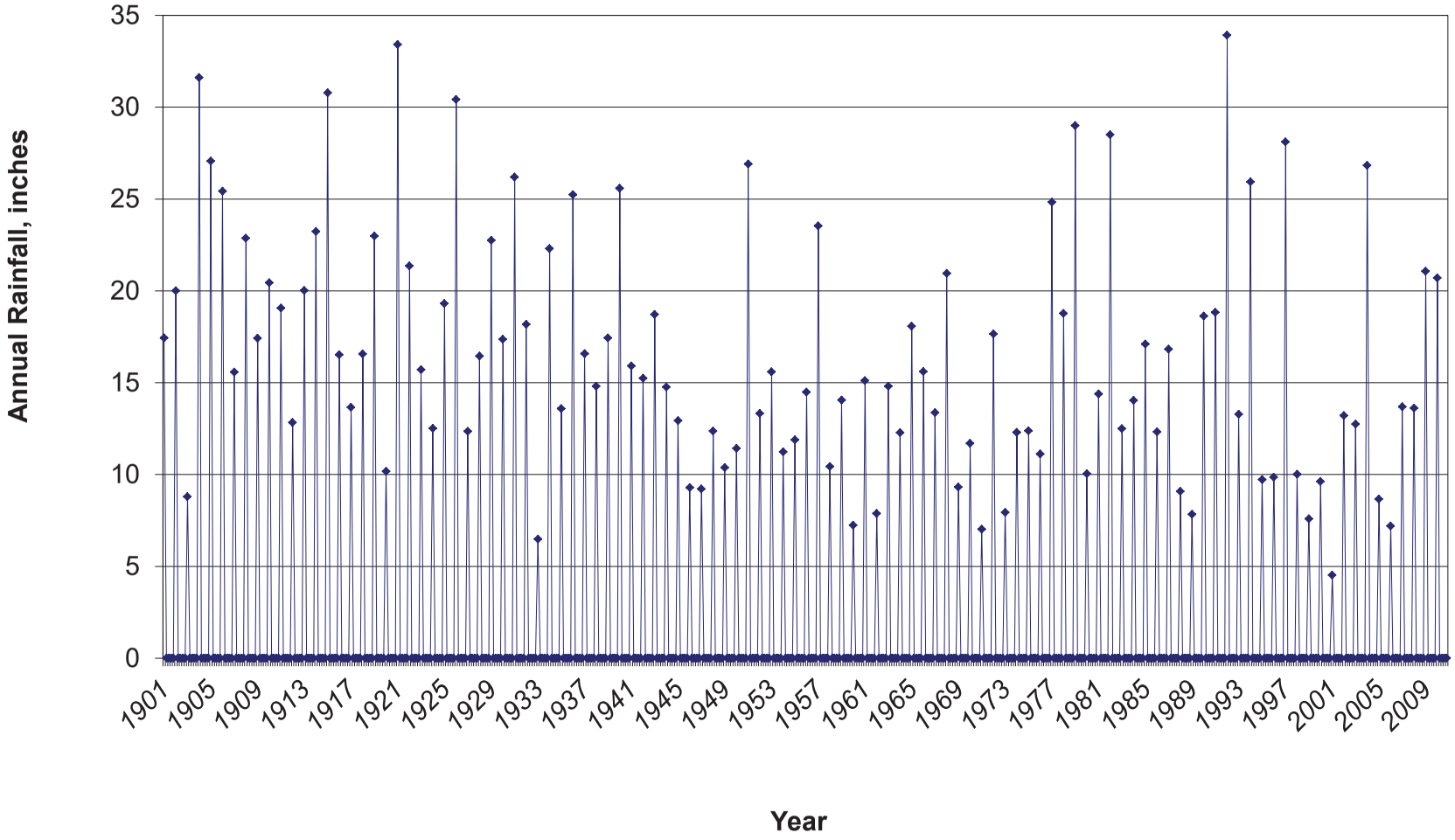
3.0 LIMITATIONS

This report evaluates changes in aquifer conditions related to the Project's groundwater demands. The evaluation uses a water balance methodology currently accepted by the County of San Diego Department of Planning and Land Use for groundwater-dependent projects, and also evaluates potential water level changes due to pumping. These estimates, similar to all geologic and hydrologic measurements, are subject to uncertainty. Water level observations and ongoing hydrological analyses during pumping are required as part of the mitigation monitoring program to more precisely assess the potential impact of groundwater pumping at the site.

This report does not guarantee, either explicitly or implicitly, that existing or future water wells installed for the Project will provide sufficient quantity and quality of water. Groundwater naturally high in total dissolved solids, radionuclides, or minerals such as arsenic, iron, and sulfate occurs in granitic terrain and ongoing water quality testing is required to assess the water obtained from the wellfield. Also, the results and findings of this report are limited to historical conditions and do not preclude the potential for drought conditions in excess of those observed between 1900 and 2012.

O7-8
Cont.

Figure A.1
Annual Rainfall at Campo, CA
(WRCC Station 1424)



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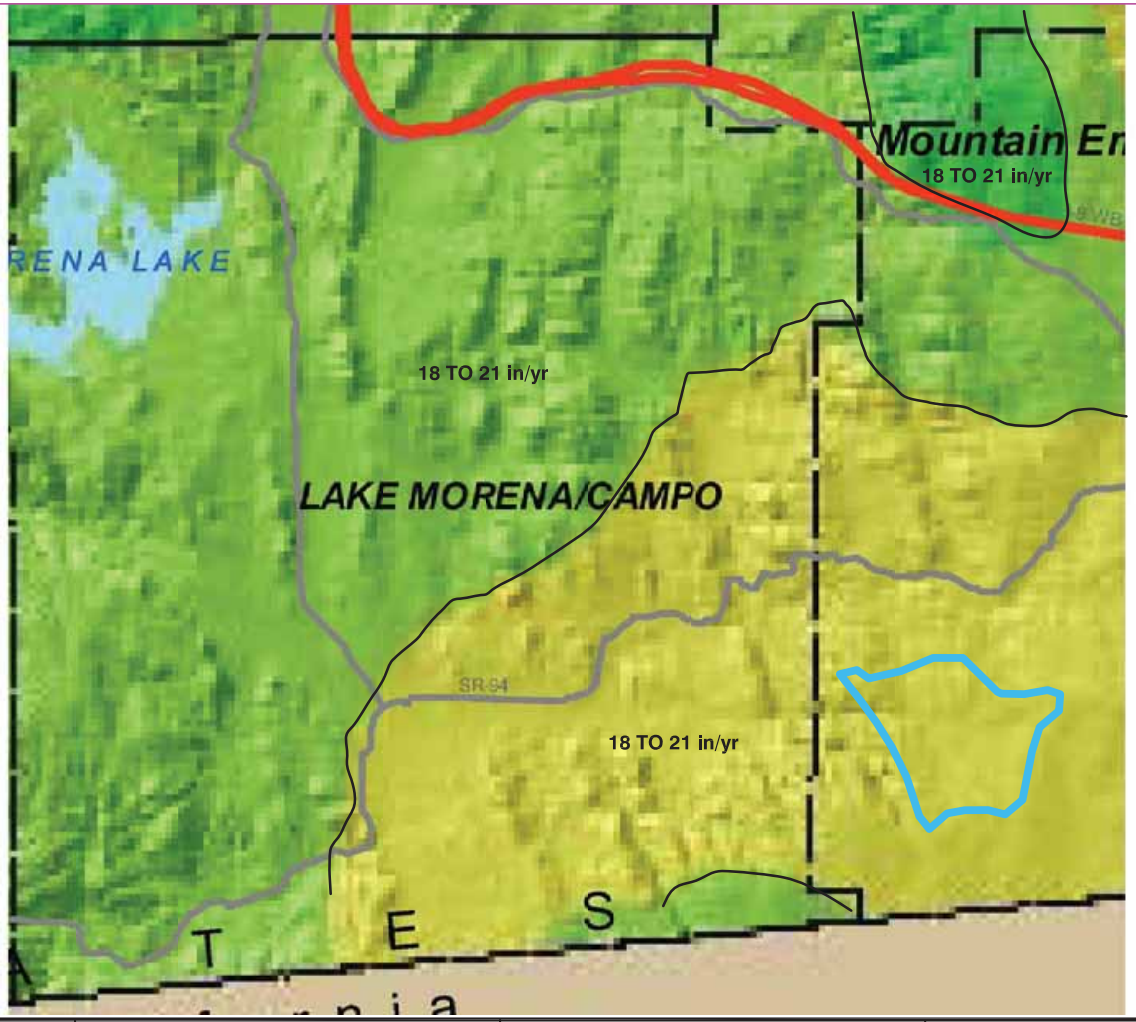
C:\Drawing Files\Environmental Navigation Services\SE Campo Water Supply\Rpt B\Fig A.2, Annual Rainfall At Site From DPLU 2004 - 06/13/2013



Environmental Navigation Services, Inc.	EXPLANATION BLOCK		**ANNUAL RAINFALL AT SITE FROM DPLU, 2004** Campo Indian Reservation San Diego County, California
NOT TO SCALE			PE/PG: JWJ; Project Number: SECWS; Figure: **A.2** Project Manager: JWJ; Drafter: CM; Date: 06/13/2013

O7-8 Cont.

RECHARGE CALCULATIONS: Soil Moisture Balance

ver. June11, 2013

Proposed Short-term Water Supply, SE Campo Indian Reservation

Rainfall Statistics (inches/yr)			
maximum	33.9	(1992-1993)	
minimum	4.5	(2001-2002)	
average	16.4	14.58	...total and since 1945
st dev	6.6	6.3	...total and since 1945
30 year avg (1971 to 2001)		15.3	
DPLU Map Rainfall (15 to 18 in/yr)		16.5	avg
Difference (increase)		1.08	
Adjustment Factor		1.00	(rf)

Soil Parameters	
2.4	Soil Moisture Capacity, smcap
0.2	Runoff Coefficient, roff

Indicates Input Variables

Campo Evaporation and pET

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	total
CIMIS 16: ET rate	9.30	8.37	6.30	4.34	2.40	1.55	1.55	2.52	4.03	5.70	7.75	8.70	62.51
CIMIS 9	7.44	6.82	5.70	4.03	2.70	1.86	2.17	2.80	4.03	5.10	5.89	6.60	55.14
CIMIS 16	9.30	8.37	6.30	4.34	2.40	1.55	1.55	2.52	4.03	5.70	7.75	8.70	62.51
Lake Morena Evap.	8.82	6.39	2.39	2.29	2.80	6.29	2.20	1.70	2.40	4.40	6.10	7.30	53.07

Campo Rainfall: 1900- 2012 (water years, July to June)

WATER YEAR ending			July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Annual RF Total	Annual Runoff& Rechge (inches)	by pct.	
1901			0.61	0.63	0.00	1.02	0.43	0.23	4.28	4.72	4.00	1.33	0.07	0.12	**17.44**		**17.44**	
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.80	0.26	0.00	0.00		**2.01**	12%	runoff
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	2.37	0.00	0.00	0.00				
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.33	1.26	0.00	0.00	0.00	0.00		**1.59**	9%	recharge
1902			2.24	0.00	0.00	0.03	2.27	3.04	1.85	4.93	2.30	3.23	0.11	0.00	**20.00**		**20.00**	
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.74	0.46	0.18	0.00	0.00		**1.61**	8%	runoff
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.49	1.79	2.40	0.67	0.00	0.00	0.00				
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06	0.00	0.00	0.00	0.00		**1.06**	5%	recharge
1903			0.00	0.00	0.47	0.03	0.00	0.00	0.41	2.68	4.19	0.49	0.52	0.00	**8.79**		**8.79**	
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.01	0.00	0.00		**0.07**	1%	runoff
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.32	0.00	0.00	0.00				
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge
1904			0.85	1.59	0.64	0.13	0.00	1.82	4.32	11.94	6.87	0.92	2.53	0.00	**31.61**		**31.61**	
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.10	2.39	1.37	0.18	0.00	0.00		**4.04**	13%	runoff
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.27	2.40	2.40	2.40	0.00	0.00	0.00				
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.54	7.03	1.47	0.00	0.00	0.00		**9.04**	29%	recharge
1905			0.00	0.25	0.68	0.00	5.85	1.12	2.98	3.69	10.20	1.60	0.70	0.00	**27.07**		**27.07**	
	Runoff		0.00	0.00	0.00	0.00	0.00	0.22	0.49	0.74	2.04	0.32	0.00	0.00		**3.81**	14%	runoff
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	2.40	1.97	2.40	2.40	2.40	0.00	0.00	0.00				
	Recharge		0.00	0.00	0.00	0.00	1.05	0.00	0.51	0.43	4.13	0.00	0.00	0.00		**6.12**	23%	recharge
1906			0.18	2.12	0.90	0.10	3.23	7.15	5.24	1.67	3.91	0.25	0.41	0.26	**25.42**		**25.42**	
	Runoff		0.00	0.00	0.00	0.00	0.00	0.49	1.05	0.33	0.51	0.03	0.00	0.00		**2.41**	9%	runoff
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.83	2.40	2.40	1.55	1.43	0.00	0.00	0.00				
	Recharge		0.00	0.00	0.00	0.00	0.00	3.54	2.64	0.00	0.00	0.00	0.00	0.00		**6.18**	24%	recharge
1907			0.00	0.00	0.00	2.46	0.25	0.12	4.21	4.90	1.91	0.71	1.01	0.00	**15.57**		**15.57**	
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.98	0.38	0.02	0.00	0.00		**1.38**	9%	runoff
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	0.28	0.00	0.00	0.00				
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.26	1.40	0.00	0.00	0.00	0.00		**1.66**	11%	recharge

O7-8 Cont.

1908			0.26	0.00	0.40	1.72	0.77	1.83	8.41	5.43	4.05	0.00	0.00	0.00	**22.87**		**22.87**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.20	1.09	0.81	0.00	0.00	0.00		**2.09**	9%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.28	2.40	2.40	2.40	0.00	0.00	0.00					
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	4.54	1.82	0.00	0.00	0.00	0.00		**6.37**	28%	recharge	
1909			0.00	0.00	0.00	0.00	3.44	5.82	4.93	0.66	2.25	0.32	0.00	0.00	**17.42**		**17.42**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.50	0.99	0.13	0.10	0.00	0.00	0.00		**1.72**	10%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	1.04	2.40	2.40	0.54	0.00	0.00	0.00	0.00			63%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	2.41	2.39	0.00	0.00	0.00	0.00	0.00		**4.80**	28%	recharge	
1910			3.44	0.05	1.94	1.03	1.12	0.15	4.65	5.70	1.40	0.96	0.00	0.00	**20.44**		**20.44**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.14	0.28	0.00	0.00	0.00		**1.42**	7%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	0.00	0.00	0.00	0.00			80%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.70	2.04	0.00	0.00	0.00	0.00		**2.74**	13%	recharge	
1911			0.40	0.00	0.00	0.00	0.10	2.08	0.64	0.00	10.67	3.51	1.52	0.15	**19.07**		**19.07**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.70	0.03	0.00		**0.76**	4%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	2.40	0.21	0.00	0.00			74%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.24	0.00	0.00	0.00		**4.24**	22%	recharge	
1912			0.15	0.20	0.00	0.98	0.92	0.00	2.75	5.27	1.90	0.33	0.13	0.20	**12.83**		**12.83**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.38	0.01	0.00	0.00		**0.91**	7%	runoff	
1913			0.36	1.77	0.00	0.05	2.39	1.49	5.85	4.07	0.92	2.34	0.78	0.00	**20.02**		**20.02**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.81	0.18	0.00	0.00	0.00		**1.00**	5%	runoff	
	SM param		-8.94	-6.60	-6.30	-4.29	-0.01	-0.06	4.30	3.95	-0.71	-3.36	-6.97	-8.70					
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	1.90	0.74	0.00	0.00	0.00	0.00		**2.64**	13%	recharge	
1914			0.75	0.00	0.22	0.88	0.76	3.99	6.36	4.47	1.74	1.50	2.56	0.00	**23.23**		**23.23**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	1.27	0.89	0.35	0.01	0.00	0.00		**2.53**	11%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	2.40	0.11	0.00	0.00	0.00			69%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.04	3.54	1.06	0.00	0.00	0.00	0.00		**4.63**	20%	recharge	
1915			0.50	0.35	0.00	0.00	1.20	3.40	20.44	0.90	3.81	0.19	0.00	0.00	**30.79**		**30.79**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	3.15	0.18	0.25	0.01	0.00	0.00		**3.59**	12%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.85	2.40	0.78	0.56	0.00	0.00	0.00			39%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	15.19	0.00	0.00	0.00	0.00	0.00		**15.19**	49%	recharge	

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1916			0.18	0.85	0.43	0.85	0.00	2.32	4.85	2.88	0.80	2.79	0.57	0.00	**16.52**		**16.52**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.58	0.16	0.00	0.00	0.00		**1.05**	6%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.77	2.40	2.40	0.00	0.00	0.00	0.00			85%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	1.36	0.00	0.00	0.00	0.00	0.00		**1.36**	8%	recharge	
1917			0.93	0.00	0.03	0.00	0.35	0.00	1.62	2.73	7.55	0.00	0.25	0.20	**13.66**		**13.66**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.18	0.00	0.00	0.00		**0.19**	1%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.28	2.40	0.00	0.00	0.00			90%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.22	0.00	0.00	0.00		**1.22**	9%	recharge	
1918			0.10	2.17	0.00	1.10	1.89	2.19	0.75	4.04	3.07	1.08	0.17	0.00	**16.56**		**16.56**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.39	0.05	0.00	0.00		**0.48**	3%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.64	0.00	1.52	0.56	0.00	0.00	0.00			97%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1919			0.57	0.15	0.20	1.20	3.66	1.01	1.90	7.44	5.84	0.66	0.35	0.00	**22.98**		**22.98**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.11	0.11	0.66	1.17	0.13	0.00	0.00		**2.18**	10%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	1.26	0.72	1.07	2.40	2.40	0.00	0.00	0.00			75%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.93	0.64	0.00	0.00	0.00		**3.57**	16%	recharge	
1920			0.00	1.00	0.15	1.10	0.12	0.79	2.90	0.51	0.95	0.15	2.50	0.00	**10.17**		**10.17**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00		**0.06**	1%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.35	0.00	0.00	0.00	0.00	0.00			99%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1921			5.30	0.60	0.35	2.12	0.38	11.85	4.55	3.54	2.84	1.03	0.85	0.00	**33.41**		**33.41**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.91	0.71	0.57	0.10	0.00	0.00		**2.29**	7%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	2.40	1.21	0.00	0.00	0.00			62%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	7.90	2.09	0.31	0.00	0.00	0.00	0.00		**10.30**	31%	recharge	
1922			7.10	1.32	0.25	0.53	1.65	3.39	1.40	1.96	1.68	1.93	0.00	0.15	**21.36**		**21.36**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.28	0.16	0.00	0.00	0.00		**0.65**	3%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.84	1.69	1.13	0.00	0.00	0.00	0.00			97%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1923			1.35	0.62	1.60	1.10	0.05	3.29	0.35	0.00	5.47	1.88	0.00	0.00	**15.71**		**15.71**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.23	0.00	0.00		**0.28**	2%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.74	0.54	0.00	1.44	0.00	0.00	0.00			98%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1924			0.00	0.00	0.00	0.50	1.50	3.17	0.36	0.41	1.96	3.78	0.00	0.83	**12.51**		**12.51**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.00	0.00	0.00	0.00		**0.06**	1%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.62	0.43	0.00	0.00	0.00	0.00	0.00			99%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1925			0.31	0.00	0.00	2.88	2.29	1.06	1.50	2.00	0.35	8.92	0.00	0.00	**19.31**		**19.31**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.00	0.00			96%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.00		**0.82**	4%	recharge	
1926			0.00	0.07	0.00	0.00	1.25	4.62	1.00	16.50	4.20	1.26	1.31	0.21	**30.42**		**30.42**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.20	2.54	0.84	0.25	0.00	0.00		**3.84**	13%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	1.85	2.40	2.40	0.00	0.00	0.00			49%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.67	0.00	10.89	0.00	0.00	0.00	0.00		**11.56**	38%	recharge	
1927			0.00	0.52	0.00	2.43	0.00	4.00	0.96	2.48	1.26	0.28	0.42	0.00	**12.35**		**12.35**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.37	0.19	0.00	0.00	0.00		**0.75**	6%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	1.81	1.77	0.00	0.00	0.00	0.00			94%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00		**0.05**	0%	recharge	
1928			0.00	0.00	0.00	0.33	1.10	2.94	3.19	3.95	2.95	1.99	0.00	0.00	**16.45**		**16.45**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.79	0.59	0.22	0.00	0.00		**1.97**	12%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.39	2.40	2.40	1.32	0.00	0.00	0.00			83%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.64	0.00	0.00	0.00	0.00		**0.90**	5%	recharge	
1929			0.00	3.23	0.52	0.00	0.00	0.00	8.26	1.23	4.04	0.62	4.85	0.00	**22.75**		**22.75**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.37	0.06	0.00	0.00		**0.68**	3%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	1.11	1.12	0.00	0.00	0.00			78%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	4.31	0.00	0.00	0.00	0.00	0.00		**4.31**	19%	recharge	
1930			1.12	0.00	0.35	0.00	3.45	0.00	3.18	5.86	0.40	2.51	0.49	0.00	**17.36**		**17.36**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.08	0.00	0.00	0.00		**0.88**	5%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	1.05	0.00	1.63	2.40	0.00	0.00	0.00	0.00			85%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.77	0.00	0.00	0.00	0.00		**1.77**	10%	recharge	
1931			0.00	0.00	0.00	0.81	3.93	6.21	1.70	11.73	0.34	1.38	0.00	0.10	**26.20**		**26.20**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.79	0.34	2.35	0.07	0.00	0.00	0.00		**3.55**	14%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	1.53	2.40	2.40	2.40	0.00	0.00	0.00	0.00			49%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	3.00	0.00	6.86	0.00	0.00	0.00	0.00		**9.86**	38%	recharge	
1932			0.00	0.00	0.00	0.50	0.00	6.91	6.20	0.00	0.00	2.98	1.44	0.14	**18.17**		**18.17**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	1.24	0.00	0.00	0.00	0.00	0.00		**1.24**	7%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	0.00	0.00	0.00	0.00	0.00			58%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	2.96	3.41	0.00	0.00	0.00	0.00	0.00		**6.37**	35%	recharge	
1933			0.00	0.00	0.00	0.00	0.98	1.80	0.00	2.23	0.54	0.00	0.04	0.90	**6.49**		**6.49**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00			100%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1934			0.17	2.29	0.00	0.80	1.03	2.94	4.00	5.83	2.88	2.34	0.02	0.00	**22.30**		**22.30**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.46	1.17	0.58	0.24	0.00	0.00		**2.45**	11%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.39	2.40	2.40	1.25	0.00	0.00	0.00			75%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.98	2.14	0.00	0.00	0.00	0.00		**3.12**	14%	recharge	
1935			0.03	2.55	0.43	0.08	0.18	1.00	0.50	5.58	2.20	1.03	0.00	0.00	**13.58**		**13.58**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.05	0.00	0.00		**0.49**	4%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.57	0.00	0.00	0.00			92%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.00	0.00	0.00		**0.66**	5%	recharge	
1936			0.33	0.92	0.28	1.24	0.46	6.23	4.05	7.15	3.56	0.75	0.27	0.00	**25.24**		**25.24**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.81	1.43	0.71	0.12	0.00	0.00		**3.07**	12%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	2.40	1.93	0.00	0.00	0.00			59%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	2.28	1.69	3.20	0.00	0.00	0.00	0.00		**7.17**	28%	recharge	

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1937			0.60	0.00	0.00	0.00	0.00	1.68	1.95	4.79	6.32	1.08	0.16	0.00	**16.58**		**16.58**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.21	1.26	0.22	0.00	0.00		**1.71**	10%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.53	2.40	2.40	0.00	0.00	0.00			82%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	1.03	0.00	0.00	0.00		**1.21**	7%	recharge	
1938			0.03	0.12	0.00	0.12	0.09	5.54	2.90	3.42	1.85	0.73	0.01	0.00	**14.81**		**14.81**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.68	0.37	0.01	0.00	0.00		**1.65**	11%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	2.40	0.22	0.00	0.00	0.00			71%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	1.59	0.77	0.22	0.00	0.00	0.00	0.00		**2.58**	17%	recharge	
1939			0.00	0.35	5.30	0.44	0.71	0.68	2.49	4.22	0.31	2.72	0.21	0.00	**17.43**		**17.43**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.06	0.00	0.00	0.00		**0.39**	2%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	2.40	0.00	0.00	0.00	0.00			98%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1940			0.00	0.00	0.22	1.55	0.69	6.81	1.29	3.62	5.65	5.00	0.73	0.02	**25.58**		**25.58**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.65	1.13	1.00	0.10	0.00		**3.14**	12%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.14	2.40	2.40	1.70	0.00	0.00			74%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	2.86	0.00	0.19	0.49	0.00	0.00	0.00		**3.54**	14%	recharge	
1941			0.10	0.95	0.05	3.22	0.81	3.04	1.40	2.58	2.04	1.70	0.02	0.00	**15.91**		**15.91**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.29	0.24	0.00	0.00	0.00		**0.70**	4%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.49	1.34	1.40	0.00	0.00	0.00	0.00			96%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1942			0.00	0.00	0.00	0.46	0.13	1.56	5.85	1.95	2.79	2.43	0.00	0.08	**15.25**		**15.25**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.43	0.12	0.00	0.00		**0.94**	6%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.01	2.40	1.83	0.59	0.00	0.00	0.00			81%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	1.91	0.00	0.00	0.00	0.00	0.00		**1.91**	12%	recharge	
1943			0.00	0.30	0.00	0.61	0.00	4.99	1.67	8.11	1.40	1.11	0.45	0.08	**18.72**		**18.72**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.33	1.62	0.28	0.00	0.00	0.00		**2.24**	12%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	2.40	0.00	0.00	0.00	0.00			61%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	1.04	0.00	3.97	0.00	0.00	0.00	0.00		**5.01**	27%	recharge	
1944			0.00	0.01	0.05	0.00	5.43	0.89	0.79	1.73	5.23	0.55	0.03	0.05	**14.76**		**14.76**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.18	0.11	0.14	0.08	0.06	0.00	0.00		**0.58**	4%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	2.40	1.74	0.98	0.19	1.39	0.00	0.00	0.00			92%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.63**	4%	recharge	
1945			0.10	1.80	0.05	0.14	0.25	5.91	0.96	1.01	2.18	0.50	0.04	0.00	**12.94**		**12.94**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.15	0.05	0.00	0.00	0.00		**0.40**	3%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	1.81	0.30	0.00	0.00	0.00	0.00			82%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	1.96	0.00	0.00	0.00	0.00	0.00	0.00		**1.96**	15%	recharge	
1946			0.83	0.05	0.14	1.45	3.30	1.91	0.46	0.32	0.42	0.40	0.01	0.00	**9.29**		**9.29**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.14	0.05	0.00	0.00	0.00	0.00	0.00		**0.20**	2%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.90	1.26	0.17	0.00	0.00	0.00	0.00	0.00			98%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1947			0.00	0.36	0.13	0.46	0.66	2.79	0.07	1.96	2.32	0.21	0.06	0.20	**9.22**		**9.22**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00		**0.01**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.24	0.00	0.00	0.00	0.00	0.00	0.00			100%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1948			0.00	0.00	0.22	1.10	0.00	2.56	4.33	2.24	1.39	0.11	0.41	0.00	**12.36**		**12.36**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.45	0.25	0.00	0.00	0.00		**1.06**	9%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.01	2.40	2.12	0.00	0.00	0.00	0.00			83%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	1.03	0.00	0.00	0.00	0.00	0.00		**1.03**	8%	recharge	
1949			0.00	0.00	0.00	0.77	1.09	2.42	2.74	1.19	1.68	0.48	0.01	0.00	**10.38**		**10.38**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.10	0.00	0.00	0.00		**0.51**	5%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.87	2.06	0.73	0.00	0.00	0.00	0.00			95%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1950			0.10	0.00	0.22	0.00	0.41	0.34	4.00	1.39	1.12	3.57	0.27	0.00	**11.42**		**11.42**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.12	0.00	0.00	0.00		**0.40**	3%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	1.27	0.00	0.00	0.00	0.00			96%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00		**0.05**	0%	recharge	
1951			0.44	1.34	0.01	1.09	0.82	7.19	5.05	0.95	8.40	1.62	0.00	0.00	**26.91**		**26.91**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	1.01	0.19	0.58	0.32	0.00	0.00		**2.11**	8%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	0.83	2.40	0.00	0.00	0.00			63%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	3.24	2.49	0.00	2.22	0.00	0.00	0.00		**7.95**	30%	recharge	
1952			1.24	0.00	0.00	0.00	2.85	3.13	1.04	1.05	2.28	1.24	0.49	0.01	**13.33**		**13.33**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.12	0.18	0.13	0.01	0.00	0.00	0.00		**0.44**	3%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.45	2.03	1.52	0.05	0.00	0.00	0.00	0.00			97%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1953			0.04	0.01	0.00	0.00	1.14	0.18	4.89	2.49	6.45	0.16	0.18	0.05	**15.59**		**15.59**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.27	0.03	0.00	0.00		**1.80**	12%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.37	2.40	0.00	0.00	0.00			75%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.00	1.12	0.00	0.00	0.00		**2.06**	13%	recharge	
1954			1.42	0.03	0.13	0.00	0.68	0.75	3.85	1.23	0.68	0.52	1.95	0.00	**11.24**		**11.24**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.06	0.00	0.00	0.00		**0.29**	3%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.30	1.01	0.00	0.00	0.00	0.00			97%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1955			0.82	1.90	0.00	0.00	1.14	1.77	1.70	1.75	0.00	2.36	0.45	0.00	**11.89**		**11.89**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.00	0.00	0.00	0.00		**0.09**	1%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.37	0.00	0.00	0.00	0.00	0.00			99%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1956			0.65	0.00	0.00	0.07	0.00	0.40	7.05	0.78	1.57	1.09	2.60	0.28	**14.49**		**14.49**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.09	0.00	0.00	0.00		**0.24**	2%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.66	0.00	0.00	0.00	0.00			77%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	3.10	0.00	0.00	0.00	0.00	0.00		**3.10**	21%	recharge	
1957			0.01	0.65	0.44	2.17	0.84	1.34	0.72	5.23	6.55	4.90	0.60	0.09	**23.54**		**23.54**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.31	0.98	0.08	0.00		**2.37**	10%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	1.60	0.00	0.00			83%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	1.21	0.00	0.00	0.00		**1.52**	6%	recharge	

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Cont.

1958			1.40	0.81	0.30	0.00	0.80	0.09	1.12	5.61	0.00	0.17	0.14	0.00	**10.44**		**10.44**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.00	0.00	0.00	0.00			93%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.00		**0.69**	7%	recharge	
1959			0.03	0.16	0.34	0.50	0.13	2.93	2.97	4.10	0.45	1.95	0.49	0.00	**14.05**		**14.05**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.82	0.09	0.00	0.00	0.00		**1.25**	9%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.38	2.40	2.40	0.00	0.00	0.00	0.00			85%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.76	0.00	0.00	0.00	0.00		**0.82**	6%	recharge	
1960			0.17	0.03	1.59	0.16	1.67	0.07	1.09	0.16	2.28	0.00	0.02	0.00	**7.24**		**7.24**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			100%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1961			0.00	0.62	0.00	0.37	0.77	2.08	3.61	4.53	2.12	0.00	0.90	0.11	**15.11**		**15.11**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.91	0.42	0.00	0.00	0.00		**1.49**	10%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.53	2.40	2.40	0.49	0.00	0.00	0.00			83%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.03	1.10	0.00	0.00	0.00	0.00		**1.13**	8%	recharge	
1962			0.00	0.00	0.00	0.07	0.00	0.65	0.42	3.03	1.72	1.86	0.00	0.13	**7.88**		**7.88**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00		**0.07**	1%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51	0.00	0.00	0.00	0.00			99%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1963			0.00	0.63	2.45	1.35	1.77	0.31	2.12	1.34	3.22	0.95	0.67	0.00	**14.81**		**14.81**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00		**0.06**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.00			100%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1964			0.00	0.03	0.07	0.39	1.88	1.83	0.80	0.00	1.20	6.03	0.05	0.00	**12.28**		**12.28**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00		**0.02**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.00	0.33	0.00	0.00			100%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1965			0.36	0.13	0.00	0.00	9.03	4.31	1.35	1.40	1.16	0.05	0.07	0.22	**18.08**		**18.08**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.86	0.27	0.26	0.10	0.00	0.00	0.00		**1.49**	8%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	2.40	2.40	2.20	1.08	0.00	0.00	0.00	0.00			58%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	4.23	1.90	0.00	0.00	0.00	0.00	0.00	0.00		**6.13**	34%	recharge	
1966			0.39	0.19	0.20	0.46	0.83	7.00	1.42	0.00	1.03	3.54	0.48	0.06	**15.60**		**15.60**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.00	0.00	0.00		**0.28**	2%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.27	0.00	0.00	0.00	0.00	0.00			79%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	3.05	0.00	0.00	0.00	0.00	0.00	0.00		**3.05**	20%	recharge	
1967			0.34	0.49	0.00	0.00	3.65	4.23	0.58	0.73	2.19	0.85	0.28	0.03	**13.37**		**13.37**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.44	0.12	0.09	0.00	0.00	0.00	0.00		**0.64**	5%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	1.25	2.40	1.43	0.00	0.00	0.00	0.00	0.00			87%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	1.09	0.00	0.00	0.00	0.00	0.00	0.00		**1.09**	8%	recharge	
1968			1.88	0.06	0.00	0.05	0.72	1.66	8.30	5.67	1.96	0.10	0.43	0.12	**20.95**		**20.95**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.08	1.13	0.39	0.00	0.00	0.00		**1.60**	8%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.11	2.40	2.40	0.33	0.00	0.00	0.00			62%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	4.38	2.02	0.00	0.00	0.00	0.00		**6.40**	31%	recharge	
1969			0.01	0.00	0.20	0.02	1.85	0.26	0.85	0.96	3.95	1.18	0.00	0.03	**9.31**		**9.31**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			100%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1970			0.03	2.66	0.08	0.12	1.28	2.66	1.12	1.22	0.40	1.46	0.67	0.00	**11.70**		**11.70**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.07	0.00	0.00	0.00	0.00		**0.17**	1%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.11	0.68	0.00	0.00	0.00	0.00	0.00			99%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1971			*0.07*	*1.00*	*0.25*	*1.18*	*0.05*	*3.60*	*0.00*	*0.18*	*0.00*	*0.24*	*0.14*	*0.31*	**7.02**		**7.02**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00		**0.01**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.05	0.50	0.00	0.00	0.00	0.00	0.00			100%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1972			*0.00*	*0.04*	*0.14*	*1.87*	*2.60*	*2.55*	*1.70*	*3.13*	*5.24*	*0.29*	*0.09*	*0.00*	**17.65**		**17.65**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.04	0.17	0.35	0.86	0.06	0.00	0.00		**1.48**	8%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.20	1.20	1.35	1.96	2.40	0.00	0.00	0.00			92%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1973			*0.00*	*0.09*	*0.00*	*0.05*	*1.69*	*0.11*	*4.29*	*0.07*	*1.24*	*0.24*	*0.16*	*0.00*	**7.94**		**7.94**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00		**0.01**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.00	0.00	0.00	0.00	0.00			96%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.00	0.00	0.00		**0.34**	4%	recharge	
1974			*1.28*	*0.13*	*0.31*	*2.32*	*0.39*	*1.24*	*0.40*	*1.02*	*3.40*	*1.58*	*0.11*	*0.12*	**12.30**		**12.30**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			100%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1975			*0.09*	*0.00*	*0.18*	*0.07*	*2.15*	*0.63*	*0.07*	*5.47*	*1.81*	*1.85*	*0.06*	*0.00*	**12.38**		**12.38**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.03	0.00	0.00		**0.39**	3%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.18	0.00	0.00	0.00			92%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.00	0.00		**0.55**	4%	recharge	
1976			*0.61*	*0.00*	*2.85*	*0.24*	*1.02*	*0.76*	*3.10*	*0.35*	*0.85*	*0.19*	*1.15*	*0.00*	**11.12**		**11.12**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00		**0.05**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.55	0.00	0.00	0.00	0.00	0.00			100%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1977			*0.00*	*1.18*	*0.00*	*0.88*	*0.25*	*1.90*	*7.79*	*5.38*	*5.45*	*1.48*	*0.53*	*0.00*	**24.84**		**24.84**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.22	1.08	1.09	0.30	0.00	0.00		**2.69**	11%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.35	2.40	2.40	2.40	0.00	0.00	0.00			65%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	3.96	1.78	0.33	0.00	0.00	0.00		**6.08**	24%	recharge	
1978			*0.00*	*0.01*	*0.16*	*0.06*	*3.05*	*4.45*	*3.99*	*1.95*	*4.88*	*0.03*	*0.19*	*0.00*	**18.77**		**18.77**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.24	0.80	0.39	0.74	0.01	0.00	0.00		**2.18**	12%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.65	2.40	2.40	1.83	2.40	0.00	0.00	0.00			75%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.91	1.64	0.00	0.00	0.00	0.00	0.00		**2.55**	14%	recharge	

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1979			*0.00*	*0.16*	*0.04*	*0.82*	*0.26*	*0.69*	*11.82*	*8.82*	*3.72*	*1.87*	*0.80*	*0.00*	**29.00**		**29.00**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.76	0.74	0.33	0.00	0.00		**2.83**	10%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	2.09	0.00	0.00	0.00			47%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	7.87	4.54	0.00	0.00	0.00	0.00		**12.41**	43%	recharge	
1980			*0.55*	*0.00*	*0.00*	*0.28*	*0.00*	*0.54*	*0.91*	*2.64*	*4.22*	*0.80*	*0.10*	*0.00*	**10.04**		**10.04**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.02	0.00	0.00		**0.06**	1%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.31	0.00	0.00	0.00			99%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1981			*0.05*	*0.03*	*0.31*	*0.19*	*1.35*	*0.03*	*5.04*	*2.15*	*4.30*	*0.82*	*0.12*	*0.00*	**14.39**		**14.39**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.73	0.16	0.00	0.00		**1.31**	9%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.03	2.30	0.00	0.00	0.00			83%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	1.09	0.00	0.00	0.00	0.00	0.00		**1.09**	8%	recharge	
1982			*0.33*	*0.56*	*0.37*	*0.13*	*4.42*	*3.44*	*2.23*	*4.82*	*9.78*	*2.23*	*0.19*	*0.00*	**28.50**		**28.50**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.58	0.45	0.96	1.96	0.45	0.00	0.00		**4.39**	15%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	2.02	2.40	2.40	2.40	2.40	0.00	0.00	0.00			63%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.93	0.23	1.34	3.79	0.00	0.00	0.00		**6.29**	22%	recharge	
1983			*0.01*	*4.05*	*0.68*	*1.16*	*2.45*	*3.20*	*0.12*	*0.00*	*0.04*	*0.24*	*0.00*	*0.55*	**12.50**		**12.50**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00		**0.03**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.05	1.70	0.27	0.00	0.00	0.00	0.00	0.00			100%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1984			*1.51*	*2.29*	*0.67*	*0.18*	*1.43*	*4.25*	***0.26***	*1.59*	*1.46*	*0.27*	*0.04*	*0.09*	**14.04**		**14.04**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.15	0.02	0.00	0.00	0.00		**0.22**	2%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	1.11	0.18	0.00	0.00	0.00	0.00			96%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00		**0.30**	2%	recharge	
1985			*1.74*	*0.01*	*0.33*	*0.69*	*4.53*	*1.76*	*0.75*	*3.53*	*3.47*	*0.28*	*0.01*	*0.00*	**17.10**		**17.10**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.31	0.15	0.45	0.69	0.04	0.00	0.00		**1.65**	10%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	2.13	2.34	1.54	2.40	1.84	0.00	0.00	0.00			90%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1986			*0.35*	*0.06*	*1.32*	*2.12*	*0.57*	*0.72*	*1.66*	*2.55*	*2.58*	*0.31*	*0.08*	*0.01*	**12.33**		**12.33**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.00		**0.05**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.14	0.00	0.00	0.00	0.00			100%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1987			*0.00*	*0.65*	*0.48*	*3.13*	*2.48*	*1.82*	*3.49*	*1.93*	*0.00*	*2.48*	*0.36*	*0.01*	**16.83**		**16.83**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.01	0.10	0.37	0.00	0.00	0.00	0.00		**0.48**	3%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.08	0.35	2.29	1.70	0.00	0.00	0.00	0.00			97%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1988			*0.02*	*1.65*	*0.00*	*0.00*	*1.08*	*2.12*	*1.05*	*1.18*	*1.65*	*0.21*	*0.13*	*0.00*	**9.09**		**9.09**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.00	0.00	0.00	0.00		**0.06**	1%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.07	0.00	0.00	0.00	0.00	0.00			99%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1989			*0.00*	*0.00*	*0.17*	*0.36*	*0.03*	*0.29*	*3.06*	*1.78*	*0.70*	*0.99*	*0.23*	*0.22*	**7.83**		**7.83**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.04	0.00	0.00	0.00		**0.27**	3%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.51	0.77	0.00	0.00	0.00	0.00			97%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1990			*0.11*	*0.18*	*0.62*	*0.04*	*0.56*	*1.30*	*1.35*	*2.23*	*12.18*	*0.05*	*0.00*	*0.00*	**18.62**		**18.62**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00		**0.01**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.00	0.00	0.00			69%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.75	0.00	0.00	0.00		**5.75**	31%	recharge	
1991			*0.62*	*0.00*	*0.35*	*0.58*	*0.30*	*2.83*	*3.24*	*5.05*	*4.94*	*0.68*	*0.23*	*0.01*	**18.83**		**18.83**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.35	1.01	0.99	0.14	0.00	0.00		**2.48**	13%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.28	2.40	2.40	2.40	0.00	0.00	0.00			78%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.22	1.52	0.00	0.00	0.00	0.00		**1.74**	9%	recharge	
1992			*0.75*	*2.05*	*0.01*	*0.24*	*0.06*	*4.04*	*18.61*	*6.51*	*1.53*	*0.00*	*0.12*	*0.00*	**33.92**		**33.92**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	3.72	1.30	0.31	0.00	0.00	0.00		**5.33**	16%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	2.40	0.00	0.00	0.00	0.00			37%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.09	13.34	2.69	0.00	0.00	0.00	0.00		**16.12**	48%	recharge	
1993			*0.00*	*0.00*	*0.00*	*0.30*	*1.49*	*1.16*	*1.70*	*4.14*	*3.14*	*1.35*	*0.00*	*0.00*	**13.28**		**13.28**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.46	0.10	0.00	0.00		**0.61**	5%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	1.77	0.88	0.00	0.00	0.00			95%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1994			*0.00*	*1.22*	*0.00*	*0.19*	*0.68*	*0.97*	*10.12*	*3.28*	*6.63*	*1.26*	*1.10*	*0.48*	**25.93**		**25.93**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	1.33	0.25	0.00	0.00		**2.23**	9%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	2.40	0.00	0.00	0.00			62%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	6.17	0.10	1.27	0.00	0.00	0.00		**7.55**	29%	recharge	
1995			*0.06*	*0.64*	*0.28*	*0.00*	*0.08*	*0.57*	*1.54*	*3.20*	*2.76*	*0.53*	*0.07*	*0.00*	**9.73**		**9.73**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.00		**0.16**	2%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.00			98%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1996			*0.00*	*0.07*	*0.03*	*1.56*	*0.92*	*1.07*	*4.33*	*1.53*	*0.02*	*0.22*	*0.00*	***0.11***	**9.86**		**9.86**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	0.00		**0.31**	3%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	1.41	0.00	0.00	0.00	0.00			93%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00		**0.38**	4%	recharge	
1997			*0.10*	*0.07*	*1.93*	*0.16*	*1.74*	*4.21*	*1.60*	*10.37*	*4.40*	*2.35*	*1.17*	*0.02*	**28.12**		**28.12**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.32	2.07	0.88	0.47	0.00	0.00		**3.74**	13%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	2.40	2.40	0.00	0.00	0.00			65%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.26	0.00	5.78	0.00	0.00	0.00	0.00		**6.04**	21%	recharge	
1998			*0.10*	*0.20*	*0.20*	*0.03*	*1.17*	*1.42*	*1.66*	*0.83*	*0.62*	*3.31*	*0.01*	*0.46*	**10.01**		**10.01**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00		**0.01**	0%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00			100%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	
1999			*0.12*	*0.01*	*0.14*	*0.00*	*0.01*	*0.21*	*0.75*	*4.20*	*1.47*	*0.46*	*0.01*	*0.21*	**7.59**		**7.59**		
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00		**0.21**	3%	runoff	
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.68	0.00	0.00	0.00	0.00			97%	ET bal	
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge	

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Cont.

2000			*0.00*	*0.13*	*0.30*	*0.65*	*0.39*	*0.04*	2.49	3.28	1.36	0.97	0.01	0.00	**9.62**		**9.62**			
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.19	0.00	0.00	0.00		**0.45**	5%	runoff		
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	1.70	0.00	0.00	0.00	0.00			95%	ET bal		
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge		
2001			0.12	0	0.24	0	1.11	1.02	0.4	0.12	1.12	0.39	0	0	**4.52**		**4.52**			
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	runoff		
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			100%	ET bal		
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge		
2002			0.19	0	1.16	0.03	1.04	1.86	0.18	4.09	2.2	1.55	0.91	0	**13.21**		**13.21**			
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00		**0.29**	2%	runoff		
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.00	1.57	0.00	0.00	0.00	0.00			98%	ET bal		
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge		
2003			1.93	1.49	0.38	0	0.55	1.26	0.68	4.45	0.66	1.34	0	0	**12.74**		**12.74**			
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00		**0.11**	1%	runoff		
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.93	0.00	0.00	0.00	0.00			99%	ET bal		
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge		
2004			0.14	0.01	0	8.59	1.08	4.74	5.17	4.89	1.6	0.58	0.04	0	**26.84**		**26.84**			
	Runoff		0.00	0.00	0.00	0.00	0.22	0.43	1.03	0.98	0.32	0.00	0.00	0.00		**2.97**	11%	runoff		
	Soil Mo.	0.00	0.00	0.00	0.00	2.40	1.08	2.40	2.40	2.40	0.00	0.00	0.00	0.00			62%	ET bal		
	Recharge		0.00	0.00	0.00	1.85	0.00	1.44	2.59	1.39	0.00	0.00	0.00	0.00		**7.27**	27%	recharge		
2005			0.47	2.53	0.01	0.62	0.11	0	0.99	1.3	0	2.25	0.22	0.16	**8.66**		**8.66**			
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	runoff		
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			100%	ET bal		
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge		
2006			0.52	0.03	0.07	0.36	0.17	1.19	0.75	3.08	0.22	0.77	0.04	0	**7.20**		**7.20**			
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00		**0.01**	0%	runoff		
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.00	0.00	0.00	0.00			100%	ET bal		
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge		
2007			0.18	0	0	0.17	0.32	2.68	7.29	2.45	0.38	0	0.22	0	**13.69**		**13.69**			
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.49	0.07	0.00	0.00	0.00		**1.25**	9%	runoff		
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.13	2.40	2.33	0.00	0.00	0.00	0.00			63%	ET bal		
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	3.78	0.00	0.00	0.00	0.00	0.00		**3.78**	28%	recharge		
2008			0	1.35	0	0	1.8	6.2	0.2	3.7	0.09	0.24	0	0.03	**13.61**		**13.61**			
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.32	0.02	0.00	0.00	0.00		**0.38**	3%	runoff		
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	1.05	2.23	0.00	0.00	0.00	0.00			81%	ET bal		
	Recharge		0.00	0.00	0.00	0.00	0.00	2.25	0.00	0.00	0.00	0.00	0.00	0.00		**2.25**	17%	recharge		
2009			0	0	0.03	0.03	0.7	4.86	6.6	5.13	1.37	2.35	0	0	**21.07**		**21.07**			
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	1.32	1.03	0.27	0.00	0.00	0.00		**2.62**	12%	runoff		
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	2.40	2.40	0.00	0.00	0.00	0.00			58%	ET bal		
	Recharge		0.00	0.00	0.00	0.00	0.00	0.91	3.73	1.58	0.00	0.00	0.00	0.00		**6.22**	30%	recharge		
2010			0.07	0	0.08	3.22	1.19	8.22	0.24	4.93	1.64	0.39	0.72	0	**20.70**		**20.70**			
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.45	0.33	0.00	0.00	0.00		**0.82**	4%	runoff		
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	2.40	1.09	2.40	0.01	0.00	0.00	0.00			72%	ET bal		
	Recharge		0.00	0.00	0.00	0.00	0.00	4.27	0.00	0.65	0.00	0.00	0.00	0.00		**4.92**	24%	recharge		
2011			0.22	1.28	0.22	0.64	3.39	1.62	0.73	2.01	2.88	2.85	0	0	**15.84**		**15.84**			
	Runoff		0.00	0.00	0.00	0.00	0.00	0.13	0.06	0.04	0.00	0.00	0.00	0.00		**0.24**	2%	runoff		
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.99	1.06	0.24	0.00	0.00	0.00	0.00	0.00			98%	ET bal		
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge		
2012			0.39	0.67	0.59	0.37	0.59	2.74	2.28	1.52	1.78	0	0	0	**10.93**		**10.93**			
	Runoff		0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.24	0.14	0.00	0.00	0.00		**0.61**	6%	runoff		
	Soil Mo.	0.00	0.00	0.00	0.00	0.00	0.00	1.19	1.92	0.92	0.00	0.00	0.00	0.00			94%	ET bal		
	Recharge		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		**0.00**	0%	recharge		

0 RF data missing (calculations underestimate total)

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RECHARGE CALCULATIONS: Annual Recharge, Aquifer Storage, and Groundwater Use

SM capacity	**2.40**	inches		input variables
runoff coeff.	**0.20**	%	**20.00**	**%**
storage DG	**0.05**		**5.00**	percent effective porosity
DG aq area	**1462.00**	acres		
storage frx	**0.0005**		**0.05**	percent effective porosity (500 ft deep)
WS aq area	**1462.00**	acres		
DG sat_depth	**30.00**	feet		
Eff. capacity	**1279.25**	Available Ac-ft (50% allowed)		
pumping rate	**173.00**	Ac-ft/yr	**107**	in gpm (24 hr/day)
			154,434	gallons per day

14.58	Avg Rainfall, inches	
1777	Avg Rainfall, Acft	
9.7%	Pumping, as % of rainfall	

lowest remaining aquifer vol	**4**	Ac-ft	In 1976...(based on 50% of total)	
1945 to 2007	**1283**	of total	**50%**	percent
average aquifer volume	**2092**	Acft	**81.8%**	avg percent

DG storage	**2193**	total, Acft	**1097**	"allowed per SD Co DPLU"
Rock storage	**366**	total, Acft	**183**	"allowed per SD Co DPLU"
	2559	total	**1279**	50% of total capacity (cap)

Initial Aquifer Volume at beginning of calc. period **1279** full (calculations based on 50% of total aquifer volume)

Recharge Rate	**8.74%**	as % of RF
1945 to 2012	**230**	AcFt/yr

		Annual Recharge			Net	Start aquifer volume	End aquifer volume	Net Recharge to Aquifer (water rejected if aquifer is a maximum volume)		
		inches	pct of RF	Acft	-pump'g		(w/pumping)	In	Rej'd	Rej'd
YEAR	RF					Acft	Acft	Acft	Acft	pct
1901	17.44	1.59	9.1%	193.23	20.23	1279.25	1279.25	173.00	20.23	10%
1902	20.00	1.06	5.3%	129.70	-43.30	1279.25	1235.95	129.70	0.00	0%
1903	8.79	0.00	0.0%	0.00	-173.00	1235.95	1062.95	0.00	0.00	0%
1904	31.61	9.04	28.6%	1101.47	928.47	1062.95	1279.25	389.30	712.18	65%
1905	27.07	6.12	22.6%	745.96	572.96	1279.25	1279.25	173.00	572.96	77%
1906	25.42	6.18	24.3%	752.62	579.62	1279.25	1279.25	173.00	579.62	77%
1907	15.57	1.66	10.7%	202.24	29.24	1279.25	1279.25	173.00	29.24	14%
1908	22.87	6.37	27.8%	775.81	602.81	1279.25	1279.25	173.00	602.81	78%

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1909	**17.42**	4.80	27.6%	584.75	411.75	1279.25	1279.25	173.00	411.75	70%
1910	**20.44**	2.74	13.4%	333.82	160.82	1279.25	1279.25	173.00	160.82	48%
1911	**19.07**	4.24	22.2%	516.57	343.57	1279.25	1279.25	173.00	343.57	67%
1912	**12.83**	1.02	8.0%	124.64	-48.36	1279.25	1230.89	124.64	0.00	0%
1913	**20.02**	2.64	13.2%	321.15	148.15	1230.89	1279.25	221.36	99.79	31%
1914	**23.23**	4.63	19.9%	564.58	391.58	1279.25	1279.25	173.00	391.58	69%
1915	**30.79**	15.19	49.3%	1850.51	1677.51	1279.25	1279.25	173.00	1677.51	91%
1916	**16.52**	1.36	8.2%	165.55	-7.45	1279.25	1271.80	165.55	0.00	0%
1917	**13.66**	1.22	9.0%	149.10	-23.90	1271.80	1247.90	149.10	0.00	0%
1918	**16.56**	0.00	0.0%	0.00	-173.00	1247.90	1074.90	0.00	0.00	0%
1919	**22.98**	3.57	15.5%	434.77	261.77	1074.90	1279.25	377.35	57.42	13%
1920	**10.17**	0.00	0.0%	0.00	-173.00	1279.25	1106.25	0.00	0.00	0%
1921	**33.41**	10.30	30.8%	1255.13	1082.13	1106.25	1279.25	346.00	909.13	72%
1922	**21.36**	0.00	0.0%	0.00	-173.00	1279.25	1106.25	0.00	0.00	0%
1923	**15.71**	0.00	0.0%	0.00	-173.00	1106.25	933.25	0.00	0.00	0%
1924	**12.51**	0.00	0.0%	0.00	-173.00	933.25	760.25	0.00	0.00	0%
1925	**19.31**	0.82	4.2%	99.90	-73.10	760.25	687.15	99.90	0.00	0%
1926	**30.42**	11.56	38.0%	1407.94	1234.94	687.15	1279.25	765.10	642.84	46%
1927	**12.35**	0.05	0.4%	6.09	-166.91	1279.25	1112.34	6.09	0.00	0%
1928	**16.45**	0.90	5.5%	109.71	-63.29	1112.34	1049.05	109.71	0.00	0%
1929	**22.75**	4.31	18.9%	525.10	352.10	1049.05	1279.25	403.20	121.90	23%
1930	**17.36**	1.77	10.2%	216.13	43.13	1279.25	1279.25	173.00	43.13	20%
1931	**26.20**	9.86	37.6%	1201.55	1028.55	1279.25	1279.25	173.00	1028.55	86%
1932	**18.17**	6.37	35.1%	776.08	603.08	1279.25	1279.25	173.00	603.08	78%
1933	**6.49**	0.00	0.0%	0.00	-173.00	1279.25	1106.25	0.00	0.00	0%
1934	**22.30**	3.12	14.0%	380.20	207.20	1106.25	1279.25	346.00	34.20	9%
1935	**13.58**	0.66	4.9%	80.41	-92.59	1279.25	1186.66	80.41	0.00	0%
1936	**25.24**	7.17	28.4%	873.55	700.55	1186.66	1279.25	265.59	607.96	70%
1937	**16.58**	1.21	7.3%	147.96	-25.04	1279.25	1254.21	147.96	0.00	0%
1938	**14.81**	2.58	17.4%	313.84	140.84	1254.21	1279.25	198.04	115.80	37%
1939	**17.43**	0.00	0.0%	0.00	-173.00	1279.25	1106.25	0.00	0.00	0%
1940	**25.58**	3.54	13.9%	431.83	258.83	1106.25	1279.25	346.00	85.83	20%
1941	**15.91**	0.00	0.0%	0.00	-173.00	1279.25	1106.25	0.00	0.00	0%
1942	**15.25**	1.91	12.5%	232.11	59.11	1106.25	1165.36	232.11	0.00	0%
1943	**18.72**	5.01	26.8%	610.14	437.14	1165.36	1279.25	286.89	323.25	53%
1944	**14.76**	0.63	4.3%	76.76	-96.25	1279.25	1183.01	76.75	0.00	0%
1945	**12.94**	1.96	15.1%	238.79	65.79	1183.01	1248.80	238.79	0.00	0%
1946	**9.29**	0.00	0.0%	0.00	-173.00	1248.80	1075.80	0.00	0.00	0%
1947	**9.22**	0.00	0.0%	0.00	-173.00	1075.80	902.80	0.00	0.00	0%
1948	**12.36**	1.03	8.3%	124.95	-48.05	902.80	854.75	124.95	0.00	0%
1949	**10.38**	0.00	0.0%	0.00	-173.00	854.75	681.75	0.00	0.00	0%
1950	**11.42**	0.05	0.4%	6.09	-166.91	681.75	514.84	6.09	0.00	0%
1951	**26.91**	7.95	29.5%	968.45	795.45	514.84	1279.25	937.41	31.04	3%
1952	**13.33**	0.00	0.0%	0.00	-173.00	1279.25	1106.25	0.00	0.00	0%
1953	**15.59**	2.06	13.2%	250.50	77.50	1106.25	1183.75	250.50	0.00	0%
1954	**11.24**	0.00	0.0%	0.00	-173.00	1183.75	1010.75	0.00	0.00	0%
1955	**11.89**	0.00	0.0%	0.00	-173.00	1010.75	837.75	0.00	0.00	0%
1956	**14.49**	3.10	21.4%	377.68	204.68	837.75	1042.44	377.68	0.00	0%
1957	**23.54**	1.52	6.5%	185.19	12.19	1042.44	1054.62	185.19	0.00	0%
1958	**10.44**	0.69	6.6%	84.07	-88.94	1054.62	965.69	84.07	0.00	0%
1959	**14.05**	0.82	5.8%	99.71	-73.29	965.69	892.40	99.71	0.00	0%

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1960	**7.24**	0.00	0.0%	0.00	-173.00	892.40	719.40	0.00	0.00	0%
1961	**15.11**	1.13	7.5%	138.23	-34.77	719.40	684.63	138.23	0.00	0%
1962	**7.88**	0.00	0.0%	0.00	-173.00	684.63	511.63	0.00	0.00	0%
1963	**14.81**	0.00	0.0%	0.00	-173.00	511.63	338.63	0.00	0.00	0%
1964	**12.28**	0.00	0.0%	0.00	-173.00	338.63	165.63	0.00	0.00	0%
1965	**18.08**	6.13	33.9%	746.59	573.59	165.63	739.23	746.59	0.00	0%
1966	**15.60**	3.05	19.6%	371.59	198.59	739.23	937.82	371.59	0.00	0%
1967	**13.37**	1.09	8.1%	132.72	-40.28	937.82	897.54	132.72	0.00	0%
1968	**20.95**	6.40	30.5%	779.72	606.72	897.54	1279.25	554.71	225.01	29%
1969	**9.31**	0.00	0.0%	0.00	-173.00	1279.25	1106.25	0.00	0.00	0%
1970	**11.70**	0.00	0.0%	0.00	-173.00	1106.25	933.25	0.00	0.00	0%
1971	**7.02**	0.00	0.0%	0.00	-173.00	933.25	760.25	0.00	0.00	0%
1972	**17.65**	0.00	0.0%	0.00	-173.00	760.25	587.25	0.00	0.00	0%
1973	**7.94**	0.34	4.3%	41.42	-131.58	587.25	455.67	41.42	0.00	0%
1974	**12.30**	0.00	0.0%	0.00	-173.00	455.67	282.67	0.00	0.00	0%
1975	**12.38**	0.55	4.4%	67.01	-105.99	282.67	176.68	67.01	0.00	0%
1976	**11.12**	0.00	0.0%	0.00	-173.00	176.68	3.68	0.00	0.00	0%
1977	**24.84**	6.08	24.5%	740.17	567.17	3.68	570.86	740.17	0.00	0%
1978	**18.77**	2.55	13.6%	310.79	137.79	570.86	708.65	310.79	0.00	0%
1979	**29.00**	12.41	42.8%	1511.46	1338.46	708.65	1279.25	743.60	767.86	51%
1980	**10.04**	0.00	0.0%	0.00	-173.00	1279.25	1106.25	0.00	0.00	0%
1981	**14.39**	1.09	7.6%	132.80	-40.20	1106.25	1066.05	132.80	0.00	0%
1982	**28.50**	6.29	22.1%	766.93	593.93	1066.05	1279.25	386.20	380.73	50%
1983	**12.50**	0.00	0.0%	0.00	-173.00	1279.25	1106.25	0.00	0.00	0%
1984	**14.04**	0.30	2.1%	36.55	-136.45	1106.25	969.80	36.55	0.00	0%
1985	**17.10**	0.00	0.0%	0.00	-173.00	969.80	796.80	0.00	0.00	0%
1986	**12.33**	0.00	0.0%	0.00	-173.00	796.80	623.80	0.00	0.00	0%
1987	**16.83**	0.00	0.0%	0.00	-173.00	623.80	450.80	0.00	0.00	0%
1988	**9.09**	0.00	0.0%	0.00	-173.00	450.80	277.80	0.00	0.00	0%
1989	**7.83**	0.00	0.0%	0.00	-173.00	277.80	104.80	0.00	0.00	0%
1990	**18.62**	5.75	30.9%	700.54	527.54	104.80	632.34	700.54	0.00	0%
1991	**18.83**	1.74	9.3%	212.53	39.53	632.34	671.87	212.53	0.00	0%
1992	**33.92**	16.12	47.5%	1963.47	1790.47	671.87	1279.25	780.38	1183.08	60%
1993	**13.28**	0.00	0.0%	0.00	-173.00	1279.25	1106.25	0.00	0.00	0%
1994	**25.93**	7.55	29.1%	919.60	746.60	1106.25	1279.25	346.00	573.60	62%
1995	**9.73**	0.00	0.0%	0.00	-173.00	1279.25	1106.25	0.00	0.00	0%
1996	**9.86**	0.38	3.9%	46.30	-126.70	1106.25	979.55	46.30	0.00	0%
1997	**28.12**	6.04	21.5%	735.39	562.39	979.55	1279.25	472.70	262.68	36%
1998	**10.01**	0.00	0.0%	0.00	-173.00	1279.25	1106.25	0.00	0.00	0%
1999	**7.59**	0.00	0.0%	0.00	-173.00	1106.25	933.25	0.00	0.00	0%
2000	**9.62**	0.00	0.0%	0.00	-173.00	933.25	760.25	0.00	0.00	0%
2001	**4.52**	0.00	0.0%	0.00	-173.00	760.25	587.25	0.00	0.00	0%
2002	**13.21**	0.00	0.0%	0.00	-173.00	587.25	414.25	0.00	0.00	0%
2003	**12.74**	0.00	0.0%	0.00	-173.00	414.25	241.25	0.00	0.00	0%
2004	**26.84**	7.27	27.1%	885.90	712.90	241.25	954.15	885.90	0.00	0%
2005	**8.66**	0.00	0.0%	0.00	-173.00	954.15	781.15	0.00	0.00	0%
2006	**7.20**	0.00	0.0%	0.00	-173.00	781.15	608.15	0.00	0.00	0%
2007	**13.69**	3.78	27.6%	460.96	287.96	608.15	896.11	460.96	0.00	0%
2008	**13.61**	2.25	16.5%	274.13	101.13	896.11	997.23	274.13	0.00	0%
2009	**21.07**	6.22	29.5%	758.29	585.29	997.23	1279.25	455.02	303.27	40%
2010	**20.70**	4.92	23.8%	599.69	426.69	1279.25	1279.25	173.00	426.69	71%
2011	**15.84**	0.00	0.0%	0.00	-173.00	1279.25	1106.25	0.00	0.00	0%
2012	**10.93**	0.00	0.0%	0.00	-173.00	1106.25	933.25	0.00	0.00	0%

O7-8
Cont.

Attachment 3.
Supplemental Well and Test Logs, Wells MW-21A and HG-60

Existing wells HG-21A and HG-31 were initially installed as unlined test wells for the formerly-proposed Campo Landfill. They were prepared for water production by overdrilling followed by the installation of casing (PVC SDR 17) and a pea gravel filter packing within the well annulus.

HG-21A has a total depth of 480 feet, with an estimated yield of 60 gpm (1-hour air lift test).

HG-31 has a total depth of 360 feet, with an estimated yield of 100 gpm (1-hour air lift test). HG-31 is nearby to well HG-60. As described in AECOM (2012). HG-60 has a reported well capacity of 25 gpm. These wells may be used together.

The well logs, and the exact well locations within the Reservation, are confidential. While not applicable to the Campo Reservation, confidentiality of drillers logs is consistent with State Law (California Water Code 13752),

O7-8
Cont.

Attachment 4.
Letter to JFI from Muht-Hei, Inc.

O7-8
Cont.

Muht-Hei Inc.

Jed Francis
Jed Francis, Inc.
9530 Hageman Road, Suite B-356
Bakersfield, California 93312

Re: Sales and Storage Agreement

Dear Mr. Francis:

I write in connection with the Sales and Storage Agreement ("Agreement") that is to be entered into between Muht-Hei, Inc. d/b/a Campo Materials Company ("CMC") and Jed Francis, Inc. ("JFI").

Muht-Hei ("MHI") is a corporation formed under tribal law and wholly owned by the Campo Band of Mission Indians ("the Band"). MHI's delegated authority from the General Council of the tribe includes "authority and responsibility for the management, development, and operations of the real and personal property together with all buildings and improvements thereon as set forth in Section 4" of the First Amended and Restated Articles of Incorporation ("Articles"). MHI Articles, Section 9(1).

Pursuant to this corporate authority, MHI is granting JFI the right to use water at the CMC facility pursuant to the terms and conditions set forth in the Agreement. The property on which the water source is located is trust land beneficially owned by the Band. The delegation of authority to MHI in Section 9(1) of its Articles by the General Council does not require additional Council approval.

The Agreement contains no restriction that would prohibit JFI from using the water for construction purposes for off-Reservation projects, provided JFI's use remains within the safe yields as determined by previous studies. The Band will monitor groundwater drawdowns, and the Agreement expressly reserves the right to discontinue drafts if there is evidence of excessive depletion. Drafts will remain within the sustained yield calculations for the basin drawn and will not result in a measurable effect on off-Reservation storage.

This Agreement has not been submitted to the BIA. BIA approval is unnecessary because the Agreement does not encumber tribal land, has a term of fewer than seven years, and requires no federal action that would trigger a NEPA process.

O7-8
Cont.

Sincerely,

MUHT-HEI, INC.

By: Marcus Cuero
Marcus Cuero, President

Read & Approved

Ralph Goff
Chairman
Campo Band of Mission Indians

O7-8
Cont.